

The Egyptian Journal of Surgery

The official organ of the Egyptian Society of Surgeons

Vol. (34), No. (4), October 2015

Table of contents

Original articles

- 215 **Comparative study of single-layer anastomosis in high-risk colonic anastomosis versus single layer reinforced using fibrin glue**
Basem M. Sieda, Osama Gharib
- 222 **Clopidogrel versus acetyl salicylic acid in arteriovenous fistula salvage**
Ahmad M. Tawfik, Wael Elshimy
- 226 **The value of serum carbohydrate antigen 19-9 as a predictor of resectability in pancreatic adenocarcinoma**
Ayman A. Albatanony, Alaa A. Alseesi
- 230 **Outcome of liver resection in breast cancer liver metastases**
Mostafa Abdo, Ali El Anwar
- 238 **Endovascular treatment of chronic total occlusion of the iliac artery**
Hisham Fathi, Amr Abdel Rahim, Karim Hosni, Khaled Hindawi, Omar El-Kashef, Amr Gad
- 245 **Ghrelin gastric tissue expression and wall thickness in patients submitted to laparoscopic sleeve gastrectomy as the primary weight loss procedure**
Ghada Morshed, Laila Rashed, Mohamed Hafez
- 251 **Outcome of karydakis lateral flap versus open technique in the treatment of pilonidal sinus**
Hady S. Abou Ashour, Moharram A. Abelshahid
- 258 **Bone cutting and heat cautery circumcision**
Gamal A. Makhlof, Mohamed B.M. Kootb
- 261 **Comparison between balloon dissection and conventional dissection for extrapleural approach in tracheoesophageal fistula repair**
Basem Saied, Hesham Sheir, Hosam Ghazy
- 264 **Discharging patients after colorectal surgery: a Medical Research Institute experience**
Moustafa R. Abo Elsoud, Mohamed G. Soror
- 272 **Evaluation of component separation technique in the repair of complex large ventral hernia with large defects**
Mohamed Samir, Mohamed Hany, Mohamed Ibrahim
- 276 **Duodenal injuries: how to deal with it?**
Amr Elheny, Adel M. Shehata, Abdel Fattah Saleh, Emad El Sageer
- 281 **Short Form 36 quality of life after lay open of anal fistula**
Ahmed A. Abou-Zeid, Ali El-Anwar
- 287 **Pilonidal sinus: minimal excision and primary closure under local anesthesia**
Hussein G. Elgohary, Ehab M. Oraby

Case report

- 293 **Laparoscopic cholecystectomy in a patient with situs inversus totalis: a case report on how to obtain a critical view of safety?**
Ahmed M. El-Saady

The Egyptian Journal of Surgery

*The official organ of the
Egyptian Society of Surgeons*



Wolters Kluwer
Health

Medknow

The Egyptian Journal of Surgery

*The official organ of the
Egyptian Society of Surgeons*



EGYPTIAN JOURNAL OF SURGERY

Editor-in-Chief

Adel Hosny

Co-Executive Editors

Hamed Rashad

Ahmed Hazem Helmy

Co-Editor

Mohamed Farid

Executive Editor

Abdel Moeti Hussein

ESS Board

Treasurer

Galal Abu Riah

Vice President

Abdel Moeti Hussein
Safwat Abdel Kader

President

Adel Hosny

Secretary General

Mohamed Farid

Sec. General Assist

Hemeda El Sayed

Members

Ahmed Farag El Kased
Atef Abdel Ghany
Farouk Murad
Hamed Rashad

Khaled El Feky
Mansour Kabbash
Mostafa Rezk
Nabil Gad El Hak

Nabil Shedid
Sarwat Mohamed Ali
Tarek Ibrahim
Yehia Zakaria

Reviewers

Abdalla Beshir	(Jordan)	Essam El Halaby	(Egypt)	Mohsen George	(Egypt)
Abdel Ghany El Shamy	(Egypt)	Hesham Mostafa	(Egypt)	Montasser Elkotby	(Egypt)
Abdel Raouf Shalash	(Egypt)	Hussein Saber	(Egypt)	Mostafa Al Sanadiky	(Egypt)
Abdel Wahab Ezzat	(Egypt)	Ibrahim Galal	(Egypt)	Mostafa El Shazly	(Egypt)
Ahmed Abdel Aziz	(Egypt)	Ibrahim Marwan	(Egypt)	Mostafa Soliman	(Egypt)
Ahmed Abdel Raouf	(Egypt)	Khaled Abdel Aal	(Egypt)	Nabil Gadel Hak	(Egypt)
Ahmed Al Sharkawy	(Egypt)	Khaled Amer	(Egypt)	Nabil Shedid	(Egypt)
Ahmed El Baz	(Egypt)	Khaled Gawdat	(Egypt)	Nick Wilson	(UK)
Ahmed El Labban	(Egypt)	Khaled Madbouly	(Egypt)	Omar Abdel Alim	(Egypt)
Ahmed Farag	(Egypt)	Maged Bassuini	(Egypt)	Osama El Malt	(Egypt)
Ahmed Farag El Kassed	(Egypt)	Maher El Dessouky	(Egypt)	Reda Abdel Tawab	(Egypt)
Ahmed Lotfy	(Egypt)	Mahmoud Mostafa	(Egypt)	Robert Lane	(UK)
Ahmed Medhat Zaki	(Egypt)	Mamoun Ismail	(Egypt)	Said Rateb	(Egypt)
Ahmed Shokry	(Egypt)	Mattia Intra	(Italy)	Safwat Abdel Kader	(Egypt)
Ahmed Tarek Awad	(Egypt)	Medhat Anwar	(Egypt)	Sayed Ahmed Marei	(Egypt)
Alaa Abbas	(Egypt)	Mohamed Abdel Baki	(Egypt)	Sherif Fouad Naguib	(Egypt)
Alaa Ismail	(Egypt)	Mohamed Elbarbary	(Egypt)	Tarek Ibrahim	(Egypt)
Ali Sabbour	(Egypt)	Mohamed Kadry	(Egypt)	Wael Nabil	(Egypt)
Amr Gad	(Egypt)	Mohamed Abdel Wahab	(Egypt)	Yasser Saad El Din	(Egypt)
Amr Mohsen	(Egypt)	Mohamed Al Batanouny	(Egypt)	Yehia Mohamed Safwat	(Egypt)
Andrew Adamson	(UK)	Mohamed Magdy Esawy	(Egypt)	Yehia Zakaria	(Egypt)
Ashraf Shouma	(Egypt)	Mohamed S. El Libbishy	(Egypt)	Yousry Gaweesh	(Egypt)
Essam Abdel Galil	(Egypt)	Mohamed Mohsen Salem	(Egypt)		

Egyptian Journal of Surgery - Published Quarterly

Egyptian Journal of Surgery is the Official Journal of the Egyptian Society of Surgeons.

GUIDELINES FOR AUTHORS

Last updated September 2014

The Egyptian Journal of Surgery (EJS) welcomes submission of papers on clinical, experimental, cultural and historical topics from authors of diverse clinical and scientific interests and expertise, provided the paper has relevance to surgery and related fields. The EJS in its review of papers will give priority to papers that present valid evidence that can enhance patient safety during surgical care.

Papers are reviewed for publication assuming that its content have not been submitted simultaneously to another journal, have not been accepted for publication elsewhere and have not already been published. Any attempt at dual publication will lead to automatic rejection and may prejudice acceptance of future submissions and may be highlighted within the pages of the Journal.

Papers may be rejected after review in-house on account of lack of originality, a poorly conducted study or absence of a clinical message.

An electronic copy of the manuscript (Microsoft Word) including artwork (jpg) should be submitted to the EJS via the EJS section on the Egyptian Society of Surgeons web site (www.ess-eg.org). A covering letter addressed to the EJS editor requesting submission should be sent with the manuscript

The EJS style follows the Uniform Requirements for Manuscripts Submitted to Biomedical Journals which can be downloaded free from the following site: www.icmje.org

Ethics

Material relating to human investigation and animal experiments must comply with and be approved by local ethics committees. The EJS reserves the right not to publish papers on the grounds that appropriate ethical or experimental standards have not been reached. Written consent must be obtained from the patients, legal guardian or executor for publication of any details or photographs that might identify an individual.

Manuscript Preparation

Manuscripts should not exceed 4000 words using a 12 pt Times New Roman font size, on A4 pages with double spacing and at least 3cm margins. The pages of the manuscript should be numbered including the title page at the top right hand corner. The manuscript should NOT be written with a column formatting style. Each of the following sections should begin on a new page in the following order: title page; abstract; introduction; patients (materials) and methods, results, discussion, acknowledgment; references; tables; legends for illustrations.

Title Page

The title page should contain: (1) Title of the Article, (2) Full name of each author, with highest academic degree(s), (3) Department(s) and institution(s) to which the work should be attributed, and (4) Name, address, phone, fax and e-mail address of author responsible for correspondence.

Abstract

The abstract should be structured outlining the aim, methods, results and conclusions of the paper. The abstract should not exceed 200 words

Keywords

Three words using terms from Index Medicus (MeSH catalogue) wherever possible should be chosen by the author. Keywords should not repeat words from the manuscript title.

Text

The outline of the text should be; (1) Introduction (< 500 words), (2) Patients (Materials) and Methods, (3) Results, (4) Discussion (< 1000 words). To make the discussion more reader friendly please structure it using the following subheadings: summary of main findings, comparison with other studies, strength and limitations of the study, implications for future research and policy.

Tables and graphs

Each table should be on a separate page, must have an identifying number (please use Arabic numerals) and a short descriptive title.

Do not use vertical lines in your tables. All tables should be linked with the text and should supplement, not duplicate, the text. For

Footnotes Use the following symbols in the following sequence: *, †, ‡, §, ||, ¶, **, ††, ‡‡. Graphs should be constructed in black and white with no gridlines. Three dimension graphs will not be accepted.

Illustrations (Figures)

Figures should be submitted in JPG format each on a separate page with its corresponding reference number in the text and legend text. If photographs of people are used, either the subjects must not be identifiable or their pictures must be accompanied by written permission to use the photograph.

Abbreviations and symbols

The full term for which an abbreviation stands should precede its first use in the abstract and text unless it is a standard unit of measurement. Abbreviations are put in parenthesis only after their full term; no need to put abbreviations in parentheses after that. The full term of abbreviations used in a table should accompany the table as a footnote even if mentioned before in the abstract or text. Avoid abbreviations in the title.

References

The EJS reference style follows the Uniform Requirements for Manuscripts Submitted to Biomedical Journals which is based largely on an ANSI standard style adapted by the National Library of Medicine (NLM) for its databases:

www.nlm.nih.gov/bsd/uniform_requirements.html. Authors are advised to check their references using the PubMed Single Citation Matcher: <http://www.ncbi.nlm.nih.gov/sites/pubmedutils/citmatch>.

Example for standard journal article

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. *N Engl J Med*. 2002;347:284-7.

For articles with more than six authors: List the first six authors followed by et al.

Rose ME, Huerbin MB, Melick J, Marion DW, Palmer AM, Schiding JK, et al. Regulation of interstitial excitatory amino acid concentrations after cortical contusion injury. *Brain Res*. 2002;935:40-6.

Scientific misconduct

The EJS will activate its policies and procedures on scientific misconduct once redundant publication, plagiarism, data fabrication or falsification suspected. The EJS essentially follows the Committee on Publication Ethics (COPE); www.publicationethics.org.uk guidelines and flowcharts.

Authorship Agreement

All authors will be requested to sign an authorship agreement form once the submitted manuscript becomes legible for peer review.

ANNUAL SUBSCRIPTION

The Egyptian Journal of Surgery is published four times a year; in January, April, July and October. The annual subscription fees are as follows:

Members of ESS:	L.E. 100
Institutions:	L.E.100

Issues will be mailed to subscribers only.

INFORMATION & CORRESPONDENCE

Any information requests or correspondence including paper submission, subscription order, change of address of subscriber and, advertising in the Journal, should be addressed to:

www.journalonweb.com/ejs

The Information about the Journal is also available at: www.ejs.eg.net

Executive Editor:

Prof. Abdel Moati Hussein

Editorial Office:

Conference Organizing Bureau

Tel.: 33023642 33027672

Website: www.cob-eg.org

Editorial Assist:

Mohamed Salah

Comparative study of single-layer anastomosis in high-risk colonic anastomosis versus single layer reinforced using fibrin glue

Basem M. Sieda, Osama Gharib

Department of General Surgery, Zagazig University Hospitals, Zagazig University, Zagazig, Egypt

Correspondence to Basem M. Sieda, MD, General Surgery Department, Zagazig University Hospitals, Zagazig University, El Kawmia, Zagazig, Sharkia, 13 El Hasn Ben ElHaithem St., Egypt
Tel: +20 100 008 9500, +20 120 001 6007;
e-mail: drbasemsieda@yahoo.com

Received 22 February 2015

Accepted 16 March 2015

The Egyptian Journal of Surgery
2015, 34:215–221

Introduction

Complications of bowel anastomosis may be a catastrophe and devastating to the patient's life. Reinforcing colonic wall anastomosis is of utmost importance to decrease leakage in risky colonic anastomosis.

Aim

The aim of this study was to consider the efficacy of reinforcing single-layer colonic anastomosis with fibrin glue in high-risk colonic anastomosis.

Patients and methods

A prospective study was conducted in Zagazig University Hospitals from December 2011 until May 2014 on 70 patients with high-risk colonic anastomosis, who were divided into two groups. Group I included 35 patients operated by means of single extramucosal bowel anastomosis and group II included 35 patients operated by means of single layer reinforced by adding fibrin glue.

Results

In our study, there were 28 male and seven female patients in group I and 10 male and 25 female patients in group II. We recorded seven (20%) cases with postoperative leak; of them, five complicated to fecal fistula in group I, whereas in group II there were only three (8.5%) patients with leakage and one patient with fistula. Postoperative abscesses were 8.5% in group I and 2.9% in group II.

Conclusion

Single-layer anastomosis is not enough in high-risk colonic anastomosis and needs reinforcement. Fibrin glue is widely accepted in gastrointestinal anastomosis and provides a good sealant.

Keywords:

colonic anastomosis, fibrin glue, reinforcing anastomosis

Egyptian J Surgery 34:215–221
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

It is of utmost importance to consider the incidence and prevalence of anastomotic leakage following bowel resection and primary anastomosis in high-risk patients, which lead to prolonged hospital stay, increased mortality and morbidity, abscess formation, fistula, sepsis, and possible death. The prevalence of intraperitoneal anastomotic leak after handsewn anastomosis varies between 0.5 and 30% [1–3].

Single-layer anastomosis has the superiority in elective bowel anastomosis, but in high-risk patients it may be enough yet questionable not because of the technique rather the risk factors that predispose to leakage. Therefore, reinforcement of anastomosis decreases the risk of devastating complications [4,5].

Tissue adhesives, mainly fibrin sealant, were used to reinforce gastrointestinal anastomosis. The surgery is based on two concepts. First, to prevent leakage by making an anastomosis water and airtight by applying

a seal around an anastomosis. Second, the adhesive acts as a mechanical support of wound margins instead of sutures, or as an extra support, thus decreasing an incidence of leakage [6,7]. In addition to serving as a seal for visceral leaks, it walls off infections [8]. Fibrin sealant became the first modern era material approved as a hemostat, sealant, and adhesive by the Food and Drug Administration (FDA) [9].

Patients and methods

Inclusion criteria

All adult patients requiring emergency laparotomy for symptoms and signs of intestinal obstruction or peritonitis, admitted to the Emergency Unit, Zagazig University, were considered eligible.

Exclusion criteria

Patients who had undergone small bowel resection anastomosis were excluded.

Patients with risk for bowel anastomosis were defined as those with risk factors such as diabetes, steroids, anastomotic method, poor blood loss, marked bowel distension, debilitating diseases, presence or absence of peritonitis and nutritional factors, which are predictive of anastomotic failure.

All patients were subjected to full laboratory work.

Most patients signed a high-risk consent form and gave permission for stool diversion, if necessary. High-risk patients were admitted to the operation theater with no time for elective bowel preparation and only preoperative rapid colonic preparation was performed with bowel lavage on the table.

Technique

General endotracheal intubation and nasogastric tube and Foley's catheter insertion were mandatory. The abdomen was draped and prepped in an ordinary manner. All patients underwent midline exploratory incision, thorough exploration of the abdomen and the pelvis, and had pathology identified. Bowel lavage was performed on the table, with intestinal clamps applied proximal and distal to the pathology, and resection was performed.

The two bowel segments were approximated and prepared for anastomosis, either large bowel (left hemicolectomy) or enterocolic. Two transmural stitches were applied at the sides of the two bowel segments to act as a stay for colocolic or enterocolic anastomosis (Figs. 1 and 2).

All single-layer anastomoses were constructed using a continuous 3-0 vicryl round needle suture (Fig. 3), which began at the mesenteric border (Fig. 4). All layers

of the bowel wall except the mucosa were incorporated. Each bite included 4–6 mm of the seromuscular wall; the larger bites were used at the mesenteric border to ensure an adequate seal. Each stitch was advanced ~5 mm. We rendered the anastomosis watertight. The time recorded for construction of the anastomosis began with the placement of the stay suture and first stitch and ended with tying the knot for the continuous suture.

The two transmural stay sutures at the sides were tied, and then the mesenteric window was closed.

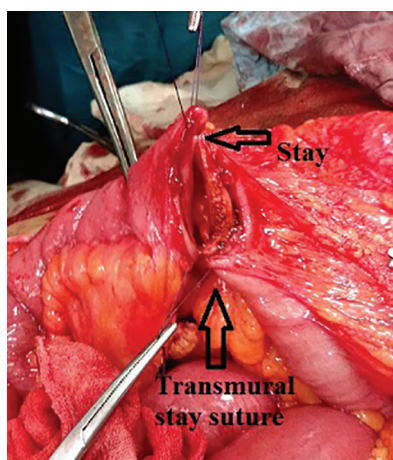
The same steps were carried out in group II, but with addition of fibrin glue. The commercial fibrin sealant includes two lyophilized pathogen inactivated components of 6.5 g/dl equal to 1000 IU/ml. Component I comprised a high concentration of human fibrinogen. Component II comprised human thrombin.

The package of the glue contained two syringes, each 3 ml, one vial of sterile water for injection, and one double barrel needle (Y-shaped delivery system).

The two component of the glue were prepared and diluted with the supplied sterile water, then applied to the Y-shaped delivery system or the two syringes approximated and injected simultaneously (Figs. 5 and 6) by dropping the glue all around the anastomosis. The glue was applied part by part as when applied on the anterior wall. We then waited for 1 min until the glue dried, and then applied on the sides, followed by the posterior wall. Any remaining drops of glue were applied to the mesenteric window.

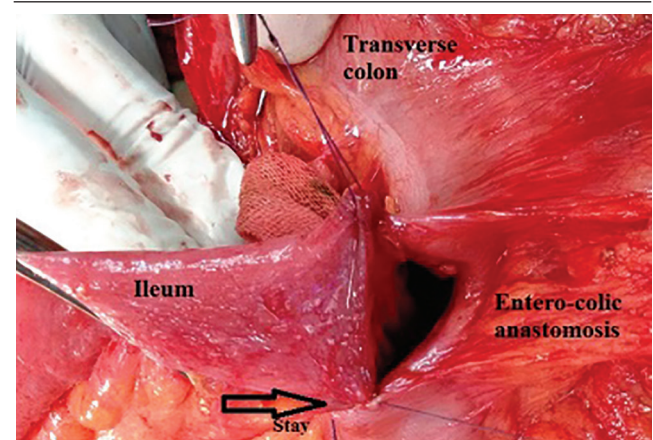
On mixing the two components, the concentrated fibrinogen in the solution is converted into a solid fibrin clot, imitating the final stage of the coagulation cascade. The velocity of the coagulation process

Figure 1



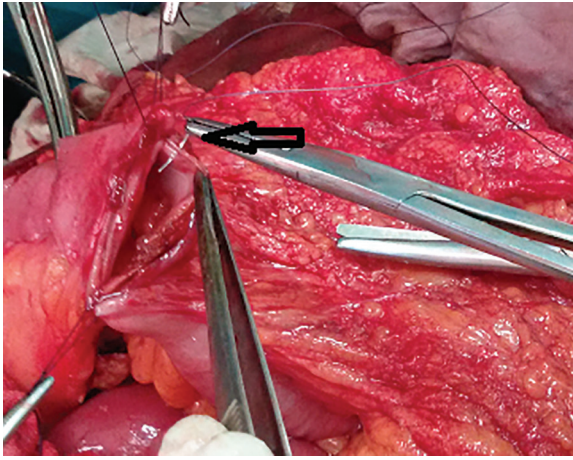
Transmural stitch.

Figure 2



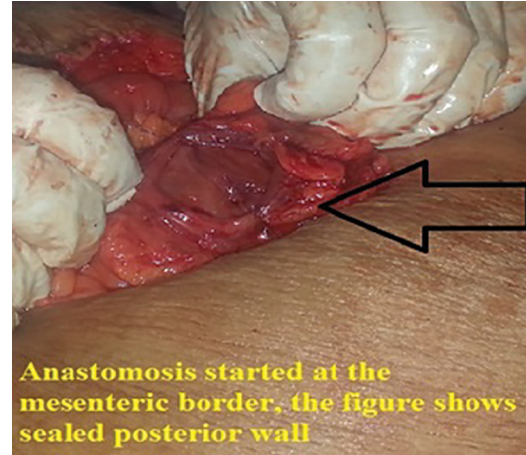
Transmural stitch for enterocolic anastomosis.

Figure 3



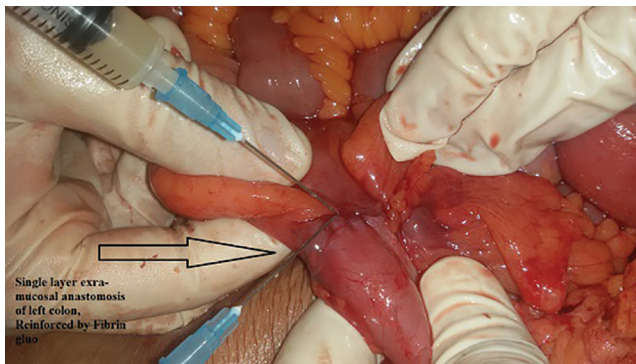
Single-layer anastomosis.

Figure 4



Anastomosis started at mesenteric border–posterior wall first.

Figure 5



Application of fibrin glue.

Figure 6



Simultaneous injection of the two syringes of glue.

depends on the concentration of the thrombin solution used. Although the sealant takes 30–60 s to set with a thrombin concentration of 4 IU/ml, this process takes only a few seconds when a higher thrombin concentration of 500 IU/ml is used. Generally, a higher thrombin concentration is used for hemostasis, whereas the lower concentration is used for sealing of tissues.

For both techniques, only one drain was inserted perianastomotically.

Data collection, parameter evaluation, and follow-up

Standardized data collection was performed by the attending resident and our surgeon team, and each patient was evaluated by the main surgeon twice per day for 3–5 days on the basis of hospital stay. The patients were then followed up at the hospital outpatient clinic monthly for 3 months.

During the hospital stay the patients were followed up for evaluating the following parameters:

- (1) Vital signs that made high attention for high fever.
- (2) Fluid therapy including maintenance and deficit depending on input and output.
- (3) Antibiotic received, as all patients received broad spectrum antibiotics and metronidazole infusion.
- (4) Drain output observed for the amount, color, and nature of contents.

Postoperatively, any complication related to the operation, including high fever, pain, distension, delayed peristalsis, abdominal distension, intestinal sounds, wound complication, and abnormal output from the drain were recorded and documented.

Patients started taking sips of water on the third postoperative day in group II and on the fourth postoperative day in group I and continued diet as tolerated. Drain was removed on the fourth postoperative day and patients were discharged from

the hospital if there was no serious infection, leakage, distension, or proved fecal fistula.

Anastomotic failure was defined as a fistula documented clinically or radiographically, or by the finding of (charcoal) draining from the wound after oral administration, or as a visible disruption of the suture line during re-exploration. The complication of abscess without fistula was also included in the analysis because it is potentially related to the anastomosis.

All patients were followed up for 9 months postoperatively. Thereafter, they were called again to continue the follow-up postoperatively every week for 4 weeks because of late infective complications known to occur occasionally after patients' discharge, followed by monthly visits.

Procedure-related complications and management

The complications in our study included early postoperative complications and late complications. Early complications included wound complications, intra-abdominal abscess, leakage, fecal fistula, and prolonged postoperative ileus. Late complications mainly attributed to postoperative adhesions and stricture.

Wound complications

Patients with wound complications responded to conservative measures such as dressing twice daily, chemical debridement for wound infection and antibiotic coverage. Cases of wound disruption were mainly partial. Such patients also responded to conservative measures and their wounds were left to heal by granulation tissue formation.

Postoperative leakage

Postoperative anastomotic leakage and fistulas were defined clinically, radiologically, and/or using the charcoal test. Most cases that presented with low output postoperative leak were managed conservatively in the form of postponing oral diet, continuous fluid therapy for maintenance and deficit, coverage with broad spectrum antibiotics, and ultrasound-guided drainage for localized collection and abscess. Patients with high output leakage were re-explored for fecal fistula.

Intra-abdominal abscess

Differentiating an 'anastomotic leak' from a postoperative abscess was difficult. In three cases in our study (two cases in group I and one case in group II), we were able to show that a postoperative abscess was caused by a small anastomotic leak and that the other patient presented with

peritonism. The majority of patients with postoperative abscess were managed with ultrasonography-guided drainage, whereas other patients responded to medical treatment, which was sufficient.

Fecal fistula and peritonitis

Cases complicated by fecal fistula with high output leakage and peritonitis were re-explored, peritoneal toilet was performed, and disrupted anastomosis was found. In the left colonic disrupted anastomosis, resection of anastomosis was performed and converted to Hartman. Diversion alone without resection of the leaking anastomosis was not ideal because of persistent sepsis from the leaking anastomosis. In such cases, wide drainage of the anastomosis was performed. Repair of the anastomosis, either alone or in combination with a proximal stoma, was not feasible nor recommended because of the high risk of recurrent anastomotic failure and/or anastomotic stricture in the presence of intra-abdominal sepsis. In all cases, two drains were inserted, perianastomotic and pelvic, and patients kept nothing per oral (NPO) for another 4 days and then diet as tolerated was started.

Prolonged postoperative ileus

Some cases suffered from prolonged postoperative ileus, and it was attributed mainly to some sort of electrolyte imbalance and lack of education in this small cohort of patients. Correction of electrolyte and ambulation correct the ileus but persist for a while in some patients proved to have intra-abdominal abscess.

Late postoperative complications

Late complications were mainly due to adhesions discovered during the postoperative follow-up period between sixth and ninth month. These patients were readmitted to the hospital and they responded to conservative methods of treatment such as of nasogastric tube (NGT), intra-venous fluids (IVF), antibiotics, and enemas.

Statistical analysis

Categorical qualitative variables were expressed as absolute frequencies (number) and relative frequencies (%). Continuous data were checked for normality using the Kolmogorov–Smirnov test. Independent Student's *t*-test was used to compare two groups of normally distributed data. Percentage of categorical variables was compared using Pearson's χ^2 -test. All tests were two-sided. A *P*-value of less than 0.05 was considered significant. All statistical analyses were performed using SPSS 22.0 (SPSS Inc., Chicago, Illinois, USA) for Windows and MedCalc 13 (MedCalc Software bvba, Ostend, Belgium) for Windows.

Results

We operated on 70 patients in the emergency unit over a period of 2.5 years. We operated on 35 patients with resection anastomosis using single-layer continuous anastomosis, and on 35 patients resection anastomosis performed using single layer reinforced with fibrin glue. In group I, the number of male patients was higher than the number of female patients (28/7). In group II, the number of female patients was higher: 25 female and 10 male patients. In group I, the ages of the patients ranged from 28 to 63 years, with a mean of 45 ± 8.5 years. In group II the ages of the patient ranged from 31 to 72 years, with a mean of 46.5 ± 9.5 years (Table 1).

The cause for exploration was mainly acute intestinal obstruction or peritonitis. In group I, there were 21 (60%) patients with malignant bowel intestinal obstruction (mainly in the left colon in 13 patients) and 14 (40%) patients with nonmalignant causes such as volvulus, perforated diverticulum, bands, and inflammatory bowel. In group II, there were 25 (71.5%) patients with malignant intestinal obstruction (mainly in the left colon in 14 patients) and 10 (28.5%) patients with nonmalignant causes such as inflammatory bowel with peritonitis, postoperative fecal fistula, and perforated sigmoid diverticulum (Table 2).

In both groups the pathology was confined to the large bowel. In group I, left-sided colonic resection anastomosis was performed for 21 cases, whereas in group II, only 16 patients underwent right hemicolectomy. Iliotransverse anastomosis was performed for 14 cases in group I and for 19 cases in group II (Table 2).

The duration of anastomosis was shorter in group I (about 20 min), whereas in group II it was 25 min. The difference is attributed to the time of fibrin glue preparation. Length of hospital stay was prolonged in group I than in group II, as they initiated diet later in group I compared with group II (Table 3).

The complications in our study included the following. In group I, the incidence of wound complications was high: there were four (11.4%) patients with seroma, three (8.5%) patients with wound infection, and two (5.7%) patients with wound disruption. However, in group II there were only two (5.7%) patients with seroma, one (2.9%) patient with wound infection, and one (2.9%) patient with wound disruption. In group I, seven (20%) patients suffered from postoperative leakage, five (14.2%) patients complicated with fecal fistula, and two patients were found to have an abscess. A total of three (8.5%) patients suffered from abscess and pelvic collection, two patients presented with leakage,

and the other patient presented with peritonism not proceeded by leakage. In group II, three (8.5%) patients suffered from postoperative leakage, one (2.9%) patient complicated with fecal fistula, one (2.9%) patient suffered from abscess and pelvic collection, and one patient improved with conservative measures. Postoperative ileus was mainly found in group I in about 14.2% of patients, whereas in group II it was found in 2.9% of patients. Late postoperative adhesion was 5.7% in group I and 2.9% in group II (Table 4).

Discussion

The reliability and suitability of any technique for intestinal anastomosis is its ability to heal without leakage. Leakage and fistula have catastrophic

Table 1 Demographic data

Diagnosis and site of anastomosis	Single layer (N = 35)	Single layer with fibrin glue (N = 35)	P
Sex			
Male	28 (80)	25 (71.4)	0.577 [†]
Female	7 (20)	10 (28.6)	
Age			
Mean \pm SD	45 \pm 8.5	46.5 \pm 9.5	0.488 [§]
Range	28–63	31–72	

Values are represented *n* (%); [†] χ^2 -Test; [§]Independent Student's *t*-test; *P* < 0.05 is significant.

Table 2 Diagnosis and site of anastomosis

Diagnosis and site of anastomosis	Single layer (N = 35)	Single layer with fibrin glue (N = 35)	P
Diagnosis			
Malignant	21 (60)	25 (71.4)	0.450 [†]
Nonmalignant	14 (40)	10 (28.6)	
Malignant IO			
Rt colon	8 (30.1)	11 (44)	0.916 [†]
Lt colon	13 (61.9)	14 (56)	
Nonmalignant IO			
Rt colon	6 (42.9)	8 (80)	0.161 [†]
Lt colon	8 (57.1)	2 (20)	
Site of anastomosis			
Colocolostomy	21 (60)	16 (45.7)	0.338 [†]
Enterocolic	14 (40)	19 (54.3)	

Values are represented as *n* (%); IO, intestinal obstruction; Lt, left; Rt, right; [†] χ^2 -Test; *P* < 0.05 is significant.

Table 3 Diet initiation, time of anastomosis, and length of hospital stay

Time of anastomosis and postoperative period	Single layer (N = 35)	Single layer with fibrin glue (N = 35)	P
Initiation of diet	4 \pm 0.9	3 \pm 0.8	<0.001 [§]
Time of anastomosis	20 \pm 2.5	25 \pm 3.5	<0.001 [§]
Length of hospital stay	7 \pm 2.3	5 \pm 1.7	<0.001 [§]

Values are represented as mean \pm SD; [§]Independent Student's *t*-test; *P* < 0.05 is significant.

Table 4 Postoperative complications

Postoperative complications	Single layer (N = 35)	Single layer with fibrin glue (N = 35)	P
Wound seroma	4 (11.4)	2 (5.7)	0.669 [†]
Wound infection	3 (8.6)	1 (2.9)	0.606 [†]
Wound disruption	2 (5.7)	1 (2.9)	1.000 [†]
Intra-abdominal abscesses	3 (8.6)	1 (2.9)	0.606 [†]
Postoperative leaks	7 (20)	3 (8.6)	0.305 [†]
Postoperative fecal fistula	5 (14.3)	1 (2.9)	0.200 [†]
Postoperative ileus	5 (14.3)	1 (2.9)	0.200 [†]
Postoperative adhesions	2 (5.7)	1 (2.9)	1.000 [†]

Values are represented as n (%); [†] χ^2 -Test; P < 0.05 is significant.

consequences on the patient's health as well as the cost of care. Ischemia, considerable tension on the anastomosis, and poor technique were added risks for anastomotic failure in critically ill patients. As high-risk bowel anastomosis carries a known incidence of anastomotic dehiscence, single-layer anastomosis was not enough and should be reinforced to decrease the incidence of early and late postoperative complications. In our study the complication rate was less, with less leakage, abscess, and fistula in reinforced anastomosis than in single layer alone, and this was comparable to the study conducted by Merad *et al.* [10], who reinforced the anastomosis but with omentoplasty, and they used more number of patients and included elective resection anastomosis in their study.

In our study, reinforcement of single layer was performed using fibrin sealant, which gained increasing acceptance among surgeons. This is in agreement with Lee and Jones [11], who frequently used fibrin sealant for reinforcing gastrointestinal anastomosis and for repairing perforated duodenal ulcers. This was similar to the method used by Truong *et al.* [12], who used fibrin sealant for endoscopic treatment of postoperative gastrointestinal fistulas and leaks.

As regards postoperative complications, we recorded an incidence of 20% for leakage and 14.2% for fistula development in the single layer group, but in the reinforcement anastomosis group, we recorded a less incidence of leakage (8.5%) and fistula (5.7%). This was comparable to that reported in another study [13], in which they used fibrin glue for the treatment of 18 cases with postappendectomy fecal fistula after failed ultrasound-guided drainage and was a successful approach. The failure and leakage accounted only for 7.8%, and they concluded that fibrin glue is safe to use in colonic anastomosis, especially in the right side.

Our approach to reinforcing single-layer colonic anastomosis and our incidence of complications were comparable to that reported by many authors [14–20],

but they used the technique for reinforcing gastric wall after continuous single-layer closure.

Our study was not compatible with the study by Bülbüller *et al.* [21], who used reinforcement methods to reduce leakage complication. They found that 18 patients had Tisseel fibrin sealant applied throughout the staple line of gastric wall after greater curvature gastrectomy. According to their results, they demonstrated that good results can be obtained without any reinforcement. Reinforcement with tissue fibrin sealant increases the cost.

Conclusion

In summary, surgeons should be aware of risky colonic anastomosis and its high incidence of leakage. Proper surgical technique avoids this devastating complication. Single-layer anastomosis is not enough for this risky anastomosis and should be reinforced. Reinforcement with fibrin glue provides a watertight anastomosis.

Fibrin sealant has been used with increasing frequency in a variety of gastrointestinal surgical anastomosis for its adhesive abilities and hemostatic function. The process of adding fibrin glue mimics the last step of the coagulation cascade and takes place independent of the patient's coagulation status.

Acknowledgements

Conflicts of interest

None declared.

References

- Garude K, Tandel C, Rao S, Shan NJ. Single layered intestinal anastomosis: a safe and economic technique. *Indian J Surg* 2013; 75: 290-3.
- Shikata S, Yamagishi H, Taji Y, Shimada T, Noguchi Y. Single- versus two-layer intestinal anastomosis: a meta-analysis of randomized controlled trials. *BMC Surg* 2006; 6:2.
- Nasirkhan MU, Abir F, Longo W, Kozol R. Anastomotic disruption after large bowel resection. *World J Gastroenterol* 2006; 12:2497–2504.
- Ceraldi CM, Rypins EB, Monahan M, Chang B, Sarfeh IJ. Comparison of continuous single layer polypropylene anastomosis with double layer and stapled anastomoses in elective colon resections. *Am Surg* 1993; 59:168–171.
- Burch JM, Franciose RJ, Moore EE, Biffl WL, Offner PJ. Single-layer continuous versus two-layer interrupted intestinal anastomosis: a prospective randomized trial. *Ann Surg* 2000; 231:832–837.
- Kawamura M, Gika M, Izumi Y, Horinouchi H, Shinya N, Mukai M, Kobayashi K. The sealing effect of fibrin glue against alveolar air leakage evaluated up to 48 h; comparison between different methods of application. *Eur J Cardiothorac Surg* 2005; 28:39–42.
- Lee MG, Provost DA, Jones DB. Use of fibrin sealant in laparoscopic gastric bypass for the morbidly obese. *Obes Surg* 2004; 14:1321–1326.
- Evans AL, Morrey AF. Current application of fibrin sealant in urologic surgery. *Int Braz J Urol* 2006; 32:131–14.
- Spotnitz WD. Fibrin sealant: the only approved hemostat, sealant, and adhesive – a laboratory and clinical perspective. *ISRN Surg* 2014; 2014:2039-43.

- 10 Merad F, Hay JM, Fingerhut A, Flamant Y, Molkhou JM, Laborde Y. Omentoplasty in the prevention of anastomotic leakage after colonic or rectal resection: a prospective randomized study in 712 patients. French Associations for Surgical Research. *Ann Surg* 1998; 227:179–186.
- 11 Lee MG, Jones D. Applications of fibrin sealant in surgery. *Surg Innov* 2005; 12:203–213.
- 12 Truong S, Bohm G, Klinge U. Results after endoscopic treatment of postoperative gastrointestinal fistulas and leaks using combined Vycril plug and fibrin sealant. *Surg Endosc* 2004; 18:1105–1108.
- 13 Okamoto K, Watanabe Y, Nakachi T, Kasuga T, Motohashi G, Chikazawa G, *et al*. The use of autologous fibrin glue for the treatment of postoperative fecal fistula following an appendectomy: report of a case. *Surg Today* 2003; 33:550–552.
- 14 Spotnitz WD. Hemostats, sealants, and adhesives: a practical guide for the surgeon. *Am Surg* 2012; 78:1305–1321.
- 15 Silecchia G, Boru CE, Mouiel J, Rossi M, Anselmino M, Tacchino RM, *et al*. Clinical evaluation of fibrin glue in the prevention of anastomotic leak and internal hernia after laparoscopic gastric bypass: preliminary results of a prospective, randomized multicenter trial. *Obes Surg* 2006; 16:125–131.
- 16 Nguyen NT, Nguyen CT, Stevens CM, Steward E, Paya M. The efficacy of fibrin sealant in prevention of anastomotic leak after laparoscopic gastric bypass. *J Surg Res* 2004; 122:218–224.
- 17 Liu CD, Glantz GJ, Livingston EH. Fibrin glue as a sealant for high-risk anastomosis in surgery for morbid obesity. *Obes Surg* 2003; 13:45–48.
- 18 Sapala JA, Wood MH, Schuhknecht MP. Anastomotic leak prophylaxis using a vapor-heated fibrin sealant: report on 738 gastric bypass patients. *Obes Surg* 2004; 14:35–42.
- 19 Gonzalez R, Nelson LG, Scott F. Anastomotic leaks after laparoscopic gastric bypass. *Obes Surg* 2004; 14:1299–1337.
- 20 Podnos YD, Jimenez JC, Wilson SE, Stevens CM, Nguyen NT. Complications after laparoscopic gastric bypass: a review of 3464 cases. *Arch Surg* 2003; 138:957–961.
- 21 Bülbüller N, Aslaner A, Öner OZ, Oruç MT, Koç U, Ayper N, Ramazan O. Comparison of four different methods in staple line reinforcement during laparoscopic sleeve gastrectomy. *Int J Clin Exp Med* 2013; 6:985–990.

Clopidogrel versus acetyl salicylic acid in arteriovenous fistula salvage

Ahmad M. Tawfik, Wael Elshimy

Vascular Surgery Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt

Correspondence to Wael Elshimy, Faculty of Medicine, Zagazig University, Zagazig, Sharqia, Egypt
Tel: 0552362621; fax: 0552312621; e-mail: wael.elshimy@yahoo.com

Received 06 April 2015

Accepted 25 April 2015

The Egyptian Journal of Surgery 2015, 34:222–225

Background

The optimal vascular access for chronic hemodialysis is the arteriovenous fistula (AVF). Several studies suggest a role for antiplatelet agents in the prevention of early AVF failure.

Aim of the study

This trial was conducted to assess the efficacy and safety of clopidogrel versus acetyl salicylic acid in hemodialysis patients.

Patients and Methods

A total of 50 patients received 75 mg/day of clopidogrel, 50 patients received 150 mg/day of acetyl salicylic acid, and 50 patients served as the control group. The treatment was initiated 7–10 days before the surgery and continued up to 6 weeks postoperatively; thereafter, patients were monitored for 6 months.

Results

The primary outcome was AVF failure 8 weeks after fistula creation. The primary AVF failures at 2 months were 32.5% in the acetyl salicylic acid group and 6.6% in the clopidogrel group. First hemodialysis from newly created AVF in the clopidogrel group was significantly more successful than that in the acetyl salicylic acid group. No life-threatening adverse event or severe bleeding was recorded in both groups.

Conclusion

Clopidogrel seems to be effective and safe compared with acetyl salicylic acid in the prevention of primary AVF failure in hemodialysis patients.

Keywords:

acetyl salicylic acid, arteriovenous fistula, clopidogrel, hemodialysis, primary arteriovenous fistula failure

Egyptian J Surgery 34:222–225
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

For efficient hemodialysis, creation of a working arteriovenous fistula (AVF) is a must. Because of the long life span and fewer complications, the AVF is considered as the best venous access for chronic hemodialysis patients [1]. There are certain criteria that must be reached before the usage of the fistula, such as vein diameter and peak systolic velocity [2]. Fistula failure is the most dramatic morbidity that can occur after fistula creation due to thrombosis, failure of the vein to reach certain diameter, or low-flow across the fistula [3]. Early fistula failure (between 4 and 6 weeks) is not uncommon and it occurs in about 7–40% of all cases. Difficulty in venous access and failure to maintain enough flow to keep the dialysis machine working are the most frequent manifestations of shunt failure [4–6]. Therefore, early fistula assessment of patency and flow is recommended [7]. Many authors reported that the use of antiplatelet agents can prevent early fistula failure [8–18]. On the basis of this, we performed our study to compare the most common antiplatelet agents in primary fistula salvage.

Patients and methods

The study was conducted at Zagazig University Hospitals Vascular Outpatient Clinic from April 2013 to April 2014. Patients older than 18 years of age with chronic renal failure requiring hemodialysis with suitable vascular condition for constructing radiocephalic shunt were included in the study. Exclusion criteria were as follows: patients with a history of previous bleeding episodes within 6 months before initiation of the study, patients already receiving chronic anticoagulation therapy (antiplatelet agents or warfarin), patients with terminal or life-threatening disease, pregnancy, malignant hypertension, a platelet count less than 100 000/mm³, and other demonstrated medical conditions that would make antiplatelet therapy dangerous.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

A total 150 consenting eligible participants were divided into three groups: the acetyl salicylic acid group included 50 patients who received 150 mg of acetyl salicylic acid; the clopidogrel group included 50 patients who received 75 mg of clopidogrel; and the control group included 50 patients who did not receive any antiplatelet. The treatment was initiated 7–10 days prior surgery and continued up to 6 weeks postoperatively with full approval by the ethical committee in our university. Patients were monitored for occurrence of complications and need for hemodialysis until 6 months after trial.

The primary endpoint was AVF failure 8 weeks after fistula creation. The fistula was classified as patent if a bruit was detectable along the vein proximal to the arteriovenous anastomosis throughout systole and diastole. Secondary endpoint was 6 months later. Platelet hemostatic functions [platelet aggregometry, flow cytometry, and bleeding time (BT)], mainly BT, were evaluated monthly. Detailed information on bleeding events was obtained. The study drug was discontinued following any bleeding event.

Statistical analysis

Data collected on history, basic clinical examination, laboratory investigations, and outcome measures were coded, entered, and analyzed using Microsoft Excel software (USA). Data were then imported into the statistical package for the social sciences (SPSS, version 20.0; SPSS Inc., Chicago, Illinois, USA) software for analysis. On the basis of the type of data, the following tests were used to test differences for significance. Differences between frequencies (qualitative variables) and percentages in groups were compared using the χ^2 -test. Differences between means (quantitative variables) in two parametric groups were determined using *t*-test. Odds ratio (OR) was used for risk assessment; *P* value was set at less than 0.05 for significant results and at less than 0.001 for highly significant results.

Results

Between April 2013 and April 2014, a total of 150 patients met our inclusion criteria and were enrolled in our study. The laboratory findings for each group are summarized in Table 1. There were no significant differences in covariables between the groups. None of the covariables (covariables thought to influence the risk for AVF included age, sex, diabetes mellitus, BT, and blood pressure) measured at baseline or follow-up correlated with the development of AVF failure. All patients had been taking the study medication since 7–10 days before surgery. However, the medication had to be discontinued prematurely in 15 (10.0%) patients

Table 1 Covariables thought to influence the risk for arteriovenous fistula

Risk factor	Clopidogrel (N = 45)	Acetyl salicylic acid (N = 40)	Control group (N = 50)	<i>P</i>
Age (mean \pm SD)	45.6 \pm 9.5	44.9 \pm 12.6	44.1 \pm 10.9	0.87
Sex [<i>n</i> (%)]				
Male	25 (55.5)	22 (55.0)	28 (56.0)	0.99
Female	20 (44.5)	18 (45.0)	22 (44.0)	
DM [<i>n</i> (%)]	12 (26.6)	11 (27.5)	13 (26.0)	0.97
SBP (mean \pm SD)	136.6 \pm 29.5	134.9 \pm 31.9	138.5 \pm 32.2	0.82
DBP (mean \pm SD)	85.6 \pm 18.7	84.9 \pm 20.7	88.3 \pm 22.5	0.64

DBP, diastolic blood pressure; DM, diabetes mellitus; SBP, systolic blood pressure.

because of withdrawal from the trial in the case of five patients and complications in the case of 10 patients. Finally, 135 patients completed the trial: 45 patients in the clopidogrel group, 40 patients in the acetyl salicylic acid group, and 50 in the control group.

During follow-up from 8 weeks to 6 months no important complication occurred. Hemodialysis was performed for 45 patients of the clopidogrel group within 6 months after AVF creation and it was successful in 42 patients (failure was 6.6%). In the acetyl salicylic acid group, hemodialysis from the AVF was performed for 40 patients and it was successful in 27 cases (failure was 32.5%); both groups were significantly successful compared with the control group in which dialysis was successful in 22 cases (failure was 56%). First dialysis from the AVF in the clopidogrel group was significantly more successful than that in the acetyl salicylic acid group (*P* = 0.0004; Table 2). The higher percentage of failure cases in groups B (aspirin) and C (control) may be attributed to loss to follow-up (mostly good responders with successful fistula were not interested in follow-up) and nonrandomization; therefore, good responders were selected to be exposed to drugs, whereas patients with poor general conditions were taken as controls. No severe bleeding episodes such as intracranial hemorrhage were recorded during the active treatment period. There were no deaths due to bleeding in either treatment group. BTs were similar at baseline for the clopidogrel group (8.1 \pm 0.3 min) and the acetyl salicylic acid group (8.4 \pm 0.6 min) and remained stable (8.5 \pm 0.4 min) for the clopidogrel group and 8.6 \pm 0.3 min for the acetyl salicylic acid group throughout the study period. After 6 months the BT was 8.3 \pm 0.8 min in the clopidogrel group and 8.5 \pm 0.7 min in the acetyl salicylic acid group (Table 3).

Discussion

Successful hemodialysis requires function venous accesses. The AVF is the method of choice for hemodialysis in patients with chronic renal failure [1].

Table 2 Arteriovenous fistula failure

Item failure	Clopidogrel	Acetyl salicylic acid	P	OR (95% CI)
AVF failure	3 (6.6)	13 (32.5)	0.0004**	6.74 (1.57–33.3)*
	Clopidogrel	Control	P	OR (95% CI)
AVF failure	3 (6.6)	28 (56.0)	0.001**	17.8 (4.44–83.2)*
	Acetyl salicylic acid	Control	P	OR (95% CI)
AVF failure	13 (32.5)	28 (56.0)	0.012*	2.64 (1.02–6.92)*

Values are represented as n (%); AVF, arteriovenous fistula; CI, confidence interval; OR, odds ratio; **Significant.

Table 3 Bleeding time

Time of bleeding	Clopidogrel (mean ± SD)	Acetyl salicylic acid (mean ± SD)	Control (mean ± SD)	P
Bleeding time at baseline	8.1 ± 0.3	8.4 ± 0.6	8.2 ± 1.2	0.29
Bleeding time post-treatment	8.5 ± 0.4	8.6 ± 0.3	8.1 ± 0.9 ^a	0.0004**
Bleeding time after 6 month	8.3 ± 0.8	8.5 ± 0.7	8.2 ± 1.0	0.26

^aGroup caused the significance; **Significant.

The fistula is relatively easy to perform under local anesthesia and has a relatively low rate of complications. However, a significant proportion (8–12%) of fistulas fail early within 3 months of surgery [4–6]. Primary fistula failure is defined as a fistula that never provided successful hemodialysis [18]. Venous access failure is the most common reason for hospitalization among hemodialysis patients [19]. The typical lesion of access thrombosis is neointimal vascular smooth muscle cell proliferation in the anastomotic draining vein. Platelet activation from endothelial injury may play an important role in stimulating platelet aggregators such as platelet derived growth factor (PDGF) and thromboxane A₂, in addition to directly stimulating vascular intimal proliferation [18]. Therefore, the preventive effect of antiplatelet agents, including acetyl salicylic acid, dipyridamole, ticlopidine, and clopidogrel, was tested [9–17]. Our study was conducted to compare the efficacy and safety of clopidogrel with that of acetyl salicylic acid in the prevention of primary AVF failure. We observed a significant risk reduction in the primary AVF failure in the clopidogrel treatment group compared with the acetyl salicylic acid group and the control group. The results of our analysis suggest that daily administration of 75 mg of clopidogrel, beginning 7–10 days before AVF creation, was successful in preventing the development of vascular failure with acceptable side effects. This finding suggests that the risk reduction in vascular failure might be attributed to clopidogrel administration. Our results are supported by the recent report by Cochrane [20]. This meta-analysis shows the effect of clopidogrel treatment as an adjuvant to increase the patency of AVFs in the short term. Yevzlin *et al.* [22] showed a negative association between antiplatelet therapy and access patency. Kaufman *et al.* [23] demonstrated no change in the risk of graft thrombosis with acetyl salicylic acid versus clopidogrel therapy. They also noted that, in chronic hemodialysis patients, there is a trend toward increased thrombosis

with acetyl salicylic acid therapy. Moreover, Kaufman *et al.* [23] were unable to demonstrate a benefit with low-dose acetyl salicylic acid on thrombovascular events in 68 hemodialysis patients. In contrast, in all studies of clopidogrel in patients with new primary fistulae, the thrombosis rate was significantly less than that in the aspirin group [20]. In a study by Gröntoft *et al.* [13], only two out of 19 who received treatment developed fistulae thromboses compared with eight out of 17 on placebo [OR = 0.13, 95% confidence interval (CI) 0.02–0.76]. In 1998, Gröntoft *et al.* [14] reported that 16 out of 130 patients who received clopidogrel developed thromboses in the fistulae compared with 25 out of 131 in the placebo group (OR = 0.60, 95% CI 0.30–1.18). The overall result of the meta-analysis also favored treatment (OR = 0.47, 95% CI 0.26–0.85). The overall P value was 0.01 [20]. These data are in agreement with those of CAPRIE (Clopidogrel vs. Aspirin in Patients at Risk of Ischemic Events) study, which proved the superiority of clopidogrel as an antiplatelet, because the ADP receptor blockers (clopidogrel) are more potent than COX-1 in activators (aspirin) [21].

The overall incidence of bleeding events was 3% in our study. According to Kaufman and colleagues, we expected to encounter 16 episodes of bleeding during the 6 months in our patients [22–23]. However, the incidence of bleeding episodes was lower than expected. This finding might be related to restrictive exclusion criteria.

Conclusion

Clopidogrel has the upper hand over acetyl salicylic acid in the prevention of early fistula failure in chronic renal failure patients. Beginning 7–10 days before AVF creation and continuing for 6 weeks, seems to prevent primary AVF failure with acceptable side effects in selected hemodialysis patients.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- 1 K/DOQI. Clinical Practice Guidelines and Clinical Practice Recommendations, 2006 updates. Hemodialysis adequacy peritoneal dialysis adequacy vascular access. *Am J Kidney Dis* 2006; 48:S192–S200.
- 2 Woods JD, Port FK. The impact of vascular access for haemodialysis on patient morbidity and mortality. *Nephrol Dial Transplant* 1997; 12:657–659.
- 3 Asif A, Roy-Chaudhury P, Beathard GA. Early arteriovenous fistula failure: a logical proposal for when and how to intervene. *Clin J Am Soc Nephrol* 2006; 1:332–339.
- 4 Asif A, Cherla G, Merrill D, Cipleu CD, Briones P, Pennell P. Conversion of tunneled hemodialysis catheter-consigned patients to arteriovenous fistula. *Kidney Int* 2005; 67:2399–2406.
- 5 Allon M, Robbin ML. Increasing arteriovenous fistulas in hemodialysis patients: problems and solutions. *Kidney Int* 2002; 62:1109–1124.
- 6 Miller PE, Tolwani A, Luscly CP, Deierhoi MH, Bailey R, Redden DT, Allon M. Predictors of adequacy of arteriovenous fistulas in hemodialysis patients. *Kidney Int* 1999; 56:275–280.
- 7 Beathard GA, Arnold P, Jackson J, Litchfield T. Aggressive treatment of early fistula failure. *Kidney Int* 2003; 64:1487–1494.
- 8 Roy-Chaudhury P, Kelly BS, Zhang J, Narayana A, Desai P, Melham M, *et al.* Hemodialysis vascular access dysfunction: from pathophysiology to novel therapies. *Blood Purif* 2003; 21:99–110.
- 9 Andrassy K, Malluche H, Bornefeld H, Comberg M, Ritz E, Jesdinsky H, Möhring K. Prevention of p.o. clotting of av. cimino fistulae with acetylsalicylic acid. Results of a prospective double blind study. *Klin Wochenschr* 1974; 52:348–349.
- 10 Janicki K, Dmoszynska A, Janicka L, Stettner S, Jesipowicz J. Influence of antiplatelet drugs on occlusion of arteriovenous fistula in uraemic patients. *Int Urol Nephrol* 1992; 24:83–89.
- 11 Michie D, Wombolt D. Use of sulfinpyrazone to prevent thrombus formation in arteriovenous fistulas and bovine grafts of patients on chronic hemodialysis. *Curr Ther Res* 1977; 22:196–204.
- 12 Albert F. Prevention of early thrombus formation in arteriovenous fistulae. *Dial Transplant* 1981; 10:167C.
- 13 Grøntoft KC, Mulec H, Gutierrez A, Olander R. Thromboprophylactic effect of ticlopidine in arteriovenous fistulas for haemodialysis. *Scand J Urol Nephrol* 1985; 19:55–57.
- 14 Grøntoft KC, Larsson R, Mulec H, Weiss LG, Dickinson JP. Effects of ticlopidine in AV-fistula surgery in uremia. *Fistula Study Group. Scand J Urol Nephrol* 1998; 32:276–283.
- 15 Fiskerstrand CE, Thompson IW, Burnet ME, Williams P, Anderton JL. Double-blind randomized trial of the effect of ticlopidine in arteriovenous fistulas for hemodialysis. *Artif Organs* 1985; 9:61–63.
- 16 Janicki K, Janicka L, Dmoszynska A, Marczewski K, Smarz I. Effects of ticlopidine on platelet activity and occlusion of arteriovenous fistulas in IPD patients. *Dial Transplant* 1994; 23:576–579.
- 17 Sreedhara R, Himmelfarb J, Lazarus JM, Hakim RM. Anti-platelet therapy in graft thrombosis: results of a prospective, randomized, double-blind study. *Kidney Int* 1994; 45:1477–1483.
- 18 Roy-Chaudhury P, Sukhatme VP, Cheung AK. Hemodialysis vascular access dysfunction: a cellular and molecular viewpoint. *J Am Soc Nephrol* 2006; 17:1112–1127.
- 19 Feldman HI, Kobrin S, Wasserstein A. Hemodialysis vascular access morbidity. *J Am Soc Nephrol* 1996; 7:523–535.
- 20 Cochrane, Da Silva AF, Escofet X, Rutherford PA. Medical adjuvant treatment to increase patency of arteriovenous fistulae and grafts. *Cochrane Database Syst Rev* 2003; 2:CD002786.
- 21 CAPRIE Steering Committee. A randomized blinded, trial of clopidogrel versus aspirin in patients at risk of ischemic events. *Lancet* 1996; 348:1329–1339.
- 22 Yevzlin AS, Conley EL, Sanchez RJ, Young HN, Becker BN. Vascular access outcomes and medication use: a USRDS study. *Semin Dial* 2006; 19:535–539.
- 23 Kaufman JS, O'Connor TZ, Zhang JH, Cronin RE, Fiore LD, Ganz MB, *et al.* Veterans Affairs Cooperative Study Group on Hemodialysis Access Graft Thrombosis. Randomized controlled trial of clopidogrel plus aspirin to prevent hemodialysis access graft thrombosis. *J Am Soc Nephrol* 2003; 14:2313–2321.

The value of serum carbohydrate antigen 19-9 as a predictor of resectability in pancreatic adenocarcinoma

Ayman A. Albatanony, Alaa A. Alseesi

General Surgery Department, Menoufia Faculty of Medicine, Shibin Alkom, Egypt

Correspondence to Ayman A. Albatanony, MD, Department of General Surgery, Menoufia Faculty of Medicine, Gamal Abdelnaser Street, Shibin Alkom 32111, Egypt
Tel: 00201024341333;
e-mail: aymanalbatanony@hotmail.com

Received 11 April 2015

Accepted 13 June 2015

The Egyptian Journal of Surgery

2015, 34:226–229

Background

Pancreatic cancer is one of the most common causes for cancer-related deaths. Recently, considerable improvements in radiological imaging have made it possible to limit surgery for patients who will benefit. However, ~25–50% of patients with resectable disease on computed tomography (CT) are found to have unresectable lesions at laparotomy. The sensitivity and specificity of carbohydrate antigen 19-9 (CA 19-9) in the diagnosis of pancreatic cancer has been reported to be as high as 90 and 98%, respectively. However, little is known about the value of serum CA 19-9 levels in evaluating the resectability of pancreatic carcinoma.

Aim of the work

The aim of this study was to evaluate the value of serum CA 19-9 level in determining resectability of pancreatic cancer in comparison with triphasic CT.

Patients and methods

This retrospective study included 40 patients with histologically confirmed pancreatic adenocarcinomas. Serum CA 19-9 level was recorded, together with the CT findings. The operative decision as regards resectability was recorded. The level of CA 19-9 in the resectable and irresectable cases was recorded to determine a cutoff value for serum CA 19-9.

Results

Serum CA 19-9 in resectable cases was 182.84 ± 219.68 , whereas in irresectable cases it was: 1119.60 ± 668.66 ($P < 0.001$). At a cutoff value of 307.55, the sensitivity for resection was 100%, specificity was 88.67%, positive predictive value was 71.43%, the negative predictive value was 100%, and accuracy was 90%.

Conclusion

Preoperative CA 19-9 serum level is a useful marker for further evaluating the resectability of pancreatic adenocarcinoma. Obviously increased serum level of CA 19-9 more than 307.55 U/ml can be regarded as a predictor for unresectable pancreatic cancer. This is beneficial in avoiding unnecessary laparotomy and preventing its morbidity.

Keywords:

carbohydrate antigen 19-9, pancreatic adenocarcinoma, resectability

Egyptian J Surgery 34:226–229
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Pancreatic cancer is one of the most common causes for cancer-related deaths. Local vascular involvement and nodal and distant metastases are frequently found at the time of diagnosis [1].

Recently, considerable improvements in radiological imaging have made it possible to limit surgery for patients who will benefit. However, ~25–50% of patients with resectable disease on computed tomography (CT) are found to have unresectable lesions at laparotomy [2].

Resectability of a pancreatic tumor was defined as a tumor limited to the pancreas with no invasion of the superior mesenteric artery and vein, portal vein, and metastases [3].

Carbohydrate antigen 19-9 (CA 19-9) is the gold-standard serologic marker for the diagnosis of pancreatic cancer. Originally described by Koprowski

and colleagues as a marker for colon cancer, the CA 19-9 antigen is sialylated lacto-*N*-fucopentaose II, related to the Lewis blood group antigen. The sensitivity and specificity of CA 19-9 in the diagnosis of pancreatic cancer has been reported to be as high as 90 and 98%, respectively [3,4]. However, little is known about the value of serum CA 19-9 levels in evaluating the resectability of pancreatic carcinoma.

Aim of the work

The aim of this study was to evaluate the value of serum CA 19-9 level in determining the

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

resectability of pancreatic cancer in comparison with triphasic CT.

Patients and methods

This retrospective study included 40 patients with histologically confirmed pancreatic adenocarcinomas presented and treated at Menoufia University Hospital and Damanhour Oncology Center between January 2011 and December 2014. All patients proved resectable on triphasic CT.

The following data were retrieved from the patients' files:

CT findings: pancreatic adenocarcinoma without invasion of the superior mesenteric vein, portal vein, or metastases.

Endoscopic retrograde cholangiopancreatography (ERCP) and cytological findings (if performed).

Serum level of CA 19-9.

Following laparotomy, the resectability of the tumor was recorded. The relationship between resectability and CA 19-9 level was statistically studied.

Statistical analysis

Data were analyzed using IBM SPSS software package, version 20 (SPSS Inc., Chicago, Illinois, USA). Significance of obtained results was judged at the 5% level. Agreement of the different predictives with the outcome was used and expressed in sensitivity, specificity, positive predictive value, negative predictive value, and accuracy. Receiver operating characteristic curve was plotted to analyze a recommended cutoff value; the area under the receiver operating characteristic curve denotes the diagnostic performance of the test. An area more than 50% gives acceptable performance and an area about 100% is the best performance for the test.

Results

The demographic data of the studied patients are presented in Table 1.

Triphasic CT imaging of patients in this study revealed pancreatic mass in 37 of 40 patients (92.5%). The mass was located in the head in 28 cases (70%), in the body in eight cases (20%), and in the tail in only one case (2.5%). In the remaining three cases (7.5%), the diagnosis was based on ERCP and cytology findings.

Table 2 represents the minimum, maximum, mean, SD and median of CA 19-9 level in both respectable and unresectable patients.

Discussion

Pancreatic cancer is one of the most common causes of cancer-related deaths. The overall 5-year survival rate ranges from 0.4 to 4%, the lowest for any cancer. Early diagnosis of pancreatic cancer is difficult because its early symptoms are usually nonspecific (weight loss, anorexia, nausea, and anemia of chronic illness). Local vascular involvement and nodal and distant metastases are frequently found at the time of diagnosis [1].

Recently, considerable improvements in radiological imaging have made it possible to limit surgery for patients who will benefit. The current methods of choice for diagnosing and staging pancreatic cancer are thin section, contrast-enhanced, and triple-phase helical CT. However, ~25–50% of patients with resectable disease on CT are found to have unresectable lesions at laparotomy. Although MRI is increasingly used in the evaluation of pancreatic tumor, it was reported that it offers no significant diagnostic advantage over CT [5].

It has been reported that CA 19-9 level is useful in both the diagnosis and the prognosis of pancreatic cancer [6]. However, little is known about the value of serum CA 19-9 levels in evaluating the resectability of pancreatic carcinoma. Certain limitations for the use of CA 19-9 do exist. Not every patient with pancreatic cancer will have high CA 19-9. Although a high CA 19-9 is most commonly associated with

Table 1 Demographic data of the studied patients

Point of comparison	Resectable (n = 30)		Irresectable (n = 10)		Test of significance	P
	No.	%	No.	%		
Sex						
Male	20	66.7	6	60	$\chi^2 = 2.22$ FEp = 0.159	
Female	10	33.6	4	40		
Age						
Min–max	51–77		48–76		$t = 1.835$	0.074
Mean \pm SD	50.6 \pm 13.64		59.4 \pm 11.35			

χ^2 , value of Chi square; FE, Fisher exact test; t, Student t-test.

Table 2 Comparison between the studied patients according to CA 19-9

Point of comparison	Resectable (n = 30)	Irresectable (n = 10)	Z	P
Min–Max	5.0–1001.0	319.0–2138.0	4.312	<0.001
Mean \pm SD	182.84 \pm 219.68	1119.60 \pm 668.66		
Median	106.75	902.0		

Z, Z for Mann Whitney test.

Table 3 Agreement (sensitivity, specificity, positive predictive value, negative predictive value and accuracy) for CA 19.9 at the presumed cutoff value of 307.55

	Level	Resectable	Irresectable	Sensitivity	Specificity	PPV	NPV	Accuracy
CA 19.9	≤307.55	26	0	100.0	88.67	71.43	100.0	90.0
	>307.55	4	10					

pancreatic cancer, high levels may be found in patients with other cancers such as colorectal and lung cancers. Furthermore, high CA 19-9 levels may also be found in noncancerous conditions such as gall stones and pancreatitis. Moreover, patients with pancreatic cancers receiving radiotherapy may have higher CA 19-9 (Table 1). Both resectable and irresectable groups were comparable as regards the demographic data ($P > 0.05$).

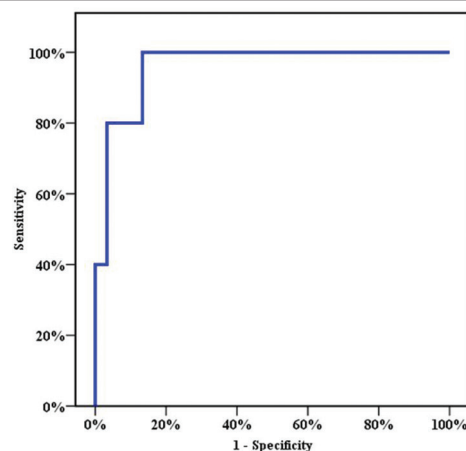
Triphasic CT imaging of patients in this study revealed pancreatic mass in 37 of 40 patients (92.5%), and in three cases the diagnosis was based on ERCP and cytology findings. In this study, CT failed to detect irresectability in 10 cases preoperatively (25%).

We agree with Clark and colleagues, who stated the following: 'CT is almost 100% accurate in predicting unresectable disease. However, the positive predictive value of the test is low and ~25–50% of patients predicted to have resectable disease on CT turn out to have irresectable lesion at laparotomy. The identification by means of preoperative imaging of patients who would not benefit from surgical exploration remains a challenge' [7].

The comparison between CA 19-9 levels in resectable versus irresectable patients (Table 2) revealed a highly significant increase of CA 19-9 in irresectable cases ($P < 0.001$), with a cutoff level of CA 19-9 between resectable and irresectable at 307.55 U/ml (Fig. 1 and Table 3), indicating that increased serum level of CA 19-9 above this value suspects irresectability of the tumor. In fact, only two cases with CA 19-9 level more than the cutoff level were found resectable.

From the above data we noticed that preoperative CA 19-9 level together with CT findings gave more accurate data about the decision as regards resectability.

This finding is in accordance with that of Zhang and colleagues, who reported similar results, yet with a higher cutoff value of CA 19-9 (353 U/ml). They reported that, at a cutoff value of CA 19-9 at 353.15 U/ml, the sensitivity, specificity, positive predictive value, and negative predictive value were 93.1, 78.3, 84.38, and 90%, respectively [8].

Figure 1

Receiver operating characteristic curve for carbohydrate antigen 19-9 to diagnose the cutoff value denoting irresectability.

Moreover, Kilic *et al.* [9] reported that the sensitivity, specificity, positive predictive value, and negative predictive value were 82.4, 92.3, 91.4, and 83.9%, respectively, in 51 patients, at a cutoff value of CA 19-9 at 256.4 U/ml.

Conclusion

Preoperative CA 19-9 serum level is a useful marker for further evaluating the resectability of pancreatic adenocarcinoma. Obviously increased serum level of CA 19-9 more than 307.55 U/ml can be regarded as a predictor for unresectable pancreatic cancer. This is beneficial in avoiding unnecessary laparotomy and preventing its morbidity.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Jemal A, Siegel R, Ward E, Hao Y, Xu J, Murray T, Thun MJ. Cancer statistics, 2008. *CA Cancer J Clin* 2008; 58:71–96.
- Hanbidge AE. Cancer of the pancreas; the best image for early detection-CT, MRI, PET or US? *Can J Gastroenterol* 2002; 16:101–105.
- Pappas S, Federle MP, Lokshin AE, Zeh HJ 3rd. Early detection and staging of adenocarcinoma of the pancreas. *Gastroenterol Clin North Am* 2007; 36:413–429.

- 4 Koprowski H, Steplewski Z, Mitchell K, Herlyn M, Herlyn D, Fuhrer P. Colorectal carcinoma antigens detected by hybridoma antibodies. *Somatic Cell Genet* 1979; 5:957–971.
- 5 Sahani DV, Shah ZK, Catalano OA, Boland GW, Brugge WR. Radiology of pancreatic adenocarcinoma: current status of imaging. *J Gastroenterol Hepatol* 2008; 23:23–33.
- 6 Dong Q, Yang XH, Zhang Y, Jing W, Zheng LQ, Liu YP, Qu XJ. Elevated serum CA19-9 level is a promising predictor for poor prognosis in patients with resectable pancreatic ductal adenocarcinoma: a pilot study. *World J Surg Oncol* 2014; 12:171.
- 7 Clarke DL, Thomson SR, Madiba TE, Sanyika C. Preoperative imaging of pancreatic cancer: a management-oriented approach. *J Am Coll Surg* 2003; 196:119–129.
- 8 Zhang S, Wang YM, Sun CD, Lu Y, Wu LQ. Clinical value of serum CA19-9 levels in evaluating resectability of pancreatic carcinoma. *World J Gastroenterol* 2008; 14:3750–3753.
- 9 Kilic M, Goemen E, Tez M, Ertan T, Keskek M, Koç M. Value of preoperative serum CA 19-9 levels in predicting resectability for pancreatic cancer. *Can J Surg* 2006; 49:241–244.

Outcome of liver resection in breast cancer liver metastases

Mostafa Abdo, Ali El Anwar

Department of General Surgery, Ain Shams University, Cairo, Egypt

Correspondence to Ali M. El-Anwar, MD, Department of General Surgery, Faculty of Medicine, Ain Shams University, Nasr City, 11371 Cairo, Egypt
Tel: +20 100 006 9690; fax: 0224019879; e-mail: alianwar1973@yahoo.com

Received 20 April 2015

Accepted 13 June 2015

The Egyptian Journal of Surgery 2015, 34:230–237

Introduction

Women with visceral metastases of breast cancer are usually considered to have a poor prognosis. A small subgroup of patients, however, present with liver metastases as the only manifestation of recurrence. The discussion whether this subgroup might benefit from an aggressive approach including liver resection is still ongoing and remains controversial. The decrease in mortality and morbidity rates has led to a broadening of the indication for hepatic resection.

Design

This was a case series study.

Methodology

Between January 2011 and December 2013, nine adult female patients underwent liver resection for liver metastases from breast cancer. Patients were considered for surgical management if they were fit for major operation; hepatic resection can be performed with adequate residual liver volume, intact inflow and outflow, and biliary drainage, and no extrahepatic disease on preoperative imaging except for limited and stable bone metastases. Hepatic resection was performed using standard techniques for either anatomic or nonanatomic resection. The type and length of the surgical procedures, intraoperative blood loss and transfusion, postoperative complications, ICU stay, and hospital stay were recorded. These patients were followed up in clinic 2 weeks postoperatively to record early postoperative complications. At subsequent follow-up visits every 3 months, chest radiography, abdominal ultrasound, and evaluation of carcinoembryonic antigen and CA 15-3 were carried out. Triphasic computed tomography of the abdomen was performed every 6 months and bone scan was performed case by case according to the patient's complain. The follow-up period was 2 years.

Results

All patients underwent tumorectomy with safety margins, except for two cases for which combined segmentectomy and tumorectomy with safety margins was performed. All patients underwent R0-resections. The mean operating time for hepatic resection was 150 ± 17 min, and blood loss was 360 ± 95 ml. Six patients were admitted to the ICU for 1 day and the main hospital stay was 5 ± 2 day. There was an overall morbidity rate of 33%, with one patient (11%) had grade 1 complication and two patients (22%) had grade 2 complications according to Clavien–Dindo score, and no postoperative mortality was detected. The mean follow-up period was 21 ± 2.7 months. One patient was presented with disease recurrence in the liver and brain at 8 months, and died at 10 months postoperatively (1-year survival, 88%). A second patient had local breast recurrence and died at 19 months postoperatively (2 years survival, 77%).

Conclusion

This approach represents a valid cytoreductive procedure for many patients with isolated liver metastases and may be curative for some of them. This benefit was obtained with a low morbidity rate and no mortality.

Keywords:

cancer breast, liver metastases, outcome

Egyptian J Surgery 34:230–237
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Breast cancer accounts for 1.38 million cancer diagnoses and 458 000 cancer deaths in women annually, making it the most frequently diagnosed cancer and the leading cause of death among women worldwide [1].

Approximately 50% of all women with breast cancer develop liver metastases [2,3]. In the majority of patients, this is associated with tumor deposits at other sites, indicating advanced disease with poor outcome and a short overall survival of 1–4 months [4]. However,

a small proportion of patients (1–3%), present with isolated liver metastases [5,6].

Surgical approaches in the treatment of metastatic disease are still contradictory and some hold the view that only chemotherapy and/or hormone therapy are

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

indicated in such conditions. However, hormonal therapy is generally of limited use because most hepatic metastases are hormone receptor negative [7]. Neither chemotherapy nor radiotherapy represents a curative treatment in this condition and long-term survival rarely observed, with reported median survivals that range from 15 months when responding to chemotherapy to as low as 3 months when not responding [8,9].

Several case series have reported an improvement in survival for patients who underwent hepatic resection for liver-only metastatic disease, with 5-year survival rates ranging from 9 to 61% [10].

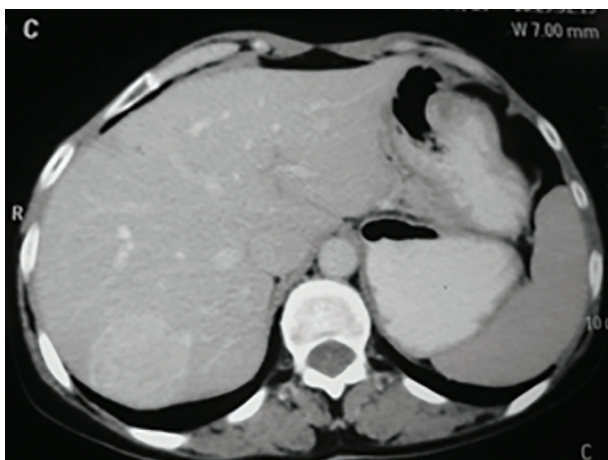
The primary endpoint of our study was to detect liver recurrence after liver resection with an intention to treat isolated breast cancer liver metastases compared with a review of the existing published literature, and the secondary endpoint was to prove its survival advantage.

Patients and methods

Between January 2011 and December 2013, nine adult female patients underwent liver resection for liver metastases from breast cancer diagnosed based on the triphasic abdominal computed tomography (CT) and MRI scan criteria. The diagnosis was confirmed with postoperative histopathology.

Clinical and pathologic parameters evaluated included age at diagnosis of breast metastases, primary breast surgery, lymph node status, chemotherapy and/or radiation of the primary tumor, interval from diagnosis of the primary tumor to the discovery of metastases, and the number, size, and location of the metastases.

Figure 1



Triphasic computed tomography showing hepatic focal lesion (HFL) in the right lobe.

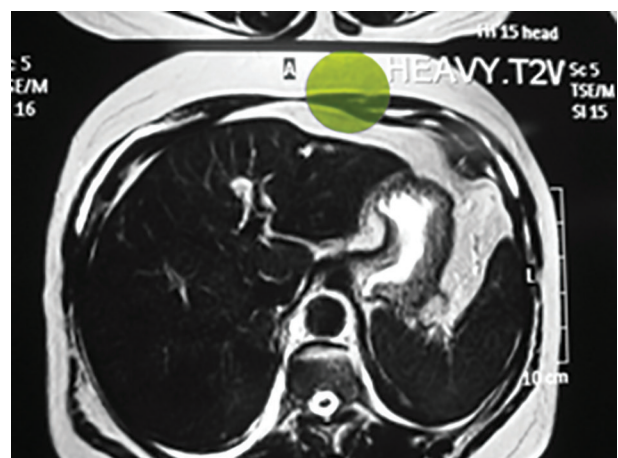
Preoperatively, all patients underwent a triphasic abdominal CT (Fig. 1) or MRI scan (Fig. 2) to assess tumor burden in the liver before surgery was considered. CT volumetry was requested if major resection was suspected. Additional distant metastases were excluded by renewed staging before liver surgery: bone scan and CT/MRI of the brain and chest and sometimes mammography.

Patients were considered for surgical management if they were fit for major operation; hepatic resection can be performed with adequate residual liver volume (35% residual liver volume), intact inflow and outflow, and biliary drainage. Patients included in the study were those with no extrahepatic disease on preoperative imaging except for limited and stable bone metastases for at least 6 months. Any patient with underlying liver disease was excluded.

Hepatic resection was performed using standard techniques for either anatomic or nonanatomic resection aiming at 1 cm safety margin (Fig. 3). All patients were taken to the operating room for a planned intraoperative ultrasound. Selective vascular clamping or Pringle maneuver was used to control intraoperative blood loss according to the intraoperative findings. A lymphadenectomy of the hepatoduodenal ligament was performed if the lymph nodes were intraoperatively considered suspicious for metastatic involvement for frozen examination and the procedure was canceled if proved to be positive. For patients who received chemotherapy the operation was performed 4–6 weeks from the last dose.

The type and length of the surgical procedures, intraoperative blood loss and transfusion, postoperative complications, ICU stay, and hospital stay were recorded.

Figure 2



MRI revealing HFL in the left lobe.

Postoperative chemotherapy was used at the discretion of a multidisciplinary tumor board.

These patients were followed up in clinic 2 weeks postoperatively to record early postoperative complications. At subsequent follow-up visits every 3 months, chest radiography and abdominal ultrasound was performed and carcinoembryonic antigen (CEA) and CA 15-3 were measured only in patients with previously elevated levels before management of the primary breast tumor. Triphasic CT of the abdomen was performed every 6 months and bone scan was performed case by case based on the patient's complain. The follow-up period was 2 years.

Curative resection was defined as removal of all macroscopically detectable disease and microscopically clear resection margins of the excised liver. Hepatectomies were classified into major and minor resections, as defined by resection of up to three segments for minor and corresponding more than three segments for major hepatectomies. Curative management of breast primary was considered if no vital tumor was evident at the site of previous tumor on MRI. Complications were classified according to the Clavien–Dindo classification of surgical complications [11]. All deaths within 30 days of surgery were considered perioperative mortality.

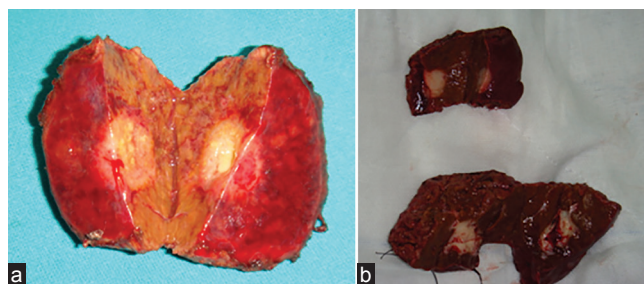
Data were analyzed using Student's *t*-test. All data were presented as mean \pm SD. Statistical analyses were performed with SPSS, version 17 for Windows computer software (IBM, Armonk, New York, USA).

Results

Patient and tumor characteristics

Nine patients diagnosed with breast cancer metastatic to the liver were considered for surgical management. The mean age at the time of referral was 52.5 years (range, 36–63 years), and all patients were female.

Figure 3



(a) Tumorectomy resection with 1 cm safety margins. (b) Tumorectomy resection with 1 cm safety margins.

Eight patients had metastatic disease confined to the liver; one patient had concurrent metastases to the bone that was managed preoperatively with radiotherapy alone (disease-free interval 6 months).

All patients underwent a resection of their primary breast cancer (three lumpectomy and six modified radical mastectomies) before the diagnosis of liver metastases. Four patients had positive axillary nodes at the time of the resection for primary cancer. The mean interval between diagnosis of primary breast cancer and subsequent liver metastases was 29 months (range, 10–44 months). CA 15-3 and CEA were evaluated at the initial evaluation and during the follow-up; they were elevated in 88 and 66% of patients, respectively. During follow-up the levels returned to normal in all patients and remained in a plateau, except for two patients who had recurrence, in whom both markers started to rise again to the preoperative levels.

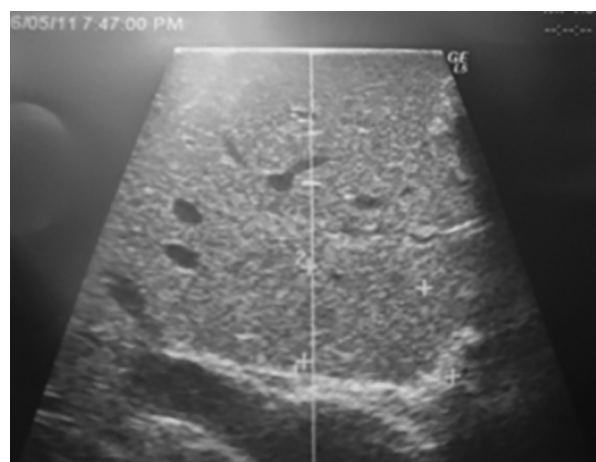
The number of liver metastases were identified intraoperatively with either visual, manual, or intraoperative ultrasound (performed routinely in all patients) (Fig. 4) and was confirmed to be solitary in one patient in the left lobe (Fig. 5) and multiple in the remaining eight cases (range, 1–4). Two cases had more than one lesion confined to one lobe of the liver, and six cases had bilateral metastases and the tumor size was more than 4 cm in only two cases.

Preoperative patient demographics and tumor characteristics are summarized in Table 1.

Surgical results

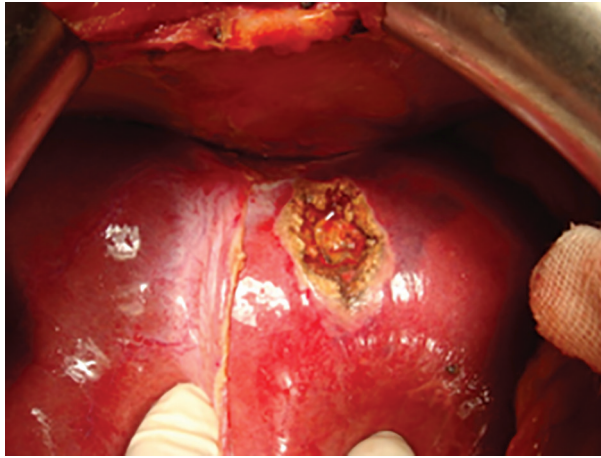
All patients underwent tumorectomy with safety margins (Fig. 6) except for two cases for which

Figure 4



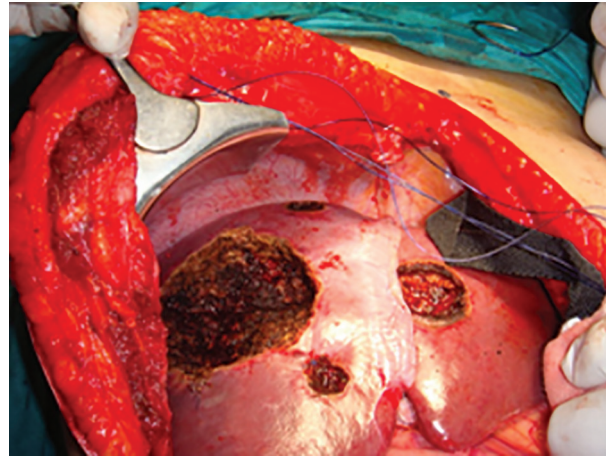
Intraoperative ultrasound revealing hypoechoic HL and its relation to the portal vein.

Figure 5



A case with solitary lesion in the left lobe.

Figure 6



Tumorectomy with safety margins for three bilobar lesions.

Table 1 Demographic and characteristics of liver metastases from breast cancer

Characteristics	N=9
Sex (number of patients)	
Female	9
Age (years)	
Mean ± SD	52.5 ± 2.6
Range	36–63
Primary breast surgery	
Lumpectomy	3
Modified radical mastectomy	6
Axillary LN	
Positive	4
Negative	5
Tumor markers CEA (ng/ml)	
>5	6
<5	3
Tumor markers CA 15-3 (IU/ml)	
>25	8
<25	1
Interval between primary and diagnosis of liver metastases (months)	
Mean ± SD	29 ± 13.3
Range	10–44
Tumor size (cm)	
≤4	7
>4	2
Number of lesions	
Solitary	1
2	4
3	2
4	2
Lesion site [nodule (n)]	
Left lobe	8
Right lobe	15
Tumor distribution	
Unilobar	3
Bilobar	6

CEA, carcinoembryonic antigen; LN, lymph node.

combined segmentectomy and tumorectomy with safety margins (Fig. 7) was performed (Table 2). One

patient was found to have a tumor adjacent to the central biliary structures that was near to the pedicle and was resected after lowering of the pedicle and freeing the biliary structures (Fig. 8). All patients underwent R0-resections.

The mean operating time for hepatic resection was 150 min (range, 85–195 min), and blood loss was around 360 ± 95 ml (range, 200–970 ml). Six patients were admitted to the ICU for 1 day and the main hospital stay was 5 ± 2 fifth day (range, 3–17) (Table 3).

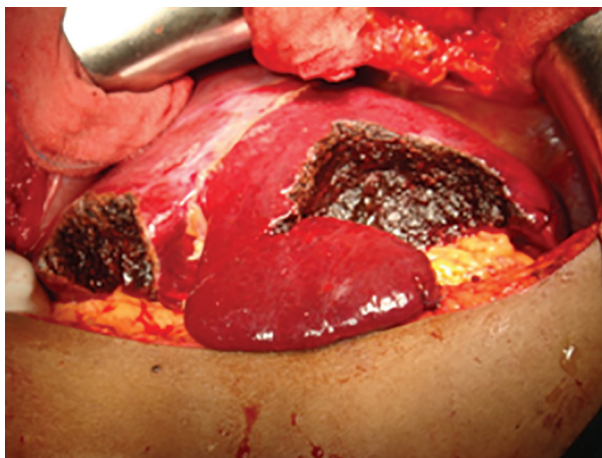
Morbidity and mortality

There was an overall morbidity rate of 33%, with grade 1 complication in one patient (wound infection opened at the bed side) (11%) and grade 2 (22%) in two patients; one patient had urinary tract infection and received antibiotics and the other had bile leak and pleural effusion, which was managed conservatively (Table 4).

Patient outcome

The mean follow-up period was 21 ± 2.7 months. Of the patients who underwent hepatic resection, one patient presented with liver and brain disease recurrence at 8 months, and died at 10 months postoperatively. Previously, this patient had four bilobar lesions, all less than 4 cm (1-year survival, 88%). The second patient had local breast recurrence and died at 19 months postoperatively. Previously, this patient had a lumpectomy for the primary breast disease and three lesions in the right lobe. The patient received chemotherapy, and died from fungal pneumonia associated with leukopenia (2-year survival, 77%) (Table 5).

Figure 7



Combined segmentectomy and tumorectomy with safety margins for a lesion in the left lobe and tumorectomy for a second lesion in the right lobe.

Table 2 Type of operative procedure adopted

Type of operation	Patients (N = 9)	Nodules (N = 23)
Major resection	0	0
Segmentectomy	0	2
Limited resection	7	21
Combined resection	2	—

Table 3 Mean operative blood loss and transfusion and mean operative time

Operative finding	Value
Mean blood loss (ml)	
Mean \pm SD	360 \pm 95
Range	200–970
Blood transfusion (number of patients)	1
Blood transfusion (number of bags)	1
Mean operating time (min)	
Mean \pm SD	150 \pm 17
Range	85–195

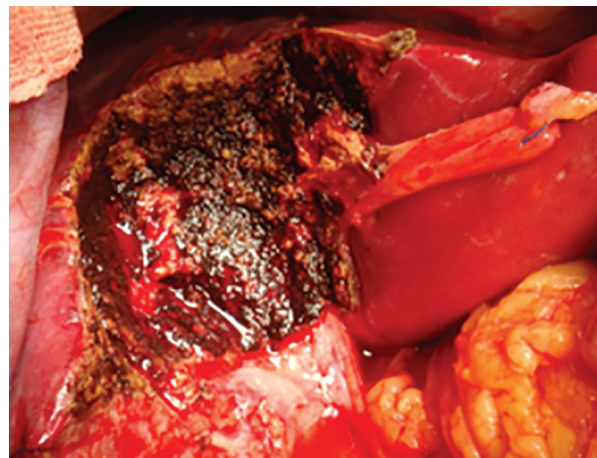
Table 4 Length of stay and surgical morbidity

Length of stay	N = 9
ICU stay	
Number of patients	6
Mean days \pm SD	1 \pm 0
Hospital stay	
Mean days \pm SD	5 \pm 2
Range	3–17
Type of complication	
Bile leak	1
Pleural effusion	1
Wound infection	1
Urinary tract infection	1
Mortality	0

Discussion

There are limited data in the published literature evaluating the use of local surgical therapies for the

Figure 8



A tumor adjacent to the central biliary structures near to the pedicle that was resected after lowering of the pedicle and freeing the biliary structures.

Table 5 Follow-up period, survival, and recurrence

Postoperative finding	Value
Follow-up period (months)	
Mean \pm SD	21 \pm 2.7
Range	17–29
1-year survival (%)	88
2-year survival (%)	77
Local recurrence (N)	1
Liver recurrence (N)	1

treatment of breast cancer liver metastases [12]. A prospective randomized-controlled study on this aspect is not available [13,14].

A general problem in all studies dealing with that topic is the inhomogeneous and small study groups. Different tumor biologies of the underlying cancers, differing medical histories and time intervals between primary breast cancer and liver metastases including variation in preceding endocrine treatment as well as chemotherapy, and different surgical approaches lead to an inevitable inhomogeneity [15,16].

The reasons for the small study groups in the literature may be due to the reluctance in referring these patients to surgical evaluation. First, most patients with breast cancer liver metastases also have extrahepatic metastases [17], a finding that has traditionally been considered a contraindication to hepatic resection. Secondly, breast cancer has been considered a systemic disease since its onset. Therefore, this concept seems to contraindicate any surgical therapy, and treatments with a minimal profile have been preferred over aggressive treatments such as resection [8].

Data on the primary tumor stages are contradictory in the literature [18–21]. A good histopathological grading of the primary cancer proved to be statistically the most favorable prognostic factor. In contrast, there are references in which the grading of the primary breast cancer was stated to be irrelevant in liver metastases [18,19]. Our limited data at this point result from the treatment of primary breast cancer at different institutions and an interval between primary surgery and liver surgery of up to 4 years.

The receptor status of the primary breast cancer is not necessarily the same in the metastases [22]. The receptor status of breast cancer patients developing liver metastases is therefore not a good indicator to select candidates for liver resection. The hormone receptor status of the primary breast cancer seems to be relevant in some studies, whereas other authors disagree with it [15,16]. Moreover, the expression of Her-2 did not show influence on survival but was described as a prognostic factor in a former study [2]. Unfortunately, we cannot answer this question for our study group.

The mean disease-free interval between the primary breast disease and the appearance of the liver metastases in our study (29 ± 13.3 months) appears to be too short when compared with the median time interval (55 months) in the study conducted by Weinrich *et al.* [23]. Pocard *et al.* [24] found that a short disease-free interval between treatment of the primary tumor and onset of liver metastases significantly correlated with poor survival and reported that survival at 36 months was 55% when liver metastases occurred before 48 months, versus 85% when liver metastases occurred after 48 months ($P = 0.01$); they found that it was the only parameter statistically correlated with survival. The poorer outcome of patients with a short disease-free interval might be explained by the more aggressive behavior of these tumors. This may explain the overall survival in this study (77%), but the small study group limits the generalization of our results.

The operation adopted in our study was tumorectomy in all nine patients, a principle adapted from the management of colorectal liver metastases; this type of resection did not increase recurrence in the liver remnant and more importantly improved 5-year survival in case of recurrence (salvageability); it was thus recommended to be the standard approach for salvage surgery in case of liver recurrence [25].

The number, and not the size, of the liver metastases was reflected in our patient outcome, as the two patients who suffered from recurrence had multiple nodules and in both of them the tumor size was less than 4 cm. Reports on the influence of the number

and size of metastases are controversial [2,26,27]. The extent of resection and the intraoperatively deviating metastasis distribution had no prognostic relevance if resection was possible. In contrast, Weinrich *et al.* [23] reported that the number of metastases proved to be a prognostically relevant factor.

It is fundamental to underline that in none of these series neither the extent of the liver disease (the number and the maximal size of the liver metastases) nor the presence of positive hilar lymph nodes had a significant prognostic impact on overall survival [28]. This suggests that hepatectomy for liver metastases is only a cytoreductive surgery and cannot be considered as a definitive and isolated treatment.

The curative resection rate (100%) in the present study is relatively higher than that reported in the references. It was stated to be 66% in a study; this series was obtained without preoperative selection of suitable patients [29] and this reflects the importance of selection of patients suitable for liver resection. Curative resection significantly correlates with superior survival and is considered as an independent prognostic factor [8].

A recent review of the literature has shown a benefit of resection in breast cancer liver metastases, with a median survival of 38 months compared with 18 months in patients with chemotherapy alone [30]. Overall, this is not surprising due to decrease in the tumor burden after resection.

In general, the prognosis of patients with breast cancer liver metastases is poor, with a median survival of 6–14 months [13,14]. Systemic chemotherapy and/or hormone therapy are still considered the treatment option of choice in these patients. Although these therapies achieved response rates between 40 and 70%, the median survival time has been reported to be no more than 5–12 months [31].

In accordance with our results, the 1- and 2-year survival in the present study was 88 and 77%, respectively. These survival rates correlate well with those published on surgically treated liver metastases in breast cancer for 1-, 2-, and 5-year survival rates of 86, 81, and 33%, respectively [23].

Selzner *et al.* [3] and Elias *et al.* [32] reported 5-year overall survival rates of 22 and 34%, respectively, in patients who underwent resection. Adam *et al.* [8] recently published the largest series so far, with 84 resected patients and a 5-year overall survival of 34%. In a study by Maximilian *et al.* [33], the 5-year overall survival was 44% after resection.

Moreover, the response to chemotherapy was found to correlate significantly with survival after liver resection [8], which documents the important role of systemic therapy in the multimodal treatment of patients with metastatic breast cancer.

The low morbidity and mortality rate indicates the safety of this procedure in these circumstances. Therefore, liver resection represents a therapeutic tool with low risk in these patients, and the results of the recently published series, as well as our study, indicate that liver resection should be considered in the multimodal treatment approach of patients with breast cancer liver metastases.

The recurrence rate among our patients (18%) was lower compared with that reported in other studies (65%) within the first 2 years, and this may be due to small sample size. Nevertheless, the 3- and 5-year survival rates of patients with local recurrence were 67 and 42%, respectively, and 57% of these patients developed metastases [3].

The two patients with recurrence in our study expressed an elevation in the CA 15-3 and CEA serum level after a period of initial decrease. Coveney *et al.* [26] proved a significant correlation between CA 15-3 value at locoregional recurrence and time to subsequent metastasis ($P = 0.0133$). Use of CEA in conjunction with CA 15-3 improves the detection of systemic disease.

Conclusion

Definitive conclusions cannot be drawn because of the limited and selected number of cases of these series; however, this approach represents a valid cytoreductive procedure for many patients with isolated liver metastases and may be curative for some of them.

The results of this study show that a selected group of patients with isolated breast cancer liver metastases benefit from complete surgical resection. This benefit was obtained with a low morbidity rate and no mortality.

Only a prospective randomized study with larger number of patients and longer follow-up period will demonstrate definitively whether surgical resection can really improve long-term survival rates in patients with isolated liver metastases with or without systemic chemotherapy, compared with other methods of treatment.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Nickkholgh A, Mehrabi A. Liver metastases from breast cancer. *Noncolorectal, Nonneuroendocrine Liver Metastases* Isidoro Di Carlo, Editors, 2015 Switzerland. Springer International Publishing; 15–31.
- Martinez SR, Young SE, Giuliano AE, Bilchik AJ. The utility of estrogen receptor, progesterone receptor, and Her-2/neu status to predict survival in patients undergoing hepatic resection for breast cancer metastases. *Am J Surg* 2006; 191:281–283.
- Selzner M, Morse MA, Vredenburgh JJ, Meyers WC, Clavien PA. Liver metastases from breast cancer: long-term survival after curative resection. *Surgery* 2000; 127:383–389.
- Wyld L, Gutteridge E, Pinder SE, James JJ, Chan SY, Cheung KL, *et al.* Prognostic factors for patients with hepatic metastases from breast cancer. *Br J Cancer* 2003; 89:284–290.
- Clark GM, Sledge GW Jr, Osborne CK, McGuire WL. Survival from first recurrence: relative importance of prognostic factors in 1015 breast cancer patients. *J Clin Oncol* 1987; 5:55–61.
- Tsukada Y, Fouad A, Pickren JW, Lane WW. Central nervous system metastasis from breast carcinoma. Autopsy study. *Cancer* 1983; 52: 2349–2354.
- Samaan NA, Buzdar AU, Aldinger KA, Schultz PN, Yang KP, Romsdahl MM, Martin R. Estrogen receptor: a prognostic factor in breast cancer. *Cancer* 1981; 47:554–560.
- Adam R, Aloia T, Krissat J, Bralet MP, Paule B, Giacchetti S, *et al.* Is liver resection justified for patients with hepatic metastases from breast cancer? *Ann Surg* 2006; 244:897–907.
- Ercolani G, Grazi GL, Ravaioli M, Ramacciato G, Cescon M, Varotti G, *et al.* The role of liver resections for noncolorectal, nonneuroendocrine metastases: experience with 142 observed cases. *Ann Surg Oncol* 2005; 12:459–466.
- Vlastos G, Smith DL, Singletary SE, Mirza NQ, Tuttle TM, Popat RJ, *et al.* Long-term survival after an aggressive surgical approach in patients with breast cancer hepatic metastases. *Ann Surg Oncol* 2004; 11:869–874.
- Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, *et al.* The Clavien–Dindo classification of surgical complications: five-year experience. *Ann Surg* 2009; 250:187–196.
- Cassera MA, Hammill CW, Ujiki MB, Wolf RF, Swanström LL, Hansen PD. Surgical management of breast cancer liver metastases. *HPB* 2011; 13:272–278.
- Metcalfe MS, Mullin EJ, Maddern GJ. Hepatectomy for metastatic noncolorectal gastrointestinal, breast and testicular tumours. *ANZ J Surg* 2006; 76:246–250.
- Largillier R, Ferrero JM, Doyen J, Barriere J, Namer M, Mari V, *et al.* Prognostic factors in 1038 women with metastatic breast cancer. *Ann Oncol* 2008; 19:2012–2019.
- Kostov DV, Kobakov GL, Yankov DV. Prognostic factors related to surgical outcome of liver metastases of breast cancer. *J Breast Cancer* 2013; 16:184–192.
- Abbott DE, Brouquet A, Mittendorf EA, Andreou A, Meric-Bernstam F, Valero V, *et al.* Resection of liver metastases from breast cancer: estrogen receptor status and response to chemotherapy before metastasectomy define outcome. *Surgery* 2012; 151:710–716.
- Lee YT. Breast carcinoma: pattern of recurrence and metastasis after mastectomy. *Am J Clin Oncol* 1984; 7:443–449.
- Lubrano J, Roman H, Tarrab S, Resch B, Marpeau L, Scotte M. Liver resection for breast cancer metastasis: does it improve survival?. *Surg Today* 2008; 38:293–299.
- Thelen A, Benckert C, Jonas S, Lopez-Hänninen E, Sehouli J, Neumann U, *et al.* Liver resection for metastases from breast cancer. *J Surg Oncol* 2008; 97:25–29.
- Van Walsum GA, de Ridder JA, Verhoef C, Bosscha K, van Gulik TM, Hesselink EJ, *et al.* Dutch Liver Surgeons Group. Resection of liver metastases in patients with breast cancer: survival and prognostic factors. *Eur J Surg Oncol* 2012; 38:910–917.
- Hoffmann K, Franz C, Hinz U, Schirmacher P, Herfarth C, Eichbaum M, *et al.* Liver resection for multimodal treatment of breast cancer metastases: identification of prognostic factors. *Ann Surg Oncol* 2010; 17:1546–1554.
- Hoefnagel LDC, van de Vijver MJ, van Slooten HJ. Receptor conversion in distant breast cancer metastases. *Breast Cancer Res* 2010; 12:75.

- 23 Weinrich M, Weib C, Schuld J, Rau BM. Liver resections of isolated liver metastasis in breast cancer: results and possible prognostic factors. *HPB Surg* 2014; 2014:893829.
- 24 Pocard M, Pouillart P, Asselain B, Falcou MC, Salmon RJ. Hepatic resection for breast cancer metastases: results and prognosis (65 cases). *Ann Chir* 2001; 126:413–420.
- 25 Mise Y, Aloia TA, Brudvik KW, Schwarz L, Vauthey JN, Conrad C. Parenchymal-sparing hepatectomy in colorectal liver metastasis: improves salvageability and survival. *Ann Surg* 2015 [Epub ahead of print].
- 26 Coveney EC, Geraghty JG, Sherry F, McDermott EW, Fennelly JJ, O'Higgins NJ, Duffy MJ. The clinical value of CEA and CA 15-3 in breast cancer management. *Int J Biol Markers* 1995; 10:35–41.
- 27 Lendoire J, Moro M, Andriani O, Grondona J, Gil O, Raffin G, *et al.* Liver resection for non-colorectal, non-neuroendocrine metastases: analysis of a multicenter study from Argentina. *HPB (Oxford)* 2007; 9: 435–439.
- 28 Elias D, Di Pietroantonio D. Surgery for liver metastases from breast cancer. *HPB (Oxford)* 2006; 8:97–99.
- 29 Maksan SM, Lehnert T, Bastert G, Herfarth C. Curative liver resection for metastatic breast cancer. *Eur J Surg Oncol* 2000; 26:209–212.
- 30 Rodes Brown S, Martin RC 2nd. Management of liver dominant metastatic breast cancer: surgery, chemotherapy, or hepatic arterial therapy – benefits and limitations. *Minerva Chir* 2012; 67:297–308.
- 31 Sakamoto Y, Yamamoto J, Yoshimoto M, Kasumi F, Kosuge T, Kokudo N, Makuuchi M. Hepatic resection for metastatic breast cancer: prognostic analysis of 34 patients. *World J Surg* 2005; 29:524–527.
- 32 Elias D, Maissonette F, Druet-Cabanac M, Ouellet JF, Guinebretiere JM, Spielmann M, Delalogue S. An attempt to clarify indications for hepatectomy for liver metastases from breast cancer. *Am J Surg* 2003; 185:158–164.
- 33 Maximilian B, Andrea F, Caroline B, Christian F, Ernesto M, Christoph EB. Outcome after resection of breast cancer liver metastases. *Int J Hepatol* 2010; 1:39–43.

Endovascular treatment of chronic total occlusion of the iliac artery

Hisham Fathi, Amr Abdel Rahim, Karim Hosni, Khaled Hindawi, Omar El-Kashef, Amr Gad

Departement of Vascular and Endovascular Surgery, Faculty of Medicine, Cairo University, Cairo, Egypt

Correspondence to Amr Abdel Rahim, MD, 18 Abdel Salam Abeid Street from Elwafaa, Haram, Giza 02, Egypt
Tel: 002001227456542;
e-mail: amrorahim@kasralainy.edu.eg

Received 31 May 2015

Accepted 15 June 2015

The Egyptian Journal of Surgery
2015, 34:238–244

Introduction

Recent results for intraluminal endovascular interventions for aortoiliac occlusive disease were published with an acceptable long term primary and secondary patencies. Although aortobifemoral bypass is still considered the gold standard for treatment of iliac artery CTOs, the procedure carries a mortality rate of 4.4% and a major complication rate of 12.1%. The aim of the study is to determine which type of patient with iliac CTO and which technique is more suitable for endovascular treatment.

Methods

It is a prospective study of 40 patients with symptomatic chronic atherosclerotic lower limb ischemia with isolated (CTO) iliac disease. According to the TASC-II classification, there were 14 patients with TASC type B lesions, 4 patients with TASC type C, and 22 patients with TASC D.

Results

Technical success was as 100% and was achieved by completion angiography, and clinical assessment of distal pulsations.

Conclusion

Endovascular treatment for iliac artery occlusive disease can be considered an alternative to open surgery for TASC-II B,C,D (CTO) disease, especially in surgically unfit patient, or who refuse surgical intervention.

Keywords:

iliac CTO, kissing stents, routine stenting, transbrachial approach

Egyptian J Surgery 34:238–244
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Percutaneous revascularization of the common iliac artery (CIA) and external iliac artery (EIA) with or without stents is a well-established, minimally invasive technique and has supplanted aortofemoral bypass for the majority of patients who have symptomatic iliac atherosclerosis Mousa *et al.* [1]. As the population develops more comorbidities, fewer patients will be considered an acceptable risk for open revascularization. As endovascular techniques have advanced, these techniques have been used for increasingly ill patients [2]. Kashyap *et al.* [2] published results for intraluminal endovascular interventions for aortoiliac occlusive disease with a primary patency rate of 74% at 3 years and a secondary patency of 95% at 3 years. Although the bulk of the literature details the use of endovascular techniques for iliac stenoses, there has been a paucity of studies addressing iliac artery chronic total occlusion (CTO). There are several technical options for accessing (transbrachial, transfemoral) and crossing (intraluminal, subintimal) of iliac CTO lesions, in addition to primary stenting versus selective stenting [2].

Aim of the study

The aim of this study is to establish certain criteria that can enable identification of patients with iliac CTO who may be more suitable for endovascular treatment and to determine which technique is more suitable for manipulation of certain lesions.

Methods

Patients

This is a prospective study of 40 patients with symptomatic chronic atherosclerotic lower limb ischemia with isolated (CTO) iliac disease. This study was carried out at Kasr-Alainy Hospital during the period from October 2012 to October 2014. Patients with iliac artery stenosis, acute embolism, thrombosis, dissection, arteritis, or those with an associated abdominal aortic aneurysm or associated other atherosclerotic lesions

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

in the lower limb arterial tree such as femoropopliteal lesions were excluded. All patients are evaluated for their demographics, risk factors, clinical presentation, and indication of intervention.

Preoperative evaluation

In addition to routine laboratory tests, all patients were evaluated by duplex and CT-angiography, and classified according to the Trans-Atlantic Inter-Society Consensus (TASC-II) classification into B, C, and D.

Operative technique

All patients were adequately well hydrated before and after the procedure and prepared with a loading dose of four tablets of 75 mg clopidogrel the day before the procedure.

All cases were performed in the endovascular suite; arterial access was obtained through the contralateral femoral artery or the left brachial artery for initial diagnostic angiography. The lesion was then approached through an ipsilateral retrograde approach or through a contralateral crossover technique. The brachial approach was reserved for patients with difficulty in crossing proximal or ostial occlusion by a contralateral approach or in bilateral iliac lesions. Heparin was administered routinely after placement of a working sheath.

In most cases, a hydrophilic stiff or a soft-tip 0.035-inch Glidewire (Terumo Interventional systems, USA) was used in combination with an angled catheter such as a Rim or Burn catheter for negotiation of the lesion. The catheter was used to engage and direct the wire toward the lesion.

Balloon angioplasty was performed in all cases for predilatation. The balloon diameter ranged between 6 and 7 mm and balloon length ranged between 60 and 100 mm. Inflation pressure ranged between 8 and 12 atm and inflation time ranged between 30 and 60 s.

Routine stenting was performed in all patients. All stents were self-expandable, except in two cases, where we used balloon-mounted stents (for ostial occlusions); stent size ranged between 6 and 8 mm and length between 60 and 120 mm.

All patients were discharged on 150 mg aspirin and 75 mg clopidogrel daily for 3 months. The study was approved by the ethical committee of our institute.

Follow-up

Clinical follow-up was performed at 1, 6, and 12 months by evaluation of symptoms such as pain improvement or

recurrence, progress of ulcer healing, appearance of a line of demarcation of gangrenous tissues, and assessment of both lower limb pulsations; also, aortoiliac duplex ultrasound studies were carried out for five patients as clinical evaluation alone was not sufficient.

Results

Between October 2012 and October 2014, 40 patients with iliac CTO underwent iliac artery angioplasty. Of these, 36 patients were men and four patients were women; 30 of these patients presented with incapacitating claudication (75%), and six patients presented with rest pain (15%), and four patients presented with tissue loss (10%) (two patients with non-healing ulcer and another two patients with dry gangrene).

According to the TASC-II classification, 14 patients had TASC type B lesions, four patients had TASC type C, and 22 patients had TASC D.

TASC B: either unilateral CIA occlusion (Fig. 1) or unilateral EIA occlusion not involving the common femoral artery (Fig. 2) and/or the internal iliac artery.

TASC C: unilateral EIA occlusion involving common femoral artery and/or internal iliac artery (Figs 3 and 4).

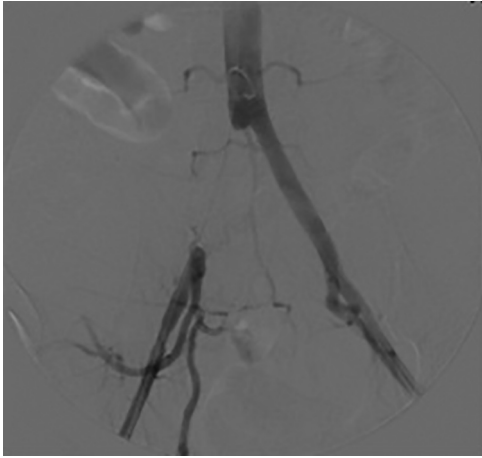
TASC D: CIA occlusion extending to EIA (Figs 5 and 6).

The bilateral retrograde femoral approach was used in 12 patients (Fig. 7), whereas the contralateral femoral approach alone was used in six patients (Fig. 8); the left brachial approach was used in six patients (Fig. 9), whereas the combined brachial and femoral approach was used in 16 patients (Fig. 10).

Balloon angioplasty was performed in all cases for predilatation. The balloon diameter ranged between 6 and 7 mm and balloon length ranged between 60 and 100 mm. Inflation pressure ranged between 8 and 12 atm. Inflation time ranged between 30 and 60 s.

Routine stenting was performed in all patients. Kissing stents were applied in 14 cases: because of flush unilateral CIA occlusion in 10 cases (Fig. 11) (by a combined brachial and retrograde femoral approach in six cases and by a bilateral retrograde femoral approach in four cases) and because of bilateral lesions in four cases (Fig. 12) (two cases were managed by a combined brachial and retrograde femoral approach and the other two cases were managed by a bilateral retrograde femoral approach). Unilateral stenting (Fig. 13) was performed in the remaining 26 cases.

Figure 1



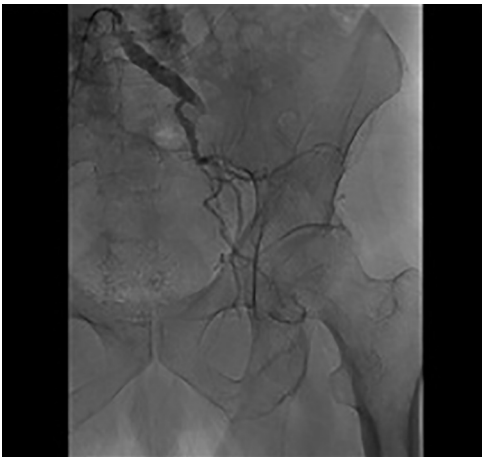
Common iliac artery occlusion.

Figure 2



Unilateral external iliac artery occlusion.

Figure 3



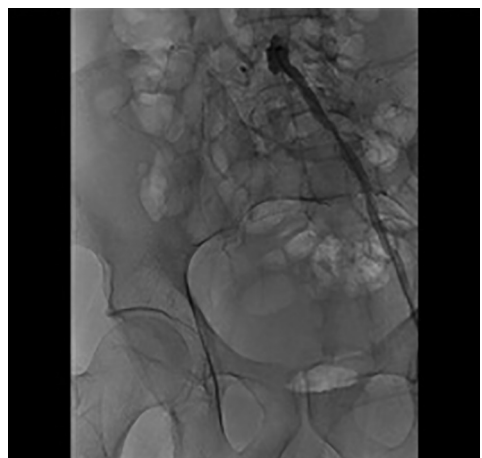
Unilateral external iliac artery occlusion.

Figure 4



Internal iliac artery proximal lesion.

Figure 5



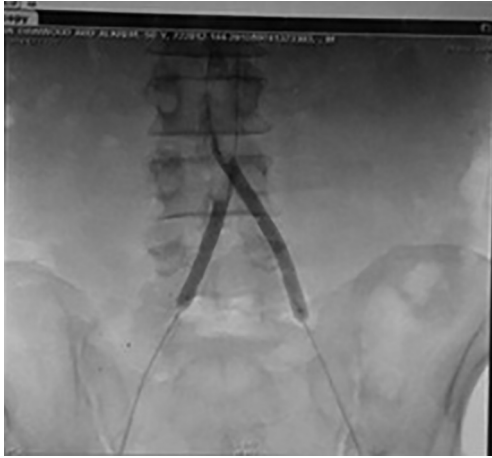
Right common iliac artery occlusion to external iliac artery.

Figure 6



Left common iliac artery occlusion to external iliac artery.

Figure 7



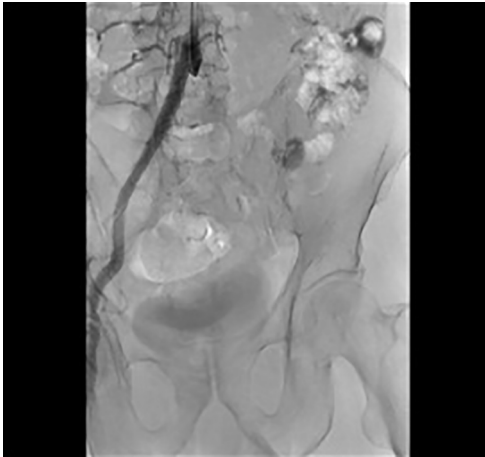
Bilateral retrograde approach.

Figure 8



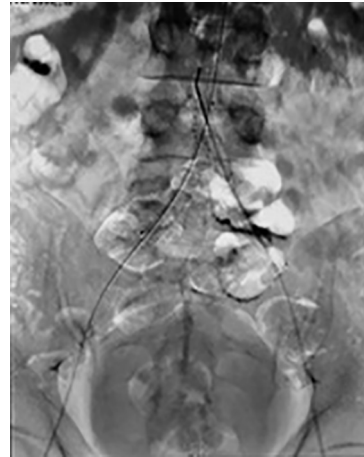
Contralateral approach.

Figure 9



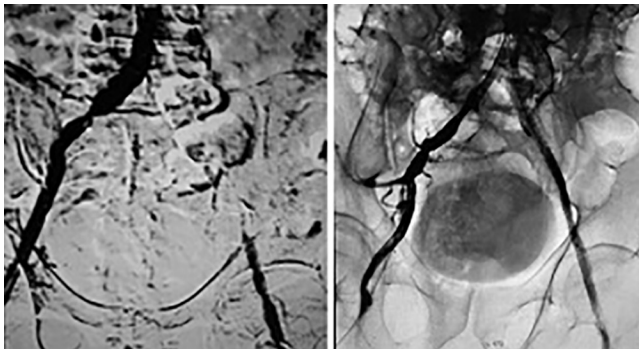
Left brachial approach.

Figure 10



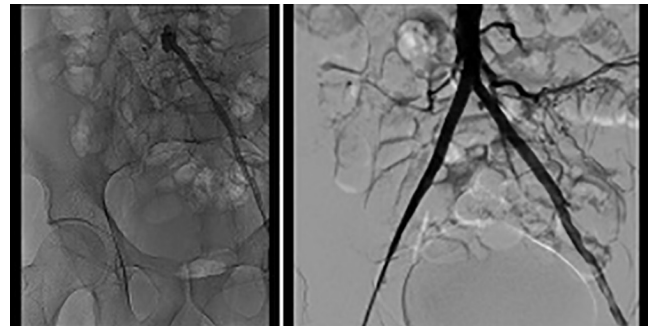
Combined approach.

Figure 11



Angioplasty for unilateral common iliac artery occlusion.

Figure 12



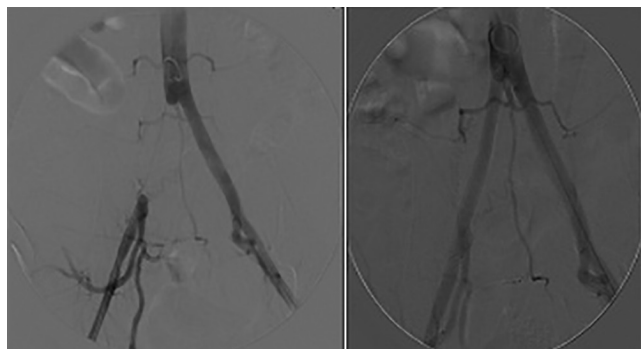
Angioplasty for bilateral iliac lesions.

Technical success (<30% stenosis on completion angiography) was 100% and was confirmed by clinical assessment of distal pulsations.

Morbidity

One patient developed brachial thrombosis after sheath removal, which was managed, and three patients developed groin hematoma that was managed conservatively.

Figure 13



Unilateral stenting for right common iliac artery occlusion.

Mortality

There was no mortality related to the intervention.

Patency rate

The primary patency rate at 12 months was 92.5%.

Discussion

Anatomical indications for endovascular therapy for iliac artery disease have been expanded even to complex lesions after TASC was revised to TASC-II [3]. However, several challenging endovascular therapy issues still remain when treating patients with complex iliac artery disease. One such issue is the technical difficulty of recanalization, particularly in getting the guidewire to cross the lesion in CTO. Another issue may be long-term patency after successful recanalization.

The age distribution in the current study reflects a higher prevalence of aortoiliac occlusive disease with increasing age, mean age 60 years (youngest 45 years and oldest 75 years of age), which is in agreement with most of the literature, being comparable with the result of De Roeck *et al.* [4] and Balzera *et al.* [5], where the mean age of the patients was between 59 and 60 years, range 45 to 75 years.

In the current study, ~90% of all patients were men, which was markedly higher than that reported in the literature of 45–68% [4,5].

Koizumi *et al.* [6] indicated that the initial success rate was inferior in TASC-II type B and D lesions compared with TASC-II type A lesions. Ozkan *et al.* [7] reported that successful recanalization was slightly less frequent (85%) in CIA occlusion without stump or with a stump length less than 1 cm, although successful recanalization was achieved in 95% of

patients who had CIA occlusion with a stump length of more than 1 cm or who had EIA occlusion. Suh *et al.* [8] reported that technical success was 100% in 110 patients with asymmetric complex aortoiliac lesions and primary patency at 3 years was 89% for the single-stent group and 87% for the kissing stent group. In the present study, initial success was achieved in 100% of patients even in those with complex disease using a bidirectional approach for recanalization by guidewire and primary stent placement, with a primary patency rate of 92.5% after 1 year. Our results confirm the findings of previous studies that reported the initial outcomes of stenting for diseased and occluded iliac arteries, and indicate the efficacy of the bidirectional approach.

Thavaa *et al.* [9], reported that the brachial approach allows a direct line for recanalization and also helped to increase the torque that could be applied to the guidewire, which was confirmed in the current study as the brachial approach alone was used successfully in 15% of cases.

Previous studies such as those of Lumsden *et al.* [10], and Schneider [11], advocated pre-stent dilatation as it has several advantages; it makes it easier to perform the second femoral ipsilateral puncture, allows smooth passage of the stent without insult to the plaque, and provides a better view of the dimensions of the balloon and stent needed. It also assesses the dilatability of the lesion before stent placement as there may be some very hard calcific stenoses that may not be amenable to balloon angioplasty at all; so to find this out when the stent is on the balloon will lead to troubles, and this also coincides with our study.

In the current study, routine stenting was used in all cases, which is in agreement with the AbuRahma *et al.* [12] study, which reported that the initial success rate was significantly higher in primary stenting for iliac artery disease compared with balloon angioplasty with selective stenting.

However, two studies by Smith *et al.* [13] and Lawrentschuk *et al.* [14] reported that no major complications occurred in the contralateral CIA with the use of unilateral angioplasty without protection of the other side; in the current study, we used kissing stents in 14 cases with unilateral ostial lesions.

Ichihashi *et al.* [15] reported the complication rates of iliac stenting; they varied between 4 and 6%. According to Kavaliauskiene *et al.* [16], the complication rates of iliac stenting were reported in all the studies and varied between 2 and 24%, whereas rates of 3 to 7.9% were reported in the iliac percutaneous transluminal

angioplasty series. Early mortality after an iliac stent implantation was described by Ozkan *et al.* [7] and ranged from 0.7 to 3.6%. The complication rate in the current study similar to that of other previous studies for endovascular treatment or bypass surgery (10%). In addition, the periprocedure mortality rate was 0%; thus, our results for complex lesions appear to be acceptable compared with other studies.

Although the Dutch iliac artery stent study did not show any superiority of primary stenting for iliac artery disease as reported by Klein *et al.* [17], other studies such as Koizumi *et al.* [6] reported better primary patency in the stent group than in the balloon angioplasty alone, which is in agreement with our study.

A study carried out by Araki *et al.* [18] to evaluate the 2-year results obtained with a self-expandable stent for CTO of the iliac artery showed primary patency at 2 years to be 96.5%. Another study carried out by Ichihashi *et al.* [15] to assess endovascular treatment with primary stent placement in patients with iliac artery occlusive disease reported a primary patency rate at 1 year of 90% in TASC-II C/D lesions. This is comparable with the result of our study, where the primary patency rate was 92.5% at 1 year.

Conclusion

Endovascular treatment for iliac artery occlusive disease can be considered an alternative to open surgery for TASC-II B, C, D (CTO) disease, especially in surgically unfit patients or those who refuse surgical intervention, and kissing stenting is a safe procedure, but not cost effective.

On comparing our results with many different studies, we can suggest certain selection criteria for the endovascular treatment of CTO of the iliac artery:

General criteria for endovascular treatment

Although endovascular treatment is amenable to all patients, it is particularly beneficial for older patients with limited life expectancy and associated multiple comorbidities such as diabetes, hypertension, and cardiac compromise owing to the less invasive nature of the endovascular procedure and its high patency rate compared with surgery.

Specific criteria for the procedure

Access

The use of different accesses is a key to success in the negotiation of complex iliac lesions; the contralateral

retrograde femoral artery is the preferred access for nonflush iliac occlusion and transbrachial access is the preferred access for flush iliac occlusion as it allows a direct line for recanalization with better torqueability and pushability.

Percutaneous transluminal angioplasty and stenting

Routine stenting is the preferred procedure for all iliac occlusive diseases as it is associated with higher success and patency rates compared with percutaneous transluminal angioplasty alone, and predilatation is preferred and has several advantages. A self-expandable stent is used for long, tortuous lesions owing to its flexibility, whereas a balloon-mounted stent is used for short bifurcation lesions owing to its high radial force and to enable precise deployment. The kissing stents technique is preferred in flush CIA occlusion of either unilateral or bilateral lesions; however, it is not mandatory for unilateral lesions.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Mousa AY, Beauford RB, Flores L, Faries PL, Patel P, Fogler R. Endovascular treatment of iliac occlusive disease: review and update. *Vascular* 2007; 15:5–11.
- Kashyap VS, Pavkov ML, Bena JF, Sarac TP, O'Hara PJ, Lyden SP, Clair DG. The management of severe aortoiliac occlusive disease: endovascular therapy rivals open reconstruction. *J Vasc Surg* 2008; 48:1451–1457.
- Norgren L, Hiatt WR, Dormandy JA, Nehler MR, Harris KA, Fowkes FG. Trans-Atlantic Inter-Society Consensus for the management of peripheral arterial disease (TASC II). *J Vasc Surg* 2007; 45:S5–67.
- De Roeck A, Hendriks JM, Delrue F, Lauwers P, Van Schil P, De Maeseneer M, *et al.* Long-term results of primary stenting for long and complex iliac artery occlusions. *Acta Chir Belg* 2006; 106:187–192.
- Balzer JO, Thalhammer A, Khan V, Zangos S, Vogl TJ, Lehnert T. Angioplasty of the pelvic and femoral arteries in PAOD: results and review of the literature. *Eur J Radiol* 2010; 75:48–569.
- Koizumi A, Kumakura H, Kanai H, Araki Y, Kasama S, Sumino H, *et al.* Ten-year patency and factors causing restenosis after endovascular treatment of iliac artery lesions. *Circ J* 2009; 73:860–866.
- Ozkan U, Oguzkurt L, Tercan F. Technique, complication, and long-term outcome for endovascular treatment of iliac artery occlusion. *Cardiovasc Intervent Radiol* 2010; 33:18–24.
- Suh Y, Ko YG, Shin DH, Kim JS, Kim BK, Choi D, *et al.* Outcomes of the single-stent versus the kissing-stents technique in asymmetric complex aortoiliac bifurcation lesions. *J Vasc Surg* 2015; head of print. published on line May 4.
- Thava VR, Stead RE, Smith RP. Subintimal recanalisation and stenting of a common iliac artery occlusion by a left axillary and an ipsilateral femoral retrograde approach using modified gooseneck grab aided by balloon dilatation of "dissection port". *Clin Radiol* 2004; 59:527–530.
- Lumsden AB, *et al.* *Endovascular therapy principles of peripheral interventions*. London: Blackwell Publishing; 2006.
- Schnieder PA. The infrarenal aorta, aortic bifurcation, and iliac arteries: advice about balloon angioplasty and stent placement. In: PA Schnieder. *Endovascular skills guidewire and catheter skills for endovascular surgery*. 3rd ed. New York: Informa Healthcare; 2008.

- 12 AbuRahma AF, Hayes JD, Flaherty SK, Peery W. Primary iliac stenting versus transluminal angioplasty with selective stenting. *J Vasc Surg* 2007; 46:965–970.
- 13 Smith JC, Watkins GE, Taylor FC, Carlson LA, Karst JG, Smith DC. Angioplasty or stent placement in the proximal common iliac artery: is protection of the contralateral side necessary? *J Vasc Interv Radiol* 2001; 12:1395-1398.
- 14 Lawrentschuk N, Stary D, Miller RJ. Percutaneous transluminal angioplasty of stenosis at the common iliac artery origin using a single-balloon technique. *Percutaneous transluminal angioplasty of stenosis at the common iliac artery origin using a single balloon technique. EJVES Extra* 2003; 5:55–56.
- 15 Ichihashi S, Higashiura W, Itoh H, Sakaguchi S, Nishimine K, Kichikawa K. Long-term outcomes for systematic primary stent placement in complex iliac artery occlusive disease classified according to Trans-Atlantic Inter-Society Consensus (TASC)-II. *J Vasc Surg* 2011; 53:992–999.
- 16 Z Kavaliauskiene, A Antusevas, RS Kaupas, N Aleksynas. Department of Cardiac, Thoracic, and Vascular Surgery, Medical Academy, Lithuanian University of Health Sciences. Department of Radiology, Medical Academy, Lithuanian University of Health Sciences, Lithuania. Recent advances in endovascular treatment of aortoiliac occlusive disease, continuing medical education. *Medicina (Kaunas)* 2012; 48:653–659.
- 17 Klein WM, van der Graaf Y, Seegers J, Spithoven JH, Buskens E, van Baal JG, et al. Dutch iliac stent trial: long-term results in patients randomized for primary or selective stent placement. *Radiology* 2006; 238:734–744.
- 18 Araki M, Hirano K, Nakano M, Ito Y, Ishimori H, Yamawaki M, *et al.* Two-year outcome of the self-expandable stent for chronic total occlusion of the iliac artery. *Cardiovasc Interv Ther* 2014; 29:40–46.

Ghrelin gastric tissue expression and wall thickness in patients submitted to laparoscopic sleeve gastrectomy as the primary weight loss procedure

Ghada Morshed, Laila Rashed, Mohamed Hafez

Departments of General Surgery, Biochemistry and Histology, Faculties of Medicine, Fayoum University, Cairo University (Kasr El Aini), Egypt

Correspondence to Ghada Morshed, MD, MRCS, 9 Said Zo El Fokkar, Manial, 589 Cairo, Egypt
Tel: +20 122 587 0476, +20 223 645 694;
e-mail: ghadamorshed@yahoo.com

Received 15 May 2015

Accepted 04 July 2015

The Egyptian Journal of Surgery

2015, 34:245–250

Background

Ghrelin (Ghr) plays a role in the regulation of food intake. Laparoscopic sleeve gastrectomy is used for treatment of morbid obesity following which the expression of ghrelin can be modulated. The aim of the present study was to analyse the expression of ghrelin in three areas of resected stomach specimens from morbid obese patients and correlate these data with plasmatic ghrelin levels before and after surgery and measure the wall thickness of the fundus, body and prepyloric area of the resected stomach and its relation to the stapler thickness (green or gold cartridge) used.

Patients and methods

Thirty morbidly obese patients were subjected to laparoscopic sleeve gastrectomy, and tissue samples were obtained from the fundus, body and prepyloric area of the resected stomach for mRNA and protein expression analysis. Blood samples were collected before and 1 month after surgery to evaluate the plasmatic ghrelin levels and for histologic examination to detect its wall thickness.

Results

Ghrelin protein expression was higher in the fundus than in the other areas. Total ghrelin plasma levels decreased significantly from 70.2 ± 80.4 pg/ml before surgery to 12.2 ± 29.3 pg/ml after surgery. The wall thickness of the prepyloric area was higher than that of the body and fundus, which is the reason for the use of a green cartridge at the prepyloric area (higher thickness) and a gold cartridge at the body and fundus (less thickness).

Conclusion

Ghrelin protein expression was higher in the fundus than in the body and prepyloric areas. The wall thickness of the prepyloric area is higher than that of the body and fundus.

Keywords:

Ghrelin, laparoscopic sleeve gastrectomy, wall thickness

Egyptian J Surgery 34:245–250
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Ghrelin (Ghr) is a 28-amino acid acylated peptide. Ghrelin stimulates appetite by acting on the hypothalamic arcuate nucleus. Ghrelin is secreted from the stomach and circulates in the blood stream under fasting conditions [1].

Ghrelin is a natural leptin antagonist [2]. In general, plasma ghrelin levels are low in obese human subjects and after food intake, and it increases during starvation and in patients with mental anorexia. In addition, ghrelin plasma levels are negatively correlated with BMI, amount of body fat, adipocyte size, and leptin, insulin and glucose levels. The ghrelin hormone not only stimulates the brain, giving rise to an increase in appetite, but also favours the accumulation of lipids in visceral fatty tissue, located in the abdominal zone and considered to be the most harmful [3,4].

The release of GH from the pituitary gland might be regulated not only by the GH-releasing hormone but also by ghrelin produced by the stomach, intestine,

placenta, pituitary gland and possibly in the hypothalamus [1,5,6]. Ghrelin and its receptor are widely distributed in the body; however, the greatest expression of ghrelin is in stomach endocrine cells.

Administration of exogenous ghrelin has been shown to stimulate pituitary growth hormone (GH) secretion, appetite, body growth and fat deposition. Thus, it is an anabolic hormone [7].

Aim of the study

Laparoscopic sleeve gastrectomy (LSG) is used for treatment of morbid obesity and the aim of this study

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

was to analyse the expression of ghrelin in three areas of resected stomach specimens from patients after LSG and determine the wall thickness of the fundus, body and pylorus in normal stomach.

Patients and methods

This was a prospective study comprising 30 morbid obese patients, seven men and 23 women, with a median age of 40 years (range 24–63 years), who had consecutively undergone LSG. Exclusion criteria were presence of noncompensated chronic liver or renal disease, BMI > 60 kg/m², and age less than 18 and more than 65 years. Median presleeve BMI value was 42.5 kg/m² (range 35–55 kg/m²) and patients (15%) presented type 2 diabetes mellitus.

Ethical committee approval was obtained before study initiation, and all participants signed an informed consent form.

Laparoscopic sleeve gastrectomy

LSG was performed under general anaesthesia, and started with division of the greater curvature blood supply (Figs 1 and 2). This was followed by resection of the fundus and greater curvature from 6 cm from the pylorus until the angle of His using an EndoGIA stapler green cartridge (4.8/60 mm) at the prepyloric area (higher thickness) and a gold cartridge (3.8/60 mm) at the body and fundus (less thickness), along with a bougie (36 Fr) (Fig. 3).

Prolene sutures were used to reinforce the staple line; methylene blue was injected intraoperatively to check for any leakage. Postoperative gastrograffin study was carried out on all patients. The patients started eating on the seventh postoperative day.

Plasma ghrelin determination

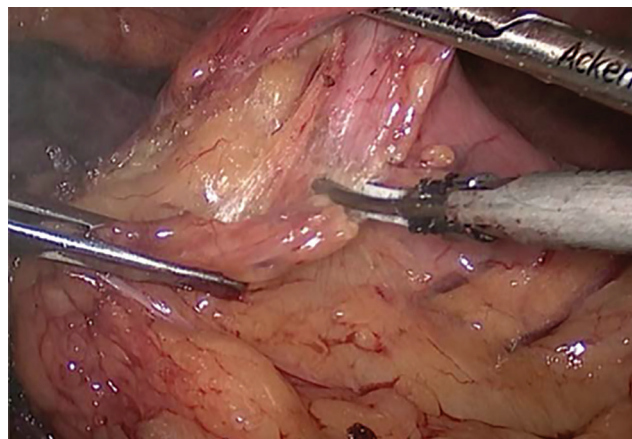
The plasmatic levels of ghrelin were measured with a commercial radioimmunoassay kit (LINCO Cat# GHRT-89HK, USA). From all overnight fasted patients a sample of peripheral blood was obtained on the day of surgery and 1 month after surgery.

Quantitative real-time PCR for ghrelin in gastric tissue

Total RNA was extracted from gastric homogenate by using the SV total RNA isolation system supplied by Promega (Madison, Wisconsin, USA) according to the manufacturer's protocol. Extracted RNA was quantified by means of a spectrophotometer at 260 nm.

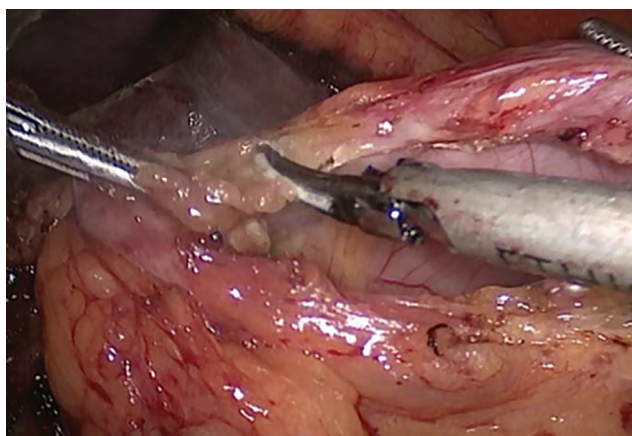
The total RNA (0.5–2 µg) was used for cDNA conversion using high capacity cDNA reverse transcription kit

Figure 1



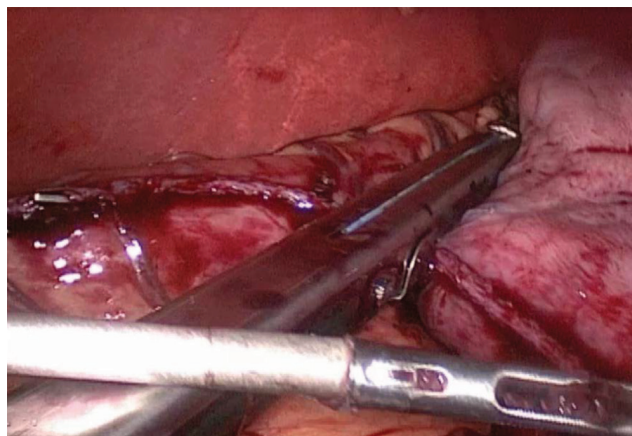
Division of the vascular supply of the greater curvature of the stomach.

Figure 2



Division of the vascular supply of the greater curvature of the stomach

Figure 3



Gastrectomy using a stapler 6 cm proximal to the pylorus laparoscopic sleeve gastrectomy (LSG).

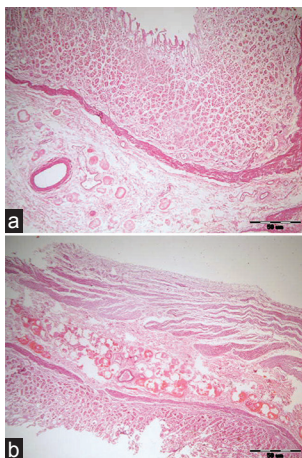
(#K1621, Fermentas, USA). cDNA was generated from 1 mg of total RNA extracted according to the

manufacturer's instructions. The relative abundance of mRNA species was assessed using the SYBR Green method on an ABI prism 7500 sequence detector system (Applied Biosystems, Foster City, California, USA). PCR primers were designed with Gene Runner Software (Hasting Software Inc., Hasting, New York, USA) from RNA sequences from GenBank (Table 1). All primer sets had a calculated annealing temperature of 60°. Quantitative RT-PCR was performed in duplicate in a 25 ml reaction volume consisting of 2X SYBR Green PCR Master Mix (Applied Biosystems), 900 nmol/l of each primer and 2–3 ml of cDNA. Amplification conditions were 2 min at 50°C, 10 min at 95°C and 40 cycles of denaturation for 15 s and annealing/extension at 60° for 10 min. Data from real-time assays were calculated using the v1.7 Sequence Detection Software from PE Biosystems (Foster City, California, USA). Relative expression of pro-ANP, SDF-1, MMP-9, Bax and bcl2 mRNA was calculated using the comparative C_t method. All values were normalized to the β -actin genes and reported as fold change (Table 1).

Histologic examination

Stomach specimens resected during sleeve gastrectomy (SG) were fixed in 10% buffered formalin for 24 h. After fixation, three tissue samples were obtained from three areas in each stomach: the fundus, body and the prepyloric area. The specimens were then trimmed using a scalpel to enable them to fit into an appropriately labelled tissue cassette. The filled tissue cassettes were stored in formalin until they were processed into thin microscopic sections using a paraffin block. Tissue specimens were then cut into sections that could be placed on a slide. Histochemical stains (typically haematoxylin and eosin) were used for staining (Figs 4–6).

Figure 4



Wall thickness in the fundus (a, b).

Morphometric study

Using a Leica Qwin 500 LTD computer-assisted image analysis system (Glory Science Co Ltd, Del Rio, TX, USA), the wall thickness (indicated by the distance parameter) was measured in H&E-stained sections using the interactive measuring menu. This was examined at magnification $\times 100$.

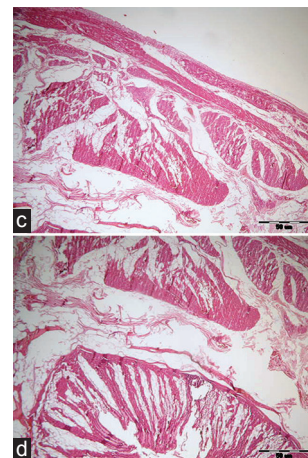
Results

Ghrelin protein expression was higher in the fundus than in the other areas (Fig. 7), and total ghrelin plasma levels decreased significantly from 70.2 ± 80.4 pg/ml before surgery to 12.2 ± 29.3 pg/ml after surgery as a result of proper total fundectomy. The wall thickness of the prepyloric area was higher than that of the body and fundus; the mean antral thickness was 4.2 mm (range 3.2–4.6 mm), the mean body thickness was 2.56 mm (range 1.5–3.56 mm) and the mean fundus thickness was 2.14 mm (range 1.7–2.7 mm) (Fig. 8). We also found that gastric smooth muscle, particularly the circular layer, is thicker and denser around the gastric antrum than around the rest of the stomach; this explains the use of the green cartridge (4.8/60 mm) at the prepyloric area (higher thickness) and the gold cartridge (3.8 mm/60 mm) at the body and fundus (less thickness). The correlations between PCR and wall thickness are shown in Fig. 9 and Table 2.

Table 1 Oligonucleotide primer sequence used for real-time PCR

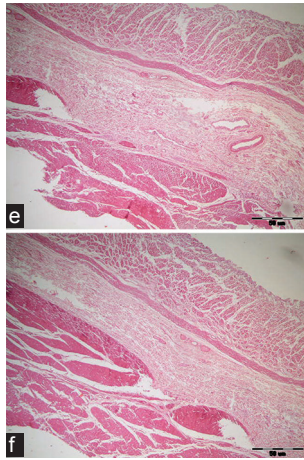
Gene	Primer sequence
Ghrelin	Forward primer 5'-TGCAGAAACCCTGGCTGA-
	3'Reverse primer 5'-CACGTGGTCTCGGAAGTG-3'
β -Actin	Forward primer 5'-TGCTGGTCTGAGTATGTCG-
	3'Reverse primer 5'-TTGAGAGCAATGCCAGCC-3'

Figure 5



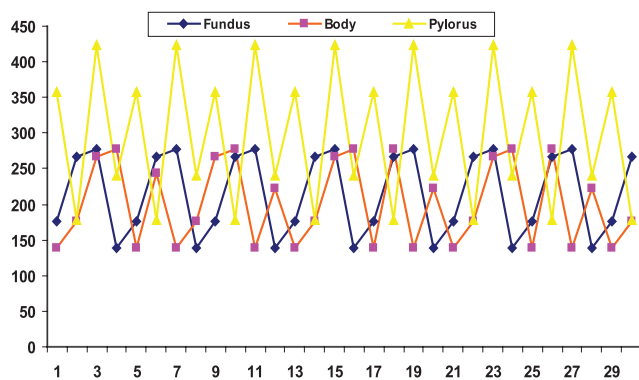
Wall thickness in the body (c, d).

Figure 6



Wall thickness in the pylorus (e, f).

Figure 8



Wall thickness in the fundus, body and pylorus

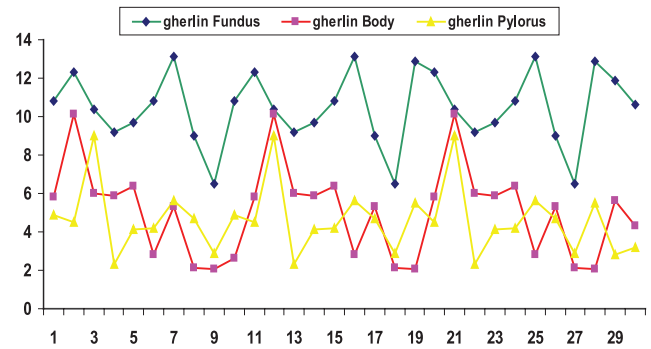
Table 2 Correlations between PCR and wall thickness

Items	Thickness	PCR
Thickness		
Pearson's correlation	1	177
Significance (two-tailed)	90	0.095
N		90
PCR		
Pearson's correlation	177	1
Significance (two-tailed)	0.095	90
N	90	

Statistical analysis

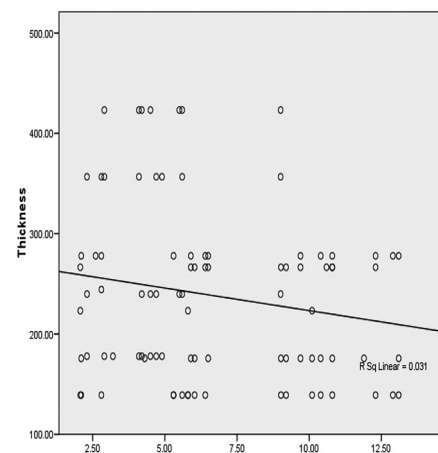
All data obtained from the various analyses were entered into a customizable database built with Microsoft Access (Microsoft Corporation). Relevant data were extracted from the database with appropriate queries and exported in Microsoft Excel (Microsoft Corporation, USA) and SPSS v.08 for further manipulations and statistical analyses (IBM SPSS Statistics, London).

Figure 7



PCR for Ghrelin expression in the fundus, body and pylorus

Figure 9



Correlations between PCR & Wall thickness

Discussion

The decrease of plasma ghrelin after LSG is advocated as one of the hormonal mediators of weight loss and glucose homeostasis in the early phase in the absence of significant weight loss [8–11].

In this prospective study, ghrelin expression and tissue distribution of cells producing this protein were evaluated to better understand the ghrelin distribution in different areas of the stomach and to correlate those findings with ghrelin plasmatic levels in patients who had undergone LSG. The total plasma ghrelin level in all patients before surgery was correlated to BMI, as found in other studies [12,13].

The ghrelin plasma level significantly decreased after surgery in all patients as a result of proper total fundectomy, as found in other studies [14,15].

In contrast, several studies have not found a modification of ghrelin plasma levels, and some authors have reported controversial results, including an increment of ghrelin

plasma level after surgery [16,17]. The contradictory results could be due to differences in study design, follow-up periods, measurement methods, surgical intervention and circadian rhythm [14,18].

Our immunohistochemical results showed that ghrelin protein expression was higher in the fundus than in the body and prepyloric area, although this difference was not statistically significant, in agreement with the findings of Goitein *et al.* [19].

Miyazaki *et al.* [18] hypothesized that greater the number of positive cells present in the stomach, better the surgical outcome, and if the number of positive cells in the stomach correlates with the mRNA ghrelin expression, this value could be considered a favourable predictor of LSG outcome. We found a distinct correlation between ghrelin mRNA expression and ghrelin protein expression in the fundus and a weak correlation between ghrelin mRNA expression and the mean value of ghrelin protein expression obtained from the three areas (fundus, body and prepyloric area). Nevertheless, as previously reported [19], levels of ghrelin mRNA did not correlate with plasmatic protein levels, which could be due to compensatory productions from extragastric organs.

Recently, there was a debate on the extension of the antral resection during SG: some authors recommend preservation of the antrum because this site is important as a pumping mechanism for gastric emptying, because the partial antrum resection does not significantly affect the long-term pouch volume [20,21] and because the removal of antral tissue allows a more extensive reduction of ghrelin-producing cells [19]. In contrast, other authors argue that the cell population present on antral tissue cannot be the real population of cells producing ghrelin because these cells are very different from those seen in other areas and also because their volume is poor [22,23]. According to this, we believe that it is not necessary to remove antral tissue as the majority of positive cells were present on fundus tissue, as previously described in other studies [22,23].

In our study patients without suspected gastric disease there was relative wall thickening of the distal gastric antrum compared with the proximal stomach as a normal finding; the mean antral thickness was 4.2 mm (range 3.2–4.6 mm), the mean body thickness was 2.56 mm (range 1.5–3.56 mm) and the mean fundus thickness was 2.14 mm (range 1.7–2.7 mm). We also found that gastric smooth muscle, particularly the circular layer, was thicker and denser around the gastric antrum than around the rest of the stomach, as found in other studies [24] and in studies using multidetector CT (MDCT) [25,26]. This explains the use of green

cartridge (4.8/60 mm) at the prepyloric area (higher thickness) and gold cartridge (3.8/60 mm) at the body and fundus (less thickness).

Conclusion

The preliminary results of the ongoing prospective study confirm that ghrelin protein expression was higher in the fundus than in the body and prepyloric areas. Moreover, smooth and uniform wall thickening of the distal gastric antrum relative to the proximal stomach is a normal finding. Normal antral wall thickening is likely caused by an anatomic component (muscular thickening), which is the reason for the use of the green cartridge (4.8/60 mm) at the prepyloric area (higher thickness) and the gold cartridge (3.8/60 mm) at the body and fundus (less thickness).

Acknowledgements

The manuscript was presented at the ESLS conference, the 12th Egyptian Society of Laparoscopic Surgery & the 10th Mediterranean & Middle Eastern Endoscopic Surgery Association & the 3rd Congress of Egyptian Society of Metabolic & Bariatric Surgery.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- 1 Kojima M, *et al.* Ghrelin: structure and function. *Physiol Rev* 2005; 85:495–522.
- 2 KM Ghrelin. A novel growth-hormone releasing peptide. *Nippon Rinsho* 2001; 59:1400–1407.
- 3 Ukkola O, *et al.* Ghrelin, growth and obesity. *Ann Med* 2002; 34:102–108.
- 4 Bronsky J, *et al.* Ghrelin-structure, function and clinical applications. *Cesk Fysiol* 2004; 53:80–85.
- 5 Kojima M, *et al.* Ghrelin: discovery of the natural endogenous ligand for the growth hormone secretagogue receptor. *Trends Endocrinol Metab* 2001; 12:118–122.
- 6 Horath TL, *et al.* Minireview: ghrelin and the regulation of energy balance—a hypothalamic perspective. *Endocrinology* 2001; 142:4163–4169.
- 7 Wang G, *et al.* Ghrelin—not just another stomach hormone. *Regul Pept* 2002; 105:75–81.
- 8 Nannipieri M, Baldi S, Mari A, Colligiani D, Guarino D, *et al.* Roux-en-Y gastric bypass and sleeve gastrectomy: mechanisms of diabetes remission and role of gut hormones. *J Clin Endocrinol Metab* 2013; 98:4391–4399.
- 9 Karamanakos SN, Vagenas K, Kalfarentzos F, Alexandrides TK. Weight loss, appetite suppression, and changes in fasting and postprandial ghrelin and peptide-YY levels after Roux-en-Y gastric bypass and sleeve gastrectomy: a prospective, double blind study. *Ann Surg* 2008; 247:401–407.
- 10 Peterli R, Wölnerhanssen B, Peters T, Devaux N, Kern B, *et al.* Improvement in glucose metabolism after bariatric surgery: comparison of laparoscopic Roux-en-Y gastric bypass and laparoscopic sleeve gastrectomy: a prospective randomized trial. *Ann Surg* 2009; 250:234–241.

- 11 Pacheco D, de Luis DA, Romero A, González Sagrado M, Conde R, *et al.* The effects of duodenal-jejunal exclusion on hormonal regulation of glucose metabolism in Goto-Kakizaki rats. *Am J Surg* 2007; 194:221–224.
- 12 Tschöp M, Weyer C, Tataranni PA, Devanarayan V, Ravussin E, *et al.* Circulating ghrelin levels are decreased in human obesity. *Diabetes* 2001; 50:707–709.
- 13 Ueno H, Yamaguchi H, Kangawa K, Nakazato M. Ghrelin: a gastric peptide that regulates food intake and energy homeostasis. *Regul Pept* 2005; 126:11–19.
- 14 Gelisgen R, Zengin K, Kocael A, Baysal B, Kocael P, *et al.* Effects of laparoscopic gastric band applications on plasma and fundicacylated ghrelin levels in morbidly obese patients. *Obes Surg* 2012; 22:299–305.
- 15 Bohdjalian A, Langer FB, Shakeri-Leidenmühler S, Gfrerer L, Ludvik B, *et al.* Sleeve gastrectomy as sole and definitive bariatric procedure: 5-year results for weight loss and ghrelin. *Obes Surg* 2010; 20:535–540.
- 16 Faraj M, Havel PJ, Phélis S, Blank D, Sniderman AD, *et al.* Plasma acylation-stimulating protein, adiponectin, leptin, and ghrelin before and after weight loss induced by gastric bypass surgery in morbidly obese subjects. *J Clin Endocrinol Metab* 2003; 88:1594–1602.
- 17 Holdstock C, Engström BE, Ohrvall M, Lind L, Sundbom M, *et al.* Ghrelin and adipose tissue regulatory peptides: effect of gastric bypass surgery in obese humans. *J Clin Endocrinol Metab* 2003; 88:3177–3183.
- 18 Miyazaki Y, Takiguchi S, Seki Y, Kasama K, Takahashi T, *et al.* Clinical significance of ghrelin expression in the gastric mucosa of morbidly obese patients. *World J Surg* 2013; 37:2883–2890.
- 19 Goitein D, Lederfein D, Tzioni R, Berkenstadt H, Venturero M, *et al.* Mapping of ghrelin gene expression and cell distribution in the stomach of morbidly obese patients – a possible guide for efficient sleeve gastrectomy construction. *Obes Surg* 2012; 22:617–622.
- 20 Weiner RA, Weiner S, Pomhoff I, Jacobi C, Makarewicz W, *et al.* Laparoscopic sleeve gastrectomy – influence of sleeve size and resected gastric volume. *Obes Surg* 2007; 17:1297–1305.
- 21 Givon-Madhala O, Spector R, Wasserberg N, Beglaibter N, Lustigman H, *et al.* Technical aspects of laparoscopic sleeve gastrectomy in 25 morbidly obese patients. *Obes Surg* 2007; 17:722–727.
- 22 Choe YH, Song SY, Paik KH, Oh YJ, Chu SH, *et al.* Increased density of ghrelin-expressing cells in the gastric fundus and body in Prader–Willi syndrome. *J Clin Endocrinol Metab* 2005; 90:5441–5445.
- 23 Maksud FA, Barbosa AJ. Letter to: Mapping of ghrelin gene expression and cell distribution in the stomach of morbidly obese patients – a possible guide for efficient sleeve gastrectomy construction. *Obes Surg* 2013; 23:115–116.
- 24 Torgersen J. The muscular build and movements of the stomach and duodenal bulb. *Acta Radiol* 1942; 45:1–100.
- 25 Kelly KA. Motility of the stomach and gastroduodenal junction. In: Johnson LR, editor *Physiology of the gastrointestinal tract*. New York: Raven; 1981. 393–410.
- 26 Kumar D. Gastric motor physiology and pathophysiology. In: Gustavsson S, Kumar D, Graham DY, editors *The stomach*. London: Churchill Livingstone; 1992. 129–142.

Outcome of karydakis lateral flap versus open technique in the treatment of pilonidal sinus

Hady S. Abou Ashour, Moharram A. Abelshahid

Department of General Surgery, Minoufiya
Faculty of Medicine, Minoufiya, Egypt

Correspondence to Hady Saleh Abou Ashour,
MD, MRCS, Eng, Egyptian Fellowship in
Surgery, Department of General Surgery,
Minoufiya Faculty of Medicine, Minoufiya, Egypt
Tel: +20 100 063 0111; fax: 002 048 2326810;
e-mail: aboashour_hady@yahoo.com

Received 29 May 2015

Accepted 23 July 2015

The Egyptian Journal of Surgery

2015, 34:251–257

Introduction

Pilonidal sinus disease is a chronic, recurrent disorder of the sacrococcygeal region, which commonly occurs in young adults following puberty. The male population is affected more frequently compared with the female population. A large number of surgical techniques (with varying complexity) have been described in the literature for the treatment of this disease. Such diversity suggests that no single technique has emerged as the preferred method in preventing recurrence of this condition.

Objectives

The aim of this study was to compare karydakis lateral flap technique with open technique in the treatment of noncomplicated pilonidal sinus.

Patients and methods

A total of 70 patients with uncomplicated pilonidal sinus, attending Minoufiya University Hospital and other private hospitals, were included in this study. They were divided into two groups: the karydakis group and the open procedure group.

Results

A total of 57 male and 13 female patients were included in this study. The mean operative time in the karydakis and the open group was 45 ± 7.27 and 23.4 ± 4 min, respectively. There was a significantly lower rate of wound infection in the karydakis group. Two patients (5.7%) showed recurrence in the karydakis group, whereas eight patients (22.8%) had recurrence in the open group. There was no significant difference between the two groups as regards scar pain and numbness ($P > 0.05$), but there was a significantly lower recurrence rate in the karydakis group ($P = 0.022$). The healing time and duration of work-off was significantly shorter in the karydakis group ($P < 0.001$).

Conclusion

Karydakis technique showed shorter hospital stay, earlier healing, shorter duration of work-off, and lower rate of complications compared with the open technique.

Keywords:

karydakis, open technique, versus

Egyptian J Surgery 34:251–257
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Natal cleft pilonidal disease is prevalent worldwide, although it is probably more common in hot humid regions like the Middle East and Mediterranean basin. Patients may present after months and even years of repeated episodes of infection, resulting in deep branching tracks and multiple skin pits. Recurrence after surgery is common and is believed to be largely secondary to persistent natal cleft following surgery [1]. Pilonidal sinus disease is a chronic, recurrent disorder of the sacrococcygeal region, which commonly occurs in young adults following puberty [2–4]. The male population is affected more frequently compared with the female population, probably due to their hirsute nature and other causes that are not related to hair characteristics, such as sedentary occupation (44%), positive family history (38%), obesity (50%), and local irritation or trauma before onset of symptoms (34%) [5]. A large number of surgical techniques (with varying complexity) have been described in

the literature for the treatment of this disease. Such diversity suggests that no single technique has emerged as the preferred method in preventing recurrence of this condition [6]. These include conservative nonexcisional care, phenol injection [7,8], pit excision and tract brushing (Millar–Lord procedure) [9,10], Bascom procedure [5,11], excision and leaving the wound to granulate [12,13], excision and marsupialization [13,14], excision and primary closure with midline or asymmetric incisions [12,15], or excision and closure using local flaps. The latter include karydakis procedure [16,17], rhomboid and Limberg flaps [18,19], Z-plasty [20,21], and V–Y flaps [22,23] or other reconstructions [24,25], and each method has

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

its own advantages. In this study, our objective was to compare karydakis lateral flap technique with open technique in the treatment of pilonidal sinus as regards operative time, complications, hospital stay, healing time, rate of recurrence, and work-off period.

Patients and methods

A total of 70 patients attending Minoufiya University Hospital and other private hospitals from January 2011 to December 2014 were included in this prospective randomized study. They were randomized into two groups: the open group and the closed group.

Open group

The open group included 35 patients who underwent sinus excision that was left open for daily dressing.

Closed (karydakis) group

The closed group included 35 patients who underwent sinus excision that was closed using karydakis lateral flap.

Inclusion criteria

Only patients with primary nonrecurrent and uncomplicated pilonidal sinus were included in the study. Patients were randomized using a sealed envelope containing the treatment option, which was chosen by the patients.

Preoperative care

A patient record form was prepared, and patients' age, sex, duration of symptoms, preoperative antibiotic use, previous treatments, length of hospital stay, return to work, and complications such as wound breakdown and infection and wound care time were recorded. All patients were subjected to full necessary laboratory tests before surgery. All patients were admitted to hospital the day before surgery and operated under general anesthesia. The natal cleft was shaved the day before the surgery. Patients were asked to use the numerical rating pain scale for pain and effect of analgesia after surgery. Patients also had the option to verbally rate their scale from 0 to 10 to be recorded.

Surgical techniques

Patients were made to lie in the prone position with the legs slightly abducted and the buttocks strapped apart with adhesive tapes on the table sides. Methylene blue mixed with 10% hydrogen peroxide was injected into the sinus orifice(s) just before the incision. All patients received a single intravenous dose of cefoperazone

at the time of induction of anesthesia and at 12 h postoperatively for 48 h and then shifted to oral forms (amoxicillin and clavulanic acid 1 g every 12 h, plus metronidazole 500 mg three times per day for 7 days).

Open method

General anesthesia was induced with the patient in the prone position, then probing and injection of methylene blue mixed with 10% hydrogen peroxide is administered by means of a plastic cannula. Adding the hydrogen peroxide helps in dislodging thick pus flecks and opening up closed fistulous tracks. An elliptical incision parallel to the midline is made. The sinuses are excised with the surrounding skin and subcutaneous fat to the level of sacrococcygeal fascia and then proper hemostasis is induced with diathermy, and any side tracks are unroofed using a fistula probe. The resulting opened wound is packed with gauze and dressing (Fig. 1).

Karydakis lateral flap method

Probing of the sinus is carried out, followed by injection of methylene blue. An asymmetrical biconcave (elliptical) incision is made, with the patient in prone position (Fig. 2). An ellipse was made based on the side of any secondary opening or induration. If the sinus is entirely central, either side can be chosen. The incision is at least 5 cm long with gentle curvature. Each end of the incision is placed 2 cm to one side of the midline (Figs. 3 and 4). The medial edge of the incision is placed crossing the midline sufficiently to encompass the primary pit (Fig. 5). The lateral edge of the excised ellipse must be symmetrical with the medial edge even if this means excision of more skin and fat well beyond the sinus; thus, the final suture line is vertical, or its

Figure 1



Open method (excision of boat-shaped wedge of tissue including the whole sinus).

Figure 2



Midline sinus.

Figure 4

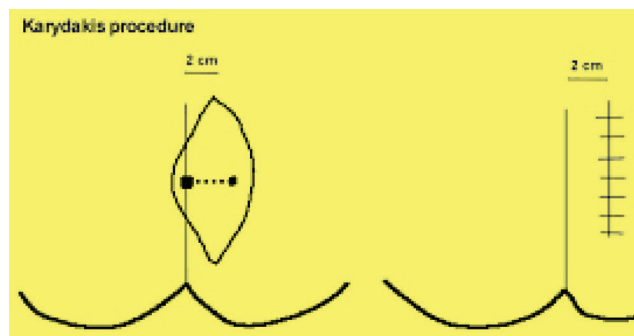


Asymmetrical biconcave incision.

central part may encroach towards the midline, which increases the risk of recurrence (Figs. 3 and 7).

Diathermy must not be used until the tissue has been removed, to avoid confusion of burn marks with that of methylene blue from divided sinus branches. The medial side of the wound is then undercut a distance of 2 cm and at the depth of 1 cm to produce a flap extending the full length of the wound. The flap should be of uniform thickness. A layer of interrupted absorbable sutures is placed; before any is tied, the needle is passed into the sacral fascia in the midline and then deeply into the fat at the base of the flap, taking a large bite that includes both surfaces of the undercut. As these series of sutures are tied, the assistant can both evert the edge with the fingers and use a thumb to push the base of the flap across to the midline to approximate the surface for knotting. A suction drain is placed across these knots and brought out well laterally before

Figure 3



The karydakis technique (off-midline closure), (ends of the incision are placed 2 cm to one side of the midline).

Figure 5



Defect with asymmetrical edges and drain away from the midline to avoid new track for hair.

the second layer of sutures is placed to approximate the undersurface of the flap to the fat in the lateral edge of the wound (Fig. 6). During insertion of these sutures, the assistant can evert the edge and hold knots during tying as before. Interrupted 2/0 vicryl or prolene sutures (vertical mattress) are used for skin closure (Fig. 7).

Postoperative care

Patients were seen routinely on postoperative days 5, 10, and 14 for wound inspection and removal of sutures. The patients with delayed healing were continued to be seen until complete healing was achieved. Any wound complications were recorded. At 3 months after surgery, patients were invited to follow-up. Time to return to work and time until complete healing were recorded. Patients were advised to shave intergluteal cleft and adjacent buttocks, or use depilatory creams, and keep the operative area clean and dry at all times. Patients were informed to follow-up every 3 months for 36 months and/or at any time of suspected recurrence.

Figure 6



Suturing of the flap to the fat in the lateral edge of the wound.

Results

Demography of the patients

A total of 70 patients were included in this study. Their ages ranged between 15 and 50 years, with a mean of 24.6 ± 7.1 years in the karydakis group and 27.43 ± 8.4 years in the open group. The karydakis group included 35 patients (30 male and five female). The open group included 35 patients (27 male and eight female). There was no significant difference between the two groups as regards age ($P > 0.05$), but was significant as regards male sex predominance ($P < 0.001$) (Table 1).

Clinical features in both groups

Clinical features varied from multiple sinuses, single sinus to sacrococcygeal swelling and sinus(es). However, there was no significant difference between the two groups as regards preoperative presentations.

Operative time

The mean operative time in the karydakis group was 45 ± 7.27 min, ranging from 35 to 55 min, compared with 23.4 ± 4.05 min, ranging from 20 to 30 min, in the open group. It was found that the operative time was significantly shorter in the open group than in the karydakis group ($P = 0.002$). These findings are shown in Table 2.

Assessment of pain using pain scale

There was a significant difference between the two groups as regards postoperative pain ($P = 0.013$) (Table 3).

Postoperative complications in both groups

In the karydakis group, no patient had postoperative hemorrhage, and one patient had hematoma, one patient had wound dehiscence, and one patient had wound infection, compared with two patients with

Figure 7



Linear closure away from the midline and flattening of the natal cleft.

Table 1 Demography of the patients

Demography	Karydakis operation	Open procedure	Total number	<i>P</i>
Age				
Mean \pm SD	24.6 ± 7.1	27.43 ± 8.4		0.7
Range	15–47	19–50		
Sex [n (%)]				
Male	30 (85.7)	27 (77.1)	57 (81.4)	
Female	5 (14.2)	8 (22.8)	13 (18.57)	

Table 2 Operative time in both groups

Operative time (min)	Karydakis operation	Open procedure	<i>P</i>
Mean	45 ± 7.27	23.4 ± 4.05	0.002
Range	33–55	17–30	<0.002

Table 3 Postoperative pain in both groups

Severity of pain	Karydakis operation	Open procedure	<i>P</i>
Postoperative pain [n (%)]	10 (28.5)	19 (54.2)	0.013
Severity of pain [n (%)]			
Mild	7 (20)	7 (20)	0.013
Moderate	3 (8.5)	7 (20)	
Severe	0	5 (14.2)	

postoperative hemorrhage and 12 patients with wound infection in the open group. There was no significant difference between the two groups as regards postoperative hemorrhage, hematoma, and wound dehiscence ($P > 0.05$). However, there was a significantly lower rate of wound infection in the karydakis group ($P < 0.001$). These findings are shown in Table 4.

Hospital stay, time of healing (days), and duration of work-off in both groups

In the karydakis group, duration of hospital stay ranged from 18 h to 3 days compared with 2–6 days in the

Table 4 Postoperative complications in both groups

Postoperative complications	Karydakis operation [n (%)]	Open procedure [n (%)]	Total number (n = 30) [n (%)]	P
Overall postoperative complications	3 (8.5)	14 (40)	17 (24)	0.03 (S)
Postoperative hemorrhage	0	2 (5.7)	2 (28.5)	0.5
Hematoma	1 (2.8)	0 (13.3)	1 (14)	0.7
Wound dehiscence	1 (2.8)	0	1 (14)	
Wound infection	1 (2.8)	12 (34.2)	13 (13.5)	<0.001 (S)

open group. The healing time was 10–24 days compared with 31–62 days in the open group, and the duration of work-off ranged from 14 to 31 days in the karydakis group compared with 37–70 days in the open group. It was found that the hospital stay was significantly shorter in the karydakis group ($P = 0.02$). Moreover, the time of healing and the duration of work-off were significantly shorter in the karydakis group ($P < 0.001$) (Table 5).

Long-term outcome in both groups

Patients in both groups were followed up for 24 months. In the karydakis group, two patients suffered from scar pain, compared with five patients in the open group. Two patients suffered from local numbness in the karydakis group, compared with one patient in the open group. Scar pain and numbness disappeared after 12 months postoperatively in both groups. Two patients showed recurrence in the karydakis group in the 14th and 16th month, whereas eight patients had recurrence in the open group – two of them had recurrence in the fourth month and the others had recurrence in the sixth, ninth, 12th, 15th, 17th, and 19th month postoperatively. There was no significant difference between the two groups as regards scar pain and numbness ($P > 0.05$), but there was a significantly lower recurrence rate in the karydakis group ($P = 0.022$) (Tables 6 and 7).

Discussion

The ideal technique for the treatment of sacrococcygeal pilonidal sinus disease is a controversial issue [26]. The most common treatment approach is the excision of the cyst cavity. The traditional treatment modalities, either leaving the wound open to heal by secondary intention or primary closure, are the most commonly used techniques worldwide [27]. A clear benefit in terms of recurrence has, however, been seen when using off-midline closure compared with midline closure [28,29]. Simple excision with primary closure not only leads to faster convalescence but also results in a midline scar in a persistent deep natal cleft, potentially leading to high recurrence rates. Therefore, flattening the natal cleft is recommended, which decreases the generation of sweat and friction caused

Table 5 Hospital stay, time of healing (days), and work-off period in both groups

Convalescence	Karydakis operation	Open procedure	P
Hospital stay (days)			
Mean \pm SD	1.3 \pm 0.83	3.2 \pm 1.4	0.02
Range	0.75–3	2–6	
Time of healing (days)			
Mean \pm SD	16 \pm 4.3	43.41 \pm 8.2	<0.001
Range	10–24	31–62	
Work-off period			
Mean \pm SD	22.4 \pm 4.7	50.47 \pm 8.1	<0.001
Range	14–31	39–70	

Table 6 Preoperative presentations

Clinical presentation	Karydakis operation [n (%)]	Open procedure [n (%)]	Total number [n (%)]	P
Multiple sinuses	10 (28.5)	14 (40)	24 (34.2)	0.73
Single sinus	18 (51.43)	12 (34.2)	30 (42.8)	
Sacrococcygeal swelling and sinus(es)	7 (20)	9 (25.7)	16 (22.8)	

Table 7 Long-term outcome in both groups

Late complications	Karydakis [n (%)]	Open procedure [n (%)]	Total [n (%)]	P
Scar pain	4 (11.4)	14 (40)	18 (25.7)	0.01
Numbness	5 (14.2)	2 (5.7)	7 (10)	0.08
Recurrence	2 (5.7)	8 (22.8)	10 (14.2)	0.022

by buttock movement, skin maceration, and debris accumulation [30]. To avoid median recurrences and flattening of the natal cleft, numerous operative techniques have been developed, such as the karydakis technique, the Bascom procedure, rhomboid excision with Limberg flap closure, Z-plasty, or rotation flap [16,31–33]. Both open method and karydakis techniques have been suggested and favored by most surgeons for the management of pilonidal sinus among different operative procedures [5,34]. In our study, there was no significant difference between the two groups as regards age and sex; the mean operative time in the karydakis group was 45 ± 7.27 compared with 23.4 ± 4.05 min in the open group ($P < 0.05\%$).

There was no significant difference between the two groups as regards postoperative bleeding and hematoma ($P > 0.05$), but there was a significantly lower rate of

wound infection in the karydakakis group ($P < 0.001$, $P < 0.05$). In the karydakakis group, four patients (11.4%) experienced temporary scar pain, compared with 14 patients (40%) in the open group. During the 36-month follow-up period, eight patients (22.8%) showed recurrence in the open method, whereas two patients (5.7%) had recurrence in the karydakakis group ($P = 0.022$).

Al-Jaberi [35] reported a recurrence rate of 4%, minimal postoperative pain, and return to work after 3 weeks in the closed method.

Malik *et al.* [36] reported a higher complication rate in open method, for which the postoperative hemorrhage was 4% and postoperative infection was 16%, whereas in the karydakakis group the overall complication rate was only 6%. In our study, no patient had postoperative hemorrhage in the karydakakis group and one patient (2.8%) had hematoma, one patient (2.8%) had wound dehiscence, and one (2.8%) had wound infection; however, in the open group, two patients (5.7%) had hemorrhage. Malik *et al.* [36] recorded a mean hospital stay of 6.74 days in the open group and 3.23 days in the karydakakis group, and the mean work-off period was 6.98 weeks in the open group and 2.68 weeks in the karydakakis group. In our study, the mean hospital stay in the karydakakis group was 1.3 ± 0.83 days compared with 3.2 ± 1.4 days in the open group; the mean healing time in the karydakakis group was 16 ± 4.3 compared with 43.41 ± 8.2 days in the open group, and the mean work-off was 22.4 ± 4.7 days compared with 50.47 ± 8.1 days in the open group. Similarly, Keshava [37] concluded that karydakakis can be performed for managing primary and recurrent pilonidal sinus (PS) with low complications rate, short hospital stay, (2.5 days), and short time to return to normal activity (5 days). He also reported low recurrence rate (5%) and good long-term results. Marzouk *et al.* [38] reported significant disadvantages of the open method as regards postoperative infection rate, mobilization time, hospital stay, and work-off following a median follow-up period of 4.5 years. They reported a higher recurrence rate of 17.9% in the open group compared with 7.5% in the karydakakis group ($P < 0.05$). Yildiz *et al.* [39] reported a morbidity rate of 10.5% and a recurrence rate of 2.3%. Karydakakis technique requires early restriction of patient activities until wound healing is complete. In our study, the incidence rate of failed primary healing in the karydakakis group was 2.8%, and healing failure in karydakakis occurred because primary closure is rarely completely free of tension together with the potential infection related to its anatomical site. Despite the previous circumstances, the dehiscence incidence was low. Another advantage of karydakakis technique is the possibility of flattening the natal cleft in contrast to

open methods, in which there is a tendency for the healing wound edges to be drawn inward by fibrosis, recreating a deep natal cleft with a broad thin epidermal cover that is easily breakable. The main cause of recurrences in the open method is believed to be hair piercing the weak scar, rather than inadequate excision during the first operation. In our study it was noticed that recurrence not only had higher incidence in the open group but also appeared earlier than that in the karydakakis group. In this comparative study, karydakakis method has been reported to have lower infection and recurrence rate, shorter hospital stay, and better esthetic result. With this technique we can alter the depth of the natal cleft at the site of the sinus disease and make the suture line away from midline. It also showed better results compared with the open method, especially in postoperative pain, hospital stay ($P < 0.05$), and work-off ($P < 0.001$). The disease mostly affects patients during their second and third decades; the work-off period is of great importance to this active sector of the community. Prolonged work-off can affect their leaning process, or may cost their labor.

Conclusion

The karydakakis technique showed a shorter hospital stay, earlier healing, shorter duration of work-off, and lower rate of complications compared with the open technique.

Acknowledgements

The authors thank professor Samir Kohla and professor Ayman Omar, professors of general surgery, General Surgery Department, Minoufiya Faculty of Medicine, Minoufiya University, for their continuous valuable help and continuous evaluation. The authors also thank junior colleagues and nursing staff and all personnel who assisted in this work.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Petersen S, Koch R, Stelzner S, Wendlandt TP, Ludwig K. Primary closure techniques in chronic pilonidal sinus: a survey of the results of different surgical approaches. *Dis Colon Rectum* 2002; 45:1458–1467.
- Petersen S, Aumann G, Kramer A, Doll D, Sailer M, Hellmich G. Short-term results of Karydakakis flap for pilonidal sinus disease. *Tech Coloproctol* 2007; 11:235–240.
- Peter M, Drongowski RA, Geiger JD, Hirschl RB, Teitelbaum DH. Comparison of Karydakakis versus midline excision for treatment of pilonidal sinus disease. *Pediatr Surg Int* 2005; 21:793–796.

- 4 Ghnnam WM, Hafez DM. Laser hair removal as adjunct to surgery for pilonidal sinus: our initial experience. *J Cutan Aesthet Surg* 2011; 4:192–195.
- 5 Senapati A, Cripps NP, Thompson MR. Bascom's procedure in the day-surgical management of symptomatic pilonidal sinus. *Br J Surg* 2000; 87:1067–1070.
- 6 Da Silva JH. Pilonidal cyst: cause and treatment. *Dis Colon Rectum* 2000; 43:1146–1156.
- 7 Hegge HG, Vos GA, Patka P, Hoitsma HF. Treatment of complicated or infected pilonidal sinus disease by local application of phenol. *Surgery* 1987; 102:52–54.
- 8 Schneider IH, Thaler K, Kockerling F. Treatment of pilonidal sinuses by phenol injections. *Int J Colorectal Dis* 1994; 9:200–202.
- 9 Millar DM, Lord PH. The treatment of acute postanal pilonidal abscess. *Br J Surg* 1967; 54:598–599.
- 10 Edwards MH. Pilonidal sinus: a 5-year appraisal of the Millar–Lord treatment. *Br J Surg* 1977; 64:867–868.
- 11 Bascom J. Pilonidal disease: long-term results of follicle removal. *Dis Colon Rectum* 1983; 26:800–807.
- 12 Fuzun M, Bakir H, Soyul M, Tansug T, Kaymak E, Harmancioglu O. Which technique for treatment of pilonidal sinus – open or closed?. *Dis Colon Rectum* 1994; 37:1148–1150.
- 13 Spivak H, Brooks VL, Nussbaum M, Friedman I. Treatment of chronic pilonidal disease. *Dis Colon Rectum* 1996; 39:1136–1139.
- 14 Solla JA, Rothenberger DA. Chronic pilonidal disease. An assessment of 150 cases. *Dis Colon Rectum* 1990; 33:758–761.
- 15 Akinci OF, Coskun A, Uzunkoy A. Simple and effective surgical treatment of pilonidal sinus: asymmetric excision and primary closure using suction drain and subcuticular skin closure. *Dis Colon Rectum* 2000; 43:701–706.
- 16 Karydakias GE. New approach to the problem of pilonidal sinus. *Lancet* 1973; 2:1414–1415.
- 17 Anyanwu AC, Hossain S, Williams A, Montgomery AC. Karydakias operation for sacrococcygeal pilonidal sinus disease: experience in a district general hospital. *Ann R Coll Surg Engl* 1998; 80:197–199.
- 18 Milito G, Cortese F, Casciani CU. Rhomboid flap procedure for pilonidal sinus: results from 67 cases. *Int J Colorectal Dis* 1998; 13:113–115.
- 19 Abu Galala KH, Salam IM, Abu Samaan KR, El Ashaal YI, Chandran VP, Sabastian M, Sim AJ. Treatment of pilonidal sinus by primary closure with a transposed rhomboid flap compared with deep suturing: a prospective randomised clinical trial. *Eur J Surg* 1999; 165:468–472.
- 20 Middleton MD. Treatment of pilonidal sinus by Z-plasty. *Br J Surg* 1968; 55:516–518.
- 21 Toubanakis G. Treatment of pilonidal sinus disease with the Z-plasty procedure (modified). *Am Surg* 1986; 52:611–612.
- 22 Dylek ON, Bekerecioglu M. Role of simple V-Y advancement flap in the treatment of complicated pilonidal sinus. *Eur J Surg* 1998; 164:961–964.
- 23 Yilmaz S, Kirimcioglu V, Katz D. Role of simple V-Y advancement flap in the treatment of complicated pilonidal sinus. *Eur J Surg* 2000; 166:269.
- 24 Onishi K, Maruyama Y. Sacral adipofascial turn-over flap for the excisional defect of pilonidal sinus. *Plast Reconstr Surg* 2001; 108:2006–2010.
- 25 McGuinness JG, Winter DC, O'Connell PR. Vacuum-assisted closure of a complex pilonidal sinus. *Dis Colon Rectum* 2003; 46:274–276.
- 26 Can MF, Sevinc MM, Hancerliogullari O, Yilmaz M, Yagci G. Multicenter prospective randomized trial comparing modified Limberg flap transposition and Karydakias flap reconstruction in patients with sacrococcygeal pilonidal disease. *Am J Surg* 2010; 200:318–327.
- 27 Thompson MR, Senapati A, Kitchen P. Simple day-case surgery for pilonidal sinus disease. *Br J Surg* 2011; 98:198–209.
- 28 McCallum IJ, King PM, Bruce J. Healing by primary closure versus open healing after surgery for pilonidal sinus: systematic review and meta-analysis. *BMJ* 2008; 336:868–871.
- 29 Limongelli P, Bruscianno L, Di Stazio C, *et al.* D-shape asymmetric and symmetric excision with primary closure in the treatment of sacrococcygeal pilonidal disease. *Am J Surg* 2013; 13:520–525.
- 30 Topgul K. Surgical treatment of sacrococcygeal pilonidal sinus with rhomboid flap. *J Eur Acad Dermatol Venereol* 2010; 24:7–12.
- 31 Bascom J, Bascom T. Failed pilonidal surgery: new paradigm and new operation leading to cures. *Arch Surg* 2002; 137:1146–1150.
- 32 Lamke LO, Larsson J, Nylen B. Treatment of pilonidal sinus by radical excision and reconstruction by rotation flap surgery or Z-plasty technique. *Scand J Plast Reconstr Surg* 1979; 13:351–353.
- 33 Horwood J, Hanratty D, Chandran P, Billings P. Primary closure or rhomboid excision and Limberg flap for the management of primary sacrococcygeal pilonidal disease? A meta-analysis of randomized controlled trials. *Colorectal Dis* 2012; 14:143–151.
- 34 Ertan T, Koc M, Gocmen E, Aslar AK, Keskek M, Kilic M. Does technique alter quality of life after pilonidal sinus surgery?. *Am J Surg* 2005; 190:388–392.
- 35 Al-Jaberi TM. Excision and simple primary closure of chronic pilonidal sinus. *Eur J Surg* 2001; 167:133–135.
- 36 Malik AM, Paracha VI, Tamimy MS. Ideal treatment for chronic pilonidal sinus. *Pak Armed Forces Med J* 2002; 52:168–173.
- 37 Keshava A, Young CJ, Rickard MJ, Sinclair G. Karydakias flap repair for sacrococcygeal pilonidal sinus disease: how important is technique?. *ANZ J Surg* 2007; 77:181–183.
- 38 Marzouk DM, Abou-Zeid AA, Antoniou A, Haji A, Benziger H. Sinus excision, release of coccygocutaneous attachments and dermal-subcuticular closure (XRD procedure): a novel technique in flattening the natal cleft in pilonidal sinus treatment. *Ann R Coll Surg Engl* 2008; 90:371–376.
- 39 Yildiz MK, Ozkan E, Odabaşı HM, Kaya B, Eriş C, Abuoğlu HH, *et al.* Karydakias flap procedure in patients with sacrococcygeal pilonidal sinus disease: experience of a single centre in Istanbul. *Sci World J* 2013; 2013:104–107.

Bone cutting and heat cautery circumcision

Gamal A. Makhlof, Mohamed B.M. Kootb

Department of General Surgery, Assiut University Hospital, Assiut University, Assiut, Egypt

Correspondence to Gamal A. Makhlof, MD, Department of General Surgery, Assiut University Hospital, Assiut University, Assiut, 71111, Egypt
Tel: +20882088089; Fax: +20 88 2354130; e-mail: g_makhlof@yahoo.com

Received 29 May 2015

Accepted 23 July 2015

The Egyptian Journal of Surgery

2015, 34:258–260

Introduction

Circumcision is the removal of the foreskin of the penis. The practice of circumcision dates to ancient times. Studies consistently report that uncircumcised male infants are at higher risk for urinary tract infection compared with circumcised male infants. Uncircumcised men are at increased risk for inflammation of the glans.

Aim of the work

The aim of this study was to evaluate heat cautery circumcision and to avoid postcircumcision bleeding and reintervention.

Patients and methods

This prospective, observational study was performed on male patients attending Assiut University Hospital, General Surgery Department, and El-Jaafareya Private Hospital for routine circumcision either as outpatients and/or inpatients; of them, three were haemophilia cases. Bone cutting and heat cautery circumcision was performed. No antibiotics or anti-inflammatory drugs were given as a routine. Postoperative pain was managed with paracetamol or declophin suppositories.

Results

A total of 518 boys were subjected to bone cutting and heat cautery circumcision. Their mean age was 3.31 ± 2.33 years. Complications occurred in 24 cases (4.7%): 13 patients developed inflammatory oedema (2.5%); five patients developed infection (1%); and six cases (1.2%) developed excess skin, which was recircumcised. No bleeding, burn or injury to the glans or urethra occurred.

Conclusion

Bone cutting and heat cautery circumcision is a safe procedure, with no bleeding even in the three haemophilia cases. No sutures are needed. Oedema and infection were minimal and were controlled with medical treatment.

Keywords:

circumcision, heat cautery, safe procedure

Egyptian J Surgery 34:258–260
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Male circumcision is the removal of the foreskin of the penis. In ancient Egypt, circumcision was performed to improve hygiene. Later, routine male infant circumcision was part of the Abrahamic covenants with Jehovah, giving rise to religious circumcisions that continue to this day in the Jewish and Muslim faiths [1,2].

Uncircumcised individuals are at increased risk for inflammation of the glans; this problem rarely occurs in circumcised men [2].

Boys who remain uncircumcised are at a greater risk for urinary tract infection [3]. Circumcision may also reduce the risk of contracting HIV [4,5]. However, occasionally, complications such as bleeding or infection may occur with circumcision [6]. In addition, infants experience pain during circumcision that may continue after the circumcision is complete.

Male circumcision does not appear to adversely affect penile sexual sensitivity or sexual satisfaction [7].

In newborns, the common circumcision techniques are as follows: Gomco clamp technique, Mogen clamp technique, Plastibell technique, dorsal slit technique, and bone cutting (guillotine methods) [8].

Aim of the work

The aims of this study were as follows: first, to evaluate heat cautery circumcision; and second, to avoid postcircumcision bleeding and reintervention.

Patients and methods

This was a prospective, observational study, which was performed in Assiut University Hospital, General

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Surgery Department, and El-Jaafareya Private Hospital during the period from December 2013 to December 2014.

Study population

Male patients attending General Surgery Department, Assiut University Hospital for routine circumcision, either as outpatients and/or inpatients, or attending El-Jaafareya Private Hospital as outpatients were included in the study, of whom three were haemophilia cases. Complete blood count, prothrombin time and concentration, bleeding time and haemophilia factors were evaluated in the three hemophilia cases.

Operative techniques: bone cutting and heat cautery circumcision

The procedures were performed under local infiltration anesthesia with lidocaine hydrochloride 1%, which was injected at 10 and 2 o'clock positions at the base of the penis 3–8 min before circumcision in patients under 1 year of age, and under general anesthesia for those above 1 year of age. Retraction of the foreskin was performed by cleaning with povidone iodine solution, and a thin film of lidocaine gel was applied to the glans. The foreskin was grasped with two mosquito forceps, and bone cutting was applied to the foreskin for 1 min. Heat cautery was used to cut the foreskin (using Hilton Electro Cautery Unit made in India by IMPEL SURGICAL CO. (ISO 9000: 2008) company in Gurgaon, volts 50 C/S 5 Amp; works on AC main 220 V only) (Figs. 1 and 2).

Application for the cautery

Before operation, take a suitable point to be used for the particular case. Fix the same in the handle. Plug to the output receptacle and finally connect the apparatus

to the main to prepare for use. On switching on, the indicator will light up. Thereafter, press the button on the handle to heat up the electrode; the intensity of heat can be regulated by turning the cautery control knob outlet terminal, which is completely insulated. We use one electrode for each case.

Thereafter, the skin was retracted to show the glans, and a thin film of xylocaine gel was applied to the glans. No dressing was applied. Postoperative pain was managed with paracetamol or declophin suppositories every 12 h, and fusidic acid ointment was used three to four times per day for 2–3 days. Oral antibiotics or anti-inflammatory drugs were not given as a routine. Hot bath was given daily without antiseptic.

Ethical consideration

Oral and written consent for participation in the study was obtained from the parent of participants.

Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 14 (SPSS Inc., Chicago, IL, USA). The results were expressed as mean \pm SD or frequency.

Results

The demographic characteristics of the study group is shown in

Types of operation and complications

Bone cutting and heat cautery circumcision was performed for all patients (Table 1). Complications occurred in 24 cases (4.7%): 13 patients developed inflammatory oedema (2.5%), which is reversible; six cases (1.2%) had excess skin, which was re-excised; and five patients developed infection (1%). No bleeding, injury, or burn to the glans or urethra occurred (Table 2).

Figure 1



Heat cautery devices.

Figure 2



(a) Cutting of the foreskin. (b) Circumcised child.

Table 1 Demographic characteristic of the study group

Variable	Number (518) (%)
Sex	Male [518 (100%)]
Mean age \pm SD	3.31 \pm 2.33 years
Age groups	
≤ 1	125 (24.1)
>1 to ≤ 2	127 (24.5)
>2 to ≤ 3	82 (15.8)
>3	184 (35.5)
Haemophilia cases	3/518 (0.58)

Table 2 Complications in the study group

Complication	n (%)
No	494/518 (95.3)
Oedema	13/518 (2.5)
Infection	5/518 (1)
Excess skin	6/518 (1.2)
Bleeding or injury or burn to the glans or urethra	0 (0)

Discussion

Circumcision is a surgical procedure in which the skin covering the end of the penis (foreskin) is removed [6]. The risks of circumcision, either during the neonatal period or in early childhood, are low. It is estimated that the complication rate during the neonatal period is less than 1% [9].

In two studies that included a total of over 200 000 circumcisions performed in US hospitals, the rate of complications during the first month after the procedure was ~0.2% [10,11].

The American Academy of Pediatrics (AAP) recommends that all infants undergoing circumcision have adequate pain control during and after the procedure [11].

Male circumcision does not appear to adversely affect penile sexual function/sensitivity or sexual satisfaction [12]. However, occasionally, complications such as bleeding or infection may occur with circumcision [6].

In our study, reversible inflammatory oedema occurred in 2.5% of cases, infection in 1% of cases and excess skin in 1.2%. However, no bleeding, injury or burn to the glans or urethra occurred in our study even in patients with blood disease.

Conclusion

Bone cutting and heat cautery circumcision is a safe procedure, with no bleeding even in the three haemophilia cases. No sutures are needed. Oedema and infection were minimal and were controlled with medical treatment.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Blank S, Brady M, Buerk E, Carlo W, Diekema D, Freedman A, *et al.* Male circumcision. *Pediatrics* 2012;130:e756–85.
- Baskin LS. Patient information: circumcision in baby boys (beyond the basics). Up to Date (2015)
- Schoen EJ, Colby CJ, Ray GT. Newborn circumcision decreases incidence and costs of urinary tract infections during the first year of life. *Pediatrics* 2000; 105(Pt 1): 789–793.
- Bailey RC, Plummer FA, Moses S. Male circumcision and HIV prevention: current knowledge and future research directions. *Lancet Infect Dis* 2001; 1:223–231.
- USAID/AIDS Mark. Male Circumcision: Current Epidemiological and Field Evidence; Program and Policy Implications for HIV Prevention and Reproductive Health. Conference Report. Washington, DC: USAID, May 2003.
- Krill AJ, Palmer LS, Palmer JS. *Scientific World Journal* 2011; 11:2458–68.
- Blank S, Brady M, Buerk E, Carlo W, Diekema D, Freedman A, *et al.* American Academy of Pediatrics Task Force on Circumcision Male circumcision. *Pediatrics* 2012; 130:e756–e785.
- Abdulwahab-Ahmed A, Mungadi IA. Techniques of male circumcision. *J Surg Tech Case Rep* 2013; 5:1–7.
- American Academy of Pediatrics. Circumcision policy statement. *Pediatrics*. 1999; 103:686–693.
- Wiswell TE, Geschke DW. Risks from circumcision during the first month of life compared with those for uncircumcised boys. *Pediatrics* 1989; 83:1011–1015.
- Christakis DA, Harvey E, Zerr DM, Feudtner C, Wright JA, Connell FA. A trade-off analysis of routine newborn circumcision. *Pediatrics* 2000; 105(Pt 3): 246–249.
- American Academy of Pediatrics Task Force on Circumcision. Circumcision policy statement. *Pediatrics* 2012; 130:585.

Comparison between balloon dissection and conventional dissection for extrapleural approach in tracheoesophageal fistula repair

Basem Saied^a, Hesham Sheir^a, Hosam Ghazy^b

^aDepartment of Pediatric Surgery, ^bDepartment of General Surgery, Mansoura University Hospital, Mansoura University, Mansoura, Egypt

Correspondence to Bassem S. Abd Elkader, Department of Pediatric Surgery, Mansoura Children Hospital, Mansoura University, Mansoura, Egypt
Tel: +20 106 167 1804, +20 114 785 9190;
Fax: +2 050 2267016;
e-mail: basemsaied2015@gmail.com

Received 10 June 2015

Accepted 28 June 2015

The Egyptian Journal of Surgery
2015, 34:261–263

Objective

The extrapleural approach for tracheoesophageal fistula is preferred by most of the pediatric surgeons. The traditional method is based on combined blunt and sharp dissection. We compared this with dissection using Foley's catheter balloon.

Patients and methods

This study included two groups: the conventional dissection group, which included 30 cases, and the balloon group, which included 22 cases.

Results

The mean time for pleural dissection in the conventional group was 10 min, with a range of 8–15 min, whereas the mean in the balloon group was 4.5 min, with a range of 2–6 min. Minor pleural tears occurred in six cases (20%) in the conventional group versus four (18%) in the balloon group. Four major pleural tears were encountered in the conventional group (13.3%), which were managed with repair and intercostal tube insertion, whereas none of the balloon group cases showed major tears. Six anastomotic leaks occurred in the conventional group versus four in the balloon group, which were managed conservatively. Three mild anastomotic strictures (10%) occurred in the conventional group versus two in the balloon group (9%), and all were managed conservatively.

Conclusion

Balloon dissection is an efficient, rapid, and safe method for pleural dissection in the extrapleural approach for repair of tracheoesophageal fistula.

Keywords:

extrapleural, Foley's catheter, tracheoesophageal fistula

Egyptian J Surgery 34:261–263
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Esophageal atresia is an anomaly in which there is a blind-ending upper esophagus with common tracheoesophageal fistula [1]. It is a relatively common congenital anomaly that is recorded in 1 : 4000 live births [2–4]. Familial cases represent less than 1% of cases, whereas the majority of them are sporadic [5]. Surgery is indicated as urgently as possible to avoid aspiration and pulmonary complications. Operative intervention is usually carried out in the first few days of life after echocardiography for ruling out associated cardiac anomalies. The operative interference entails fistula ligation and esophageal anastomosis [6]. The classic approach involves the right posterolateral, thoracotomy in the fourth intercostal space [2,7]. The extrapleural approach is preferred by most of the surgeons because if any leak occurs it will result in an esophagocutaneous fistula, which usually closes in 1–2 weeks [8]. However, the problem with this approach is the tedious time-consuming pleural separation with multiple tears that may require repair and intercostal tube application [7]. This study aimed at comparing the traditional method for combined blunt and sharp pleural dissection with a newly introduced

method using Foley's catheter balloon dissection as regards efficacy, time consumed, and the incidence of significant pleural tears.

Patients and methods

This prospective study was conducted from August 2013 to March 2015 and included a total of 55 patients who were diagnosed with esophageal atresia and distal tracheoesophageal fistula (by history of choking and regurgitation with failure to pass a 10-Fr nasogastric tube that was confirmed by radiograph showing a kinked tube in the blind pouch). Cases were randomly allocated into two groups regardless the age, sex, or associated anomalies: the first group, in which pleural dissection was achieved with the conventional method using the combined blunt and sharp technique, and the second

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

group, in which pleural separation was accomplished by using the balloon of Foley's catheter No. 10 Fr. All patients were subjected to the usual screening for associated anomalies. Cases were investigated routinely. Care as regards respiration, guarding against infection, and preparation for packed red blood cell was taken preoperatively. A posterolateral thoracotomy through the fourth space was performed (Fig. 1). The intercostal muscles were divided and the pleura was separated using the traditional method in the first group. Inflation the second group, the tip of a Foley's catheter No. 10 Fr was introduced between the pleura and the rib cage, with inflation of the balloon with 10 cm saline (Fig. 2). The balloon was deflated and redisection was carried out using Foley's No. 12 Fr and 14 Fr inflated with 20 and 30 cm saline, respectively, until the pleura was separated from the ribs with complete visualization of the azygos vein (Fig. 2). The rest of the operative task was completed as usual and a tube catheter No. 16 Fr was inserted in the extrapleural space as a drain. The time used for pleural dissection was calculated in both groups starting just after muscle separation until visualization of azygos vein. Intraoperative recording of the pleural tears was carried out. Patients were followed up with regular chest examination and plain chest radiography for complications.

Results

A total of 55 patients (33 male and 19 female) with tracheoesophageal fistula/esophageal atresia were enrolled into this study. The first group (traditional) included 30 cases, whereas the second one (balloon) included 22 cases. The mean age was similar in both groups (4 days) with a range of 2–7 in the first group and 2–8 in the second. There were associated anomalies in 12 (40%) cases of the

first group and in nine (41%) cases of the second (Table 1), with cardiac anomalies being the most common as they were reported in eight cases of the first group (27%) and in five cases (23%) of the second. Pleural dissection was accomplished within a mean of 10 min in the first group (range of 8–15 min) versus a mean of 4.5 min (a range of 2–6 min) in the second one. Six minor tears (≤ 2 cm) and four major ones (>2 cm) that required repair and intercostal tube insertion were recorded in the first group, whereas only four minor tears were recorded in the second group; one of them was repaired with vicryl 5/0 suture without intercostal tube insertion. However, in the other three, separate minor tears occurred in the pleura and they were left to heal spontaneously. No pleural effusion, empyema, or pneumothorax were recorded in any case. Anastomotic leak occurred in six cases in the first group (20%) and in four cases in the second one (18%). All developed esophagocutaneous fistulas, which were managed conservatively and closed in 7–10 days. Anastomotic stricture occurred in three cases of the first group (10%) and in two cases in the second one (9%), and all were managed successfully with dilatation.

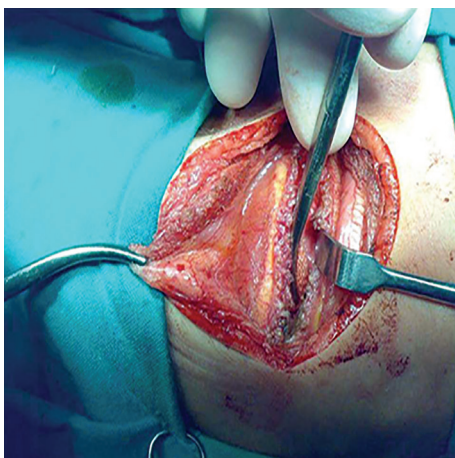
Discussion

Currently, the survival has become better and the morbidity has improved with the recent surgical

Table 1 Patient characteristics

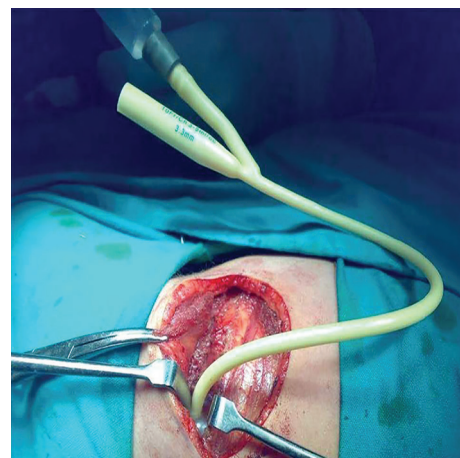
Type of pleural dissection	Conventional method		Balloon method	
	Number/ mean	Range/ percentage	Number/ mean	Range/ percentage
Sex				
Male	20	66.7%	13	59%
Female	10	33.3%	9	41%
Age (days)	4	2–7	4	2–8
Associated anomalies	12	40%	9	41%

Figure 1



Intercostal muscle division.

Figure 2



Technique of balloon dissection method.

trends in the management of esophageal atresia and tracheoesophageal fistula [9]. Associated anomalies occur in 40% of infants with esophageal atresia [10]. Cardiac anomalies were detected in 27 and 23% of cases in the first group and second group, respectively. This is in agreement with the findings of Chittmitrappap *et al.* [11], who reported an incidence of 29% for cardiac malformations. The ideal time for management is when the child becomes fit for general anesthesia [12]. Hosie and Short [1] suggested that the patient could be stabilized and planned for surgery within the first 48 h. In the present study, the mean age at the time of operation was 4 days. Nowadays, the extrapleural approach is preferred by most of the pediatric surgeons. However, if performed traditionally, it is time consuming and carries a tedious dissection [8]. In this study, we compared the traditional method of dissection with a simpler one using the balloon of Foley's catheter. The required time for balloon dissection ranged from 2 to 6 min with a mean time of 4.5 min. Thus, this method of dissection overcomes the disadvantage of the lengthy traditional extrapleural dissection. Moreover, there were no major pleural tears with subsequent intercostal tube usage after dissection using the balloon method. The incidence of anastomotic leaks was nearly similar in both groups and to other studies [8,13–15]. McKinnon and Kosloske [14] reported that the route of repair (transpleural or retropleural) did not affect the incidence of anastomotic complications. Moreover, Bishop *et al.* [13] used the transpleural approach and reported an incidence of 20% for anastomotic leak. They found that leak-related mortality reduced from 88% during the period between 1951 and 1963 to 0% during the period between 1974 and 1983. This is obviously related to the development of better technical issues. However, with the transpleural approach, the anastomotic leaks may be complicated by empyema or tension pneumothorax [8], which add to the morbidity of the patient and to the hospital cost using more aggressive antibiotic regimens. In contrast, with extrapleural approach and a patent mediastinal drain, up to 95% of anastomotic leaks close spontaneously [16]. Nowadays, in the era of endoscopic surgery, the thoracoscopic approach is acquiring popularity [17], but in many centers with limited surgical expertise, the open technique still predominates and we recommend our newly introduced technique (Table 2).

Conclusion

The extrapleural approach for repair of esophageal atresia and tracheoesophageal fistula is more desirable. Balloon dissection is a newly introduced method for

Table 2 Operative outcome

Method of pleural dissection	Conventional method		Balloon method	
	Number/ mean	Range/ percentage	Number/ mean	Range/ percentage
Pleural dissection time (min)	10	8–15	4.5	2–6
Pleural tears				
Minor	6	20%	4	18%
Major	4	13.3%	0	0
Use of intercostal tube	4	13.3%	0	0
Anastomotic leak	6	20%	4	18%
Anastomotic stricture	3	10%	2	9%

faster and safer pleural dissection with nearly 0% incidence of significant pleural tears.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Hosie GP, Short M. Oesophageal atresia. *Surgery* 2010; 28:38–42.
- Spitz L. Oesophageal atresia. *Orphanet J Rare Dis* 2007; 2:24.
- Goyal A, Jones MO, Couriel JM, Losty PD. Oesophageal atresia and tracheo-oesophageal fistula. *Arch Dis Child Fetal Neonatal Ed* 2006; 91:381–384.
- Depaepe A, Dolk H, Lechat MF. The epidemiology of tracheo-oesophageal fistula and oesophageal atresia in Europe. EUROCAT Working Group. *Arch Dis Child* 1993; 68:743–748.
- Spitz L. Esophageal atresia: lessons I have learned in a 40-year experience. *J Pediatr Surg* 2006; 41:1635–1640.
- Knottenbelt G, Skinner A, Seefelder C. Tracheo-oesophageal fistula and oesophageal atresia. *Best Pract Res Clin Anaesth* 2010; 24:387–401.
- Holland AJ, Fitzgerald DA. Oesophageal atresia and tracheo-oesophageal fistula: current management strategies and complications. *Paediatr Respir Rev* 2010; 11:100–106quiz 106–107.
- Harmon CM, Coran AG. Congenital anomalies of the oesophagus. Chapter 67. In: Grosfeld JL, O'Neill JA, Fonkalsrud EW, Coran AG, editors *Pediatric surgery*. Philadelphia: Mosby Elsevier, 2006. 1051–1081.
- Pinheiro PF, Silva AC, Pereira RM. Current knowledge on oesophageal atresia. *World J Gastroenterol* 2012; 18:3662–3672.
- Garne E, Rasmussen L, Husby S. Gastrointestinal malformations in Funen county, Denmark – epidemiology, associated malformations, surgery and mortality. *Eur J Pediatr Surg* 2002; 12:101–106.
- Chittmitrappap S, Spitz L, Kiely EM, Brereton RJ. Oesophageal atresia and associated anomalies. *Arch Dis Child* 1989; 64:364–368.
- Gupta DK, Sharma S. Esophageal atresia: the total care in a high-risk population. *Semin Pediatr Surg* 2008; 17:236–243.
- Bishop PJ, Klein MD, Philippart AI, Hixson DS, Hertzler JH. Transpleural repair of esophageal atresia without a primary gastrostomy: 240 patients treated between 1951 and 1983. *J Pediatr Surg* 1985; 20:823–828.
- McKinnon LJ, Kosloske AM. Prediction and prevention of anastomotic complications of esophageal atresia and tracheoesophageal fistula. *J Pediatr Surg* 1990; 25:778–781.
- Chittmitrappap S, Spitz L, Kiely EM, Brereton RJ. Anastomotic leakage following surgery for oesophageal atresia. *J Pediatr Surg* 1992; 27:29–32.
- Manning PB, Morgan RA, Coran AG, Wesley JR, Polley TZ Jr, Behrendt DM, *et al.* Fifty years' experience with esophageal atresia and tracheoesophageal fistula. Beginning with Cameron Haight's first operation in 1935. *Ann Surg* 1986; 204:446–453.
- Holcomb GW III, Rothenberg SS, Bax KM, Martinez-Ferro M, Albanese CT, Ostlie DJ, *et al.* Thoracoscopic repair of esophageal atresia and tracheoesophageal fistula: a multi-institutional analysis. *Ann Surg* 2005; 242:422–428. discussion 428–30.

Discharging patients after colorectal surgery: a Medical Research Institute experience

Moustafa R. Abo Elsoud^a, Mohamed G. Soror^b

^aDepartment of General Surgery, Medical Research Institute, ^bDepartment of General Surgery, Faculty of Medicine, Alexandria University, Alexandria, Egypt

Correspondence to Moustafa R. Abo Elsoud, MD, General Surgery, Safwa Business Men 2, App 511, Smouha, Alexandria 21561, Egypt
Tel: +20 342 82373, +20 342 08598;
fax: +20 342 80529;
e-mail: darsh7620012001@yahoo.com

Received 11 June 2015

Accepted 28 July 2015

The Egyptian Journal of Surgery
2015, 34:264–271

Colorectal surgery comprises a sizeable proportion of health care resources and attention is increasingly directed toward accelerating postoperative recovery thus decreasing the requirement for patient hospitalization after surgery. The use of standardized hospital discharge criteria is considered valuable to reduce the risk of premature discharge and avoid unnecessary hospital stays.

Aim of the work

The aim of this study is to compare the criteria suggested by Fiore *et al.* international consensus against the standard method used in clinical and experimental surgery department, medical research institute Hospital, Egypt.

Patients and Methods

60 patients were divided into two equal groups. Group I included 30 patients discharged according to Fiore *et al.* criteria while Group II: included 30 patients discharged according to the usual practice in the unit.

Results

There were no differences in demographic data between the two groups. Regaining of normal peristalsis in both groups was also similar, both groups passed flatus and stool at about the same time. In our study, both groups had no difference in time of pain control by oral analgesia (opioid + NSAIDs or NSAIDs alone). In this study both groups had similar rates of wound infection, 30% for group I and 23% for group II, while both groups were similar in albumin level. Differences in social acceptance of hospital discharge were not statistically significant between both groups.

Conclusion

The end point of this study was the rate of readmission which was 6.7% in both groups. So not only these discharge criteria are applicable and achievable, but we can also say they proved to be dependable

Keywords:

colorectal surgery, Fiore and colleagues' criteria, hospital readmission, standardized hospital discharge, wound infection

Egyptian J Surgery 34:264–271
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Colorectal surgery involves the utilization of a sizeable proportion of healthcare resources [1,2]. Colorectal cancer is the fourth most common form of cancer worldwide. It represents 9.4% of all incident cancer cases in men and 10.1% in women. In Egypt it contributes to 6.5% of all cancer cases [3].

Because hospital services account for a large component of this cost, attention is being increasingly directed toward accelerating postoperative recovery and decreasing the requirement for patient hospitalization after surgery [3].

Over the past two decades, improvements in colorectal surgical techniques and perioperative care have led to considerable reduction in postoperative length of stay [4–8]. However, there are concerns that early discharge may increase the risk for postoperative morbidity and hospital readmission [5,8–10].

Unplanned readmission is reported to occur in 10–20% of patients undergoing colorectal surgery [9–16].

The use of standardized hospital discharge criteria is considered valuable for reducing the risk of premature discharge and for avoiding unnecessary hospital stays [5,8]. By applying discharge criteria, the surgical team may determine when a patient has recovered sufficiently from the surgical procedure to be safely managed outside the hospital [17]. The most appropriate criteria to indicate readiness for discharge following colorectal surgery are unknown. In a recent systematic review, it was found that there are no studies comparing discharge criteria following colorectal

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

surgery [18]. Moreover, the discharge criteria described in the literature are not only variable, but also poorly defined [17].

Philosophy of enhanced recovery after surgery

The main aim of the enhanced recovery after surgery protocol is to reduce the metabolic stress caused by surgical trauma and at the same time support the return of functions that allow patients to get back to normal activities, thus decreasing hospital stay (Fig. 1).

Determination of criteria of discharge after colorectal resection surgery

A 3-round Delphi process was used to determine the criteria of discharge after colorectal resection surgery. The Delphi technique is a method of systematically surveying a group of experts to reach consensus on specific questions or issues [19–22]. It involves completion of a series of questionnaires interspersed with summary and feedback derived from previous responses. Experts remain anonymous to one another during the process. The Delphi provides several advantages over consensus methods that involve face-to-face meetings. It allows free discussion without the influence of personal status, enabling the alteration of personal views without embarrassment, and providing means to combine opinions from experts who are geographically dispersed [19–22]. This method has been widely and successfully used in healthcare [23–27] and surgical research [28–31].

Aim of the work

The aim of this study was to compare the international consensus criteria suggested by Fiore and colleagues

against the standard method used in the Clinical and Experimental Surgery Department, Medical Research Institute Hospital, Alexandria University.

Patients and methods

This study was carried out on 60 randomly allocated patients who underwent colorectal surgery.

Selection criteria

This study included 60 patients who were admitted to the Clinical and Experimental Surgery Department, Medical Research Institute Hospital, to undergo colorectal surgery.

Methods

The patients were randomly allocated by means of the closed envelope technique into two groups:

Group A: This included 30 patients who were discharged according to the criteria mentioned in Table 1.

Group B: This included 30 patients who were discharged according to the usual practice in the unit.

Statistical analysis: Data were fed into the computer and analyzed using IBM SPSS software package version 20.0 (Armonk, NY, IBM Corp). Qualitative data were described using number and percentage. Quantitative data were described using mean and SD, median, and minimum and maximum values.

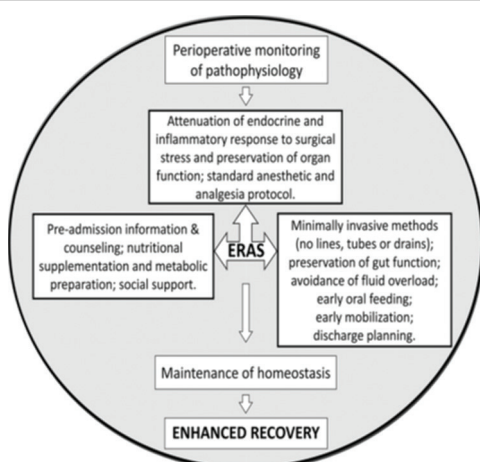
Comparison between groups regarding categorical variables was made using the χ^2 -test. When more than 20% of cells have an expected count less than 5, correction for χ^2 -test was conducted using Fisher's exact test or Monte Carlo correction.

The distributions of quantitative variables were tested for normality using the Kolmogorov–Smirnov test, the Shapiro–Wilk test, and the D'Agostino test. If the data were normally distributed, parametric tests were applied. If the data were abnormally distributed, nonparametric tests were used.

For normally distributed data, comparison between two independent populations was carried out using the independent t -test. For abnormally distributed data, comparison between two independent populations was made using the Mann–Whitney test.

Significance was ascertained as two-tailed probabilities. Significance of the obtained results was judged at the 5% level.

Figure 1



Philosophy of enhanced recovery after surgery (ERAS).

Table 1 Summary of preoperative recommendations

Preoperative elements	Rationale	Recommendations	Grade of evidence
Preadmission information and counseling	Preadmission counseling ensures a clear understanding of the intended perioperative care to be received, with emphasis on attaining specific preset targets, and would help in alleviating the stress responses to surgery [32]	Oral and written patient information regarding hospitalization, pain relief, and achieving postoperative targets, such as early nutrition, mobilization, and discharge	C
No bowel preparation	Bowel preparation leads to dehydration and changes in fluid and electrolyte balance [18] No change or rather an increased risk for complications, such as prolonged postoperative complications, and increased risk for anastomotic leakage from mechanical bowel preparation [33]	Patients undergoing elective colonic resection above peritoneal reflection should not receive routine oral bowel preparation May be considered in low rectal resection where a diverting stoma is planned [34]	A
Preoperative nutritional support	Approximately 27–45% of hospitalized patients are malnourished [35] Increases risk for tissue wasting, impaired immune function, impaired healing, and organ dysfunction resulting in increased morbidity, length of stay, readmission rates, delayed recovery, hospital costs, and mortality [36] Preoperative carbohydrate loading reduces the incidence of complications [37] and facilitates accelerated recovery through early return of gut function and shorter hospital stay leading to improved perioperative well-being [38]	Patients at risk for malnutrition should be given preoperative nutritional support, orally if possible [39] Patients should receive carbohydrate enriched drinks preoperatively [40]	A
Preoperative fasting	Preoperative fasting and surgery predisposes to metabolic stress and insulin resistance [41] Overnight fasting does not reduce the risk for aspiration. Intake of clear fluids until 2 h before anesthesia is considered safe [42]	The consensus guidelines from a Cochrane review [42] and guidelines from anesthetic societies recommend clear fluids until 2 h before induction of anesthesia and a 6-h fast for solid food [40]	A
No long-acting sedatives/ premedication	Long-acting sedatives, hypnotics, and opioids (pre-emptive analgesia) were thought to reduce anxiety and stress related to surgery, but these effects are far outweighed by the risk for prolonged recovery caused by inability to drink or mobilize postoperatively No effect on postoperative pain relief by starting analgesic treatment before the operation [43] Short-acting anxiolytics have not shown prolonged recovery or length of stay [43]	Medications causing long-term sedation should be avoided Short-acting medications given to facilitate insertion of epidural catheter are acceptable	A
Antimicrobial prophylaxis	Prophylactic antibiotics minimize infectious complications in colorectal surgery [44]	A single dose, 1 h before skin incision and further doses for procedures lasting more than 3 h [44]	A
Thromboembolic prophylaxis	Increased risk for thromboembolic complications in certain high-risk patients undergoing major abdominal surgery is associated with prolonged hospitalization and recovery	Subcutaneous low-dose unfractionated heparin or subcutaneous low-molecular-weight heparin [45]	C

Results

Comparison between the studied groups according to demographic data:

The study included 13 male and 17 female patients in group I and 15 male and 15 female patients in group II. The mean age was 55.23 years in group I and 50.90 years in group II.

There were no statistically significant differences between the two groups.

Comparison between the studied groups according to diagnosis

The study included 12 cases of rectal cancer, seven cases of right colon cancer, six cases of left colon cancer, two

cases of left diverticular disease, two cases of familial adenomatous polyps, and one case of left colonic volvulus in group I; in group II there were 10 cases of rectal cancer, seven cases of right colon cancer, eight cases of left colon cancer, one case of left diverticular disease, three cases of familial adenomatous polyps, and one case of left colonic volvulus (Table 2).

There was no statistical significance between the two groups according to diagnosis.

Comparison between the studied groups according to preoperative duration of fasting (h), surgeon, duration of surgery (min), and indication of surgery

Twenty-seven surgeries were conducted by consultants and three by specialists in group I, whereas 25 surgeries

were conducted by consultants and five by specialists in group II. No statistical significance existed between the two groups.

The mean duration of fasting was 12.45 ± 6.14 h in group I and 14.50 ± 5.42 h in group II. No statistical significance existed between the two groups. Twenty-nine surgeries were elective and one was emergency in both groups, with a mean duration of 134.33 ± 15.24 min in group I and 132.67 ± 22.27 min in group II. No statistical significance existed between the two groups (Table 3).

Comparison between the studied groups according to duration of pain control with oral analgesia (days): No statistical significance existed between the two groups according to duration of pain control with oral analgesia; median time was 4 days for opioid analgesia and 6 days for nonopioid use in both groups (Table 4).

Comparison between the studied groups according to tolerance to oral intake (one solid meal+>1000 ml fluids) (days): Median time of tolerance to oral intake (one solid meal+>1000 ml fluids) was 4 days in both groups. No statistical significance existed between the two groups (Table 5).

Comparison between the studied groups according to recovery of lower gastro-intestinal tract (GIT) function (days): Median time of passing flatus was 3 and 2.5 days in groups I and II, respectively; however, median time of passing stool was 5 days in both groups.

No statistical significance existed between the two groups (Table 6).

Comparison between the studied groups according to time to fulfilling discharge criteria (P.O. days): Median time to fulfilling discharge criteria was 5 days in both groups. No statistical significance existed between the two groups.

Comparison between the studied groups according to postoperative hospital stay (days)

Median time of postoperative hospital stay was significantly lower in group I (6 days) than in group II (8.5 days) ($P \leq 0.001$) (Table 7).

Comparison between the studied groups according to causes of delayed discharge after fulfilling the criteria

All patients in group I were discharged after fulfilling the criteria without delay, whereas all patients had delayed discharge in group II as seven cases were not controlled on nonopioid oral analgesia (23.3%), eight cases were not tolerant to more than one solid meal+1000 ml oral fluids (26.7%), eight cases did not

Table 2 Comparison between the studied groups according to diagnosis

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30) [n (%)]	Group II (n = 30) [n (%)]	P
Diagnosis			
Rectal cancer	12 (40.0)	10 (33.3)	0.919
Right colon cancer	7 (23.3)	7 (23.3)	
Left colon cancer	6 (20.0)	8 (26.7)	
Left diverticular disease	2 (6.7)	1 (3.3)	
Familial adenomatous polyposis	2 (6.7)	3 (10.0)	
Left colonic volvulus	1 (3.3)	1 (3.3)	

P, P value for Monte Carlo test between the two studied groups.

Table 3 Comparison between the studied groups as regards duration of fasting (h), surgeon, indication of surgery, and duration of surgery (min)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30) [n (%)]	Group II (n = 30) [n (%)]	Test of significance
Surgeon			
Consultant	27 (90.0)	25 (86.2)	^{FE} P=0.706
Specialist	3 (10.0)	4 (13.8)	
Duration fasting (h)			
Minimum–maximum	12.0–24.0	12.0–24.0	^t P=0.176
Mean \pm SD	12.45 ± 6.14	14.50 ± 5.42	
Median	14.0	14.0	
Elective and emergency			
Elective	29 (96.7)	29 (96.7)	^{FE} P=1.000
Emergency	1 (3.3)	1 (3.3)	
Duration (min)			
Minimum–maximum	110.0–170.0	130.0–160.0	^t P=0.736
Mean \pm SD	134.33 ± 15.24	132.67 ± 22.27	
Median	130.0	132.50	

FE, Fisher exact test; P, P value between the two studied groups; t, Student t-test.

Table 4 Comparison between the studied groups according to duration of control with oral analgesia (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
Opioid			
Minimum–maximum	2.0–7.0	3.0–5.0	0.654
Mean \pm SD	3.93 ± 1.01	4.03 ± 0.67	
Median	4.0	4.0	
Nonopioid			
Minimum–maximum	4.0–9.0	5.0–8.0	0.633
Mean \pm SD	5.83 ± 1.15	5.97 ± 1.0	
Median	6.0	6.0	

P, P value for the Student t-test between the two studied groups.

Table 5 Comparison between the studied groups according to tolerance to oral intake (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
1 solid meal+>1000 ml fluids			
Minimum–maximum	3.0–5.0	3.0–5.0	0.069
Mean \pm SD	4.37 ± 0.56	4.07 ± 0.69	
Median	4.0	4.0	

P, P value for the Student t-test between the two studied groups.

pass stool (26.7%), seven cases had wound infection (23.3%), five cases had rectal bleeding (16.7%), another five had a low serum albumin level (16.7%), and finally six cases had an elevated white blood cell count (20%).

There was statistical significance in favor of group I with respect to the causes of delayed discharge after fulfilling the criteria ($P < 0.05$) (Table 8).

Comparison between the studied groups according to readmission

Two cases were readmitted in both groups. No statistical significance existed between the studied groups. The cause of readmission was burst abdomen and pelvic collection in group I and anastomotic leak and pelvic collection in group II.

Table 6 Comparison between the studied groups according to recovery of lower GIT function (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
Flatus			
Minimum–maximum	2.0–4.0	1.0–6.0	0.897
Mean \pm SD	2.80 \pm 0.66	2.83 \pm 1.23	
Median	3.0	2.50	
Stool			
Minimum–maximum	3.0–6.0	3.0–7.0	0.169
Mean \pm SD	4.70 \pm 0.75	5.0 \pm 0.91	
Median	5.0	5.0	

Table 7 Comparison between the studied groups according to postoperative hospital stay (days)

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30)	Group II (n = 30)	P
Postoperative hospital stay			
Minimum–maximum	5.0–9.0	6.0 \pm 12.0	<0.001*
Mean \pm SD	6.50 \pm 1.11	8.53	
Median	6.0	8.50	

P, P value for the Student *t*-test for comparing between the two studied groups; *Statistically significant at $P \leq 0.05$.

Table 8 Comparison between the studied groups according to cause of delayed discharge after fulfilling criteria

Cause of delayed discharge after fulfilling the criteria	Group I (n = 30) [n (%)]	Group II (n = 30) [n (%)]	Test of significance
Discharged after fulfilling criteria	30 (100.0)	0 (0.0)	$\chi^2 P < 0.001^*$
Not controlled on nonopioid oral analgesia	0 (0.0)	7 (23.3)	$^{FE} P = 0.011^*$
Not tolerant to (more than 1 solid meal+1000 ml oral fluids)	0 (0.0)	8 (26.7)	$^{FE} P = 0.005^*$
Not passing stool	0 (0.0)	8 (26.7)	$^{FE} P = 0.005^*$
Presence of wound infection	0 (0.0)	7 (23.3)	$^{FE} P = 0.011^*$
Presence of rectal bleeding	0 (0.0)	5 (16.7)	$^{FE} P = 0.049^*$
Level of serum albumin	0 (0.0)	5 (16.7)	$^{FE} P = 0.049^*$
Elevated WBC	0 (0.0)	6 (20.0)	$^{FE} P = 0.024^*$
No social acceptance and home status	0 (0.0)	3 (10.0)	$^{FE} P = 0.237$

FE, Fisher's exact test; P, P value for comparing between the two studied groups; WBC, white blood cell; *Statistically significant at $P \leq 0.05$.

Discussion

Currently, little information exists regarding the specific criteria that indicate readiness for discharge following colorectal surgery. In a systematic review Fiore *et al.* [17] identified 156 studies that described 70 different sets of criteria to indicate readiness for discharge. To ensure an international perspective to this consensus, they recruited a panel of 15 experts from 15 different countries using the Delphi technique. Experts reached consensus that patients should be considered ready for hospital discharge when there is tolerance of oral intake, recovery of lower gastrointestinal function, adequate pain control with oral analgesia, ability to mobilize and self-care, and no evidence of complications or untreated medical problems [46].

In colorectal surgery, drains are expected to prevent hematoma, fluid collection, or abscess formation, to act as an indicator of postoperative complication, and to minimize the severity of complication-related symptoms [47].

Routine drainage has not been advocated by meta-analyses as drains have failed to demonstrate any benefit in reducing anastomotic leak rate, minimizing symptoms, or in serving as a warning function [48]. Despite the controversial results, the choice of using a drain is left to the individual surgeon's preference. Close follow-up of patients is essential on its use. It is important that the duration of drainage not be unnecessarily extended. Any complications directly associated with the use of drains should be avoided [48]. In this study, the surgeon's preference was to use a drain. In both groups a drain was inserted, and removed at approximately the same time (in 3–5 days in group I and in 4–5 days in group II).

Lassen *et al.* [40] in his consensus review of optimal perioperative care in colorectal surgery found that, although fasting from midnight has been standard practice to avoid pulmonary aspiration in elective surgery, a review has found no evidence to support this.

Equally, a Cochrane review of 22 randomized controlled trials in adult patients provides robust evidence that reducing the preoperative fasting period for clear fluids to 2 h does not increase complications [42].

A metabolically fed state in patients undergoing surgery can be achieved by providing a clear carbohydrate-rich beverage before midnight and 23 h before surgery. This reduces preoperative thirst, hunger, and anxiety and postoperative insulin resistance. Patients in a more anabolic state have less postoperative nitrogen and protein loss as well as better-maintained lean body mass and muscle strength [42]. Data from randomized controlled trials indicate accelerated recovery and shorter hospital stay in patients receiving preoperative carbohydrate loading in colorectal surgery [49]. In this study, all patients underwent 12–24 h of fasting before surgery. However, this did not affect their tolerance to oral intake, which was similar in both groups (3–5 days).

Regaining of normal peristalsis in both groups was similar. In group I it was 1–3 days and in group II it was 1–4 days. This is consistent with what Wilson [50] found that following laparotomy colonic pressure activity first occurs after 40–48 h.

Andersen and colleagues performed a Cochrane review that included 14 randomized controlled trials representing a total of 1224 patients all undergoing gastrointestinal surgery. In their study they compared early postoperative feeding against traditional management to estimate the relative risk of postoperative complications. They concluded that there is no obvious advantage in keeping patients nil by mouth following gastrointestinal surgery and supported early commencement of enteral feeding [51]. In our study both groups met the discharge criteria to tolerate at least one solid meal and more than 1000 ml oral fluids at equal times, which were from 3 to 5 days with a mean of about 4 days. In all, 26.7% of group II stayed at the hospital for an additional 1–3 days after fulfilling the discharge criteria until they were able to tolerate more than one solid meal.

Chan and Law [52] and Klappenbach *et al.* [53] in their review of postoperative ileus management set passage of flatus or stool as a sign of resolution of ileus and Delaney [54] in his study of feasibility of discharge within 24–72 h after laparoscopic colorectal surgery also set passage of either flatus and stool as the criterion for patient discharge. These studies did not show significant readmission differences because of early discharge of their patients. In this study, group I patients passed flatus with a mean of 2.8 days, whereas group II patients passed flatus at about the same time.

Both groups passed stool with a similar mean of 5 days, which is acceptable as compared with these studies.

Opioid analgesia is the most commonly used method of postoperative pain management. Pain is a subjective and extremely variable experience. Variability in the patient's perception of pain coupled with variability in the pharmacokinetic behavior of opioids results in a huge variation in analgesic requirements [55].

In the past decades we have focused on the pursuit of the ideal analgesic agent. The administration of oral analgesics can begin as soon as the patient can tolerate oral fluids.

In our study, both groups had no difference in the duration of pain control by oral analgesia (opioid+NSAIDs or NSAIDs alone). But in group II, seven patients (23.3%) were discharged about 2 days later after their pain was controlled on NSAIDs alone after fulfilling other discharge criteria.

Despite the use of preoperative antibiotic prophylaxis, infections still represent the most frequent cause of perioperative morbidity. Intra-abdominal infections are related primarily to anastomotic leaks and are potentially life-threatening. Anastomotic leaks occur with a frequency of up to 23%. In roughly half of the patients, anastomotic leaks are clinically silent and may first become evident after a median of 8 days, often when patients have developed critical illness [56].

It is important to diagnose infectious complications early in order to initiate either surgical or conservative treatment, preventing serious postoperative morbidity or death [56]. However, there is presently no reliable diagnostic test with sufficient accuracy available to detect anastomotic leaks at an early stage. In most cases, the patient will present with signs of sepsis: tachypnea, tachycardia, and fever at the sixth to eighth postoperative day. There is often abdominal pain or distension suggesting an ileus, but clinically the abdomen may show signs of peritonitis. Inflammatory markers will be elevated; the diagnosis may be difficult to make as the patients display features consistent with other postoperative infectious complications [57].

The discharge criteria proposed by Fiore and colleagues were not only achieved by an international consensus, but also these criteria are applicable and achievable. In our study both groups fulfilled the discharge criteria at about the same time, which is from 4 to 8 days with a mean of 5.5 days. However, group II had a significantly longer hospital stay of 6–12 days with a mean of 8.5 days in comparison with group I, with 5–9 days of hospital stay with a mean of 6.5 days.

The cause of readmission was burst abdomen and pelvic collection in group I and anastomotic leak and pelvic collection in group II.

Conclusion

The endpoint of this study was the rate of readmission, which was 6.7% in both groups. Therefore, not only were these discharge criteria applicable and achievable but they proved to be dependable.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Elixhauser A, Andrews RM. Profile of inpatient operating room procedures in US hospitals in 2007. *Arch Surg* 2010; 145:1201–1208.
- Schilling PL, Dimick JB, Birkmeyer JD. Prioritizing quality improvement in general surgery. *J Am Coll Surg* 2008; 207:698–704.
- Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. *Ann Surg* 2008; 248:189–198.
- Abraham NS, Young JM, Solomon MJ. Meta-analysis of short-term outcomes after laparoscopic resection for colorectal cancer. *Br J Surg* 2004; 91:1111–1124.
- Gouvas N, Tan E, Windsor A, Xynos E, Tekkis PP. Fast-track vs standard care in colorectal surgery: a meta-analysis update. *Int J Colorectal Dis* 2009; 24:1119–1131.
- Reza MM, Blasco JA, Andradas E, Cantero R, Mayol J. Systematic review of laparoscopic versus open surgery for colorectal cancer. *Br J Surg* 2006; 93:921–928.
- Varadhan KK, Lobo DN, Ljungqvist O. Enhanced recovery after surgery: the future of improving surgical care. *Crit Care Clin* 2010; 26:527–547.
- Wind J, Polle SW, Fung Kon Jin PH, Dejong CH, von Meyenfeldt MF, Ubbink DT, *et al.* Systematic review of enhanced recovery programmes in colonic surgery. *Br J Surg* 2006; 93:800–809.
- Kariv Y, Wang W, Senagore AJ, Hammel JP, Fazio VW, Delaney CP. Multivariable analysis of factors associated with hospital readmission after intestinal surgery. *Am J Surg* 2006; 191:364–371.
- Kiran RP, Delaney CP, Senagore AJ, Steel M, Garafalo T, Fazio VW. Outcomes and prediction of hospital readmission after intestinal surgery. *J Am Coll Surg* 2004; 198:877–883.
- Azimuddin K, Rosen L, Reed JFIII, Stasik JJ, Riether RD, Khubchandani IT. Readmissions after colorectal surgery cannot be predicted. *Dis Colon Rectum* 2001; 44:942–946.
- O'Brien DP. Predictors and outcome of readmission after laparoscopic intestinal surgery. *World J Surg* 2007; 31:2138–2143.
- Guinier D, Manton GA, Alves A, Kwiatkowski F, Slim K, Panis Y, *et al.* Risk factors of unplanned readmission after colorectal surgery: a prospective, multicenter study. *Dis Colon Rectum* 2007; 50:316–23.
- Andersen J, Hjort-Jakobsen D, Christiansen PS, Kehlet H. Readmission rates after a planned hospital stay of 2 versus 3 days in fast-track colonic surgery. *Br J Surg* 2007; 94:890–893.
- Basse L, Billesbolle P, Kehlet H. Early recovery after abdominal rectopexy with multimodal rehabilitation. *Dis Colon Rectum* 2002; 45:195–199.
- Basse L, Jakobsen DH, Bardram L, Billesbolle P, Lund C, Mogensen T, *et al.* Functional recovery after open versus laparoscopic colonic resection: a randomized, blinded study. *Ann Surg* 2005; 241:416–423.
- Fiore JF Jr, Browning L, Bialocerkowski A, Gruen RL, Faragher IG, Denehy L. Hospital discharge criteria following colorectal surgery: a systematic review. *Colorectal Dis* 2012; 14:270–281.
- Holte K, Nielsen KG, Madsen JL, Kehlet H. Physiologic effects of bowel preparation. *Dis Colon Rectum* 2004; 47:1397–1402.
- Murphy MK, Black NA, Lamping DL, McKee CM, Sanderson CF, Askham J, *et al.* Consensus development methods, and their use in clinical guideline development. *Health Technol Assess* 1998; 2:i-iv. 1–88
- Jones J, Hunter D. Consensus methods for medical and health services research. *Bmj* 1995; 311:376–380.
- Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs* 2000; 32:1008–1015.
- Powell C. The Delphi technique: myths and realities. *J Adv Nurs* 2003; 41:376–382.
- Elwyn G, O'Connor A, Stacey D, Volk R, Edwards A, Coulter A, *et al.* Developing a quality criteria framework for patient decision aids: online international Delphi consensus process. *BMJ* 2006; 333:417.
- Griffin SC, Barber JA, Manca A, Sculpher MJ, Thompson SG, Buxton MJ, *et al.* Cost effectiveness of clinically appropriate decisions on alternative treatments for angina pectoris: prospective observational study. *BMJ* 2007; 334:624.
- Banks DE, Shi R, McLarty J, Cowl CT, Smith D, Tarlo SM, *et al.* American College of Chest Physicians consensus statement on the respiratory health effects of asbestos. Results of a Delphi study. *Chest* 2009; 135:1619–1627.
- Hejblum G, loos V, Vibert JF, Boelle PY, Chalumeau-Lemoine L, Chouaid C, *et al.* A web-based Delphi study on the indications of chest radiographs for patients in ICUs. *Chest* 2008; 133:1107–1112.
- Ferri CP, Prince M, Brayne C, Brodaty H, Fratiglioni L, Ganguli M, *et al.* Global prevalence of dementia: a Delphi consensus study. *Lancet* 2005; 366:2112–2117.
- Phitayakorn R, Delaney CP, Reynolds HL, Champagne BJ, Heriot AG, Neary P, *et al.* Standardized algorithms for management of anastomotic leaks and related abdominal and pelvic abscesses after colorectal surgery. *World J Surg* 2008; 32:1147–1156.
- Dixon E, Armstrong C, Maddern G, Sutherland F, Hemming A, Wei A, *et al.* Development of quality indicators of care for patients undergoing hepatic resection for metastatic colorectal cancer using a Delphi process. *J Surg Res* 2009; 156:32–38.
- Burt CG, Cima RR, Koltun WA, Littlejohn CE, Ricciardi R, Temple LK, *et al.* Developing a research agenda for the American Society of Colon and Rectal Surgeons: results of a Delphi approach. *Dis Colon Rectum* 2009; 52:898–905.
- McGory ML, Kao KK, Shekelle PG, Rubenstein LZ, Leonardi MJ, Parikh JA, *et al.* Developing quality indicators for elderly surgical patients. *Ann Surg* 2009; 250:338–347.
- Blazeby JM, Soulsby M, Winstone K, King PM, Bulley S, Kennedy RH. A qualitative evaluation of patients' experiences of an enhanced recovery programme for colorectal cancer. *Colorectal Dis* 2010; 12:e236–e242.
- Jung B, Pahlman L, Nystrom PO, Nilsson E. Mechanical Bowel Preparation Study G. Multicentre randomized clinical trial of mechanical bowel preparation in elective colonic resection. *Br J Surg* 2007; 94:689–695.
- Platell C, Barwood N, Makin G. Randomized clinical trial of bowel preparation with a single phosphate enema or polyethylene glycol before elective colorectal surgery. *Br J Surg* 2006; 93:427–433.
- Schutz T, Pirlich M. Malnutrition in the hospital: age as a special risk factor. *Pflege Zeitschrift* 2006; 59:778–779.
- Stratton RJ, Elia M. Encouraging appropriate, evidence-based use of oral nutritional supplements. *Proc Nutr Soc* 2010; 69:477–487.
- Svanfeldt M, Thorell A, Hausel J, Soop M, Rooyackers O, Nygren J, *et al.* Randomized clinical trial of the effect of preoperative oral carbohydrate treatment on postoperative whole-body protein and glucose kinetics. *Br J Surg* 2007; 94:1342–1350.
- Yuill KA, Ricardson RA, Davidson HI, Garden OJ, Parks RW. The administration of an oral carbohydrate-containing fluid prior to major elective upper-gastrointestinal surgery preserves skeletal muscle mass postoperatively — a randomized clinical trial. *Clin Nutr* 2005; 24:32–7.
- Weimann A, Braga M, Harsanyi L, Laviano A, Ljungqvist O, Soeters P, *et al.* ESPEN Guidelines on Enteral Nutrition: surgery including organ transplantation. *Clin Nutr* 2006; 25:224–244.
- Lassen K, Soop M, Nygren J, Cox PB, Hendry PO, Spies C, *et al.* Consensus review of optimal perioperative care in colorectal surgery: Enhanced Recovery After Surgery (ERAS) Group recommendations. *Arch Surg* 2009; 144:961–969.
- Thorell A, Nygren J, Ljungqvist O. Insulin resistance: a marker of surgical stress. *Curr Opin Clin Nutr Metab Care* 1999; 2:69–78.
- Brady M, Kinn S, Stuart P. Preoperative fasting for adults to prevent perioperative complications. *Cochrane Database Syst Rev* 2003; 4:CD004423.

- 43 Moiniche S, Kehlet H, Dahl JB. A qualitative and quantitative systematic review of preemptive analgesia for postoperative pain relief: the role of timing of analgesia. *Anesthesiology* 2002; 96:725–741.
- 44 Song F, Glenny AM. Antimicrobial prophylaxis in colorectal surgery: a systematic review of randomized controlled trials. *Br J Surg* 1998; 85:1232–1241.
- 45 Wille-Jorgensen P, Rasmussen MS, Andersen BR, Borly L. Heparins and mechanical methods for thromboprophylaxis in colorectal surgery. *Cochrane Database Syst Rev* 2003; 4:CD001217.
- 46 Fiore JF Jr, Bialocerkowski A, Browning L, Faragher IG, Denehy L. Criteria to determine readiness for hospital discharge following colorectal surgery: an international consensus using the Delphi technique. *Dis Colon Rectum* 2012; 55:416–423.
- 47 Tsujinaka S, Konishi F. Drain vs no drain after colorectal surgery. *Indian J Surg Oncol* 2011; 2:3–8.
- 48 Jesus EC, Karliczek A, Matos D, Castro AA, Atallah AN. Prophylactic anastomotic drainage for colorectal surgery. *Cochrane Database Syst Rev* 2004; 4:CD002100.
- 49 Subrahmanyam M, Venugopal M. Perioperative fasting: a time to relook. *Indian J Anaesth* 2010; 54:374–375.
- 50 Wilson JP. Postoperative motility of the large intestine in man. *Gut* 1975; 16:689–692.
- 51 Andersen HK, Lewis SJ, Thomas S. Early enteral nutrition within 24 h of colorectal surgery versus later commencement of feeding for postoperative complications. *Cochrane Database Syst Rev* 2006; 4:CD004080.
- 52 Chan MKY, Law WL. Use of chewing gum in reducing postoperative ileus after elective colorectal resection: a systematic review. *Dis Colon Rectum* 2007; 50:2149–2157.
- 53 Klappenbach RF, Yazzi FJ, Alonso Quintas F, Horna ME, Alvarez Rodríguez J, Oría A. Early oral feeding versus traditional postoperative care after abdominal emergency surgery: a randomized controlled trial. *World J Surg* 2013; 37:2293–2299.
- 54 Delaney CP. Outcome of discharge within 24 to 72 h after laparoscopic colorectal surgery. *Dis Colon Rectum* 2008; 51:181–185.
- 55 Goudas LC, Carr DB. Postoperative opioid analgesia – reconsider, don't reject. *J Clin Anesth* 1996; 8:439–440.
- 56 Reibetanz J, Germer CT. Anastomoseninsuffizienz in der Kolorektalchirurgie: Identifikation signifikanter Risikofaktoren. *Der Chirurg; Zeitschrift für alle Gebiete der Operativen Medizin* 2013; 84: 330–331.
- 57 Bellows CF, Webber LS, Albo D, Awad S, Berger DH. Early predictors of anastomotic leaks after colectomy. *Tech Coloproctol* 2009; 13:41–47.

Evaluation of component separation technique in the repair of complex large ventral hernia with large defects

Mohamed Samir, Mohamed Hany, Mohamed Ibrahim

Department of Clinical and Experimental surgery, Medical Research Institute, University of Alexandria, Alexandria, Egypt

Correspondence to Mohamed Ibrahim, Department of Surgery, Medical Research Institute, Alexandria University, 165 Horreya Avenue Hadara, 21561 Alexandria, Egypt
Tel +2034282331; fax +2034283719; e-mail: drmohamedibrahim@yahoo.com

Received 18 June 2015

Accepted 28 June 2015

The Egyptian Journal of Surgery
2015, 34:272–275

Background

Component separation technique was initially developed in 1990 by Ramirez and colleagues for reconstruction of large abdominal wall defects. The aim of this study was to report the effectiveness of this technique over 1-year follow-up.

Patients and methods

Sixteen patients were included in the study. The indications, operative details, and clinical outcomes were recorded. The mean operative time ranged from 140 to 210 min and the hospital stay ranged from 2 to 5 days. Postoperative complications were mild, and none of the studied patients had clinical recurrence during the follow-up period.

Conclusion

Component separation technique is a feasible procedure and effective in the repair of large abdominal wall defects.

Keywords:

abdominal wall, component separation, large hernia

Egyptian J Surgery 34:272–275

© 2015 The Egyptian Journal of Surgery

1110-1121

Introduction

The term ventral is most commonly used to collectively describe those hernias that occur outside the groin, and that is what we mean in this study. Most of these hernias are small and can be repaired easily with standardized techniques. However, a subset of those patients develop a large sac with loss of domain. Repair of such types of mega ventral hernia with relative loss of domain within the abdominal cavity is technically challenging.

Component separation technique (CST) was initially developed in 1990 by Ramirez *et al.* [1] for reconstruction of large abdominal wall defects without the use of prosthetic materials. The technique separates the muscle components of the abdominal wall so that they can be mobilized and used to reconstruct midline deficiencies of the abdominal wall.

Primary ventral incisional hernia repair with sutures alone is associated with hernia recurrence rates ranging from 36 to 56% [2,3]. In this article we modified the technique with the application of prosthetic material onlay over the repair.

The aim of this study was to report the effectiveness of this technique over 1-year follow-up.

Patients and methods

(1) Patients with large ventral hernia with wide defect were included in this study and prepared for component separation repair.

- (2) All patients were subjected to complete history taking and clinical assessment, including cardiopulmonary assessment and laboratory investigations, and a computed tomography scan was obtained to assess the size of the hernia and the extent of loss of domain.
- (3) Appropriate deep venous thrombosis prophylaxis was carried out.
- (4) Operative data of all patients were recorded, including duration of the procedure, intraoperative complications, and associated procedure if any.
- (5) Patients remained in the hospital following their surgery until they were ambulatory and their bladder and bowel functions were normal.
- (6) Patients were followed up regularly for the first 3 months and then were followed up on an as-needed basis.
- (7) During the follow-up period, patients were assessed for postoperative complications such as wound infection, wound dehiscence, mesh explantation, seroma, fistula formation, recurrence, etc.

Surgical technique

(1) All surgical procedures took place under combined epidural and general anesthesia and patients

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

received perioperative parenteral antibiotics with placement of pressure garments on both lower limbs. Low molecular weight heparin was given 12 h before surgery.

- (2) Each patient required takedown of a large anterior abdominal hernia, and adhesions between peritoneum and small bowels were meticulously dissected.
- (3) Patients were selected for component separation if the abdominal wall defect appeared to be not amenable to direct closure without tension.
- (4) The abdominal skin flap was elevated at the midline, superior to the level of the costal margin and inferior to the symphysis pubis.
- (5) At 2 cm lateral from the rectus sheath, the aponeurosis of external abdominal oblique muscle was longitudinally transected, and release of the abdominal musculature was performed in a sequential manner and only to an extent clinically necessary to close the abdominal wall defect without tension.
- (6) The avascular plane between the external abdominal oblique muscle and the internal abdominal oblique muscle was separated and this was performed on either side.
- (7) Tension-free closure of the abdominal wall defect was achieved using polydioxanone continuous running sutures and reinforced with interrupted Vicryl stitch.
- (8) Finally, the repair was reinforced with an overlay mesh with a wide overlap.
- (9) Suction drains were placed subcutaneously, and the subcutis and the skin were closed.
- (10) The patients were instructed to wear an abdominal binder and to avoid heavy lifting for approximately 10 weeks.
- (11) Suction drains remained *in situ* until the output was less than 30–50 ml in 24 h.

Results

Sixteen patients were included in this study, 10 (65%) female and six (35%) male. Their ages ranged from 28 to 60 years, with a mean of 39.26 ± 9.38 years. The period of follow-up ranged from 9 to 18 months (Table 1).

Recurrent ventral hernia was the most common indication for repair of abdominal wall in seven patients. Other indications were exploration due to trauma in four patients, exploration due to peritonitis in three patients, exploration for distal pancreatectomy in one patient, and closure of colostomy and peritonitis in one patient. Duration since previous operation ranged from 8 months to 10 years.

Total operative time ranged from 130 to 210 min, with a mean of 140.45 ± 33.065 min. Hospital stay ranged from 2 to 5 days. One patient needed mechanical ventilation for 2 days during the immediate postoperative period.

Seven patients had no complications, whereas six patients developed seroma, which was managed with frequent aspiration in the outpatient clinic. Wound infection occurred in two patients and was managed conservatively with systemic and local antibiotics. Minor wound breakdown occurred in two patients and required debridement and secondary closure under local anesthesia. One patient developed wound hematoma and was managed conservatively with local fomentation and topical medications.

All studied patients had no clinical recurrence during the follow-up period and had acceptable cosmetic outcome.

Discussion

Large ventral hernia is a common problem occurring in 11–20% of patients undergoing laparotomy [4]. There is no standardized definition of what represents a giant ventral hernia, but the major problem is inoperability. Repair of such huge ventral hernias with significant loss of domain is technically challenging, with high mortality, morbidity, and recurrences rates [5]. Herein, we presented our experience with the CST with an onlay mesh in the repair of giant ventral hernias with large defects.

Component separation was first popularized by Ramirez *et al.* [1] in the 1990s. It allows for a tension-free closure of the myofascial layers of the abdominal wall.

Several investigators have published good outcomes of CST for huge ventral hernia repair [6–8].

In this study, 16 patients were included and all of them had midline closure by means of component separation and an onlay mesh. We reported no recurrence rate over a mean period of 12.2 months of follow-up.

Sailes *et al.* [9] reported a recurrence rate of 18.5% at 10-year follow-up with an onlay mesh and we believe that an important step to reduce recurrence is to achieve tension-free midline closure of the linea alba. Abrahamson and Eldar [10] also reported the importance of recreating the linea alba to provide an anchor for the lateral abdominal wall anteriorly and to decrease the risk of recurrence.

Hultman *et al.* [11] reported a hernia recurrence rate of 19.8% at a mean follow-up of 4.4 years, whereas Thomas *et al.* [12] reported no recurrences.

Table 1 The clinical data of the studied patients

Patient nos	Age	Sex	Type of previous operation	Duration since previous operation	Comorbidity	Type of wound incision	Type of mesh	Period of follow-up (months)	Postoperative complications
1	42	Female	Exploration due to trauma	2 years	Nil	Midline	Prolene	18	Nil
2	36	Female	Exploration due to peritonitis	1 year	Nil	Midline	Ultrapro	18	Seroma
3	40	Female	Exploration for pancreatectomy	8 months	Nil	Midline	Ultrapro	17	Seroma, minor wound infection
4	51	Male	Recurrent ventral hernia (puh)	2 years	T2DM	Transverse	Ultrapro	16	Seroma
5	50	Male	Exploration due to peritonitis	1 year	Nil	Midline	Ultrapro	16	Nil
6	44	Female	Recurrent ventral hernia (puh)	3 years	Nil	Transverse	Prolene	14	Wound hematoma
7	46	Male	Exploration due to trauma	10 years	HTN	Midline	Prolene	14	Nil
8	59	Female	Exploration due to peritonitis	2 years	T2DM	Midline	Ultrapro	13	Seroma
9	60	Male	Recurrent ventral hernia (puh)	4 years	T2DM, HTN, IHD	Midline	Ultrapro	12	Seroma, minor wound breakdown
10	28	Male	Exploration due to trauma	1 year	Nil	Midline	Prolene	12	Nil
11	50	Female	Closure of colostomy and peritonitis	1 year	Bronchial asthma	Midline	Prolene	11	Wound infection, seroma
12	48	Female	Recurrent incisional hernia	2 years	Nil	Midline	Prolene	11	Nil
13	32	Female	Recurrent incisional hernia	2 years	Nil	Midline	Ultrapro	9	Nil
14	45	Male	Exploration due to peritonitis	2.5 years	Nil	Midline	Prolene	9	Seroma
15	39	Female	Recurrent incisional hernia	3 years	Nil	Midline	Ultrapro	8	Minor wound breakdown
16	35	Female	Recurrent ventral hernia (puh)	3 years	Nil	Transverse	Ultrapro	8	Nil

T2DM, type 2 diabetes melitus; HTN, hypertension; IHD, ischemic heart disease

Slater *et al.* [13] reported a recurrence rate of 38.7% with component separation repair without mesh after a mean of 40.9-month follow-up, and this was significantly higher compared with that reported in the literature (14.0%, $P = 0.01$), and they concluded that mesh use decreases recurrence rate. This confirms our result as we believe that onlay mesh alongside with component separation is important to prevent long-term recurrence as shown by other investigators [14,15].

Wound complications such as dehiscence, infection, hematoma, and seroma have been reported in many studies [6,8].

In the present study, seroma was the most common postoperative complication occurring in six (37.5%) patients and it is mostly due to undermining of the subcutaneous tissues with creation of long flaps and creation of dead space during the CST. Moreover, minor wound breakdown occurred in three (18.7%) cases and wound hematoma occurred in one patient, and these minor complications were mostly due to the aforementioned factors.

Modifications of CST have been devised to improve outcomes, mostly based on minimizing subcutaneous undermining [16,17]. In the present study we attempted to decrease the dead space as much as we can and preserve the blood supply to skin flaps; moreover, the aponeurosis of external abdominal oblique muscle was longitudinally transected only to an extent clinically necessary to close the abdominal wall defect without tension.

Conclusion and recommendations

CST is a suitable technique for repair of giant ventral hernias. Data are now available from large case series and with long-term follow-up, demonstrating the efficacy of this technique.

The present study demonstrated that it is a safe and effective technique with no recurrence rate throughout the follow-up period.

Limitations of this study include small number of cases and the short follow-up period, due to which the recurrence rates are probably underestimated.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Ramirez OM, Ruas E, LeeDellon A. 'Components separation' method for closure of abdominal wall defects: an anatomic and clinical study. *Plast Reconstr Surg* 1990; 86:519–526.
- Anthony T, Bergen PC, Kim LT, Henderson M, Fahey T, Rege RV, Turnage RH. Factors affecting recurrence following incisional herniorrhaphy. *World J Surg* 2000; 24:95–100.
- Luijendijk RW, Hop WC, van den Tol MP, de Lange DC, Braaksma MM, IJzermans JN, *et al.* A comparison of suture repair with mesh repair for incisional hernia. *N Engl J Med* 2000; 343:392–398.
- Cengiz Y, Israelsson LA. Incisional hernias in midline incisions: an eight year follow up. *Hernia* 1998; 2:175–177.
- De Vries Reilingh TS, van Goor H, Charbon JA, Rosman C, Hesselink EJ, van der Wilt GJ, Bleichrodt RP. Repair of giant midline abdominal wall

- hernias: 'components separation technique' versus prosthetic repair: interim analysis of a randomized controlled trial. *World J Surg* 2007; 31:756–763.
- 6 DiBello JN Jr, Moore JH Jr. Sliding myofascial flap of the rectus abdominus muscles for the closure of recurrent ventral hernias. *Plast Reconstr Surg* 1996; 98:464–469.
 - 7 Ennis LS, Young JS, Gampper TJ, Drake DB. The 'open-book' variation of component separation for repair of massive midline abdominal wall hernia. *Am Surg* 2003; 69:733–742.
 - 8 De Vries Reilingh TS, van Goor H, Rosman C, Bemelmans MH, de Jong D, van Nieuwenhoven EJ, *et al.* 'Components separation technique' for the repair of large abdominal wall hernias. *J Am Coll Surg* 2003; 196:32–37.
 - 9 Sailes FC, Walls J, Guelig D, Mirzabeigi M, Long WD, Crawford A, *et al.* Synthetic and biological mesh in component separation: a 10-year single institution review. *Ann Plast Surg* 2010; 64:696–698.
 - 10 Abrahamson, J, Eldar, S. Should ice repair of large postoperative ventral abdominal hernias: a simple extraperitoneal technique. *Contemp Surg* 1988; 32:24.
 - 11 Hultman CS, Tong WM, Kittinger BJ, Cairns B, Overby DW, Rich PB. Management of recurrent hernia after components separation: 10-year experience with abdominal wall reconstruction at an academic medical center. *Ann Plast Surg* 2011; 66:504–507.
 - 12 Thomas WO III, Parry SW, Rodning CB. Ventral/incisional abdominal herniorrhaphy by fascial partition/release. *Plast Reconstr Surg* 1993; 91:1080-1086.
 - 13 Slater NJ, van Goor H, Bleichrodt RP. Large and complex ventral hernia repair using 'components separation technique' without mesh results in a high recurrence rate. *Am J Surg* 2015; 209:170–179.
 - 14 Kolker AR, Brown DJ, Redstone JS, Scarpinato VM, Wallack MK. Multilayer reconstruction of abdominal wall defects with acellular dermal allograft (AlloDerm) and component separation. *Ann Plast Surg* 2005; 55:36–41.
 - 15 Espinosa-de-los-Monteros A, de la Torre JI, Marrero I, Andrades P, Davis MR, Vásconez LO. Utilization of human cadaveric acellular dermis for abdominal hernia reconstruction. *Ann Plast Surg* 2007; 58:264–267.
 - 16 Maas SM, van Engeland M, Leeksma NG, Bleichrodt RP. A modification of the 'components separation' technique for closure of abdominal wall defects in the presence of an enterostomy. *J Am Coll Surg* 1999; 189:138–140.
 - 17 Celdrán-Uriarte A, Fraile M, García-Vasquez C, York E, Manso B, Granizo JJ. A simplified incision of the external oblique aponeurosis during the components separation technique for the repair of large incisional hernias. *Am J Surg* 2011; 202:e31–e33.

Duodenal injuries: how to deal with it?

Amr Elheny, Adel M. Shehata, Abdel Fattah Saleh, Emad El Sageer

Department of General Surgery, Faculty of Medicine, Minia University, Minia, Egypt

Correspondence to Abd El Hammed Elheny, Department of General Surgery, Faculty of Medicine, Minia University, Minia, Egypt
Tel: +20 1277340340;
e-mail: amr_elheny@yahoo.com

Received 21 June 2015

Accepted 02 July 2015

The Egyptian Journal of Surgery
2015, 34:276–280

Objective

The aim of this study was to report on a series of nine cases of duodenal repairs using different modalities and to describe reported complications or improvements in clinical outcomes among patients with complex duodenal trauma.

Patients and methods

This was a cross-sectional study conducted on nine cases of duodenal repairs using different modalities. A total of 50 patients with penetrating or blunt abdominal trauma and duodenal injury were admitted to the emergency department of Minia University Hospital between March 2012 and December 2014. All of the known cases of duodenal trauma among these patients were reviewed.

Results

The mean age of the patients was 35.2±10.9 years. The time elapsed from admission to the surgical intervention ranged from 20 min to 10 h, and the median time was 90 min. Postoperative complications were common and occurred in five patients. Length of hospital stay ranged from 7 to 90 days and the median length was 17 days. Primary repair, segmental resection, primary end-to-end duodenoduodenostomy, duodenal diverticulization, direct anastomosis of Roux-en-Y over the injury in an end-to-side manner, and pancreaticoduodenectomy were performed on the basis of the condition of the cases.

Conclusion

Most duodenal injuries can be managed by means of simple repair. More complicated injuries need more sophisticated operation techniques and are followed by a high incidence of postoperative complications, especially duodenal fistula and high mortality.

Keywords:

duodenal, injuries, Minia

Egyptian J Surgery 34:276–280
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Because of its retroperitoneal location, injuries to the duodenum are relatively uncommon, occurring in only 3–5% of all abdominal injuries [1,2].

The majority of duodenal injuries are caused by penetrating trauma that requires immediate exploratory laparotomy. Blunt injury is infrequent but difficult to diagnose because of its vague clinical symptoms and signs. It has been reported that the second portion of the duodenum is injured most commonly, approximately in one-third of the cases reported [3].

The anatomy of the duodenum is unique and complex because of its close relationship with adjacent structures. Lying deep within the abdomen, the duodenum is well protected in the retroperitoneal space. Duodenal trauma has the following clinical characteristics:

- (a) Low diagnostic accuracy before operation, with the rate of definite diagnosis before operation always below 10% [4];
- (b) Presence of other injuries, due to the special and complicated anatomy of the duodenum;

- (c) High incidence of missed diagnosis during operation, which can reach 20% [5]; and
- (d) High incidence of postoperative complications and mortality rate, which can reach as high as 50% [6].

Abdominal plain films, ultrasound test, and CT scan can also help in the diagnosis of duodenum injury. Retroperitoneal air, free intraperitoneal air, or other signs such as obliteration of the psoas muscle shadow and scoliosis of the lumbar vertebrae can give a clue of injury [7]. Serum amylase is elevated in 50% of patients with duodenal or upper gastrointestinal injury [8].

The vast majority of duodenal injuries can be managed by means of simple repair [2]. Repair of multiple or delayed injuries often presents a technical challenge, and a variety of techniques have been described. The use of duodenal diversion through gastrojejunostomy was originally conceived in the early 1900s [9], but the

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

simplified technique of pyloric exclusion was devised by Jordan and was first reported by Vaughan *et al.* in 1977 [10].

This procedure consists of primary repair of the duodenal wound, closure of the pylorus through gastrotomy, and gastrojejunostomy at the site of the gastrotomy. Pyloric exclusion has been recommended in selected patients with complicated duodenal injury because it decreases the morbidity associated with dehiscence and fistula formation. However, the current philosophy for the management of pancreaticoduodenal injuries is that less treatment is probably the best treatment [11].

Objective

The purpose of this study was to report on a series of nine cases of duodenal repairs using different modalities and to describe reported complications or improvements in clinical outcomes among patients with complex duodenal trauma.

Patients and methods

This was a cross-sectional study conducted on nine cases of duodenal repairs using different modalities. A total of 50 patients with penetrating or blunt abdominal trauma and duodenal injury were admitted to the emergency department of Minia University hospital between March 2012 and December 2014. All of the known cases of duodenal trauma among these patients were reviewed.

Institutional ethics committee approval was obtained. The data collected included demographics, sex, age, mechanism of injury, admission vital signs, time elapsed between injury and operation, the site and grade of duodenal injury, associated organ injuries, surgical procedure used, presence of complications (including duodenal fistula), and mortality. Duodenal injuries were classified on the basis of the American Association for the Surgery of Trauma – Organ Injury Scale (AAST-OIS) (Table 1) [12].

D1, D2, D3, and D4 are the first, second, third, and fourth portions of the duodenum, respectively. For multiple injuries, the grade is advanced by one [12].

For the operation, a midline incision was made. The first priority was to control life-threatening hemorrhage from vascular structures or parenchymatous organs, followed by controlling the sources of gastrointestinal spillage. The duodenum was explored and mobilized by means of a Kocher maneuver, a Cattell–Braasch maneuver, or both. The injuries were graded and surgical

Table 1 Duodenal injury according to the American association for the surgery of trauma

Grade	Injury	Description
I	Hematoma	Single portion of duodenum
	Laceration	Partial thickness only
II	Hematoma	Involving more than one portion
	Laceration	Disruption of <50% of circumference
III	Laceration	Disruption of 50–70% of the circumference of D2
		Disruption of 50–100% of the circumference of D1, D3, and D4
IV	Laceration	Disruption of >75% of the circumference of D2 involving the ampulla of distal common duct
V	Laceration	Massive disruption of the duodenopancreatic complex
	Vascular	Devascularization of the duodenum

repair was dictated by the surgeon's judgment. The decision was based on the degree of duodenal injury, extent of multiple organ involvement, degree of edema and friability of the duodenum, time elapsed between injury and treatment, and the general condition of the patient.

If the range of duodenum injury is less than 50% of the circumference, with regular injury border, adequate blood supply, and without serious peritoneum pollution, the injury could be primarily closed transversely and the decompression of duodenum could be achieved by means of jejunostomy.

If the range of duodenum injury is more than 50% of the circumference, or primary closure of the defect may narrow the lumen of the bowel or result in undue tension and subsequent breakdown of the suture lines, segmental resection and primary end-to-end duodenoduodenostomy are advised, especially when the first, second, or third part of the duodenum is injured.

If a large part of the duodenum is lost, suture of two ends will be impossible without causing undue tension on the suture line. If a large tissue of the first part of the duodenum is lost, surgeries of duodenal diverticulization should be carried out, which include closure of the duodenal injury, gastric antrectomy with end-to-side gastrojejunostomy, tube duodenostomy, and generous drainage in the region of the duodenal repair.

Otherwise, if such injury is distal to the ampulla of Vater, closure of distal duodenum and Roux-en-Y duodenojejunostomy is appropriate. If the injury happens to the second part of the duodenum, because of the limited mobilization of this part, a direct anastomosis of Roux-en-Y over the injury in an end-to-side manner is appropriate. This method

can be also applied to other parts when the primary anastomosis is impossible. If the patient has massive peripancreatic hemorrhage, proximal pancreatic duct or ampullary injuries that preclude the possibility of reconstruction, pancreaticoduodenectomy should be applied. A right upper quadrant drain was placed in all nine patients. The minimum follow-up was 6 months.

Ethical approval

The title, aim, and plan of the study was discussed and approved as regards the ethics of research in the General Surgical Department, Minia Faculty of Medicine. Written, informed consent was obtained from all participants or their relevant.

Results

This study included nine male patients who were exposed to duodenal injury. The mean age of the patients was 35.2 ± 10.9 years (range: 17–50 years). The causes of injury included motor car accident in three patients, blunt trauma in three patients, penetrating GSWs in one patient, motor bike accident in one patient, and pathological perforation of duodenal ulcer in one patient. The mean systolic blood pressure on admission was 113 ± 18 mmHg. The time elapsed

from admission to the surgical intervention ranged from 20 min to 10 h and the median time was 90 min (Table 2).

One patient had grade V injuries and two patients had grade II injuries. Three patients had grade III and another three patients had grade I injuries. Associated abdominal injuries were identified in five patients and are listed in Table 2. Postoperative complications were common and occurred in five patients. Length of hospital stay ranged from 7 to 90 days and the median length was 17 days (Table 3).

In the first and third cases, the range of duodenal injury was less than 50% of the circumference of D3 and so they were managed with primary repair. Partial thickness laceration of D3, D1, and D4 was found in sixth, seventh, and eighth cases, respectively, and they were also managed through primary repair.

More than 50% of D3 was lacerated in fifth case and so segmental resection and primary end-to-end duodenoduodenostomy was carried out. In ninth case, the large tissue of D1 was lost and duodenal diverticulization was performed. The injury happened to the second part of the duodenum in the fourth case and direct anastomosis of Roux-en-Y over the injury in an end-to-side manner was appropriate. Massive peripancreatic hemorrhage with ampullary

Table 2 Summary of patients

Patient number	Mechanism	Time elapsed between admission and surgery	Grade of injury	Associated abdominal injuries
1	Motor car accident	4 h	II	No
2	Motor bike accident	10 h	V	Common bile duct, pancreas
3	Motor car accident	1 h	II	Mesentery of small intestine
4	Motor car accident	45 min	III	Liver
5	Gunshot wound	20 min	III	No
6	Blunt	1 h	I	Injury of transverse colon
7	Pathological perforation of duodenal ulcer	2 h	I	No
8	Blunt	90 min	I	Stomach
9	Blunt	3 h	III	No

Table 3 Postoperative complications and outcome

Patient number	Complications	Reoperation	LOS	Survival
1	None	No	7	Yes
2	Wound infection and burst abdomen, pancreatic and biliary fistula	Reanastomosis of the gall bladder and the jejunum	90	Yes
3	None	No	15	Yes
4	Wound infection, bile discharge, duodenal fistula	Removal of liver pack after 48 h	28	Yes
5	Vomiting after 1 week from the operation	Refashioning of the gastrojejunal anastomosis	30	Yes
6	Burst abdomen	Closure of colostomy after 3 months	10	Yes
7	None	No	8	Yes
8	Wound infection	No	17	Yes
9	None	No	20	Yes

LOS, length of stay.

injury had happened in the second case and pancreaticoduodenectomy was applied.

Discussion

The management of duodenal injuries remains controversial, and this field lacks a consensus as regards the optimal treatment. Approximately 70–85% of all duodenal injuries can be repaired safely by means of primary repair. Patients with severe duodenal injuries should be considered candidates for more complex duodenal repairs, such as duodenal diverticulization or pyloric exclusion. However, there is no clear definition on when these procedures should be indicated and which duodenal injuries should be considered severe [4,13].

In the present study, five cases of duodenal injury were managed through primary repair or serosal omental patch. Most injuries of the duodenum may be repaired by means of primary suture in one or two layers. The closure should be orientated transversely, if possible to avoid luminal compromise. Excessive inversion should be avoided. Longitudinal duodentomies may usually be closed transversely if the length of the duodenal injury is less than 50% of the circumference of the duodenum [14].

If there is a probability of primary closure that could compromise the lumen of the duodenum, there are several alternatives that can be employed: pedicled mucosal graft, using a segment of the jejunum or a gastric island flap from the body of the stomach, has been suggested as a method of closing large duodenal defects [15]. Another possibility is the use of a jejunal serosal patch to close the duodenal defect [16]. The clinical application of both of these methods is limited and suture line leaks have been reported [17].

In the ninth case, a large tissue of D1 was lost and duodenal diverticulization was performed. The main problem of duodenal diverticulization is that it is a time-consuming operation, and thus not recommended in hemodynamically unstable patients, or when several accompanied injuries are presented. A less formidable and less destructive alternative is the pyloric exclusion, which does not involve antrectomy, biliary diversion, or vagotomy [18]. Fang *et al.* [19] at Chang-Gung Memorial hospital in Taiwan described a technical method of controlled release of the pyloric exclusion knot, thereby timing the opening of the pyloric occlusion.

Massive peripancreatic hemorrhage with ampullary injury occurred in the second case and

pancreaticoduodenectomy was applied. Snyder reported that ampullary injuries had an incidence of only 3% [20]. However, in a study by Asensio *et al.* [1], which included 170 patients who underwent pancreaticoduodenectomy in 50 reported series, the overall mortality rate reached 33%. Hence, pancreaticoduodenectomy should be applied carefully.

One biliary and another duodenal fistula have been developed. In the literature, duodenal fistula rates range from 0 to 16.2%, with an average incidence of 6.6% [21,2]. In a collective review of 15 series including 1408 patients with duodenal injuries, Asensio *et al.* [1,8] reported an average incidence of 6.6% for duodenal fistula.

Conclusion

Most duodenal injuries can be managed by means of simple repair. More complicated injuries need more sophisticated operation techniques and are followed by a high incidence of postoperative complications, especially the duodenal fistula and high mortality.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Asensio JA, Feliciano DV, Britt LD, Kerstein MD. Management of duodenal injuries. *Curr Probl Surg* 1993; 30:1023–1093.
- Fraga GP, Biazotto G, Villaça MP, Andreollo NA, Mantovani M. Duodenal trauma: factors related to morbimortality. *Rev Col Bras Cir.* 2008; 35: 94–102.
- Girgin S, Gedik E, Yagmur Y, *et al.* Management of duodenal injury: our experience and the value of tube duodenostomy. *Ulus Travma Acil Cerrahi Derg* 2009; 15:467–472.
- Cogbill TH, Moore EE, Feliciano DV, Hoyt DB, Jurkovich GJ, Morris JA, *et al.* Conservative management of duodenal trauma: a multicenter perspective. *J Trauma* 1990; 30:1469–1475.
- Astarcioglu H, Kocdor MA, Sokmen S, *et al.* Comparison of different surgical repairs in the treatment of experimental duodenal injuries. *Am J Surg* 2001; 181:309–312.
- Wisner DH, Victor NS, Holcroft JW. Priorities in the management of multiple trauma: intracranial versus intra-abdominal injury. *J Trauma* 1993; 35:271–276; discussion 276–278.
- Jayaraman MV, Mayo-Smith WW, Movson JS, *et al.* CT of the duodenum: an overlooked segment gets its due. *Radiographics* 2001; 21:S147–S160.
- Asensio JA, Demetriades D, Hanpeter DE, Gambaro E, Chahwan S. Management of pancreatic injuries. *Curr Probl Surg* 1999; 36:325–419.
- Berg AA. Duodenal fistula: its treatment by gastrojejunostomy and pyloric occlusion. *Ann Surg* 1907; 45:721–729.
- Vaughan GD III, Frazier OH, Graham DY, Mattox KL, Petrecky FF, Jordan GL Jr. The use of pyloric exclusion in the management of severe duodenal injuries. *Am J Surg* 1977; 134:785–790.
- Seamon MJ, Pieri PG, Fisher CA, Gaughan J, Santora TA, Pathak AS, *et al.* A ten-year retrospective review: does pyloric exclusion improve clinical outcome after penetrating duodenal and combined pancreaticoduodenal injuries?. *J Trauma* 2007; 62:829–833.

- 12 Moore EE, Cogbill TH, Malangoni MA, Jurkovich GJ, Champion HR, Gennarelli TA, *et al.* Organ injury scaling, II: pancreas, duodenum, small bowel, colon, and rectum. *J Trauma* 1990; 30:1427–1429.
- 13 Timaran CH, Martinez O, Ospina JA. Prognostic factors and management of civilian penetrating duodenal trauma. *J Trauma* 1999; 47: 330–335.
- 14 Boone DC, Peitzman AB Abdominal injury-duodenum and pancreas. In: Peitzman AB, Rhodes M, Swab SW, Wealy DM, editors. *The trauman manual*. Philadelphia, PA: Lippincott-Raven; 1998:242–247.
- 15 Papachristou DN, Fortner JG Reconstruction of duodenal wall defects with the use of a gastric “island” flap. *Arch Surg* 1977; 112:199–200.
- 16 Walley BD, Goco I Duodenal patch grafting. *Am J Surg* 1980; 140: 706–708.
- 17 Wynn M, Hill DM, Miller DR, Waxman K, Eisner ME, Gazzaniga AB. Management of pancreatic and duodenal trauma. *Am J Surg* 1985; 150:327–332.
- 18 Buck JR, Sorensen VJ, Fath JJ, Horst HM, Obeid FN Severe pancreatoduodenal injuries: the effectiveness of pyloric exclusion with vagotomy. *Am Surg* 1992; 58:557–560; discussion 561.
- 19 Fang JF, Chen RJ, Lin BC Controlled reopen suture technique for pyloric exclusion. *J Trauma* 1998; 45:593–596.
- 20 Degiannis E, Saadia R Controversies in management of penetrating injuries of the pancreas. *S Afr J Surg* 1999; 37:38–40.
- 21 Snyder WH III, Weigelt JA, Watkins WL, Bietz DS. The surgical management of duodenal trauma. Precepts based on a review of 247 cases. *Arch Surg* 1980; 115:422–429.

Short Form 36 quality of life after lay open of anal fistula

Ahmed A. Abou-Zeid, Ali El-Anwar

Department of Surgery, Faculty of Medicine,
Ain Shams University, Cairo, Egypt

Correspondence to Ali El-Anwar, MD,
13 Mohamed Hussien Heikal Street,
Nasr City, Cairo 11371, Egypt
Tel: 01000069690; fax: 0224019879;
e-mail: alianwar1973@yahoo.com

Received 04 July 2015

Accepted 16 July 2015

The Egyptian Journal of Surgery
2015, 34:281–286

Background

Fistulotomy is a standard procedure in the treatment of anal fistula. Most reports on fistulotomy focus on the clinical outcome of surgery with only few studies examining the impact of fistula surgery on patient's quality of life (QOL). The aim of the present study was to examine the effect of fistulotomy on patient's QOL.

Patients and methods

A total of 169 patients, who had lay open for perianal fistula at Ain Shams University Hospitals during the period from January 2011 to June 2013, were contacted at least 1 year after surgery, and were asked to fill up the Short Form 36 (SF36) QOL questionnaire. The patients' SF36 scores were compared with those of the US norms.

Results

The patients who were cured of their fistula ($n = 106$, 62.7%) were significantly better than the US norms in the domains of physical functioning, bodily pain, vitality and physical role limitation, whereas the US norms were significantly better in mental health (MH). The US norms were significantly better than patients who developed fistula recurrence ($n = 6$, 3.5%) in MH and social functioning. The US norms were significantly better than fistula patients who developed postoperative incontinence ($n = 53$, 31.3%) in the domains of general health perception, vitality, social functioning and MH; the difference in other domains was not significant. The US norms were significantly better than patients who developed minor postoperative symptoms other than incontinence and recurrence ($n = 31$, 18.3%) in general health perception and MH, whereas no significant difference was found in other domains. All groups of patients either did not show significant difference or were significantly better than the US norms in the domain of physical role limitation.

Conclusion

The majority of patients have a good QOL after fistulotomy. Recurrence, stool incontinence and the development of other postoperative symptoms can negatively affect some domains of QOL. Solid stool incontinence has the worst effect on QOL. The least affected QOL domain is the physical role limitation.

Keywords:

Anal fistula, quality of life, Short Form 36

Egyptian J Surgery 34:281–286
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Anal fistula is a common disease. Fistulotomy is a standard procedure in the treatment of anal fistula that results in cure in over 90% of the patients [1,2]. Most reports on fistulotomy focus on the clinical outcome of surgery regarding the incidence of fistula recurrence and the development of postoperative anal incontinence [3–5]. The WHO defines health as a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity. This definition coincides with the definition of health related quality of life (QOL) as patients' own appraisal of their current physical and mental health (MH), social interaction and general well-being [6]. Unfortunately, only few studies have examined the impact of fistula surgery on patient's QOL [7–9]. The aim of the present study was to examine the effect of fistulotomy on patient's QOL.

Patients and methods

The present study included 178 patients who had lay open for perianal fistula at Ain Shams University Hospitals during the period from January 2011 to June 2013. The patients with anal fistula of noncryptogenic origin ($n = 13$) and those who had other types of surgery ($n = 23$) were excluded from the study. All the patients were contacted by mail and/or telephone calls at least 1 year after the fistula surgery, and were asked to fill up the Short Form 36 (SF36) QOL questionnaire that measures the physical and mental function in eight separate health quality dimensions including physical functioning (PF), role physical (RP), bodily pain (BP),

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

social functioning (SF), vitality (VT), general health (GH), role emotional (RE) and MH. The ceiling of each scale distribution is a score of 100 except the VT and MH (96–100). According to the SF36 manual the bottom of each scale distribution is 0–25, 0, 0–22, 0–25, 0–15, 0–25, 0–25, 0–36 for PF, RP, BP, GH, VT, SF, RE and MH, respectively. Each scale score is considered to be excellent when it is 100, very good when it is 84–99, good when it is 61–83, fair when it is 25–60 and poor when it is 0–24. Nine patients did not respond and this left us with 169 patients (156 males, mean age 38.4 years, age range 16–69 years), who were the participants of the present study. The patients' SF36 scores were compared with those of the US norms (Table 1).

The analysis of data was performed by IBM computer using SPSS (version 20 for Windows; SPSS Inc., IBM, Armonk, New York, USA) package. The qualitative data were presented as number and percentages, whereas the quantitative data were presented as mean and SDs. The comparison between two groups with quantitative data and parametric distribution were done by using independent samples

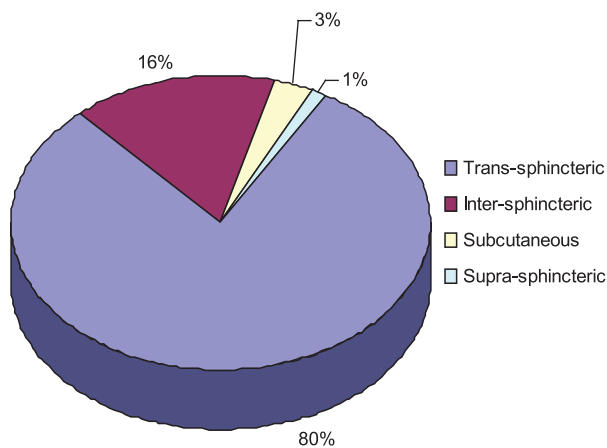
t-test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. Therefore, the *P*-value was considered significant at the level of less than 0.05.

Results

This study included 169 patients with perianal fistula (13 female and 156 males), with a mean age of 38.4 years (range 16–69 years). The pathological types of fistula in the present study are shown in Table 2 and Fig. 1. A total of 104 patients had primary fistula and 65 patients had recurrent fistula.

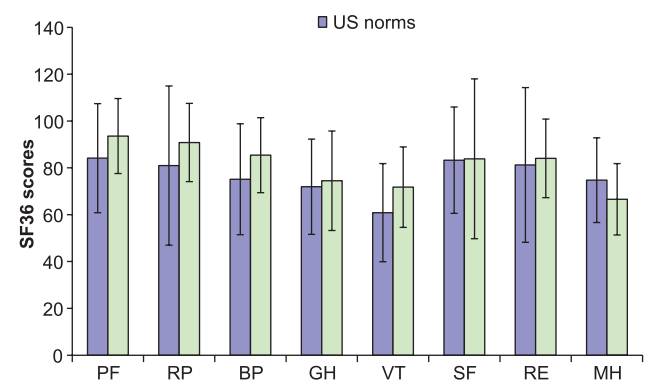
A total of 106 (62.7%) patients were cured of their fistula without developing any postoperative symptom or complications. Patients who were cured of their fistulas were significantly better than the US norms in the domains of PF, BP, VT and RP limitation, whereas the US norms were significantly better in MH (Table 3 and Fig. 2). The subgroup of patients who were cured of recurrent fistula were significantly better than the US norms in PF, RP

Figure 1



Types of perianal fistula.

Figure 2



Short Form 36 (SF36) scores of perianal fistula patients who were cured of their disease compared with US norms. BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality.

Table 1 Norms for the general US population, total sample

	PF	RP	BP	GH	VT	SF	RE	MH
Mean	84.15	80.96	75.15	71.95	60.86	83.28	81.26	74.74
25th percentile	70.00	50.00	61.00	57.00	45.00	75.00	66.67	64.00
50th percentile	90.00	100.00	74.00	72.00	65.00	100.00	100.00	80.00
75th percentile	100.00	100.00	100.00	85.00	75.00	100.00	100.00	88.00
SD	23.28	34.00	23.69	20.34	20.96	22.69	33.04	18.08
Range	0–100	0–100	0–100	5–100	0–100	0–100	0–100	0–100
% ceiling	38.79	79.85	31.85	7.40	1.50	52.32	71.01	3.91
% floor	0.84	10.33	0.58	0.00	0.52	0.64	9.61	0.00

Statistics for each Short Form 36 in the general US population. These includes the mean, median, 25th percentile, 75th percentile, SD, observed range of scores, and the percentage score at the ceiling (highest possible score) and at the floor (the lowest possible score) for each Short Form 36 scale. These descriptive statistics are first presented for the total sample; BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality.

limitation, RE and BP, whereas the US norms scores were significantly better in this subgroup in MH and SF (Table 4 and Fig. 3).

Overall, 63 (37.2%) patients developed postoperative symptoms or complications (recurrence, $n = 6$; incontinence, $n = 53$; other minor complaints, $n = 31$). An overlap of postoperative symptoms occurred in 27 patients. The US norms were significantly better than patients who developed fistula recurrence in MH and SF, whereas those patients were significantly better than the US norms in RP limitation. The difference in other domains was not significant (Table 5 and Fig. 4).

A total of 53 (31.3%) patients developed different degrees of fecal incontinence (incontinence to solid stools, $n = 4$; incontinence to soft stools, $n = 21$; and incontinence to flatus, $n = 28$). The US norms were significantly better than fistula patients who developed postoperative incontinence in the domains of GH perception, VT, SF and MH; the difference in other domains was not significant (Table 6 and Fig. 5). The number of domains in which the US norms showed better results increased as the degree of incontinence worsened (Table 7).

A total of 31 (18.3%) patients developed minor postoperative symptoms other than incontinence and recurrence (pruritus, $n = 3$; mucus discharge, $n = 17$; avoiding certain types of food, $n = 3$; affection of sexual life, $n = 2$; nonspecific pain, $n = 6$). In those patients, scores of the US norms were significantly better in GH perception and MH, whereas no significant difference was found in other domains (Table 8 and Fig. 6).

Discussion

The success of any surgery should be judged by how much it enhances the patient's QOL and not by the mere cure of the original disease. This statement is especially true in the treatment of perianal fistula because successful surgery is associated, not infrequently, with unpleasant postoperative symptoms that can significantly limit the patient's activities and affect his lifestyle. Unfortunately, reports on the effect of perianal fistula and its treatment on the QOL are sparse in the medical literature [7,9,10]. Some studies used simple questionnaires and found that patients' dissatisfaction after surgical treatment of perianal fistula was associated with fistula recurrence or incontinence [8,11]. In the present study, we used the SF36, a commonly used generic instrument, to assess the QOL after fistulotomy in patients with perianal fistula [12,13].

Table 2 Demographic data and types of fistula included in the study

Age		
Mean \pm SD		38.4 \pm 8.15
Range		16–69
Sex [n (%)]		
Males		156 (92.3)
Females		13 (7.69)
Type of fistula [n (%)]		
Trans-sphincteric		138 (81.66)
Intersphincteric		24 (14.2)
Subcutaneous		5 (2.96)
Suprasphincteric		2 (1.18)

Table 3 Short Form 36 scores of perianal fistula patients who were cured of their disease compared with US norms

Scales	US norms		Egyptians		T	P	Significance
	Mean	SD	Mean	SD			
PF	84.15	23.28	93.59	16.01	2.5	<0.05	S
RP	80.96	34.00	90.82	16.71	3.4	<0.05	S
BP	75.15	23.69	85.42	16.03	2.7	<0.05	S
GH	71.95	20.34	74.49	21.24	1.7	>0.05	NS
VT	60.86	20.96	71.77	17.18	3	<0.05	S
SF	83.28	22.69	83.86	34.11	0.6	>0.05	NS
RE	81.26	33.04	84.04	16.79	1.4	>0.05	NS
MH	74.74	18.08	66.57	15.25	2.7	<0.05	S

BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; S, significant; SF, social functioning; VT, vitality.

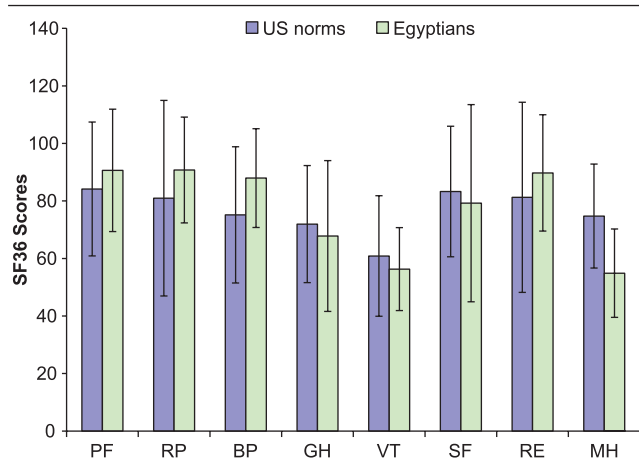
Table 4 Short Form 36 scores of recurrent perianal fistula patients who were cured of their disease compared with US norms

Scales	US norms		Egyptians		T	P	Significance
	Mean	SD	Mean	SD			
PF	84.15	23.28	90.64	21.29	2.8	<0.05	S
RP	80.96	34.00	90.76	18.38	3.3	<0.05	S
BP	75.15	23.69	87.96	17.17	4.9	<0.01	HS
GH	71.95	20.34	67.81	26.23	1.4	>0.05	NS
VT	60.86	20.96	56.30	14.43	1.1	>0.05	NS
SF	83.28	22.69	79.23	34.29	4.2	<0.05	S
RE	81.26	33.04	89.74	20.23	2.5	<0.05	S
MH	74.74	18.08	54.89	15.37	5.2	<0.01	HS

BP, bodily pain; GH, general health; HS, highly significant; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; S, significant; SF, social functioning; VT, vitality.

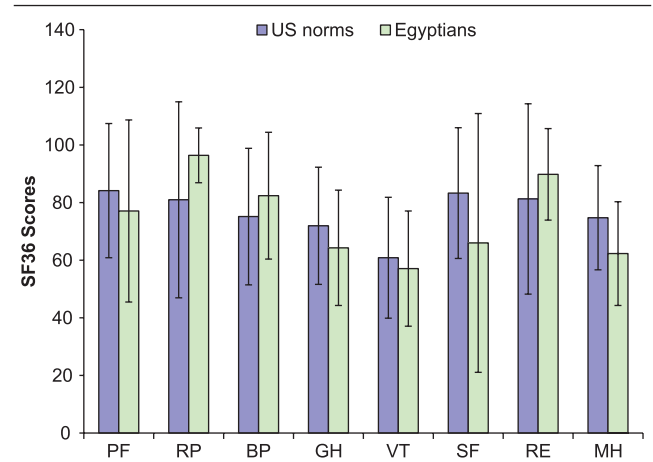
In the present study, 106 (62.7%) patients were cured of their fistula without developing postoperative symptoms or complications. Those patients were significantly better than the US norms in the domains of PF, BP, VT and RP limitation. This reflects the patients' satisfaction with the result of the surgery, the disappearance of the chronic pain of the original disease, the sense of being healthy and the ability to work and earn money. The MH score was exceptionally lower in those patients than the US norms. A good MH score in SF36 means that the patient feels peaceful, happy and calm all of the time. A low score might thus reflect

Figure 3



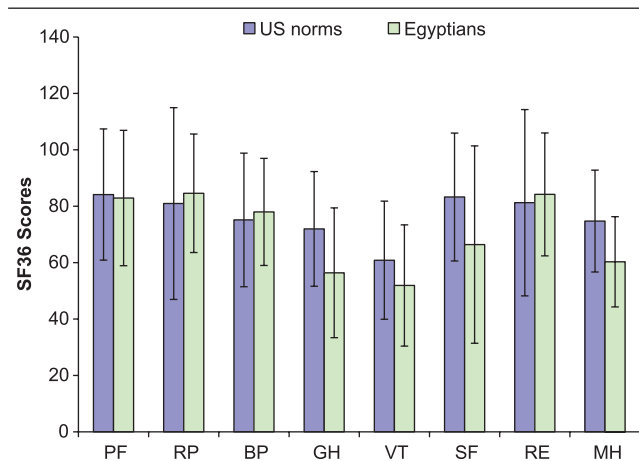
Short Form 36 (SF36) scores of recurrent perianal fistula patients who were cured of their disease compared with US norms. BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality.

Figure 4



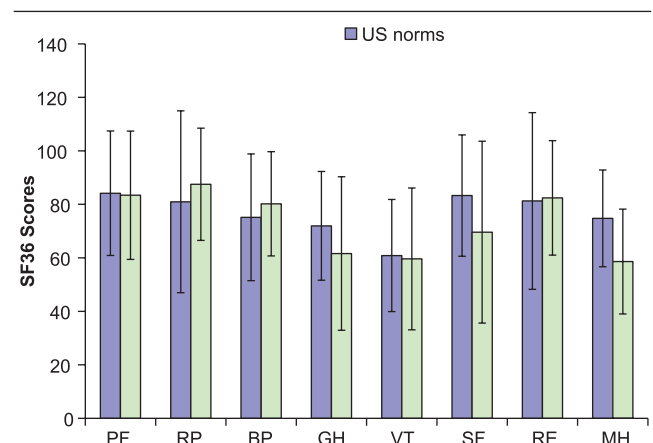
Short Form 36 (SF36) scores of perianal fistula patients who developed postoperative recurrence compared with US norms. BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality.

Figure 5



Short Form 36 (SF36) scores of perianal fistula patients who developed postoperative incontinence compared with US norms. BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality.

Figure 6



Fistula patients who showed other symptoms after treatment when compared with the US norms. BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality.

the busy and crowded lifestyle in a big city like Cairo. Supporting this hypothesis is the finding that the MH score was similarly low in all other studied groups of patients. Additional explanation for the low MH score in the present study is the fear of recurrence, in those who were cured, and the worries and depression, in those who developed postoperative symptoms or complications.

Patients who developed postoperative recurrence or incontinence and those who were cured from recurrent fistulas had significantly worse SF scores than the US norms. A good SF score in SF36 means that the patient performs normal social activities without interference because of physical or emotional problems, which

Table 5 Short Form 36 scores of perianal fistula patients who developed postoperative recurrence compared with US norms

Scales	US norms		Egyptians		T	P	Significance
	Mean	SD	Mean	SD			
PF	84.15	23.28	77.1	31.6	1.1	>0.05	NS
RP	80.96	34.00	96.4	9.5	3.5	<0.05	S
BP	75.15	23.69	82.4	22	1.3	>0.05	NS
GH	71.95	20.34	64.3	20	1.2	>0.05	NS
VT	60.86	20.96	57.1	20	1.1	>0.05	NS
SF	83.28	22.69	66	44.9	3.1	<0.05	S
RE	81.26	33.04	89.8	15.9	1.3	>0.05	NS
MH	74.74	18.08	62.3	18	3.3	<0.05	S

BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; S, significant; SF, social functioning; VT, vitality.

Table 6 Short Form 36 scores of perianal fistula patients who developed postoperative incontinence compared with US norms

Scales	US norms		Egyptians		T	P	Significance
	Mean	SD	Mean	SD			
PF	84.15	23.28	82.9	24	0.6	>0.05	NS
RP	80.96	34.00	84.6	21	1.16	>0.05	NS
BP	75.15	23.69	78	19	0.9	>0.05	NS
GH	71.95	20.34	56.4	23	2.9	<0.05	S
VT	60.86	20.96	51.9	21.5	2.2	<0.05	S
SF	83.28	22.69	66.4	35	3.3	<0.05	S
RE	81.26	33.04	84.2	21.8	1.1	>0.05	NS
MH	74.74	18.08	60.3	16	3.6	<0.05	S

BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; S, significant; SF, social functioning; VT, vitality.

Table 7 The number of domains in which US norms showed better results increased as the degree of incontinence worsened

Scales	Flatus (<i>n</i> = 53)	Soft stool (<i>n</i> = 21)	Solid (<i>n</i> = 4)
PF	Patients better	NS	US norms better
RP	Patients better	NS	NS
BP	NS	NS	US norms better
GH	Patients better	US norms better	US norms better
VT	Patients better	NS	NS
SF	NS	US norms better	US norms better
RE	Patients better	NS	US norms better
MH	US norms better	US norms better	US norms better

BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; SF, social functioning; VT, vitality.

Table 8 Fistula patients who showed other symptoms after treatment when compared with the US norms

Scales	US norms		Egyptians		T	P	Significance
	Mean	SD	Mean	SD			
PF	84.15	23.28	83.4	24	0.13	>0.05	NS
RP	80.96	34.00	87.5	21	1.7	>0.05	NS
BP	75.15	23.69	80.2	19.5	1.5	>0.05	NS
GH	71.95	20.34	61.6	28.7	2	<0.05	S
VT	60.86	20.96	59.6	26.5	0.6	>0.05	NS
SF	83.28	22.69	69.6	34	1.2	>0.05	NS
RE	81.26	33.04	82.4	21.4	0.61	>0.05	NS
MH	74.74	18.08	58.6	19.6	4.2	<0.05	S

BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role emotional; RP, role physical; S, significant; SF, social functioning; VT, vitality.

obviously is not the case in incontinent patients and in patients with fistula recurrence. A bad SF score in patients who were cured of recurrent fistula can only be explained on the assumption that those patients were more liable to develop incontinence and other annoying postoperative symptoms.

Besides the regular social activities, an important religious and social activity in the Egyptian community is going to the mosque to perform prayers five times a

day, after which people meet and talk, participate in social activities and exercise. Mosque prayers require cleanliness, fitness and the absence of pain, all of which are missing in incontinent patients and those who develop fistula recurrence, thus aggravating their social isolation.

In addition to the low SF and MH scores, patients who had postoperative incontinence had impaired GH and VT. This means that those patients evaluate their personal health as poor and believe it is likely to get worse and that they feel tired and worn out all of the time. This reflects the severe depression those patients have because of their disability. Similar to incontinent patients, patients who developed postoperative symptoms other than recurrence and incontinence (*n* = 31, 18.3%) showed lower scores than the US norms in GH, whereas other domains did not differ significantly from the US norms. Obviously, a patient with chronic symptom will evaluate his GH as poor.

It is to be noted that the poor SF36 scores represented the incontinent group of patients as a whole. If we analyze those patients more critically, we can find that the majority of the incontinent patients (*n* = 28, 16.5%) were incontinent to flatus. Those patients performed exactly like patients who were cured without developing postoperative symptoms or complications, where they were significantly better than the US norms in almost all domains. The patients who were incontinent to solid stools (*n* = 4, 2.3%) had the worse QOL scores with the US norms significantly better in almost all domains. Patients incontinent to liquids (*n* = 21, 12.4%) resided in between the two previous incontinent groups.

Despite the low scores in MH and SF scores, the RP limitation did not differ significantly from the US norms in incontinent patients and in patients who developed postoperative symptoms and it was significantly better than the US norms in patients who developed postoperative recurrence. This can be explained by the fact that despite their disability, those patients had to work hard to continue earning their living and not to lose their jobs.

Conclusion

The majority of patients have good QOL after fistulotomy, including patients who develop minor postoperative flatus incontinence. Recurrence, stool incontinence and the development of other postoperative symptoms can negatively affect some domains of QOL. Solid stool incontinence has the worst effect on QOL. The least affected QOL domain is the RP limitation.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- 1 Tozer P, Sala S, Cianci V, Kalmar K, Atkin GK, Rahbour G, *et al.* Fistulotomy in the tertiary setting can achieve high rates of fistula cure with an acceptable risk of deterioration in continence. *J Gastrointest Surg* 2013; 17:1960–1965.
- 2 Hall JF, Bordeianou L, Hyman N, Read T, Bartus C, Schoetz D, Marcello PW. Outcomes after operations for anal fistula: results of a prospective, multicenter, regional study. *Dis Colon Rectum* 2014; 57:1304–1308.
- 3 Garcia-Aguilar J, Belmonte C, Wong WD, Goldberg SM, Madoff RD. Anal fistula surgery. Factors associated with recurrence and incontinence. *Dis Colon Rectum* 1996; 39:723–729.
- 4 Jain BK, Vaibhaw K, Garg PK, Gupta S, Mohanty D. Comparison of fistulectomy and fistulotomy with marsupialization in the management of a simple anal fistula: a randomized, controlled pilot trial. *J Korean Soc Coloproctol* 2012; 28:78–82.
- 5 Göttgens KW, Janssen PT, Heemskerk J, van Dielen FM, Konsten JL, Lettinga T, *et al.* Long-term outcome of low perianal fistulas treated by fistulotomy: a multicenter study. *Int J Colorectal Dis* 2015; 30:213–219.
- 6 Langenhoff BS, Krabbe PF, Wobbes T, Ruers TJ. Quality of life as an outcome measure in surgical oncology. *Br J Surg* 2001; 88:643–652.
- 7 Mylonakis E, Katsios C, Godevenos D, Nousias B, Kappas AM. Quality of life of patients after surgical treatment of anal fistula; the role of anal manometry. *Colorectal Dis* 2001; 3:417–421.
- 8 Cavanaugh M, Hyman N, Osler T. Fecal incontinence severity index after fistulotomy: a predictor of quality of life. *Dis Colon Rectum* 2002; 45: 349–353.
- 9 Grucela A, Gurland B, Kiran RP. Functional outcomes and quality of life after anorectal surgery. *Am Surg* 2012; 78:952–956.
- 10 Sailer M, Bussen D, Debus ES, Fuchs KH, Thiede A. Quality of life in patients with benign anorectal disorders. *Br J Surg* 1998; 85:1716–1719.
- 11 Garcia-Aguilar J, Davey CS, Le CT, Lowry AC, Rothenberger DA. Patient satisfaction after surgical treatment for fistula-in-ano. *Dis Colon Rectum* 2000; 43:1206–1212.
- 12 Jenkinson C, Coulter A, Wright L. Short form 36 (SF36) health survey questionnaire: normative data for adults of working age. *BMJ* 1993; 306:1437–1440.
- 13 Bensoussan A, Chang SW, Menzies RG, Talley NJ. Application of the general health status questionnaire SF36 to patients with gastrointestinal dysfunction: initial validation and validation as a measure of change. *Aust N Z J Public Health* 2001; 25:71–77.

Pilonidal sinus: minimal excision and primary closure under local anesthesia

Hussein G. Elgohary, Ehab M. Oraby

Department of General Surgery, Faculty of Medicine, Benha University, Benha, Egypt

Correspondence to Ehab Mahroos Oraby, MD, Department of General Surgery, Faculty of Medicine, Benha University, Fareed Nada Street, Benha, Egypt
Tel: +20 100 378 3425; fax: 3225509
e-mails: ehab.arabi@fmed.bu.edu.eg, ehaboraby@yahoo.com, ehaboraby@gmail.com

Received 22 June 2015

Accepted 28 July 2015

The Egyptian Journal of Surgery
2015, 34:287–292

Introduction

Many surgeons treat pilonidal sinus (PNS) by wide excision, leaving a lay open or a primary sutured midline wound. Others use more sophisticated techniques such as skin flap reconstruction.

Objectives

The aim of the study was to determine the method of excising PNS minimally under local anesthesia and study its subsequent effects on wound closure and the healing process.

Patients and methods

This prospective study was carried out on 30 consecutive patients with primary nonrecurrent sacrococcygeal PNS. All patients were treated surgically with minimal excision and primary closure under local anesthesia. Parameters of follow-up included wound seroma, infection, or disruption, in addition to pain, difficulty in mobilization, time off work, and recurrence.

Results

The mean operative time was 38 min. Hospital stay ranged from 2 to 4 h. Healing time was 14–20 days. Three cases presented with wound seroma. One patient had a wound infection. One patient had significant wound infection and wound disruption; this patient had a recurrence after 6 months, which was treated with wide excision and rhomboid flap reconstruction.

Conclusion

Minimal excision and primary closure for uncomplicated cases of PNS under local anesthesia is a safe and easy operative procedure with shorter operative time, short duration of hospital stay, less postoperative time off work, low complication rates, and low chances of recurrence.

Keywords:

complication rates, local anesthesia, minimal excision, pilonidal sinus

Egyptian J Surgery 34:287–292
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Pilonidal sinus (PNS) is a common pathology in general surgical practice. It accounts for almost 15% of anal suppuration. Male patients are affected more frequently than female patients by a ratio of 3 : 1. In the USA the incidence of PNS is 0.07% and is higher in the male population aged between 15 and 30 years [1].

PNS is a chronic inflammatory condition that often causes long-term disability in young adults [2].

The term ‘pilonidal sinus’ refers to a tract or cyst under the skin that contains loose hair. The most common are in the sacrococcygeal ‘tail bone’ area and the umbilicus [3].

The development of PNS was attributed by Karydakos to three main factors: the invader – that is, loose hair; the force of insertion; and the vulnerability of skin to the insertion of hair at the depth of the natal cleft. These three factors are aided by risk factors such as obesity, moisture, hairy back, prolonged sitting, and negative suction of these loose hair through a small

breach in the skin, leading to inflammation and later infection [2].

Several treatment modalities have been tried for PNS, including shaving, incision and drainage, phenol application, cryosurgery, excision with packing, excision with marsupialization, excision with primary closure, and excision with flap closure [4].

The controversy in the surgical treatment for PNS surrounds the method of wound closure after excision. Many surgeons treat PNS by wide excision down to the sacral fascia, leaving a lay open or a primary sutured midline wound. Other surgeons, although still committed to the same wide excisions, use more sophisticated techniques such as various types of skin flaps designed to keep the incision away from the midline or flatten the natal cleft. Such extensive

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

operations often require hospitalization, general or regional anesthesia, and variable use of stitches, drains, and antibiotics. However, in this study we are dealing with how to excise PNS minimally and the subsequent effect on wound closure and the healing process.

The ideal operation should be simple, should not require prolonged hospital stay, should involve a low recurrence rate, minimal pain, and minimal wound care, and should decrease the patient's time off work [4].

Patients and methods

This prospective study was conducted at Department of General Surgery, Benha University Hospital after obtaining approval from local ethical committee and after fully informed written consent signed by patient. This study carried out on 30 consecutive patients with primary nonrecurrent sacrococcygeal PNS from June 2012 to May 2015 to allow a minimum follow-up period of at least 6 months for the last case operated upon.

Age, sex, presentation, number of sinus pits, midline or lateral pits, treatment, complications, inpatient stay, and postoperative outcome were recorded.

Mean age at presentation was 23.7 years (18–37 years). There were 18 male and 12 female patients.

All patients had midline pits, and only three patients had an additional lateral sinus opening due to a branched tract.

All patients were treated surgically with minimal excision and primary closure.

Figure 1



Patient position.

Technique

All patients were subjected to a preoperative antibiotic injection (sulbactam+metronidazole). The patient was positioned in the prone position. Hair clipping was done on the table. Field preparation was done using antiseptic and sterile towels.

In this technique, the buttocks are pulled apart by means of a traction plaster on both sides to expose the natal cleft (Fig. 1).

About 20–30 cm mixture solution (prepared using 15 ml xylocaine 2% + 35 ml normal saline + 0.25 mg adrenaline to get an adrenaline concentration of 1/200 000) is used for local subcutaneous infiltration around the PNS tract (Fig. 2).

We did not inject methylene blue for sinus delineation. Instead, we depended on color contrast between the dark pilonidal cyst, due to contained hair, and the surrounding bloodless field due to the effect of adrenaline.

A small elliptical incision is created that passes through the following points: upper point 2 cm above the uppermost sinus pit, lower point 0.5 cm below the lowermost sinus pit, and right and left points 0.5 cm lateral to midline. For patients with lateral openings due to a 'branched tract', a V-cut was performed to enclose the lateral pit (Fig. 3).

The incision is deepened to about 1–1.5 cm in the subcutaneous tissue according to the obesity of the patient and then dissection is carried out medially. At this step the exact wall of the sinus tract can be identified and we can continue dissection just outside the fibrotic wall and complete the excision with overlying sinus pits (Fig. 4).

Figure 2



Local anesthetic infiltration.

If the track of PNS is accidentally opened during the dissection, it can be easily recognized by protrusion of granulation tissue. This is corrected by means of a backward step in recognizing the dissection plane and re-excision of all pathological tissue.

After completion of the excision, wound irrigation with normal saline is carried out, hemostasis is ensured, and the traction plaster is released. The wound edges will come comfortably without any tension (Fig. 5).

The wound is closed in two layers: deep dermal and skin. No drains are inserted. The wound is dressed for 48 h and then exposed (Fig. 6). We overcome the problem of anaerobic environment by early exposure of the wound. In the case of heavy buttocks we used the strategy of reversed plaster to pull the buttocks away from the cleft wound.

The patient is discharged 2–4 h after the operation and scheduled for follow-up visits at 2 days, 7 days, 14 days, 1 month, 3 months, and 6 months postoperative.

Instructions on discharge include avoidance of prolonged sitting and riding a bicycle for 6 weeks. The patient is also advised to improve local hygiene and regularly remove hair by shaving, clipping, or using depilatory creams.

Follow-up parameters include wound seroma, infection, or disruption, in addition to pain, reduced mobilization, time off work, and recurrence.

Results

Minimal excision of PNS was performed on 30 patients, 18 men and 12 women. The mean age was 23.7 years (range 18–37 years) (Table 1).

Figure 3



Incision for minimal excision.

Figure 4



Clear dissection plane.

Figure 5



Resultant cavity after excision.

Figure 6



Wound after release of traction plaster.

As regards clinical presentation of our patients (Table 2), 23 patients (76.6%) presented with natal cleft pain, 12 patients (40%) complained of intermittent discharge, and only two patients (6.6%) gave a history of previous pilonidal abscess with surgical drainage.

The mean operative time was 38 min (range 25–47 min). The duration of hospital stay ranged from 2 to 4 h. Healing time was 14–20 days. Three cases (10%) presented with wound seroma, which was treated with repeated aspiration by means of a wide pore needle. Two patients (6.6%) presented with wound infection without disruption, which was treated with repeated dressing. One patient (3.3%) presented with significant wound infection and wound disruption. The wound was left open to heal by secondary intention and this patient presented with recurrent PNS after 6 months, which was treated with wide excision and rhomboid flap reconstruction (Table 3).

Discussion

In 1833, Herbert Mayo described a hair-containing sinus [5], but it was not until 1880 that Hodge [6] suggested the term 'pilonidal' (Latin: *pilus* = hair and *nidus* = nest). By definition, a PNS is a sinus that contains hair, mainly in the sacrococcygeal area, and is due to favoring conditions like the existence of a deep natal cleft and the presence of hair within the cleft, sweating, maceration, bacterial contamination, and penetration of hair [4]. In addition, certain effect exerted by the movement of the buttocks encourages loose dead hair to gain entry into the sinus [7]. PNS was also branded as 'jeep disease' during the Second World War because of the high incidence among jeep drivers [8].

Table 1 Demographic data of patients (original)

Age (years)	23.7 (18–37)	
Sex	18♂	12♀

Table 2 Clinical data of patients (original)

Clinical presentation	n (%)
Pain	23 (76.6)
Discharge	12 (40)
Previous abscess	2 (6.6)

Table 3 Postoperative data (original)

Operative time	38 min (25–47 min)
Hospital stay	2–4 h
Healing time	15 days (14–20 days)
Wound seroma	3 cases (10%)
Infection	2 cases (6.6%)
Disruption	1 case (3.3%)
Recurrence	1 case (3.3%)

Management of PNS varies widely, from nonradical treatment like gluteal shaving and incision and drainage to radical treatment in the form of wide local excision only or followed by different methods of reconstruction.

Although many surgical and nonsurgical treatment methods have been described, the ideal treatment method has not yet been established for pilonidal disease [9].

The ideal surgical technique for the treatment of PNS should involve minimal financial cost, allow patients to return earlier to work, be simple to perform, not require a prolonged hospital stay, inflict minimal pain, and have a low disease recurrence rate [10].

The controversy in PNS management surrounds wound management after wide local excision. Wide local excision creates a big defect, which if closed primarily will be under tension. This tension in the wound will cause ischemia and pain and will be complicated by infection and later wound disruption. Previous work considered the groove of a natal cleft to be one of the predisposing factors for the development of PNS and paid every effort to obliterate it or make an off-midline incision. The principles of flap reconstruction after wide local excision are used for elimination of tissue tension and obliteration of the natal cleft groove but can still be considered a complex operation that should be preserved for complex cases.

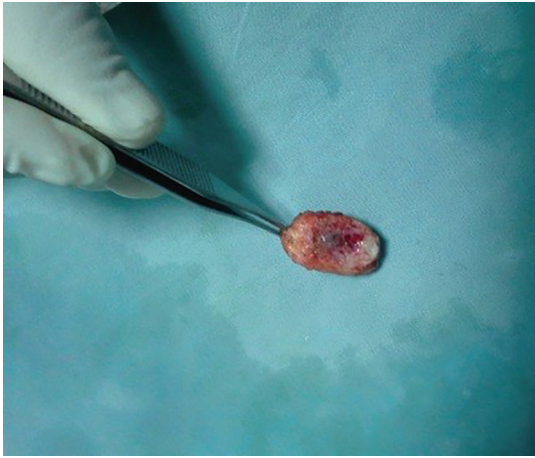
In wide local excision, the surgeon creates a big defect without additional benefits and then tries to find a way to close it. Primary closure will put tissues under tension and flap reconstruction will obliterate the natal cleft, which is a normal anatomy.

In this study we tried to look at PNS operations from a different perspective. We tried to make it simple and an office operation and focused on how to excise PNS minimally.

The technique for minimal excision of PNS is based on two main principles for PNS treatment: the elimination of tissue tension and the complete excision of diseased tissue.

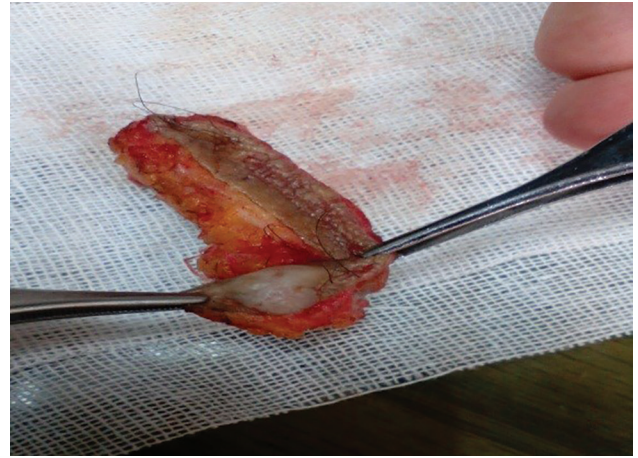
Other advantages of this technique are preservation of healthy tissues and that, being a simple procedure, it can be done under local anesthesia. This simplicity makes it an office procedure with minimal morbidity. Moreover, this procedure does not interfere with healing time or increase complications such as wound seroma, infection, and disruption.

Figure 7



The completely excised sinus.

Figure 8



Pilonidal sinus (PNS) with lateral opening.

Figure 9



The excised long tract with clear color contrast.

Figure 10



Opened sinus containing hair coils.

In this study we encountered 10% wound seroma cases and 6.6% wound infection and disruption cases. Only one patient (3.3%) presented with recurrent PNS after 6 months and this condition was treated with wide excision and rhomboid flap reconstruction.

Recurrence has been consistently reported to be low (1–4%) [11–13] with the Karydakakis technique even with prolonged follow-up as compared with other treatment modalities, especially simple drainage (25%) [14], open excision (0.5–5%) [15,16], simple midline closure (3.5–4.2%) [15,17], and Bascom's cleft excision (10%) [18,19].

This study is considered a preliminary study for this new technique; moreover, the number of patients was relatively small. This recurrence rate can be validated through further studies.

Here, we introduce a simple, fast technique for minimal excision, which can be considered a form of radical treatment for PNS as we excise all pathological tissue and preserve healthy tissue (Figs 7–10).

Conclusion

Minimal excision and primary closure for uncomplicated cases of PNS under local anesthesia is a safe and easy operative procedure. It has been found to result in shorter operative time, shorter length of hospital stay, less postoperative time off work, less healing time, low complication rates, with low chances of recurrence. Complicated and recurrent sinuses require wider excision and flap reconstruction.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- 1 Doureid O, Alain R, Mahmoud D, Tarek BA, Ali S, Abdo J. 25 years' experience in the management of pilonidal sinus disease. *Open J Gastroenterol* 2014; 4:1–5.
- 2 Mohammad A. Karydakias flap operation for chronic pilonidal sinus. *Pak J Surg* 2007; 23:65–69.
- 3 Abbasi HR, Hosseini SV, Yarmohammadi H, Bolandparvas SH. Comparison between two methods of excision and primary closure of pilonidal sinus. *IRCMJ* 2007; 9:143–146.
- 4 Mahdy T, Mahdy T, Gaertner WB, Hagerman GF, Goldberg SM, Finne CO III. Surgical treatment of the pilonidal disease: primary closure or flap reconstruction after excision. *Dis Colon Rectum* 2008; 51:1816–1822.
- 5 Chintapatla S, Safarani N, Kumar S, Haboubi N. Sacrococcygeal pilonidal sinus: historical review, pathological insight and surgical options. *Tech Coloproctol* 2003; 7:3–8.
- 6 Da Silva JH. Pilonidal cyst: cause and treatment. *Dis Colon Rectum* 2000; 43:1146–1156.
- 7 Bolandparvaz S, Moghadam Dizaj P, Salehi R, Paydar S, Bananzadeh M, Abbasi HR, Eshraghian A. Evaluation of the risk factors of pilonidal sinus: a single center experience. *Turk J Gastroenterol* 2012; 23:535–537.
- 8 Mentis O, Bagci M, Bilgin T, Coskun I, Ozgul O, Ozdemir M. Management of pilonidal sinus disease with oblique excision and primary closure: results of 493 patients. *Dis Colon Rectum* 2006; 49:104–108.
- 9 McCallum IJ, King PM, Bruce J. Healing by primary closure versus open healing after surgery for pilonidal sinus: systemic review and meta-analysis. *BMJ* 2008; 336:868–871.
- 10 Ciccolo A, Rossitto M, Panacea D, Manfrè A, Buonamonte S, Ardizzone A. Treatment of pilonidal disease in short-stay surgery: personal method. *Ann Ital Chir* 2004; 75:603–605.
- 11 Petersen S, Aumann G, Kramer A, Doll D, Sailer M, Hellmich G. Short-term results of Karydakias flap for pilonidal sinus disease. *Tech Coloproctol* 2007; 11:235–240.
- 12 JH Anderson, CO Yip, JS Nagabhushan, SJ Connelly. Day-case Karydakias flap for pilonidal sinus. *Dis Colon Rectum* 2008; 51:134–138.
- 13 Akinci OF, Kurt M, Terzi A, Atak I, Subasi IE, Akbilgic O. Natal cleft deeper in patients with pilonidal sinus: implications for choice of surgical procedure. *Dis Colon Rectum* 2009; 52:1000–1002.
- 14 Hosseini SV, Bananzadeh AM, Rivaz M, Sabet B, Mosallae M, Pourahmad S, Yarmohammadi H. The comparison between drainage, delayed excision and primary closure with excision and secondary healing in management of pilonidal abscess. *Int J Surg* 2006; 4:228–231.
- 15 Kareem TS. Surgical treatment of chronic sacrococcygeal pilonidal sinus. Open method versus primary closure. *Saudi Med J* 2006; 27:1534–1537.
- 16 Lee HC, Ho YH, Seow CF, Eu KW, Nyam D. Pilonidal disease in Singapore: clinical features and management. *Aust N Z J Surg* 2000; 70:196–198.
- 17 Al-Jaberi TM. Excision and simple primary closure of chronic pilonidal sinus. *Eur J Surg* 2001; 167:133–135.
- 18 Bascom J, Bascom T. Failed pilonidal surgery: new paradigm and new operation leading to cures. *Arch Surg* 2002; 137:1146–1150.
- 19 Senapati A, Cripps NP, Thompson MR. Bascom's operation in the day surgical management of symptomatic Pilonidal sinus. *Br J Surg* 2000; 87:1067–1070.

Laparoscopic cholecystectomy in a patient with situs inversus totalis: a case report on how to obtain a critical view of safety?

Ahmed M. El-Saady

Department of General Surgery, Kafr El-Sheikh General Hospital, Kafr El-Sheikh, Egypt

Correspondence to Ahmed M. El-Saady, MD, 40 El-Ommal Street, Takseem 2, Kafr El-Sheikh, Egypt

Tel: +20 100 519 4294;
e-mail: ahmedelsaady30@gmail.com

Received 18 May 2015

Accepted 22 June 2015

The Egyptian Journal of Surgery

2015, 34:293–298

Laparoscopic cholecystectomy is considered the procedure of choice in the operative management of cholelithiasis. But despite the maturation of this procedure in surgical practice, bile duct injuries (BDI) still occur at a higher rate than in the open cholecystectomy era. The incidence of BDI post-laparoscopic cholecystectomy approximately 3/1,000 cases. Different recommendations were provided in the recent years to minimize such risks, with special emphasis on the use of the critical view of safety (CVS) to identify the cystic duct and cystic artery before clipping for safe laparoscopic cholecystectomy. But when right becomes left and left becomes right, the procedure becomes more demanding & needs special attention to deliver safe procedure. This is the so in patient with SIT.

SIT is a rare autosomal recessive anomaly, characterized by transposition of organs to the opposite site of the body as in Fig 1. It was first reported by Fabricius in 1600, and occur in an incidence of about 1:10 000 to 1:20 000. In such patient, different scenarios should be in mind to achieve CVS and compensate less skilled non dominant left hand for safe procedure.

Keywords:

laparoscopic cholecystectomy, rare laparoscopic cases, situs inversus totalis

Egyptian J Surgery 34:293–298
© 2015 The Egyptian Journal of Surgery
1110-1121

Introduction

Laparoscopic cholecystectomy is considered the procedure of choice in the operative management of cholelithiasis [1]. But despite the maturation of this procedure in surgical practice, bile duct injuries still occur at a higher rate than in the open cholecystectomy era [2]. The incidence of bile duct injury postlaparoscopic cholecystectomy is ~3/1000 cases [3]. Different recommendations were provided in the recent years to minimize such risks, with special emphasis on the use of the critical view of safety (CVS) to identify the cystic duct and cystic artery before clipping for safe laparoscopic cholecystectomy [4]. But when right becomes left and left becomes right, the procedure becomes more demanding and needs special attention to deliver a safe procedure [5]. This is so in a patient with situs inversus totalis (SIT).

SIT is a rare autosomal recessive anomaly [6], characterized by transposition of organs to the opposite site of the body [7] as shown in Fig. 1. It was first reported by Fabricius in 1600 [8], and occur in an incidence of about 1 : 10 000 to 1 : 20 000 [9]. In such patients, different scenarios should be kept in mind to achieve CVS and compensate for a less-skilled nondominant left hand for a safe procedure.

Case report

A female patient aged 52 years presented with chronic calcular cholecystitis with multiple gall bladder stones on ultrasound. She had confirmed diagnosis of SIT.

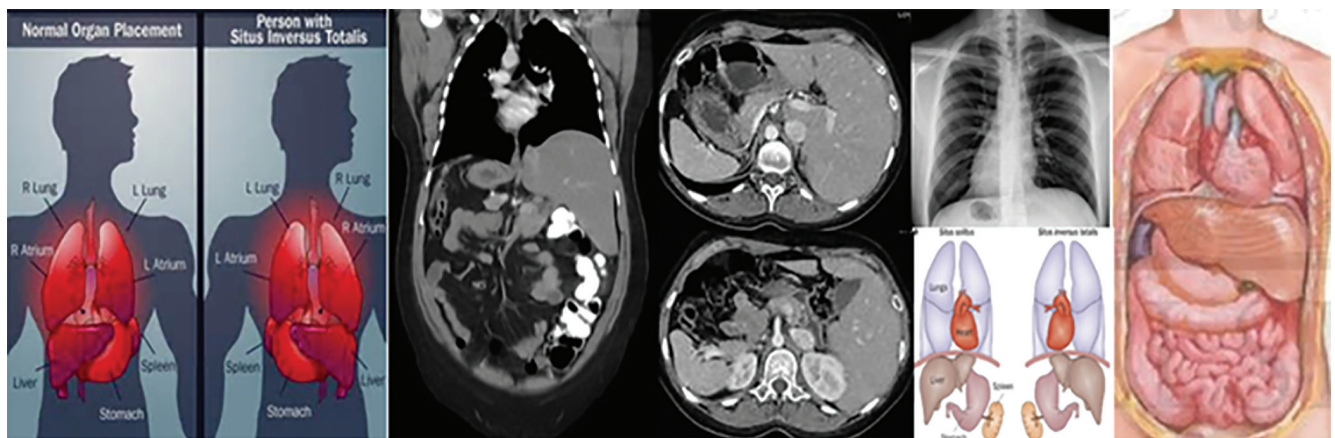
Also, she suffered from Parkinsonism 6 years back. Two months back, one of her close relatives suffered from complete transection of the common hepatic duct postlaparoscopic cholecystectomy, which made a fatal imprint in the patient's mind towards the laparoscopic approach. However, after discussion, she accepted the laparoscopic approach, and the procedure was delivered safely. All patients gave their formal consent. The protocol was approved by the Ethical Committee of the Kafr El Sheikh General Hospital.

Technique

Laparoscopic cholecystectomy was performed using four trocars with the operative team and laparoscopic devices located in the opposite site as a mirror image configuration of laparoscopic cholecystectomy in normally positioned gall bladder as shown in Fig. 2. The surgeon and the monitor assistant were positioned on the patient's right-hand side. The Hasson technique was used to introduce a 10 mm trocar through the umbilicus. The pneumoperitoneum (CO₂) was created with a pressure of 14 mmHg. Another 10 mm trocar was inserted into the abdominal cavity, through the epigastrium in the

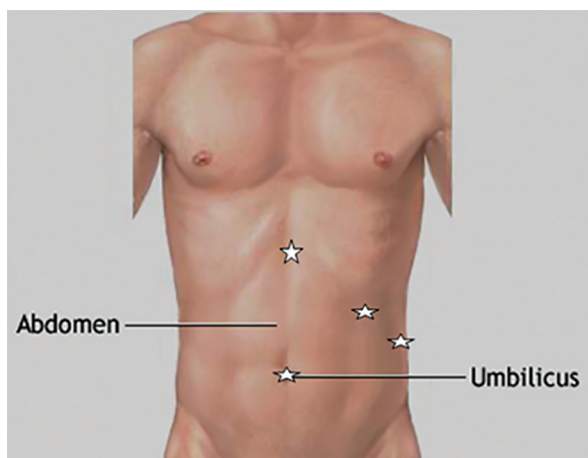
This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Figure 1



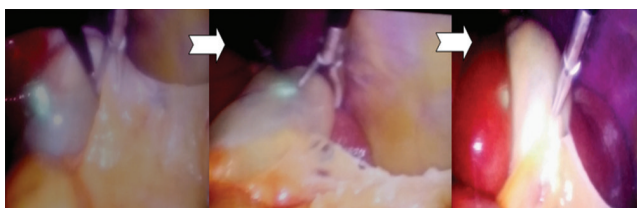
Situs inversus totalis with complete transposition of organs and viscera.

Figure 2



Position of trocars for laparoscopic cholecystectomy in a patient with situs inversus totalis (mirror image).

Figure 3



Adhesions to the gall bladder with adhesiolysis.

subxiphoid location (slightly lower than usual). A 5 mm trocar was inserted at the left midclavicular line. Some adhesions were found to gall bladder as well as the left-hand side of the abdominal wall (Figs 3 and 4). Adhesiolysis was started at the line of attachment of the adhesions, which is the least vascular site. Careful use of diathermy was done on dealing with adhesions. Then 5 mm trocar was inserted in the left anterior axillary line

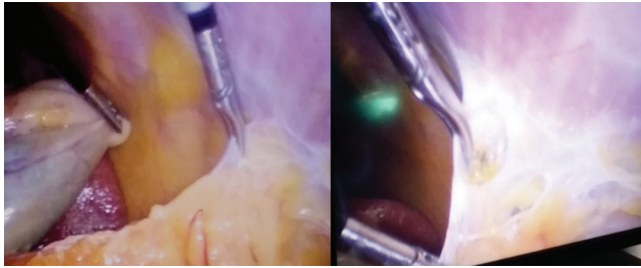
under the view of laparoscope after adhesiolysis. Then we tried to obtain a CVS and expose the hepatocystic triangle (HCT). Fundus of the gall bladder was grasped and pulled upward and to the left by the assistant through the fourth axillary trocar, while the Hartmann's pouch was pushed downward and laterally through the second subxiphoid trocar by the left hand of the surgeon as shown in (Fig. 5) and we started to remove the peritoneal covering of the HCT anteriorly and then change the position and dissect posteriorly as shown in Fig. 6. Dissection of HCT was continued until skeletonization of cystic duct and artery as the only two structures entered the gall bladder within the triangle as shown in Fig. 7. Dissection was performed above the plane of Rouviere's sulcus. Both cystic duct and cystic arteries were clipped and then divided by scissors. The remaining part of gall bladder was separated from its attachment to the liver bed by using electrocautery. Gall bladder was then extracted through the 10 mm umbilical port. Closure of trocars sites was done after putting a drain. The postoperative period was uneventful, and the patient was discharged on the first day of postoperative period after removal of the drain with re-visit 1 week later where she did well.

Discussion

SIT is a rare autosomal recessive anomaly characterized by general transposition of organs and viscera. Actually, SIT does not predispose to gall bladder disease. But pain is exhibited on right-hand side of the abdomen in about 10% of patients, which may lead to some diagnostic confusion [10].

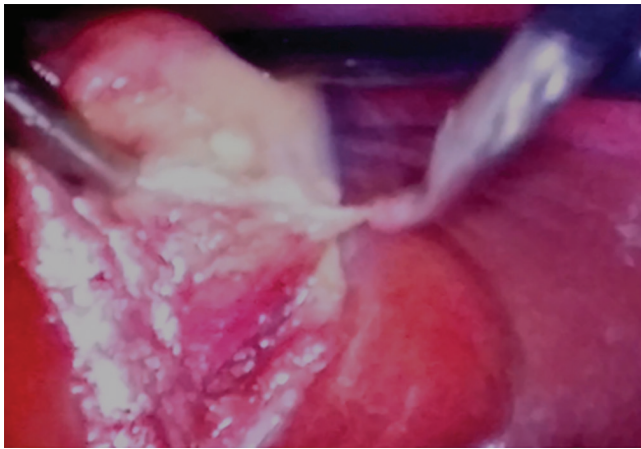
Laparoscopic cholecystectomy is the procedure of choice in the management of cholelithiasis, with achievement of CVS being mandatory for a safe procedure [4]. Several reports emphasized the feasibility of the safe laparoscopic

Figure 4



Adhesions to the left side of the abdomen with adhesiolysis to introduce the fourth axillary trocar.

Figure 6



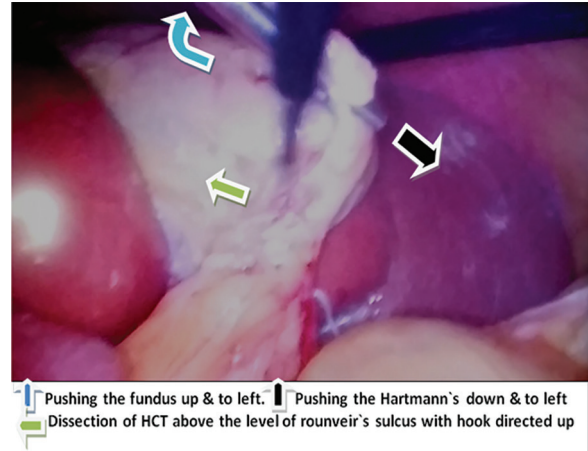
Dissection of the posterior (lateral) aspect of hepatocystic triangle.

cholecystectomy in SIT [11], with CVS being still mandatory for a safe procedure in these patients. But to achieve it, the procedure is more demanding.

In right-sided gall bladder, the fundus is pushed upward and to the right by the assistant (through the fourth axillary trocar), while Hartmann's pouch is pulled down and to the right by the surgeon's left hand (through third midclavicular trocar) as in Figure 9 while he manipulated and dissected the HCT by his right hand through the second subxiphoid trocar, with exposure of the cystic plate (liver bed of the gall bladder) leaving only structures entering gall bladder; cystic duct and cystic artery [2] as shown in Fig. 8.

To apply this maneuver in SIT a mirror image is needed, including directions of tractions. The problem as in Figure 10 is the dominant hand of surgery. When the surgeon uses his hands well there is no great problem, but if the surgeon is only right handed, the manipulation may be cumbersome and not precise with some technical difficulties arising, for example, crossing of the hands [12]. This in addition to the need of reorientation of the field and redirection of the visual-motor skills of the surgeon and the camera man

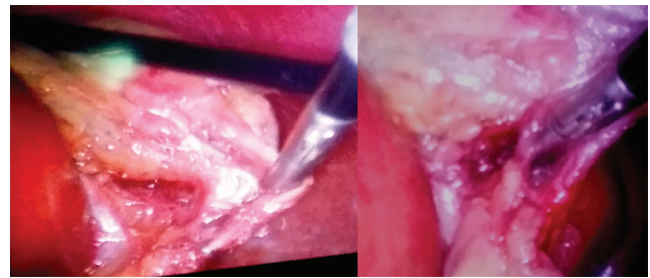
Figure 5



Pushing the fundus up & to left. Pushing the Hartmann's down & to left
Dissection of HCT above the level of rouvenir's sulcus with hook directed up

Directions of tractions and dissection to achieve the critical view of safety.

Figure 7



Dissection of hepatocystic triangle with the identification of cystic duct and cystic artery as the only two structures entering gall bladder.

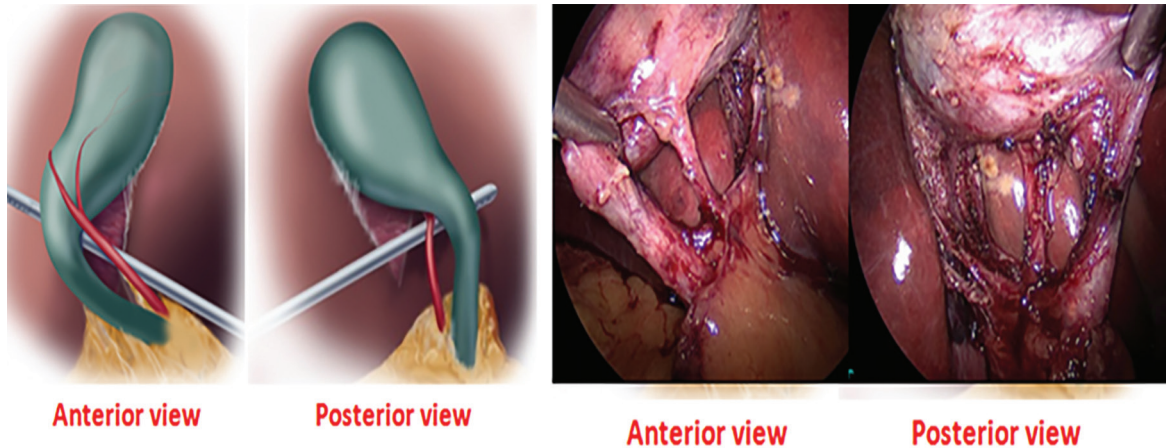
to the left upper quadrant usually consumes extra time and may add more difficulties [13].

Many suggested alternatives could be used to compensate for the surgeon's unskilled nondominant left hand, including:

- (1) Pushing the Hartmann's pouch down and to the left by his left hand through the second epigastric trocar where the HCT is dissected by his right hand through the third midclavicular trocar as in Figure 11.
- (2) Another approach is to pull the Hartmann's pouch down and to the left (by the third midclavicular trocar grasped by the assistant's hand) where the HCT is dissected by the right hand of the surgeon through the second epigastric trocar [14] (which is better to be down in position than usual).

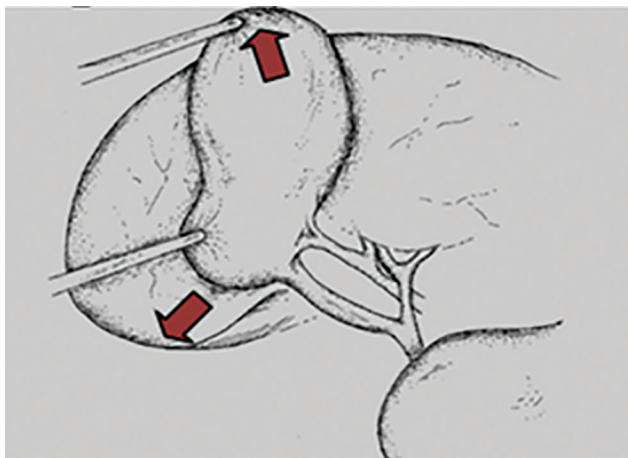
Also, the exposure of HCT can be achieved by adding a trocar in left hypochondrium (or even replacing the second epigastric trocar) as in Figure 12 especially in the wide abdomen. Hartmann's pouch down and lateral by the assistant, while the surgeon uses his right hand to dissect HCT (specially the medial aspect of the triangle);

Figure 8



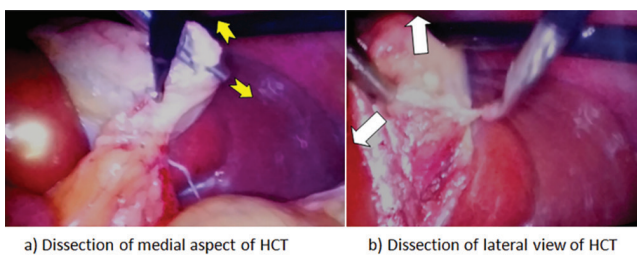
Documentation of the doublet view to confirm critical view of safety.

Figure 9



Direction of traction to identify the hepatocystic triangle and disalignment of the cystic duct from common bile duct.

Figure 11

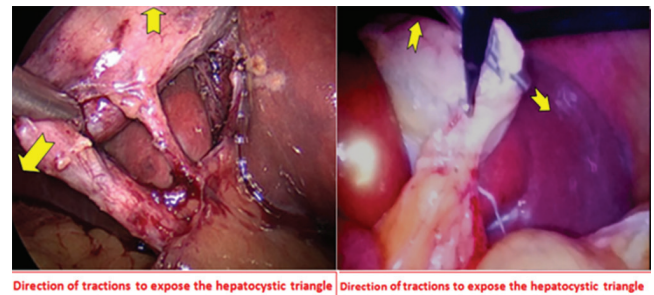


Dissection of hepatocystic triangle by right hand, while manipulating the Hartmann's pouch by the left hand.

on dealing with the lateral aspect, the surgeon can use both hands through the second and third trocars.

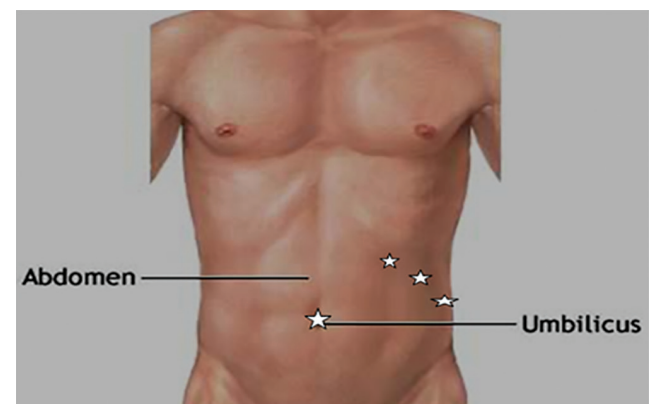
Apart from mirror image transposition, patients with SIT usually do not have associated extrahepatic biliary, venous, and arterial anomalies [15]. Hence, it appears that

Figure 10



Direction of tractions to expose the hepatocystic triangle in right-sided gall bladder and gall bladder in situs inversus totalis (mirror image).

Figure 12



Alternative sites of trocars to compensate for the less-skilled nondominant left hand.

the surgeon should not be discouraged from performing laparoscopic cholecystectomy for situs inversus on the ground of unexpected associated biliary tract anomalies [16].

Since the first case reported by Campos and Sipes [17], many additional cases have been reported in the literature.

Table 1 Laparoscopic cholecystectomy in patients with situs inversus totalis reported in the literature

Published cases number	Series	Year of publication	Diagnosis
1	Campos and Sipes [16]	1991	CC
2	Takei <i>et al.</i> [19]	1992	Biliary colic
3	Lipschutz <i>et al.</i> [20]	1992	Cholangitis/CBD calculi
4	Goh [21]	1992	Empyema
5	Drover <i>et al.</i> [22]	1992	CC
6	Huang <i>et al.</i> [23]	1992	CC
7	Schiffino <i>et al.</i> [24]	1993	CC
8	Mc Dermott and Caushaj [25]	1994	Cholangitis/CBD calculi
9	Elhomsy <i>et al.</i> [26]	1996	AC
10	Malatani [27]	1996	AC
11	Crosher <i>et al.</i> [28]	1996	Biliary colic
12	D'Agata and Boncompagni [29]	1997	CC
13	Habib <i>et al.</i> [30]	1998	CC
14/15	Demetriades <i>et al.</i> [31]	1999	AC/CC
16	Djohan <i>et al.</i> [32]	2000	CC/appendectomy
17	Wong [33]	2001	CC/CBD calculi
18	Dorthi <i>et al.</i> [34]	2001	CC
19	Nursal <i>et al.</i> [35]	2001	CC
20/21	Yaghan <i>et al.</i> [36]	2001	CC/CC
22	Al Jumaily and Hoche	2001	CC
23	Singh and Dhir [37]	2002	CC
24	Trongue <i>et al.</i> [38]	2002	CC
25	Polychronidis <i>et al.</i> [39]	2002	CC
26	Oms and Badia	2003	AC
27	Jesudason <i>et al.</i>	2004	CC
28	Kang and Han [40]	2004	CC/CBD calculi
29	Docimo <i>et al.</i> [41]	2004	CC
30	Antal <i>et al.</i> [42]	2004	CC
31	Pitiakoudis <i>et al.</i> [43]	2005	CC
32	McKay and Blake	2005	AC
33	Kamitani <i>et al.</i> [44]	2005	CC
34	Puglisi <i>et al.</i> [45]	2006	CC
35	Bedioui <i>et al.</i>	2006	CC
36	Aydin <i>et al.</i> [46]	2006	CC
37	Machado and Chopra [12]	2006	CC
38	Kumar and Fusai [47]	2007	CC
39	Fernandes <i>et al.</i> [48]	2008	CC
40	Hamdi and Abu hamdan [49]	2008	AC
41	Pavlidis <i>et al.</i> [50]	2008	AC
42	Taskin <i>et al.</i> [51]	2009	CC/gastric banding
43	Masood <i>et al.</i> [52]	2009	CC
44	Pereira-Graterol <i>et al.</i> [53]	2009	CC
45	Romano <i>et al.</i> [54]	2009	Biliary colic
46	Pataki <i>et al.</i> [55]	2010	CC
47	Hall <i>et al.</i> [56]	2010	CC
48	Gonzalez Valverde <i>et al.</i> [57]	2010	CC
49	Sanduc and Toma [58]	2010	CC
50	Han <i>et al.</i> [59]	2011	CC
51	Suleyman Bozkurt <i>et al.</i> [11]	2012	CC
52	Ibrahim Salama <i>et al.</i> [13]	2013	CC
53	Elbert Khiangte <i>et al.</i> [7]	2013	CC
54	Raghuveer MN <i>et al.</i> [17]	2014	CC

AC, acute cholecystitis; CC, chronic cholecystitis; CBD, common bile duct.

Salama *et al.* [14] enumerated 52 cases, while Raghuveer *et al.* [15] enumerated 54 cases, as shown in Table 1.

Four-port, three-port, and more recently a single-port laparoscopic cholecystectomy approach have been reported in the literature [14]. The theoretical assumption of increased rate of conversion to open cholecystectomy in SIT or increased complications is actually not present in the reported cases, which may be attributable to the extra precautions taken before and during the procedure [14].

Conclusion

Although laparoscopic cholecystectomy in patients with SIT may consume extra time, it should be considered the procedure of choice in the management of cholelithiasis as the normally positioned gall bladder. Different scenarios should be kept in mind to compensate for the unskilled nondominant left hand for achieving the CVS, which is mandatory for a safe procedure. The surgeon should not forget training and gaining skills for his nondominant hands. Also, he should gain skills in dealing with all instruments well (e.g. hook, grasper) and not stick to only one in his dissection. Extra precautions taken before and during the procedure usually safeguard against complications in these cases with no increase in rate of conversion.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Zaydfudim V, Asai K, Sarr MG. Gall bladder stones, gall bladder and biliary tree. Current Surgical Therapy. Cameron JL, ed. Philadelphia: Elsevier 11th edi. 2014;71:383–384.
- Sanford DE, Strasberg SM. A simple effective method for generation of a permanent record of the critical view of safety during laparoscopic cholecystectomy by intraoperative 'doublet' photography. J Am Coll Surg 2014; 218:170–178.
- Gurusamy KS, Davidson BR. Surgical treatment of gallstones. Gastroenterol Clin North Am 2010; 39:229–244.
- Strasberg SM, Brunt LM. Rationale and use of the critical view of safety in laparoscopic cholecystectomy. J Am Coll Surg 2010; 211:132–138.
- Han HJ, Choi SB, Kim CY, Kim WB, Song TJ, Choi SY. Single-incision multiport laparoscopic cholecystectomy for a patient with situs inversus totalis: report of a case. Surg Today 2011; 41:877–880.
- Wong J, Tang CN, Chau CH, Luk YW, Li MK. Laparoscopic cholecystectomy and exploration of the common bile in a patient with situs inversus. Surg Endosc 2001; 15:218.
- Khiangte E, Newme I, Patowary K, Phukan P. Single-port laparoscopic cholecystectomy in situs inversus totalis using the E.K. glove port. J Minim Access Surg 2013; 9:180–182.
- McKay D, Blake G. Laparoscopic cholecystectomy in situs inversus totalis: a case report. BMC Surg 2005; 5:5.

- 9 Djohan RS, Rodriguez HE, Wiesman IM, Unti JA, Podbielski FJ. Laparoscopic cholecystectomy and appendectomy in situs inversus totalis. *JLS* 2000; 4:251–254.
- 10 Borgaonkar VD, Deshpande SS, Kulkarni VV. Laparoscopic cholecystectomy and appendectomy in situs inversus totalis: a case report and review of literature. *J Minim Access Surg* 2011; 7:242–245.
- 11 Machado NO, Chopra P. Laparoscopic cholecystectomy in a patient with situs inversus totalis: feasibility and technical difficulties. *JLS* 2006;10:386–391.
- 12 Bedioui H, Chebbi F, Ayadi S, Makni A, Fteriche F, Ksantini R. Laparoscopic cholecystectomy in a patient with situs inversus. *Ann Chir* 2006; 131:398–400.
- 13 Donthi R, Thomas DJ, Sanders D, Schmidt SP. Report of laparoscopic cholecystectomy in two patients with left sided gall bladders. *J Soc Laparoendosc Surg* 2001; 5:53–56.
- 14 Salama IA, Abdullah MH, Houseni M. Laparoscopic cholecystectomy in situs inversus totalis: feasibility and review of literature. *Int J Surg Case Rep* 2013; 4:711–715.
- 15 Raghuvier MN, Mahesh Shetty S, Sunil Kumar BB. Laparoscopic cholecystectomy in situs inversus totalis. *J Clin Diagn Res* 2014; 8:ND03–ND05.
- 16 Schiffino L, Mouro J, Levard H, Dubois F. Cholecystectomy via laparoscopy in situs inversus totalis. A case report and review of the literature. *Minerva Chir* 1993; 48:1019–1023.
- 17 Campos L, Sipes E. Laparoscopic cholecystectomy in a 39-year-old female with situs inversus. *J Laparoendosc Surg* 1991; 1:123–125 discussion 126
- 18 Bozkurt S, Coskun H, Atak T, Kadioglu H. Single incision laparoscopic cholecystectomy in situs inversus totalis. *J Surg Tech Case Rep* 2012; 4:129–131.
- 19 Takei H.T., Maxwell J.G., Clancy T.V., Tinsley E.A. Laparoscopic cholecystectomy in situs inversus totalis. *Journal of Laparoendoscopic Surgery*. 1992;2(4):171–176.
- 20 Lipschutz J.H., Canal D.F., Hawes R.H., Ruffolo T.A., Besold M.A., Lehman G.A. Laparoscopic cholecystectomy and ERCP with sphincterotomy in an elderly patient with situs inversus. *American Journal of Gastroenterology*. 1992;87:200–218.
- 21 Goh P., Tekant Y., Shang N.S., Ngoi S.S. Laparoscopic cholecystectomy in a patient with empyema of the gall bladder and situs inversus. *Endoscopy*. 1992;24:799–800.
- 22 Drover J.W., Nguyen K.T., Pace R.F. Laparoscopic cholecystectomy in a patient with situs inversus viscerum: a case report. *Canadian Journal of Surgery*. 1992;35:65–66.
- 23 Huang S.M., Chau G.Y., Lui W.Y. Laparoscopic cholecystectomy for cholelithiasis in a patient with situs inversus totalis. *Endoscopy*. 1992;24:802–803
- 24 Schiffino L., Mouro J., Levard H., Dubois F. Cholecystectomy via laparoscopy in situs inversus totalis. A case report and review of the literature. *Minerva Chirurgica*. 1993;48:1019–1023.
- 25 Mc Dermott J.P., Caushaj P.F. ERCP and laparoscopic cholecystectomy for cholangitis in a 66 year old male with situs inversus. *Surgical Endoscopy*. 1994;8:1227–1229.
- 26 Elhomysy G., Matta W., Varaei K., Garcet L., Rahmani M. The millepede and the surgeon: a propos of laparoscopic cholecystectomy in a case of situs inversus or autonomic gesture constrict by reason. *Journal de Chirurgie*. 1996;133:43 ([French]).
- 27 Malatani, T.S. Laparoscopic cholecystectomy in situs inversus totalis: A case report and review of literature. *Annals of Saudi Medicine*. 1996;16:458–459.
- 28 Crosher R.F., Hamarayan P., Bremner D.N. Laparoscopic cholecystectomy in situs inversus totalis. *Journal of the Royal College of Surgeons of Edinburgh*. 1996;41:183–184.
- 29 D'Agata, A., Boncompagni, G. Video laparoscopic cholecystectomy in situs viscerum inversus totalis. *Minerva Chirurgica*. 1997;52:271–275 ([Italian]).
- 30 Habib Z., Shanafey S., Arvdsson S. Laparoscopic cholecystectomy in situs viscerum inversus totalis. *Annals of Saudi Medicine*. 1998;18:247–248.
- 31 Demetriades H., Botsios D., Dervenis C., Evagelou J., Agelopoulos S., Dadoukis J. Laparoscopic cholecystectomy in two patients with symptomatic cholelithiasis and situs inversus totalis. *Digestive Surgery*. 1999;16:519–521.
- 32 Djohan R.S., Rodriguez H.E., Wiesman I.M., Unti J.A., Podbielski F.J. Laparoscopic cholecystectomy and appendectomy in situs inversus totalis. *Journal of the Society of Laparoendoscopic Surgeons*. 2000;4:251–254.
- 33 Wong J., Tang C.N., Chau C.H., Luk Y.W., Li M.K. Laparoscopic cholecystectomy and exploration of the common bile in a patient with situs inversus. *Surgical Endoscopy*. 2001;15:218.
- 34 Dorthi R., Thomas D.J., Sanders D., Schmidt S.P. Report of laparoscopic cholecystectomy in two patients with left sided gall bladders. *Journal of the Society of Laparoendoscopic Surgeons*. 2001;5:53–56.
- 35 Nursal T.Z., Baykal A., Iret D., Aran O. Laparoscopic cholecystectomy in a patient with situs inversus totalis. *Journal of Laparoendoscopic and Advanced Surgical Techniques: Part A*. 2001;11:239–241.
- 36 Yaghan R.J., Gharaibeh K.I., Hammori S. Feasibility of laparoscopic cholecystectomy in situs inversus. *Journal of Laparoendoscopic and Advanced Surgical Techniques: Part A*. 2001;11(4):233–237.
- 37 Singh K. Dhir A. Laparoscopic cholecystectomy in situs inversus totalis: a case report. *Surgical Technology International*. 2002;10:107–108.
- 38 Trongue A., Monestes J., Trongue G., Genna A. Abdominal situs inversus: report of a case. *Acta Gastroenterologica Latinoamericana*. 2002;32:43–45.
- 39 Polychronidis A., Karayiannakis A., Botaitis S., Perente S., Simopoulos C. Laparoscopic cholecystectomy in a patient with situs inversus totalis and previous abdominal surgery. *Surgical Endoscopy*. 2002;16:1110.
- 40 Kang S.B., Han H.S. Laparoscopic exploration of the common bile duct in a patient with situs inversus totalis. *Journal of Laparoendoscopic and Advanced Surgical Techniques: Part A*. 2004;14:103–106.
- 41 Docimo G., Manzi F., Maione L., Canero A., Veneto F., Lo Schiavo F. *et al*, A case report: laparoscopic cholecystectomy in situs viscerum inversus. *Hepato-Gastroenterology*. 2004;51:958–960.
- 42 Antal A., Koracs Z., Szasz K. Unusual laparoscopy surgical cases: cholelithiasis in situs inversus totalis and gall bladder agenesis. *Magyar Sebeszet*. 2004;57:81–83 (Hungarian).
- 43 Pitiakoudis M., Tsaroucha A.K., Katotomichelakis M., Polychronidis A., Simopoulos C. Laparoscopic cholecystectomy in a patient with situs inversus using ultrasonically activated coagulating scissors. Report of a case and review of the literature. *Acta Chirurgica Belgica*. 2005;105:114–117 (2005).
- 44 Kamitani S., Tsutamoto Y., Hanasawa K., Tani T. Laparoscopic cholecystectomy in situs inversus totalis with "inferior" cystic artery: a case report. *World Journal of Gastroenterology*. 2005;11:5232–5234.
- 45 Puglisi F., Troilo V.L., De fazio M., Capuano P., Lograna G., Catelang G. *et al*, cholecystectomy in situs viscerum inversus totalis. Does laparoscopy increase the pitfalls?. *Chirurgia Italiana*. 2006;58:179–183.
- 46 Aydin U., Unalp O., Yazici P., Gurcu B., Sozbilen M., Coker A. Laparoscopic cholecystectomy in a patient with situs inversus totalis. *World Journal of Gastroenterology*. 2006;12:7717–7719 (21).
- 47 Kumar S., Fusai G. Laparoscopic cholecystectomy in situs inversus totalis with left-sided gall bladder. *Annals of the Royal College of Surgeons of England*. 2007;89.
- 48 Fernandes M.N., Neivaa I.N.C., Camachoa F.A., Meguins L.C., Fernandes M.N., Meguins E.M.C. Three-port laparoscopic cholecystectomy in a brazilian amazon woman with situs inversus totalis: surgical approach. *Case Reports in Gastroenterology*. 2008;2:170–174.
- 49 Hamdi J., Abu hamdan O. Laparoscopic cholecystectomy in situs inversus totalis. *The Saudi Journal of Gastroenterology*. 2008;14:31–32.
- 50 Pavlidis T.E., Psarras K., Triantafyllou A., Marakis G.N., Sakantamis A.K. Laparoscopic cholecystectomy for severe acute cholecystitis in a patient with situs inversus totalis and posterior cystic artery. *Diagnostic and Therapeutic Endoscopy*. 2008;3.
- 51 Taskin M., Zengin K., Ozben V. Concomitant laparoscopic adjustable gastric banding and laparoscopic cholecystectomy in a super-obese patient with situs inversus totalis who previously underwent intragastric balloon placement. *Obesity Surgery*. 2009;19:1724–1726.
- 52 Masood R., Samiullah Chaudhary, I.A. Taimur Laparoscopic cholecystectomy for left sided gall bladder: an unusual case. *Journal of Ayub Medical College, Abbottabad*. 2009;21:162–163.
- 53 Pereira-Graterol F., Siso-Calderón L. Technical considerations during laparoscopic cholecystectomy in a patient with situs inversus totalis. *Cirugia y Cirujanos*. 2009;77:145–148.
- 54 Romano G.G., Grande G., Romano F., Di Luna G., Musto L.A., Saldutti, L. Laparoscopic cholecystectomy in situs viscerum inversus totalis: technical note. *Giornale di Chirurgia*. 2009;30:369–373 (Italian).
- 55 Pataki I., Soultan T.G., Chanis W. Laparoscopic cholecystectomy in totalis situs inversus for cholecystitis. *Magyar Sebeszet*. 2010;63:23–25 ([Hungarian]).
- 56 Hall T.C., Barandiaran J., Perry E.P. Laparoscopic cholecystectomy in situs inversus totalis: is it safe?. *Annals of the Royal College of Surgeons of England*. 2010;92:W30–W32.
- 57 González Valverde F.M., Gómez Ramos M.J., Méndez Martínez M., Pérez Montesinos J.M., Tamayo Rodríguez M.E., Ruiz Marín M. *et al*, Laparoscopic cholecystectomy in a patient with situs inversus totalis. *Acta Gastroenterologica Latinoamericana*. 2010;40:264–267 ([Spanish])
- 58 Sandu C., Toma M. Laparoscopic cholecystectomy in a patient with situs inversus totalis. *Chirurgia (Bucur)*. 2010;105:705–707 ([Romanian]).
- 59 Han H.J., Choi S.B., Kim C.Y., Kim W.B., Song T.J., Choi S.Y. Single-incision multiport laparoscopic cholecystectomy for a patient with situs inversus totalis: report of a case. *Surgery Today*. 2011;41:877–880.