Splenic bed lavage: a new technique to avoid postsplenectomy subphrenic abscess in patients with portal hypertension

Wael E. Lotfy[a], Wael M. Awad[a], Abdelwahab M. Hamed[a], Ghada K. Gouhar[b], Hoda A. Salem[c]

Departments of [a]General Surgery [b]Radiodiagnosis [c]Clinical Pathology, Faculty of Medicine, Zagazig University, Zagazig, Egypt

Correspondence to Wael Elsayed Lotfy Mokhtar MD, Prof. of General Surgery, Faculty of Medicine, Zagazig University, El Mohafza Tower behind Kasr El Thakafa Zagazig-Sharkeia, Egypt
Tel: +20552345187 - +20552310360;
Mobile: +201223502050 - +201000662264.
e-mail: waellotfy@hotmail.com, waellotfy@zu.edu.eg

Received 28 December 2013
Accepted 9 January 2014

The Egyptian Journal of Surgery
2014, 33:81–85

Aim
The aim of the study was to evaluate the effectiveness of splenic bed lavage (SBL) (new technique) in prophylaxis against postsplenectomy subphrenic abscess.

Study type
This was a randomized control trial.

Patients and methods
A total of 44 patients with splenomegaly due to portal hypertension underwent splenectomy. They were randomized into two groups: group I included 25 patients who underwent SBL postoperatively and group II included 19 patients who underwent only tube drainage of the splenic bed. All patients were followed up by ultrasonography to check for occurrence of subphrenic collection.

Results
None of the group I patients developed subphrenic abscess (0% risk), whereas three patients in group II developed subphrenic abscesses, which needed either ultrasonography-guided drainage or open surgical drainage.

Conclusion
SBL is an effective technique to prevent subphrenic abscess after splenectomy in patients with portal hypertension.

Keywords:
splenectomy, splenic bed lavage, subphrenic abscess

Egyptian J Surgery 33:81–85

1110-1121

Introduction

Subphrenic collection and abscess formation is a well-known complication of splenectomy. It may be an isolated complication or occurs as a result of injury to an adjacent organ, especially in patients with a massively enlarged spleen [1].

Following splenectomy, there is a large potential space in the left hypochondrium in close proximity to the tail of pancreas, which is inevitably manipulated and even damaged during the operation, with possible accumulation of pancreatic ferments, blood and serum in the region that becomes infected [2,3].

In cases of portal hypertension, surgeons are confronted with multiple challenges, such as huge organ difficult to remove, thin-walled veins with high pressure inside and possible bleeding tendency due to hypoprothrombinaemia and/or thrombocytopaenia. Undoubtly, meticulous haemostasis during dissection of the spleen can help minimize postoperative oozing and the potential risk for abscess formation [4–8].

Every effort has been performed to prevent this dreadful complication, but still subphrenic abscess does occur and its incidence ranges from 0.7 up to 18% in different studies [1,9–12].

Almost all surgeons prohibit Penrose drains after splenectomy, as they do not evacuate fluids actively and also permit introduction of bacteria to splenic bed [11–15], whereas some surgeons advise the use of low-pressure suction drains after splenectomy [2]. In contrast, many surgeons advocated no drainage of splenic bed after splenectomy, as drainage increases the incidence of septic complications up to 10 folds [11,13,16].

In addition, some surgeons tried to leave antibiotic sponge in the splenic bed, but they were surprised that these implants not only fail to reduce the risk for subphrenic abscess, but also may contribute to increase its incidence [17].

Postoperative splenic bed lavage (SBL) is a new method designed by the main author hoping to prevent or at least reduce the incidence of subphrenic abscess after splenectomy. SBL aims not only at the prevention of accumulation of blood clots and tissue debris in the subphrenic space, but also to dilute and wash out any pancreatic enzymes that might escape to the space from the pancreatic tail during or after the operation.

 DOI: 10.4103/1110-1121.131653

Patients and methods

This study included 44 patients with splenomegaly due to portal hypertension secondary to liver cirrhosis. All patients were admitted to Zagazig University Hospital from October 2010 to September 2013 and they were prepared for splenectomy due to hypersplenism.

Inclusion criteria

(1) Patients above 18 years and below 60 years.
(2) All patients with compensated liver cirrhosis, with portal hypertension and secondary hypersplenism.
(3) All patients should have the criteria of hypersplenism – that is, splenomegaly, monocytopenia or pancytopenia and active bone marrow.
(4) Patients fit for surgery with all organs functions within acceptable ranges.
(5) All patients who are mentally oriented and consented for joining this research study.

Exclusion criteria

(1) Patients below 18 years or above 60 years.
(2) Patients with splenomegaly due to any cause other than portal hypertension.
(3) Patients with decompensated liver cirrhosis – that is, ascites and encephalopathy.
(4) Patients with severe or uncorrectable hypoalbuminaemia (albumin<2.5 g% on presentation or fails to increase to 3 g% or more on albumin therapy).
(5) Patients with severe or uncorrectable hypoprothrombinaemia – international normalizing ratio is greater than 2.2 on presentation or less than 2.2 but fails to decrease below 1.5 after plasma transfusion.
(6) Patients with severe or uncorrectable thrombocytopaenia – that is, platelets count is less than 20 000/mm^3 on presentation or greater than 20 000/mm^3 but fails to increase to 50 000/mm^3 or more on platelets transfusion.
(7) Patients unfit for surgery because of any other cause.
(8) Patients in whom unexpected events occurred during the operation, such as bowel injury that might influence the incidence of subphrenic abscess, and hence our results.
(9) Patients who were lost during the postoperative follow-up period.

We randomized the patients into two groups:

(1) Group I included patients who would be operated upon on Saturday list; they were planned to undergo splenectomy and SBL postoperatively.
(2) Group II (the control group) included patients who would be operated upon on Tuesday list. They were planned to undergo splenectomy and only two tubes drainage of the splenic bed.

The randomization was completely unbiased without surgeons' preference or patients' choice, and this randomization resulted into two unequal groups. All patients were operated upon by the same surgical team with the same procedure of splenectomy.

Preoperative care

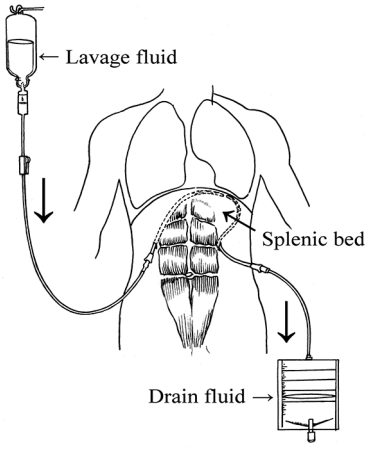
All patients were immunized with the three vaccines against pneumococci, meningococci and *Haemophilus influenza* bacteria at least 2 weeks before surgery. After admission, patients were prepared for surgery – that is, correction of bleeding tendency with fresh plasma and platelets transfusion, correction of hypoalbuminaemia by albumin infusion; also, at least 2 U of blood were arranged to be available at the time of operation.

Complete preoperative laboratory investigations were ordered. Patients were not allowed to undergo the operation unless their investigations were within acceptable range: international normalizing ratio less than 1.5, platelet count more than 50 000/mm^3 and serum albumin level more than 3 g%.

Technique of splenic bed lavage

After completion of splenectomy and ensuring perfect haemostasis, two large-sized Nelaton catheters (32 Fr) are inserted in the splenic bed through two small stabs in the subcostal plane on the right and left midclavicular lines, respectively, so that the tips of the two tubes are touching each other at the maximum depth of the left subphrenic space (Fig. 1), then a lavage using warm saline (37.5°C) heated in water bath is started intraoperatively. The saline bottle is

Figure 1



The technique of splenic bed lavage.

connected to the right tube and allowed to drip at a rate of 20 drops/min to empty the 500 ml in about 8 h. Watching the draining fluid in the left tube, we ensure continuous flow and collection of the draining fluid in a collecting bag. If the flow of the fluid in the draining tube stops, we can reverse the flow so that the lavage bottle is connected to the left tube and the collection bag is connected to the right one. The tubes should be clamped during exchange of the bottle and strict aseptic precautions must be taken not to introduce infection intra-abdominally. The 24-h collection of the draining fluid is tested for amylase concentration every other day, that is, on the first, third and fifth postoperative days (PODs), and data are collected for comparison. This lavage is continued for 3 days postoperatively, but the tubes are left until the fifth POD (Photo 1).

Postoperative care

All patients were postoperatively cared in the ICU for at least 24 h and then transported to the inpatient ward when they were haemodynamically stable. On the third POD, complete blood count was ordered to check haemoglobin % and platelets count. In addition, continuous monitoring of body temperature was blotted on fever chart for early detection of intra-abdominal collection. Ultrasound examination was performed for all patients on the fifth and the 10th POD using General Electric Logiq 3 (GE (USA), India) ultrasound machine, convex abdominal probe 3.5 MHz.

Three patients in group II showed subphrenic turbid collections (43 × 39 mm, 72 × 32 mm and 79 × 63 mm, respectively) on ultrasonography (US) examination on the fifth POD. These patients were managed conservatively with broad-spectrum antibiotic, and another US was performed on the 10th POD when there were still subphrenic collections in the three patients, and US-guided drainage tubes were inserted to drain those collections. The condition of first patient improved by the 21st POD and the drainage tube was removed when she was clinically and ultrasonographically free, whereas the other two patients were still feverish and the US examination showed increase in the size of collection to 113 × 73 mm and 170 × 230 mm, respectively, with turbid contents when a decision was taken to surgically drain the collection on the 17th POD. Both patients recovered well after drainage and were discharged from the hospital on the 27th and 29th POD, respectively, when they were clinically and ultrasonographically free. Only one patient in group I showed clear subphrenic collection (42 × 33 mm) on the fifth POD US, which resolved spontaneously under conservative measures by the 10th POD, and the patient was discharged from the hospital.

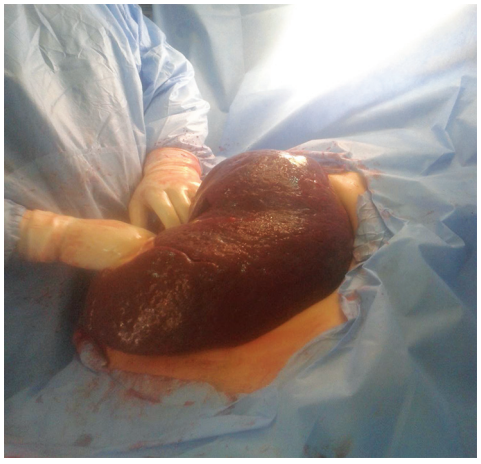
Two patients were excluded from this study after they were operated upon. In the first one, there was an accidental injury to the wall of the stomach, which was repaired in two layers. The other case was lost to follow-up during the postoperative period.

Results

This study included 44 patients with hypersplenism, 28 men (64%) and 16 women (36%). Their ages ranged from 21 to 58 years with an average age of 37.5 years. Patients were randomly divided into two unequal groups.

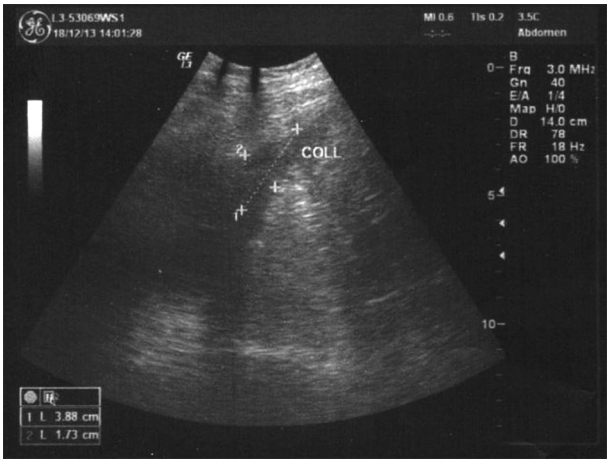
Group I (the SBL group) included 25 patients, 16 men and nine women with an average age of 36.5 years. Three patients were diabetic and only one patient was hypertensive. Of them, 17 patients had massive splenomegaly (Photo 2) and eight patients had moderate splenomegaly. On admission, nine

Photo 1



A huge spleen of portal hypertension.

Photo 2



Abdominal ultrasonography examination showing a subphrenic collection 3.8 × 1.7 cm.

patients had normal serum albumin, 14 patients had mild hypoalbuminaemia and two patients had moderate hypoalbuminaemia. Ten patients had normal prothrombin time, 12 had mild hypoprothrombinaemia and three had moderate hypoprothombinaemia. In all, 20 patients had mild thrombocytopaenia and five had moderate thrombocytopaenia (Table 1).

Group II (the control group) included 19 patients, 12 men and seven women with an average age of 39.3 years. Two patients were diabetic and none of them were hypertensive. Of them, 13 patients had massive splenomegaly and six had moderate splenomegaly. On admission, seven patients had normal serum albumin, 11 had mild hypoalbuminaemia and only one had moderate hypoalbuminaemia. Seven patients had normal prothrombin time, nine had mild hypoprothombinaemia and three had moderate hypoprothrombinaemia. A total of 15 patients had mild thrombocytopaenia and four had moderate thrombocytopaenia (Table 1).

Statistically, there was no significant difference between the two groups with regards to age, sex distribution, diabetes mellitus, hypertension, hypoprothrombinaemia, thrombocytopaenia and degree of splenomegaly, and this ensures perfect randomization of the two groups.

The draining fluid amylase showed steady decrease in its level in both groups along the five PODs. In addition, the levels of the draining fluid amylase in group II were statistically much higher than those in group I (Table 2). It is worth to mention that none of our patients developed clinical criteria of acute pancreatitis or pancreatic fistula.

The amylase level of the draining fluid was significantly higher in the three patients who developed subphrenic abscess than those who did not develop subphrenic abscess in the same group (Table 3).

None of the group I patients developed subphrenic abscess by the 10th POD and all patients were discharged from the hospital surgically free (Table 4). There was no perioperative mortality in either group.

Discussion

Subphrenic abscess is the old nightmare for surgeons going to perform splenectomy, especially in patients with portal hypertension. In this study, we hope to render this dreadful complication a historical one.

There were no statistically significant differences in patients and disease characteristics in our two groups, and this ensures perfect randomization and the absence of confounding factors in the research study.

The significantly lower values of the amylase concentration in the draining fluid in group I compared with group II on the first and third POD are certainly because of the dilution effect of the lavage fluid; however, the persistence of significant lower values in group I on the fifth POD after SBL was stopped, which may point to the effective washing of the enzymes out of the tissues by this technique.

Table 1 Patient characteristics in both groups

Patient characteristics	Group I (*N* = 25) [*n* (%)]	Group II (*N* = 19) [*n* (%)]	*P*
Age (years)	36.5 ± 12.5	39.3 ± 9.5	0.42
Male : female	16 : 9	12 : 7	0.95
Diabetes	3 (12)	2 (11)	0.87
Hypertension	1 (4)	0 (0)	0.37
Splenomegaly[a]			
Massive	17 (68)	13 (67)	0.93
Moderate	8 (32)	6 (33)	
Serum albumin[b]			
Normal	9 (36)	7 (37)	
Mild hypoalbuminaemia	14 (56)	11 (58)	0.94
Moderate hypoalbuminaemia	2 (8)	1 (5)	
Prothrombin time[c]			
Normal	10 (40)	7 (37)	0.93
Mild hypoprothombinaemia	12 (48)	9 (47)	
Moderate hypoprothombinaemia	3 (12)	3 (16)	
Thrombocytopaenia[d]			
Mild	20 (80)	15 (79)	0.93
Moderate	5 (20)	4 (21)	

[a]Massive splenomegaly, >1000 g in weight; moderate splenomegaly, 500–1000 g in weight; [b]Normal, serum albumin = 3.5–5 g%; mild hypoalbuminaemia, serum albumin = 3–3.5 g%; and moderate hypoalbuminaemia, serum albumin = 2.5–3 g%; [c]Normal, international normalizing ratio (INR) = 1–1.2; mild hypoprothombinaemia, INR = 1.2–1.7; and moderate hypoprothombinaemia, INR = 1.7–2.2; [d]Mild thrombocytopaenia, platelets count = 50 000–70 000/mm^3 and moderate thrombocytopaenia, platelets count = 20 000–50 000/mm^3.

Table 2 Amount and amylase level of the drain fluid in both groups

Drain fluids	Group I (n = 25)	Group II (n = 19)	P
Day 1			
Amount (ml)	1735 ± 35.25	509 ± 23	0.000
Amylase level (IU/l)	23.25 ± 5.25	156.4 ± 18.1	
Day 3			
Amount (ml)	1352.5 ± 25.5	120.2 ± 15.3	0.000
Amylase level (IU/l)	12.5 ± 13.0	73.6 ± 9.3	
Day 5			
Amount (ml)	25.25 ± 10.5	28.3 ± 9.5	0.000
Amylase level (IU/l)	6.5 ± 3.25	24.6 ± 8.3	

Table 3 Amylase concentration in the drain fluid among patients of group II

Drain fluid amylases	Patients who developed subphrenic abscess (n = 3)	Patients who did not develop subphrenic abscess (n = 16)	P
Day 1	153.3 ± 21	133.3 ± 13.2	0.03
Day 3	75.6 ± 12	59.7 ± 6.9	0.01
Day 5	31.6 ± 5.5	22.3 ± 7.1	0.04

Table 4 Incidence of subphrenic abscess in both groups

	Group I (n = 25)	Group II (n = 19)	P
Subphrenic abscess (by 10th POD)	0	3	0.041

POD, postoperative day.

Our results regarding the mean amylase level in the draining fluid in group II (156.4 and 73.6 U/l on the first and third POD, respectively) were much less than those recorded by Ugochukwu and Irving [2] (5542.7 and 6493.7 U/l on the first and third POD, respectively). This may be because of the greater care taken by surgeons nowadays to avoid pancreatic insult during splenectomy.

The statistically significant higher amylase levels in the draining fluid of patients who developed subphrenic abscess compared with those who did not develop it support the theory of the pancreatic enzymes incrimination in the causation of subphrenic abscess after splenectomy.

Subphrenic abscess never occurred in group I in which we used SBL technique, whereas three cases of subphrenic abscess were recorded in group II (the control group). This statistically significant difference points to the efficacy of this technique to avoid subphrenic abscess after splenectomy.

Conclusion

SBL is an effective technique to prevent subphrenic abscess after splenectomy in patients with portal hypertension. The technique not only prevents accumulation of blood clot or tissue debris in the subphrenic space, but also dilutes and washes out pancreatic ferments from the space. However, we should stress that this technique is not a substitute for meticulous surgery and perfect haemostasis.

Recommendation

We recommend performing this research on a wider scale of patients or multicentre study to judge the efficacy of this method.

In addition, we suggest studying the effect of pancreatic lipase rather than amylase in causation of subphrenic abscess. Theoretically, lipase is more harmful than amylase because of its action on fat globules or droplets on the splenic bed and release of the noxious free fatty acids.

Acknowledgements

Conflicts of interest

None declared.

References

1 Bhandarkar DS, Katara AN, Mittal G, Shah R, Udwadia TE. Prevention and management of complications of laparoscopic splenectomy. Ind J Surg 2011; 73:324–330.

2 Ugochukwu AL, Irving M. Intraperitoneal low pressure suction drainage following splenectomy. Br J Surg 1985; 72:247–248.

3 Romano F, Garancici M, Ciravegna AL, Uggeri F, Degrate L, Matenini M, Uggeri F. The implications for patients undergoing splenectomy: postsurgery risk management. Open Access Surg 2011; 4:21–34.

4 Johnson HA, Deterling RA. Massive splenomegaly. Surg Gynecol Obstet 1989; 168:131–137.

5. Hiatt JR, Gomes AS, Machleder H. Massive splenomegaly. Arch Surg 1990; 125:1363–1367.

6 Dantforth DN, Fraker DL. Splenectomy for the massively enlarged spleen. Am Surg 1991; 57:108–113.

7 Letoquart JP, La Gamma A, Kunin N, Grosbois B, Mambrini A, Leblay R. Splenectomy for splenomegaly exceeding 1000 grams: analysis of 47 patients. Br J Surg 1993; 80:334–335.

8 Aksnes J, Abdelnoor M, Mathisen O. Risk factors associated with mortality and morbidity after elective splenectomy. Eur J Surg 1995; 161:253–258.

9 Patel AG, Parker JE, Wallwork B, Kau KB, Donaldson N, Rhodes MR, *et al.* Massive splenomegaly is associated with significant morbidity after laparoscopic splenectomy. Ann Surg 2003; 238:235–240.

10 Terrosu G, Baccarani U, Bresadola V, Sistu MA, Uzzau A, Bresadola F. The impact of splenic weight on laparoscopic splenectomy for splenomegaly. Surg Endosc 2002; 16:103–107.

11 Cohn, LH. Local infections after splenectomy. Arch Surg 1965; 90:230–232.

12 Daoud FS, Fischer DS, Hafner CD. Complications following splenectomy with special emphasis on drainage. Arch Surg 1966; 90:32–34.

13 Cerise EJ, Pierce WA, Diamond DL. Abdominal drains: their role as a source of infection following splenectomy. Ann Surg 1970; 171:764–769.

14 Nora PF, Vanecko RM, Bransifield JJ. Prophylactic abdominal drains. Arch Surg 1972; 105:173–196.

15 Olsen WR, Beaudoin DE. Wound drainage after splenectomy. Am J Surg 1969; 117:615–620.

16 Slater H. Complications of splenectomy. Ann Surg 1973; 39:221–223.

17 Migaczewski M, Zub-Pokrowiecka A, Budzyński P, Matłok M, Budzyński A. Prevention of early infective complications after laparoscopic splenectomy with the Garamycin sponge. Wideochir Inne Tech Malo Inwazyjne 2012; 7:105–110.