Med. J. Cairo Univ., Vol. 89, No. 4, September: 1555-1567, 2021
www.medicaljournalofcairouniversity.net

Comparative Study between Anterior and Lateral Approaches of Laparoscopic Splenectomy

HISHAM OMRAN, M.D.; MAHMOUD A. EL-SHAFEI, M.D.; MARK M. LABIB, M.Sc. and HOSSAM S. ABD EL-RAHIM, M.D.

Endocrine Surgery Unit, General Surgery Department, Faculty of Medicine, A in Shams University

Abstract

Background: The primary basis of treatment for ITP and many hematological disorders was splenectomy. There are many approaches and techniques that have evolved for splenectomy. Reports of laparoscopic splenectomy began appearing in the literature in 1991 and 1992. Over time it has become the standard for elective splenectomy for both benign and malignant indications although open splenectomy remains perfectly acceptable for all indications as well. Laparoscopic splenectomy developed many techniques and approaches through last years, examples of these are anterior approach laparoscopic splenectomy, lateral approach laparoscopic splenectomy, single port laparoscopic splenectomy, hand assisted laparoscopic splenectomy (HALS).

Aim of Study: The goal of this study is to compare laparoscopic splenectomy anterior and lateral approaches, including operative time, blood loss, surgical complications, conversion to open surgery, postoperative morbidity, postoperative length of stay, number of trocars used and blood transfusion requirements in each approach.

Materials and Methods: The present study was a randomized controlled prospective study with 40 patients. Indicated for splenectomy at El-Demerdash Hospital between 2018 and 2020, splenectomy was done by the same surgical team. The 40 cases in our sample were obtained from Ambulatory Clinics in University Hospitals in Ain-Shams. The closed envelope system split the patients into two classes: Group 1 including 20 patients underwent laparoscopic splenectomy using anterior approach, group 2 including 20 patients underwent laparoscopic splenectomy using lateral approach. The inclusion criteria were all adult patients indicated for surgery, fit for anesthesia and consented to participate in the study, aged between 18 to 60 years with a diagnosis of: Hematological disorder (Idiopathic thrombocytopenic purpura ITP, Thrombotic Thrombocytopenic Purpura TTP, chronic hemolytic anemia except sickle cell disease), hydatid cyst, splenic tumor; as lymphoma, felty syndrome and sarcoidosis. We excluded patients with bleeding tendency due to causes other than ITP, patients with previous upper laparotomies, patients with generalized diseases that contra-indicates laparoscopic maneuvers, patients with huge splenomegaly with longitudinal axis more than 20cm and pregnancy.

Correspondence to: Dr. Hisham Omran, Endocrine Surgery Unit, General Surgery Department, Faculty of Medicine, Ain Shams University

Results: In the present study; there were statistically important ties between the types of approach used and both operative time and number of ports., we found that the lateral approach had a shorter operative time; as well as, the number of ports was less in lateral approach. On the contrary there was no statistically significant difference between two types of approach in terms of age, body mass index (BMI), gender, indication of surgery, complete blood count (CBC) findings, spleen size, blood loss, vascular or visceral injury, conversion to open surgery, hospital stay and post-operative complications (chest infection, wound infection, pancreatic leak and acute gastric dilatation).

Conclusion: We find that for laparoscopic splenectomy, the lateral approach has a greater intraoperative benefit than the anterior approach. The lateral solution was connected to much shorter operative times and a smaller number of ports.

Key Words: *Anterior – Lateral approaches – Laparoscopic splenectomy – Idiopathic thrombocytopenic purpura.*

Introduction

SINCE splenectomy was initially described for hereditary spherocytosis (HS) by Sutherland and Burghard in 1910 and for idiopathic thrombocytopenic Purpura (ITP) by Kanzelson in 1916, it has been well recognized as an effective cure for some hematologic disorders. Splenectomy remained the mainstay of treatment of ITP for more than 30 years until 1951, when Harrington et al., 1951 discovered the role of plasma immune globulin in the induction of thrombocytosis in ITP [1]. Medical management has since replaced surgery as the primary treatment of chronic ITP, although it was later demonstrated to be less effective than surgery, with a long-term remission rate of approximately 25% compared with 66% after splenectomy [1]. Referrals for splenectomy have been limited by the perceived risk of open surgery, despite the well-known adverse consequences of longstanding steroid use [1]. While open splenectomy has been performed since the 1500s, reports of laparoscopic

splenectomy began appearing in the literature in 1991 and 1992. Over time it has become the standard for the performance of elective splenectomy for both benign and malignant indications although open splenectomy remains perfectly acceptable for all indications as well. This technique was initially proposed for normally sized spleens, but recent reports demonstrating consistent success utilizing hand-assisted techniques and utilization of larger extraction bags make removal of very large spleens feasible using minimally invasive techniques as well. The most recent technique adaptations involve the use of robotics to perform the resection [2]. The benefits of minimally invasive resection of the spleen are similar to those of other solid organ resections (adrenal, pancreas, liver, kidney), allowing for smaller, less painful incisions, improved cosmoses, shorter hospitalization, earlier return to full activity, and a reduction of a variety of pulmonary and wound complications. The interpolar length of the normal spleen typically measures 7 to 11cm. An experienced operator can resect these spleens as well as moderately enlarged ones up to 20cm laparoscopically usually without a hand assisted technique [3]. Since medically stable patients who undergo uncomplicated laparoscopic splenectomy may be discharged from the hospital on the first postoperative day, there is the potential for significant cost savings that may offset the increased expense of longer operative procedures. Economic benefits also may be derived from the patients more rapid return to full activity and employment postoperatively [1]. Laparoscopic splenectomy developed many techniques and approaches through last years, examples of these are anterior approach laparoscopic splenectomy, lateral approach laparoscopic splenectomy, single port laparoscopic splenectomy, hand assisted laparoscopic splenectomy (HALS), robotic assisted laparoscopic splenectomy and natural orifice trans luminal endoscopic surgery (NOTES) with transvaginal route [4]. Laparoscopic splenectomy is especially challenging in most patients, both for technical reasons and because of the underlying disease process. Many patients with splenomegaly have associated hematological malignancies and are older, thus potentially complicating operative management. The surgical approach to these patients and consequent outcomes, therefore, deserve special consideration [5]. Several modifications in technique should be considered in approaching the patient with splenomegaly [5] the anterior or "supine" position was applied mostly in the early years of LS. This position allows for good access to the omental pouch. Difficulties arise in exposing and dissecting the ligamental structures as well as the dorsal vessels and the splenic hilum, with its close relationship to the tail of the pancreas [3]. The anterior position is indicated in case concurrent procedures need to be performed (e.g. cholecystectomy, lymph node biopsies, or biopsies of other organs). Then the table may be tilted to achieve a semi-lateral position, which facilitates the process of splenectomy. This position for concomitant procedures also can be achieved by putting the patient in a semi-lateral position and then tilting the table to the patient's left so that a supine position is reached. Some authors state that this approach may be advantageous in case of very large spleens. The splenic artery may be ligated early, thereby diminishing the risk of severe hemorrhage [3]. The description by Ganger and associates (1994) of the lateral approach to laparoscopic splenectomy has been a useful addition to the armamentarium of techniques that are necessary to successful undertake laparoscopic splenectomy for different hematological conditions and for spleens of various sizes. This approach is especially useful for safe excision of normal or slightly enlarged spleens without prior splenic artery ligation [1]. There are many reasons for this: (1) It allows dissection of the splenic vessels in the relatively avascular areolar tissue of the retro-peritoneum, and this is an easier access than that in the anterior approach. (2) It almost eliminates inadvertent trauma from instruments usually held by assistants to lift the lower pole of the spleen, as done in the anterior approach. In the lateral approach, little force is necessary to retract the spleen. Gravity is almost all that is required, as the spleen naturally will fall toward the left lobe of the liver and out of the way, permitting identification of the vessels and the tail of the pancreas after the lower portion of the phrenocolic ligament is sectioned. Because the phrenocolic ligament is so accessible in this approach, it can be dissected early, leaving a generous portion on the splenic side that can easily be grasped to manipulate the spleen. (3) With the lateral approach, it is much easier to distinguish and separate the gastro-splenic and lieno-renal ligaments to identify the anatomic structures that they contain. It is relatively easy to safely create windows through the ligaments to place clips or staples, especially above the tail of the pancreas. (4) The tail of the pancreas is more accessible to dissection, especially in its superior and posterior aspects, than in the anterior approach. (5) When one refrains from cutting the last portion of the phreno-colic ligament at the end of the procedure, there is more room in this position to insert the spleen in a plastic bag before extraction [1]. However, there are some disadvantages of the approach, (1) The anterior

approach is probably better suited to a situation in which concomitant surgery is needed, such as cholecystectomy. (2) Dealing with a large spleen is probably safer with prior splenic artery ligation and an anterior approach. (3) Performing complete exploration for accessory spleens is possibly more difficult by the lateral approach [1].

Patients and Methods

Pre-operative work up:

History was taken from all patients regarding their personal history, complaint, past history, family history, medical and surgical history. All patients were examined considering their vital signs, body built, abnormal discoloration and presence of lymphadenopathy. Abdominal examination was done including inspection for gynecomastia, dilated veins (caput medusae), ecchymosis and petechiae, visible masses and scars of previous operations. Palpation was done to detect any site of tenderness, any masses and to assess lower border of liver and splenic size. Percussion was done to confirm liver span and splenic size. Laboratory investigations were requested for all patients Including CBC, liver function test, renal function test and coagulation profile. Abdominal ultrasound was requested to assess liver size, splenic size and to determine if there are gall bladder stones or not. Hematological consultation was requested for all patients to elevate platelets to at least 50,000 * 10^6/L and to elevate hemoglobin to at least 1 0g/dl. Packed RBCs, fresh frozen plasma and platelets units were prepared for all cases. Triple vaccine was given to all patients two weeks preoperatively.

Procedure:

For the anterior approach, the patient was placed in supine position with reversed Trendelenburg position and tilting the table to the right side (Fig. 1). Abdominal insufflation was done by introducing the verrus needle in the palmer's point (left subcostal). We used four ports: A 10-mm umbilical port for the 30 laparoscope, a 12-mm port for the right working hand in the left hypochondrium at the anterior axillary line., a 5-mm port mid-way between xiphisternum and umbilicus at the midline for the left working hand and a 5-mm port below costal margin at the left anterior axillary line for assistance (Fig. 2).

We begin with mobilization of the splenic flexure of colon from the lower pole of spleen by dividing the lieno-colic and phrenico-colic ligaments (Fig. 3), then opening the gastro-colic ligament to access the lesser sac exposing the lieno-renal ligament, by the instruments gentle counter traction on visceral surface of the spleen laterally (Fig. 4).

Then division of, the anterior layer of lieno-renal ligament to reveal splenic vessels and pancreatic tail, then short gastric vessels are divided by dividing the gastro-splenic ligament by the ligasure to move the stomach fundus away from the spleen and mobilise the upper spleen pole (Fig. 5).

Then shifting posteriorly and gentle elevation of the lateral border of the spleen medially exposing and dividing the posterior layer of lieno-renal ligament up to the upper pole of the spleen (Fig. 6). The splenic vessels are divided by linear stapler using white cartridge (Fig. 7).

After stapling the splenic vessels, platelets were given. Accessory splenules were searched for in the hilum, greater omentum and pancreatic tail and systematically removed. The spleen is extracted through small pfannenstiel incision and a drain is inserted in the peritoneal cavity. A Ryle tube is inserted.

For the lateral approach, the patient was placed in the right lateral decubitus position for the lateral approach. To widen the gap between the left subcostal margin and the iliac crest, a flank sandbag was mounted below the right loin (Fig. 8). For the 30 laparoscopes, the initial 10-mm port was inserted 2-3cm below the costal margin at the midclavicular axis. Two additional ports were placed: A 5-mm port just below the costal margin for the left working hand at the left linea-semi lunaris in the epigastrium. A 12-mm port just below the costal margin at the left anterior axillary line for the right working hand (Fig. 9). Technique followed is the same as the anterior approach.

Post-operative follow-up: All patients were observed post-operatively in the ward. We gave patient nothing by mouth with Ryle kept inserted at least 24 hours to avoid gastric ileus. Drain was removed once output is less than 50ml per 24 hours. Dressing of the wound was done for all patients before discharge. Follow-up CBC was requested for all cases. In out-patient clinic all patients were given oral penicillin and instructed about symptoms and signs of post splenectomy sepsis, they were also instructed to go on oral aspirin if rebound thrombocytosis appeared during follow-up.

Study outcomes: For contrast, we reported the outcomes of all patients who underwent laparoscopic splenectomy using anterior and lateral ap-

proaches. Results were defined as surgical outcomes, such as surgical duration, blood loss, visceral or vascular damage, amount of trocars used with each approach, and open surgery conversion. Post-operative effects such as post-operative hospital stay, bleeding and complications such as chest infection, wound infection, pancreatic leakage and acute gastric dilation have also been reported.

Statistical analysis: Using the statistical package SPSS (Statistical Package for Social Sciences) version 25, the data collected was coded, tabulated and statistically analyzed. Continuous data were presented as mean ± SD (standard deviation) and minimum & range maximum, while categorical data were expressed as number and percentage. The meaning amount was taken at a value of $p<0.05$ and is significant, otherwise it is not significant. To compare continuous variables between the three sample classes, the independent *t*-test was used while the chi square test was used to compare categorical variables. The paired *t*-test was used to compare continuous variables between pre- and post-data for each patient.

Fig. (1): Showing patient positioning in the anterior approach in a reversed Trendelenburg-position with slight tilting of the table to the right.

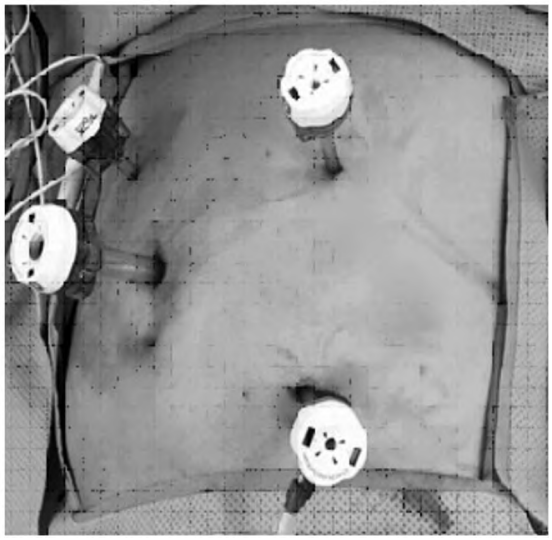

Fig. (2): Showing trocars placement in the anterior approach. A fourth working port may be added for liver retraction.

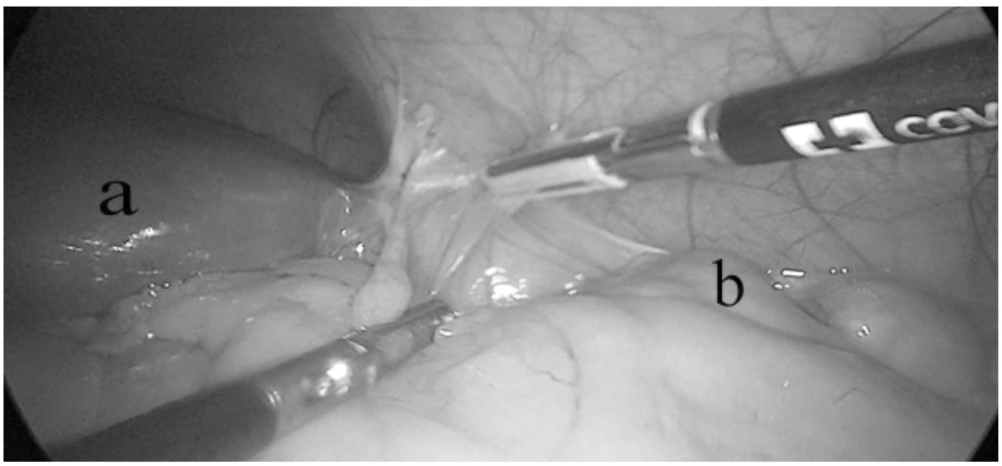

Fig. (3): Mobilization of the splenic flexure of the colon where (A) Is the spleen, (B) Is the beginning of the descending colon.

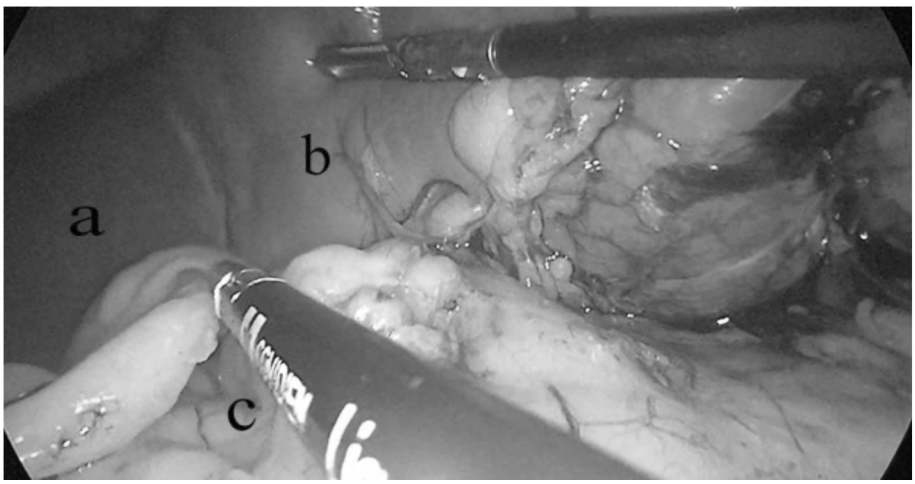

Fig. (4): Dissection of the gastro-colic ligament (greater omentum) to enter lesser sac and reach splenic hilum where (A) Is the left lobe of the liver, (B) Is the spleen and (C) Is the gastro-colic ligament.

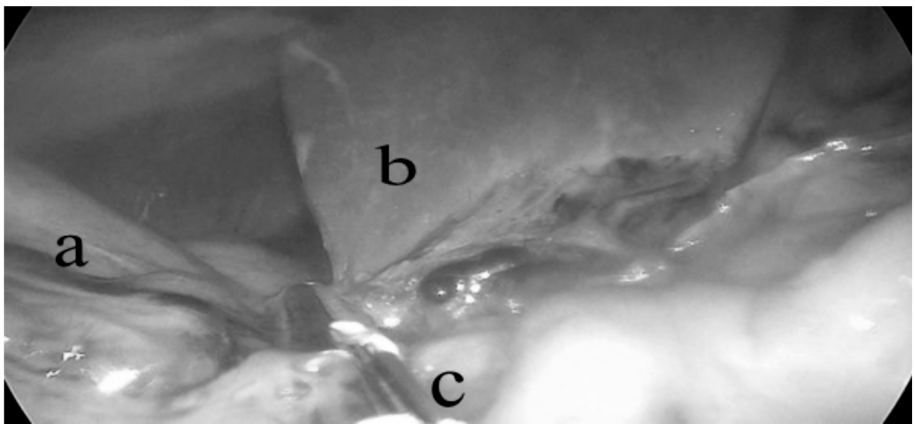

Fig. (5): Dissection of the gastro-splenic ligament to mobilize fundus of stomach away from the spleen where (A) Is the stomach fundus, (B) Is the spleen and (C) Is the gastro-splenic ligament containing short gastric vessels.

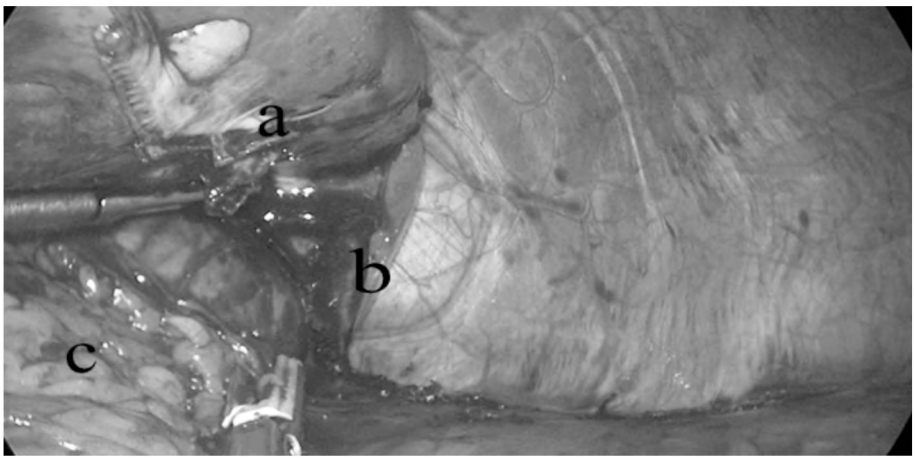

Fig. (6): Dissection of the posterior layer of the lieno-renal ligament to expose splenic vessels where (A) Is the spleen, (B) Is the posterior layer of lieno-renal ligament and (C) Is the fascia containing splenic vessels at the splenic hilum.

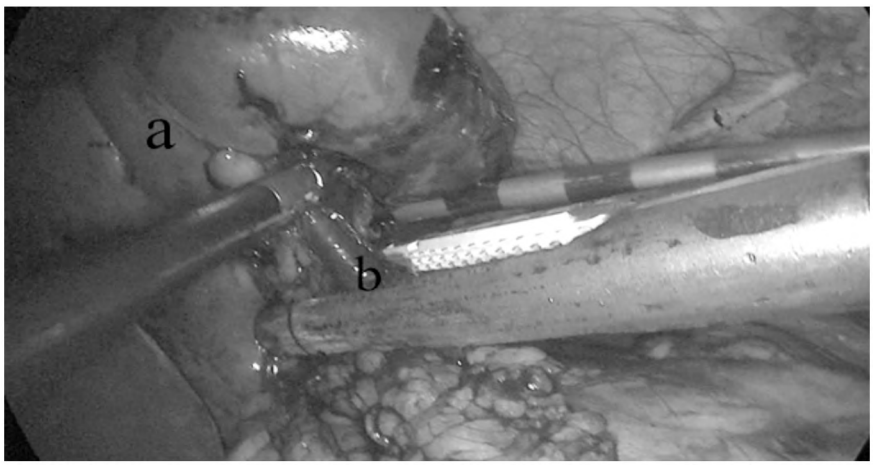

Fig. (7): Stapling of the splenic artery using white cartridge where (A) Is the spleen and (B) Is the splenic vessels.

Fig. (8): Showing patient positioning in lateral approach in right lateral decubitus.

Fig. (9): Showing trocars placement in the lateral approach.

Results

The mean age of the patients included in Group I was 21.45±4.8 years, half of whom were males. Although the mean age of the patients included in group 2 was 21.6±5.6 years and the majority of the patients were female, Table (1) indicates that there was no statistically significant difference in age, BMI, or gender in both groups.

Table (2) shows the association between type of procedure and indication. There were no statistically significant associations between type of procedure and presentation.

Table (3) shows the association between type of procedure and CBC findings. There were no statistically significant associations between type of procedure and hemoglobin, or platelet count.

Table (4) shows the association between type of procedure and spleen size. The relation between the type of approach and the size of the spleen was not statistically relevant (p=0.99).

Table (5) shows the association between type of procedure and operative characteristics. There were statistically significant associations between approach type and operating time and number of ports. On the contrary, there was no statistically meaningful correlation between the type of approach and blood loss or intraoperative complications or conversion to open surgery due to splenic damage.

Table (6) shows the association between type of procedure and post-operative outcomes. There were no statistically significant associations between type of procedure and hospital stay or bleeding or post-operative complications (chest infection, wound infection, pancreatic leak and acute gastric dilatation).

Table (1): The demographic characteristics of the included patients.

Variables	Group 1 (N=20)	Group 2 (N=20)	*p*-value
Age in years:			
Mean ± SD	23.77±4.8	23.04±5.6	0.83
Range	18-35	18-32	
Gender, No. (%):			
Male	10 (50%)	8 (40%)	0.47
Female	10 (50%)	12 (60%)	
BMI in Kg/m ^{2}:			
Mean ± SD	26.69±3.2	25.63±2.8	0.32
Range	20.9-33.4	19.8-30.3	

*Data are presented as mean ± SD, Range, or number (%).

Table (2): The indications of the included patients.

Variables	Group 1 (N=20)	Group 2 (N=20)	*p*-value
Indication, No (%):			
TTP	1 (5%)	0	0.69
HS	4 (20%)	6 (30%)	
ITP	13 (65%)	12 (60%)	
Thalassemia	2 (10%)	2 (10%)	

*Data are presented as mean ± SD, Range, or number (%).

Table (3): CBC findings of the included patients.

Variables	Group 1 (N=20)	Group 2 (N=20)	*p*-value
Hemoglobin (g/dL):			
Mean ± SD	11.96± 1.2	12.22±0.85	0.32
Range	10-15	10.8-14	
Platelet count (%):			
Mean ± SD	174.1±99.1	201.25± 108.2	0.95
Range	77-470	90-440	

*Data are presented as mean ± SD, Range, or number (%).

Table (4): Spleen Size of the included patients.

Variables	Group 1 (N=20)	Group 2 (N=20)	*p*-value
Spleen size (cm):			
Mean ± SD	11.16± 1.5	11.41± 1.49	0.99
Range	8.2-17.5	8.4-17.8	

*Data are presented as mean ± SD and range.

Table (5): Operative outcomes of the included patients.

Variables	Group 1 (N=20)	Group 2 (N=20)	*p*-value
Operative time in min:			
Mean ± SD	149.5 ± 17.9	131.7± 12.1	<0.001
Range	130-190	110-157	
Number of ports:			
3 ports	2 (10%)	16 (80%)	<0.001
4 ports	18 (90%)	4 (20%)	
Blood loss in mL:			
Mean ± SD	105.7± 19.8	98.99±21.8	0.059
Range	75-147	70-140	
Vascular or visceral injury, No (%):			
No	18 (90%)	19 (95%)	1
Yes	2 (10%)	1 (5%)	
Conversion, No. (%):			
Yes	2 (10%)	1 (5%)	0.776
No	18 (90%)	19 (95%)	

*Data are presented as mean ± SD, Range, or number (%).

Table (6): Association between type of procedure and postoperative outcomes.

Variables	Group 1 (N=20)	Group 2 (N=20)	*p*-value
Hospital stay (days):			
Mean ± SD	3.1± 1.6	2.8±1	0.93
Range	2-5	2-4	
Post-operative bleeding, No (%)	1 (5%)	0 (0%)	0.77
Postoperative Complications, No (%):			
Chest infection	1 (5%)	2 (10%)	1
Wound infection	1 (5%)	1 (5%)	
Pancreatic leak	0 (0%)	0 (0%)	
Acute gastric dilatation	1 (5%)	0 (0%)	

*Data are presented as mean ± SD, Range, or number (%).

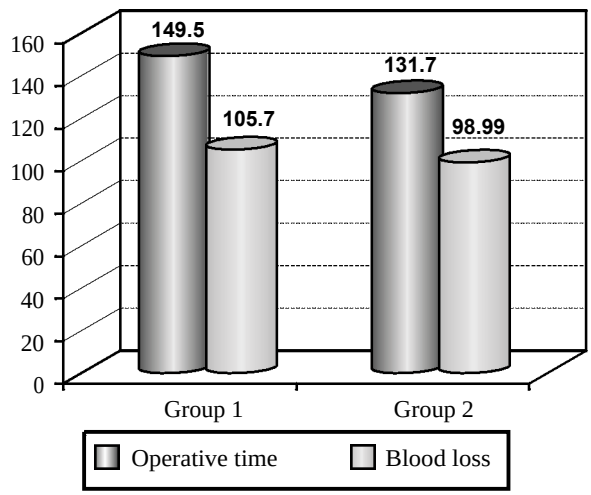

Fig. (10): Comparison between group 1 and group 2 regarding operative time and blood loss.

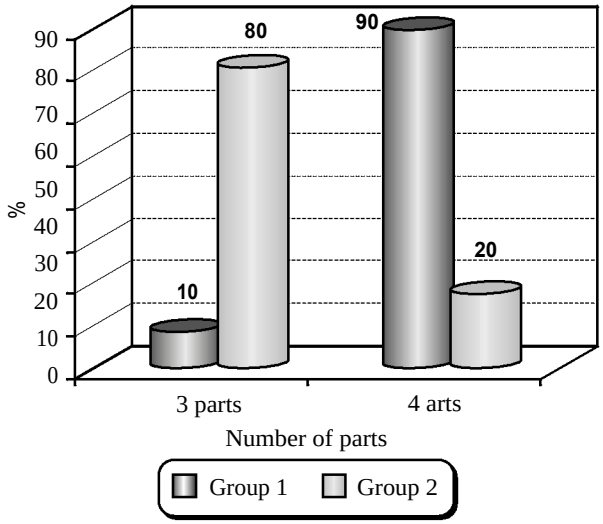

Fig. (11): Comparison between group 1 and group 2 regarding number of ports at 3 and 4 ports.

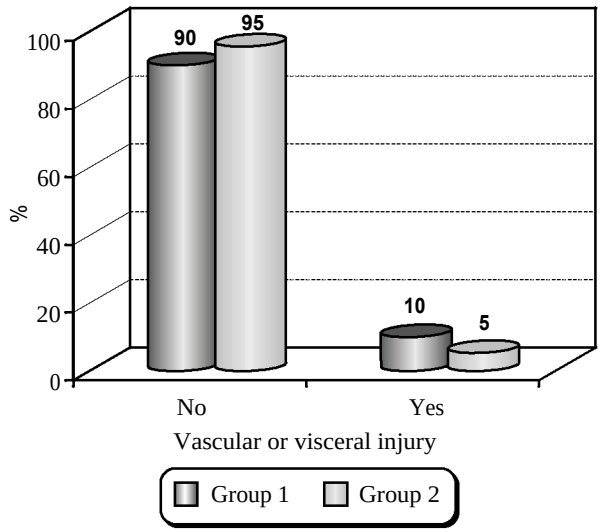

Fig. (12): Comparison between group 1 and group 2 regarding vascular of visceral injury.

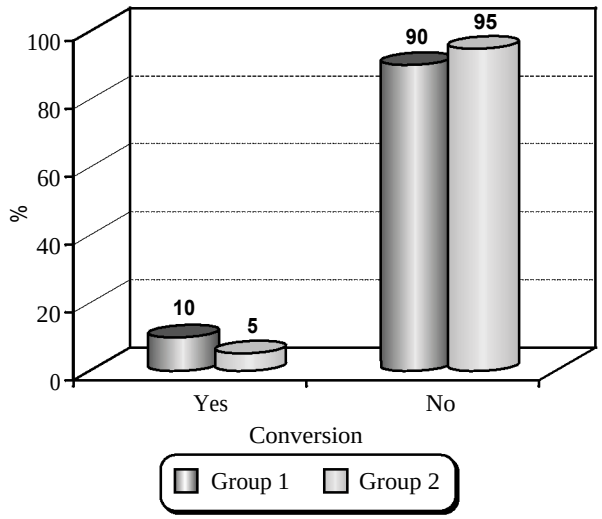

Fig. (13): Comparison between group 1 and group 2 regarding conversion.

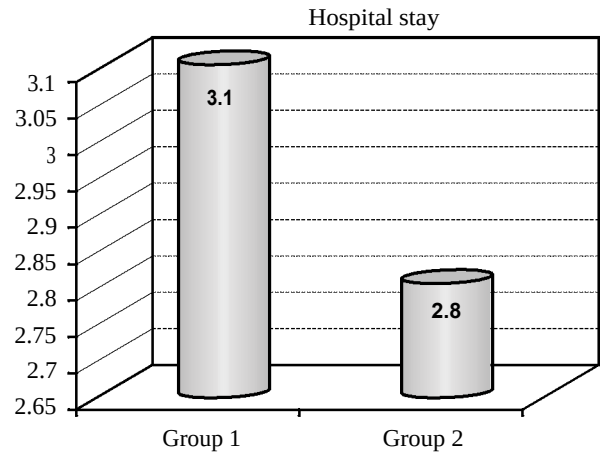

Fig. (14): Comparison between group 1 and group 2 regarding hospital stay.

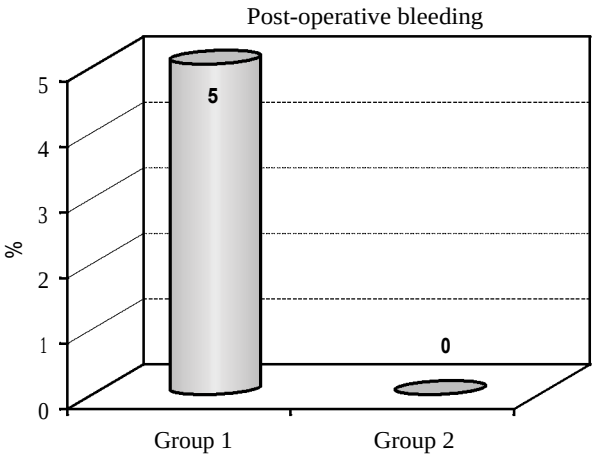

Fig. (15): Comparison between group 1 and group 2 regarding post-operative bleeding.

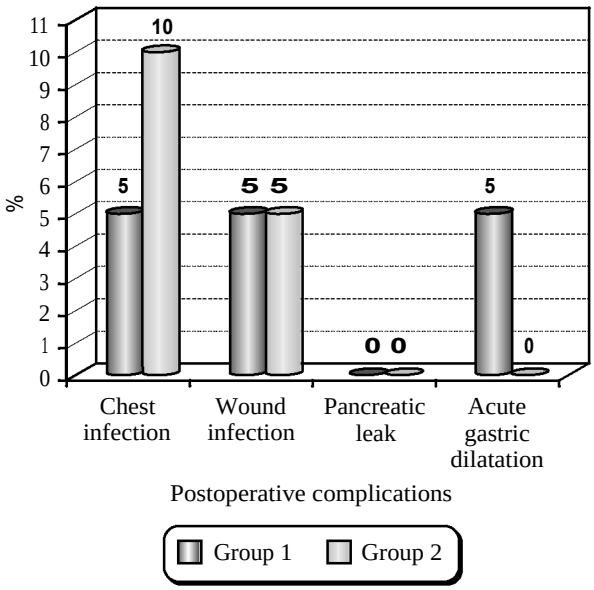

Fig. (16): Comparison between group 1 and group 2 regarding postoperative complications.

Discussion

Minimal invasive surgical procedures have been commonly used for various operations in General Surgery since the late 80's. The causes that laparoscopy has now become the preferred solution for many surgical procedures are less intraoperative bleeding, subordinate postoperative pain, shorter hospital stay, and improved cosmetic outcomes. Therefore, since 1991, when Delaitre and Maignien first described it, laparoscopic splenectomy has been generally recognised as a secure and feasible procedure for most cases of splenectomy [6].

Nonetheless, in most patients, laparoscopic splenectomy is extremely difficult, both for technical reasons and because of the underlying process of the disease. Many patients with splenomegaly have related haematological malignancies and are older, making surgical management potentially difficult. Therefore, the surgical approach to these patients and consequent findings merit special consideration [7].

Different approaches [standard laparoscopic approach (anterior, semi-lateral and lateral), hand-assisted laparoscopic surgery (HALS), single-incision laparoscopic splenectomy] and different patient positions have been reported since the first cases were carried out. In many cases, each of these methods offers advantages and the choice depends on the surgeon's preference in certain instances. The lateral approach to laparoscopic splenectomy has the benefit of improved visualization of the pancreatic splenic hilum and tail, thereby preventing injury and improving ligament dissection. In the event that conversion to open surgery is necessary, a subcostal incision may be used [8].

Recently, many studies highlighted effectiveness and safety of lateral approach; nonetheless, these studies are limited to specific diagnosis, although the splenectomy population is very heterogeneous, making these results difficult to extrapolate to the entire cohort of subjects with diverse indications for splenectomy. Thus, we conducted the present study in order to make a distinction between laparoscopic splenectomy anterior and lateral approaches, including surgical time, blood loss, surgical complication, open surgery conversion, postoperative morbidity, postoperative duration of stay, number of trocars used in each approach.

The present study was a prospective randomized controlled trial, involving 40 patients done by the same surgical team for splenectomy at El–Demerdash Hospital between 2018 and 2019. The closed envelope system split the patients into two classes:

- Group 1 including 20 patients underwent laparoscopic splenectomy using anterior approach.
- Group 2 including 20 patients underwent laparoscopic splenectomy using lateral approach.

The mean age of the included patients in group 1 was 21.45±4.8 years and half of patients were males. While the mean age of the included patients in group 2 was 21.6±5.6 years and the majority of patients were females (60%). The BMI in group 1 was 26.69±3.2, while in group 2 was 25.63 ±2.8.

In line with our findings, a previous study in 2007 recruited 27 patients who underwent splenectomy performed by the same surgical team between October 1999 and March 2006. The mean age of the patients was 29 years old and there was slight female predominance [9].

Likewise, a study in 2009 reviewed the Records of 150 patients undergoing splenectomy over a period of thirteen years. The median age was 29.5±24.11 years, but most patients were males [10].

Previous study similar to ours was done in Mansoura faculty of medicine. The study compared prospectively anterior versus lateral approach for laparoscopic splenectomy. 94 patients with splenomegaly were referred to the surgical unit at the Oncology Center of the University of Mansoura, Egypt, between September 2011 and April 2015. 14 patients were excluded due to splenomegaly and associated gall bladder stones. The remaining patients were divided into two groups: 40 patients underwent LS using anterior approach and 40 patients underwent LS using lateral approach. Patients BMI in the group underwent LS using anterior approach was 29.95 ±5.06 and BMI of patients of lateral approach was 32.45 ±4.49. No significant association between BMI and approaches used was found in accordance with the results of our study [2].

The most common indication of splenectomy in our study was immune thrombocytopenia in 13 patients in group 1 (65%) and 12 patients in group 2 (60%), followed by heriditary spherocytosis in 4 patients in group 1 (20%) and 6 patients in group 2 (30%) and thalassemia in 2 patients in group 1 (10%) and 2 patients in group 2 (10%).

A 2005 trial examined the safety and usefulness of laparoscopic splenectomy for a variety of splenic disorders in line with our results, the authors reviewed 8 years of experience through retrospective

chart analysis. There were a total of 131 laparoscopic splenectomy patients. 63 idiopathic thrombocytopenic purpura (ITP), 23 malignancies and 12 thrombotic thrombocytopenic purpura were included in the pathology (TTP), 10 autoimmune hemolytic anemias (AIHA), and 23 others [11].

In the present study there was no statistically significant association between type of procedure and hemoglobin concentration or platelets count. The HG concentration was 11.96±1.2g/dl in group 1 and platelets count was 174.1 ±99.1/mm^3, while in group 2 the HG concentration was 12.22± 0.85g/dl and platelets count was 201.25±108.2/ mm^3.

In agreement with our results, In previous studies, Laparoscopic splenectomy was performed in patients with surgical spleen disorders scheduled for elective LS between March 2005 and June 2011 via posterolateral and anterior approach in hepatobiliary and pancreatic surgery department in the first Bethune hospital at Jilin university, the study showed that there was 27 anemic patients out of 145 (71.4%) patients in the group underwent splenectomy using anterior approach, while in the lateral approach there was 29 anemic patients out of 58 (28.6%) patients in the group using lateral approach. There was no statistically significant association between HG concentration and the type of approach [4].

Likewise a previous study was done in Hospital Clinic at university of Barcelona in 1995, 10 patients underwent LS using anterior approach (group 1) and 17 patients underwent LS using lateral approach (group 2). The study showed that there was no significant association between type of procedures and platelet count as in the both anterior and lateral approach groups, the number of preoperative platelets ranged from 5,000 to 102,000 /mm^3 [12].

In our study there was no significant between type of procedure and splenic size as in group 1 the splenic size was 11.16±1.5cm, while in group 2 it was 11.41±1.49cm. In agreement with us, the previous study in Mansoura University showed that there was no association between type of procedure and splenic size as the spleen diameter was 15.60±3.93 in the anterior approach group, while in the group of the lateral approach it was 15.85±2.37 with a p-value less than 0.005 [2].

In the present study, there were statistically important correlations between the type of approach and both the operative time and number of ports used. On the contrary, the correlation between the type of approach and blood loss, vascular or visceral damage and conversion to open surgery was not statistically important. In group 1 the operative time was 149.5±17.9 mins and we used an accessory 4th port in 18 (90%) of patients, the blood loss was 105.7±19.8ml, vascular injury happened in 2 patients which demanded conversion to open surgery. In group 2 the operative time was 131.7 ±12.1 mins and we used an accessory 4th port in 4 (20%) of patients, the blood loss was 98.99 ± 21.8ml, vascular injury happened in 1 patient which demanded conversion to open surgery.

In agreement with our findings, the Jilin University trial showed Significantly shorter operating time (65.0±12.3min vs. 95.0±21.3min, p<0.01) and decreased intraoperative blood loss (200.0 ± 23.4mL vs. 350.0±45.2mL, p<0.01) were correlated with the posterolateral method. In the anterior approach group, the conversion to open surgery was 2.1 percent, while in the lateral approach group there was no conversion to open surgery [4].

Likewise, Mansoura Faculty of Medicine study showed that the lateral approach was associated with significantly shorter operation time (150.50 ± 62.70min vs 200±56.57min). In addition, the lateral approach had a borderline significantly lower blood loss (179.50±155.88ml vs 283.00±176.79ml). Of the 80 patients, 12 (15%) required conversion to laparotomy, including 4 patients in the ALS group and 2 in the LLS group who developed intraoperative uncontrolled bleeding, 4 in the ALS group who had peri-splenic adhesions, and 2 in the LLS group owing to a focal lesion at the splenic hilum, preventing visualization of the pedicle [2].

Hospital clinic study report showed similar findings to our analysis. A significantly lower number of trocars (4.5 ±0.5 vs 4±0.5, p<0.05) and a significantly shorter operation period (235 ±24min vs 159±75min, p<0.03) were performed with LS through lateral approach. Conversion to open surgery in the anterior approach group was needed in two patients with ITP and HIV thrombocytopenia following splenic vessel ligature and full spleen mobilization due to difficulties in managing oozing bleeding from the peritoneal surface of the splenic bed [12].

Lateral approach enables dissection of the splenic vessels through the comparatively avascular retro-peritoneal areolar tissue. The lateral method makes it much simpler to differentiate and isolate the gastro-splenic and lieno-renal ligaments in order to recognize the anatomical structures they contain. It is relatively easy to safely create win-

dows through the ligaments to place clips or staples, especially above the tail of the pancreas.

On the contrary, other studies aimed at comparing surgical complications of laparoscopic splenectomy in anterior versus lateral approaches in infants. Between January 1993 and December 2009, the authors checked 84 medical reports of patients operated on for haematological illnesses. Splenectomy was done in 47 patients using anterior approach and in 37 patients using lateral approach. Between the two categories, operating time, blood loss and hospital stay were not different. In intraoperative complications, the lateral approach was beneficial to the anterior approach. In the anterior group (9 cases) Operative complications included haemorrhages. (5), bowel injury (1), diaphragmatic injury (1), injury to tail of the pancreas (1), and parietal hematoma (1) versus 1 lateral group haemorrhage (p<.02). Conversion to open surgery was done in 5 cases in the anterior Group: Four for management of haemostasis and one for bowel resection. There was no conversion to open surgery in the lateral group. The statistical significance was reached between the two groups regarding conversions to laparotomy for surgical complications **[13]**.

Different epidemiological features, such as the age of the patients, different sample sizes, and differences in the experience of surgeons, can be related to the exact cause of this discrepancy. The lateral method almost removes inadvertent trauma from equipment normally carried by assistants to raise the lower spleen pole. Little force is needed in the lateral approach to retract the spleen. Gravity is almost all that is required, as the spleen will naturally fall to the left liver lobe and out of the way, allowing the vessels and tail of the pancreas to be identified after sectioning the lower portion of the phreno-colic ligament. Since this technique makes the phreno-colic ligament so accessible, it can be dissected early, leaving a generous section on the splenic side that can be quickly grasped to manipulate the spleen. The tail of the pancreas, especially in its superior and posterior aspects, is more accessible for dissection than in the anterior approach **[14]**.

In the present study, there were no statistically correlations between the type of approach regarding post-operative hospital stays, bleeding or complications after surgery (chest infection, wound infection, pancreatic leak and acute gastric dilatation). The mean of hospital stay was 3.1 ± 1.6 days in group 1 vs 2.8± 1 days in group 2. Post-operative complications in group 1 was 1 chest infection, 1 wound infection and 1 acute gastric dilatation (3 cases) and in group 2 there were 2 chest infection and 1 wound infection (3 cases).

On the contrary to our findings, **[4]** the posterolateral approach was reported to be associated with a considerably shorter hospital stay (5.0 ±2.0 days vs 9.0±3.0 days, p<0.001). The level of pancreatic leakage following LLS was marginally lower (0.0 percent [0/58] vs. 3.4 percent [5/145], p=0.324) than following ALS.

Likewise, **[2]** showed that the mean length of hospital stay was statistically significant in the LLS group than in the ALS group (4.2 ± 1.4 days vs. 7.2±2.09 days, respectively, p=0.00 1). Assessments of postoperative morbidity showed that 2 patients who underwent ALS developed splenic bed collections, which were treated by US-guided aspiration, and another 2 cases developed pancreatic leakage 3 days after surgery, which was treated conservatively for 1 week. Two patients who underwent LLS developed portal vein thrombosis and were treated with low-molecular-weight heparin, and another 2 cases developed pneumonia and were controlled with antibiotics.

In hospital clinic study, Postoperative stay was substantially longer in group I (6.5 ± 3.6 vs 4±2, p<0.05). A postoperative complication occurred in three patients in group I (30%): Lung atelectasis in two cases and abdominal wall hematoma in ITP-affected patients who did not immediately react to splenectomy. In group II, after unintended perforation of the diaphragm during the mobilization of the splenic flexure of the colon, one patient developed pneumothorax. A postoperative febrile syndrome developed in two patients, one as a result of the reactivation of pulmonary tuberculosis in an HIV patient and another secondary to bronchial hypersecretion without lung consolidation. Following a minor tear in the left suprarenal gland, one patient needed to be re-operated on for a hemoperitoneum **[12]**.

Again, the exact cause of such difference may be attributed to different epidemiological characteristics, such as age of the patients, different sample sizes, and variations in surgeons' experience.

Conclusion:

We found that the lateral approach has more intraoperative advantage for laparoscopic splenectomy in comparison to the anterior approach. Although there were no statistically significant associations between the type of approach and blood loss, vascular or visceral damage, conversion to

open surgery, post-operative blood loss, hospitalisation and post-operative complications, the lateral approach technique was associated with substantially shorter operating times and a reduced number of ports.

References

1- WAEL N., MAGED S., HADY G. and SALAH A.: Laparoscopic splenectomy versus open splenectomy in the treatment of some hematological disorders Cairo University, 48667.CD, 2008.

2- ADEL F., OSAMA E., OSAMA B., ADEL D., TAMER F., FAYEZ S., ASHRAF K., WALEED E., SAMEH R., OMAR F., AHMED S., EMAD H. and AHMED S.: Lateral versus anterior approach laparoscopic splenectomy a randomized controlled study El Mansoura University surgical laparoscopy, endoscopy and advanced techniques, DOL: 10.1097, 2016.

3- KARIM G., AMR A. and AHMED A.: Assessment of hand port assisted laparoscopic splenectomy for massive and supramassive splenomegaly. Cairo University, 53886.CD, 2010.

4- BAI J., YINGCHAO W., PING Z., GUANGYI W. and YAHUI L.: Anterior Versus Posterolateral Approach for Total Laparoscopic Splenectomy: A Comparative Study. International Journal of Medical Science, 10 (3), 2013.

5- YASSER I., SAMIR A., MOUSTAFA A. and MOHAMED H.: Laparoscopic splenectomy benefits and complications. Cairo University, 50903.CD, 2008.

6- SCHIZAS D., KATSAROS I., KARATZA E., KYKALOS S., SPARTALIS E., TSOUROUFLIS G., DIMITROULIS D. and NIKITEAS N.: 'Concomitant Laparoscopic Splenectomy and Cholecystectomy: A Systematic Review of the Literature', Journal of Laparoendoscopic and Advanced Surgical Techniques. Mary Ann Liebert Inc., 730-736, 2020.

7- GARZI A., ARDIMENTO G., FERRENTINO U., BRONGO S., DI CRESCENZO R.M., CALABRÒ E., RUBINO M.S. and CLEMENTE E.: 'Laparoscopic Splenectomy: Postero-Lateral Approach.', Translational medicine @ UniSa. Università Degli Studi di Salerno, 20: 9-12, 2019.

8- FERNÁNDEZ-ANANÍN S., PONZ C.B., FORGIONE A. and TARGARONA E.M.: 'Lateral approach for laparoscopic splenectomy', Annals of Laparoscopic and Endoscopic Surgery, 4, 2019.

9- BAÚ P., CAVAZOLLA S.A., SOUZA H.P. and GARIC-OCHEA B.: 'Preoperative embolization of the splenic artery in patients that underwent splenectomy for immune thrombocytopenic purpura', Acta Cirurgica Brasileira. Acta Cirúrgica Brasileira/SOBRADPEC, 22: 470-473, 2007.

10- MACHADO N.O., GRANT C.S., ALKINDI S., DAAR S., AL-KINDY N., AL LAMKI Z. and GANGULY S.S.: 'Splenectomy for haematological disorders: A single center study in 150 patients from Oman', International Journal of Surgery. Elsevier, 7: 476-481, 2009.

11- POMP A., GAGNER M., SALKY B., CARACCIO A., NAHOURAII R., REINER M. and HERRON D.: 'Laparoscopic splenectomy: A selected retrospective review', Surgical Laparoscopy, Endoscopy and Percutaneous Techniques. Lippincott Williams and Wilkins, 139-143, 2005.

12- M. TRIAS, E.M. TARGARONA and C. BALAGU C.: Laparoscopic splenectomy: An evolving technique A comparison between anterior and lateral approaches Surg. Endosc., 10: 389-392, 1996.

13- PODEVIN G., VICTOR A., DE NAPOLI S, HELOURY Y. and LECLAIR M.D.: 'Laparoscopic Splenectomy: Comparison Between Anterior and Lateral Approaches', Journal of Laparoendoscopic & Advanced Surgical Techniques. Mary Ann Liebert, Inc. 140 Huguenot Street, 3 rd Floor New Rochelle, NY 10801 USA, 21: 865-868, 2011.

14- CHENG H., CLYMER J.W., PO-HAN C.B., SA-DEGHIRAD B., FERKO N.C., CAMERON C.G. and HINOUL P.: 'Prolonged operative duration is associated with complications: A systematic review and meta-analysis', Journal of Surgical Research. Academic Press Inc., 134-144, 2018.

دراسة مقارنة بين المأتى الأمامى والمأتى الجانبى فى استئصال الطحال بالمنظار

الهدف من هذه الدراسة: المقارنة بين المأتى الأمامى والجانبى لاستئصال الطحال بالمنظار من حيث مدة الجراحة وعدد المبازل المستعملة وكمية النزيف والمضاعفات الجراحية والتحول إلى الجراحة المفتوحة، وفترة الإقامة بالمستشفى ما بعد الجراحة ومضاعفات ما بعد الجراحة.

المرضى والطرق: تمثل هذه الدراسة دراسة مستقبلية عشوائية محكمة تم اجراؤها على المرضى المترددين على قسم الجراحة العامة بمستشفيات جامعة عين شمس ويعانون من أمراض الطحال التى تحتاج لاجراء جراحة استئصال الطحال وتم تقسيم المرضى إلى مجموعتين بطريقة الاظرف المغلقة :

- المجموعة الأولى ٢٠ مريض سيتم استئصال الطحال لهم بالمأتى الأمامى.
- المجموعة الثانية ٢٠ مريض سيتم استئصال الطحال لهم بالمأتى الجانبى.

مدة هذه الدراسة كانت عام تم فيه عمل ملاحظة وتدوين لبيانات المجموعتين المجموعة التى تم فيها استئصال الطحال من المأتى الأمامى والمجموعة التى تم فيها استئصال الطحال من المأتى الجانبى مع المقارنة بين المجموعتين من حيث :

نتائج أثناء الجراحة مدة الجراحة عدد المبازل المستعملة كمية النزيف إصابة الطحال التحول إلى الجراحة المفتوحة.

نتائج ما بعد الجراحة فترة الاقامة بالمستشفى ما بعد الجراحة المضاعفات ما بعد الجراحية المحتملة الحدوث مثل عدوى الجهاز التنفسى والجروح والتسريب البنكرياسى وتمدد المعدة الحاد.

النتائج: فى المجموعة ١: تم استعمال ٤ مبازل فى ١٨ مريض ٩٠٪ من الحالات ومتوسط وقت الجراحة ١٤٩ دقيقة ومتوسط كمية النزيف ١٠٥ مل وتم التحول إلى الجراحة المفتوحة فى ٢ من المرضى ١٠٪ من الحالات نتيجة لإصابة الطحال وتم تسجيل مضاعفات ما بعد الجراحة فى عدد ٣ من المرضى ١٥٪ من الحالات ومتوسط الإقامة بالمستشفى ٣ أيام.

فى المجموعة ٢: تم استعمال ٣ مبازل فى ١٦ مريض ٨٠٪ من الحالات ومتوسط وقت الجراحة ١٣٠ دقيقة ومتوسط كمية النزيف ١٠٠ مل وتم التحول إلى الجراحة المفتوحة فى ٢ من المرضى ١٠٪ من الحالات نتيجة لإصابة الطحال وتم تسجيل مضاعفات ما بعد الجراحة فى عدد ٣ من المرضى ١٥٪ من الحالات ومتوسط الإقامة بالمستشفى ٣ أيام.

الخاتمة: بناءا على النتائج السابقة تبين أنه يوجد ارتباط ذو دلا لة إحصائية بين نوع المأ تى ووقت الجراحة وعدد المبازل المستعملة وعلى النقيض تبين أنه لا يوجد ارتباط ذو دلالة إحصائية بين نوع المأتى وكمية النزيف أو المضاعفات الجراحية أو التحول إلى الجراحة المفتوحة نتيجة لإصابة الطحال أو المضاعفات ما بعد الجراحة أو فترة الإقامة بالمستشفى.