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Prospective Study of Outcomes of Laparoscopic Versus Open Splenectomy in Hematological and Benign Splenic Diseases

General Surgery

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ABSTRACT

Background: In the last 20 years, laparoscopic surgery has advanced at a remarkable pace. The standard for the management of hematologic diseases of the spleen is laparoscopic splenectomy (LS).

Aim of the work: To evaluate laparoscopic and open splenectomy patients in terms of operating time, intraoperative complications, hospitalization length, and duration to return to normal activities.

Patients and methods: Twenty patients with hematological and benign splenic disorders were included in prospective research at Al-Azhar University Hospitals (Al-Hussein and Sayed Galal). They were divided into groups at random by picking every two patients and assigning one to group (A) and the other to group (B), with each group consisting of ten patients. Group (A) undergo laparoscopic splenectomy. Group (B) undergo open splenectomy.

Results: There is significant reduction in the hospital stay between both group (P=0.00). Patients in lap group were dismissed from the hospital on the 2nd postoperative day (8cases), but (2cases) were discharged on the 3rd day as they were converted to open surgery with median stay in hospital 1.3 days.

Conclusion: LS are efficient in producing the desired therapeutic response in patients with suitable indication for splenectomy. The operative times for Laparoscopic splenectomy are longer than those for OS but they tend to decrease with experience. The intraoperative blood loss and complications of LS are generally better than those reported for OS.

Keywords: *outcomes; Laparoscopic; open splenectomy; hematological; splenic diseases.*

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INTRODUCTION

In the last 20 years, laparoscopic surgery has advanced at a remarkable pace. The gold standard for the management of hematologic diseases of the spleen is laparoscopic splenectomy (LS).[1]

Laparoscopic splenectomy (LS) was often used to treat benign and malignant disorders, as well as normal or slightly enlarged spleens. Several studies published in the last several years have proved its feasibility, safety, and effectiveness, as well as certain benefits over open splenectomy, such as less postoperative discomfort, a shorter hospital stay, and a quicker resumption to normal activities.[2]

Exchange rates in significant series range from 2% to 10%, with splenomegaly and uncontrolled hemorrhage from the splenic hilum being the most common reasons for converting to open splenectomy.[3]

The technique to hilar vessels can be challenging due to vascular risk, particularly when the pancreas tail is tightly adhered to vascular pedicles or main branches split far away from the spleen, and dissection without splenic tractions is suggested to prevent incidental bleeding, which can be difficult to treat during laparoscopy. The median intraoperative blood loss is considerable in several studies.[4]

The goal of the research was to assess laparoscopic and open splenectomy patients in terms of operating time, intraoperative complications, hospital stay, and time to return to normal activities.

PATIENTS AND METHODS

Twenty patients with hematological and benign splenic disorders were included in prospective research at Al-Azhar University Hospitals (Al-Hussein and Sayed Galal). They were divided into groups at random by picking every two patients and assigning one to group (A) and the other to group (B), with each group consisting of ten patients. Group (A) undergo laparoscopic splenectomy. Group (B) undergo open splenectomy

Methods of study:

Patient's history: Full detailed history was taken from each of the included patients was including name, age, gender, employment, place of residence, and any medically important habits.

General examination: A thorough examination was conducted for each patient stressing revision of all systems of the body.

Local examination: Local abdominal examination.

Preoperative Investigations:

Laboratory: Tests for liver functions: Total and direct bilirubin and alanine transaminase, aspartate transaminase and alkaline phosphatase, blood urea and serum creatinine, complete blood picture including the hematocrite value, fasting blood sugar and coagulation profile: Prothrombin time, concentration and INR, Bleed length, coagulation time and activated partial thromboplastin time.

Imaging: Abdominal ultrasound examination was requested for each patient included in this study. The morphology of the spleen, its major longitudinal axis was measured. Any other abdominal lesions e.g., liver cirrhosis, ascites or gall stones were documented.

Inclusion criteria: Gender: Both males and females, age: more than 16 years old, heamatological diseases (sphyrocytosis, idiopathic thrombocytopenic purpur ITP, hypersplenism) unresponsive to medical treatment and benign splenic focal lesions

Exclusion criteria: Malignant lesion of spleen, splenectomy due to trauma or other nonhematologic conditions **and** splenectomy during gastric cancer surgery

Preoperative management: Vaccination were given to all patients under the age of 25ys in the form of polyvalent pneumococcal, meningococcal, hemophilus influenze vaccinations, at least one week before surgery. Prophylactic antibiotics one day pre operative usually in the form of parenteral third generation cephalosporin

Operative Techniques:

All surgeries were carried out by consultant's two assistants**:**

Open Splenectomy: Mobilization of spleen: Open Splenectomy was carried out using the standard technigue employing LT subcostal incision. **Division of splenic vessels:** The tail of the pancreas is gently pushed aside by gauze stripping, which may partly conceal the arteries. The artery and vein are split independently using clamps or ligatures after a finger is passed beneath the vascular pedicle. Because the vessels are very fragile and easily damaged, gentle handling is needed. **Post operative care:** Blood transfusions may be necessary after surgery if acute anemia is diagnosed. Thrombocytosis may develop during the first 10 days; it is important that blood specimens are taken to evaluate this so that the condition can be treated with Aspirin if it occurs. Any patient following splenectomy is in danger from major postoperative sepsis. Careful observation is therefore required and, if present, the condition must be treated vigorously. Penicillin should be recommended**.**

Laparoscopic Splenectomy: Four 10-mm openings are used to do the surgery from a lateral approach. The splenic hilar arteries and short gastric vessels are identified, ligated, and split after normal investigation to rule out accessory spleens. Also ligated or stapled is the proximal splenic artery. The spleen is then morcellated in an entrapment sac once it has been released. The fractured specimen is taken out of the abdomen.

Technique for laparoscopic splenectomy: The lateral methods are the surgical techniques to laparoscopic splenectomy:

Lateral Approach: In a right lateral decubitus posture, the patient is placed. To extend the space between the lower rib and the iliac crest, the operation table is bent and the bolster is lifted. Four 10-mm trocars are often employed along the costal margin to provide for the most flexibility in the interchange of the camera, clip applier, linear stapler, and other equipment. Three trocars are anteriorly positioned along the rib border, while one is posteriorly situated.

Operative Procedure: laparoscopic splenectomy may be broken down into five phases: **Step 1:** The spleen's inferior aspect is dissected. **Step 2:** The short gastric vessels are dissected.

Fig 1: Dissection of the short gastric vessels

Step 3: The splenic hilum is involved in a transaction.

The inferior aspect spleen is lifted superiorly using a 10 mm fan retractor. The pancreas' tail should be recognized. Sharp dissection is used to split the splenorenal and colosplenic ligaments. To mobilize the whole spleen, the incision is performed superiorly and laterally.

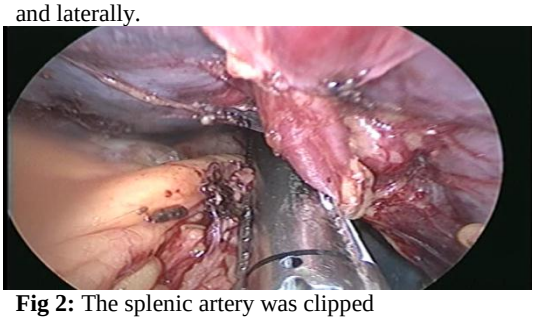

Fig 2: The splenic artery was clipped

Step 4: The lateral and retroperitoneal attachments are dissected.

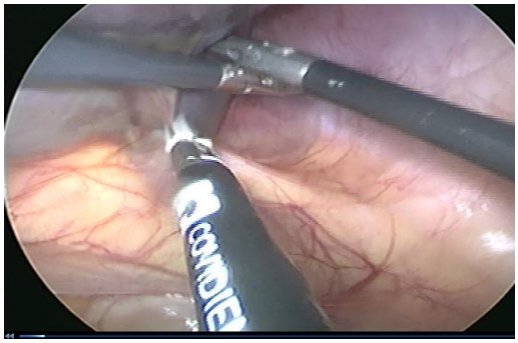

Fig 3: The posterior layer of lienorenal ligament was divided

Step 5: Removing the spleen.

Postoperative Care: A laparoscopic splenectomy patient's postoperative care is typically uncomplicated. Based on the length and severity of the treatment, the nasogastric tube is withdrawn either in the recovery room once it is obvious that the stomach has been emptied or the following morning. Before the patient is released from the recovery room, the urinary catheter is generally withdrawn. The patient is allowed to drink clear fluids the following day, and if this is tolerated well, the patient is permitted to switch to a diet of his or her choosing. Individualized postoperative pain medication is prescribed to provide total patient comfort. The first night may be spent with NSAID (diclophenac Na) injections, followed by oral diclophenac Na alone.

Surgical Complications of laparoscopic Splenectomy: Uncontrollable bleeding, which demands transition to an open splenectomy, is one of the most common intraoperative consequences of laparoscopic splenectomy occur in two cases.20% of group 1. Delayed postoperative complications include minor wound infections.of group 1.

Statistical analysis: The IBM SPSS software program version 20.0 was utilized to examine the data that was supplied into the computer (Armonk, NY: IBM Corp). Number and percent were employed to describe qualitative data. The Kolmogorov-Smirnov test was employed to ensure that the distribution was normal. Range (minimum and maximum), mean, standard deviation, and median were used to characterize quantitative data. The relevance of the acquired findings was assessed at a 5% substantial level.

RESULTS

The study includes 20 patients with splenic disorders in whom splenectomy was indicated 10 were males and 10 were females. Their ages ranged from 16 to 31 years). Patients were assigned to one of two groups at random. The first group, group I, consisted of ten patients who had laparoscopic splenectomy. Group II included 10 patients to whom conventional open splenectomy was done.

	type of operation	Mean	Std. Deviation	Independent t test	P
Age	Laparoscopy	27.10	5.626		
	Open splenectomy	24.90	3.900	1.016	.323

Table 1: Age distribution among open and laparoscopic groups

As regard age there is no substantial variation in both groups p=0.323 (table.1)

	type of operation	Mean	Std. Deviation	Independent t test	P
RBC	Laparoscopy	4.0000	1.24722	1.353	.193
	open splenectomy	3.3000	1.05935		
WBC	Laparoscopy	4.0000	2.05480	-.733	.473
	open splenectomy	4.7000	2.21359		
PLT	Laparoscopy	81.70	43.587	1.752	.097
	open splenectomy	53.30	26.973		

P value =ns as regard CBCin both group.

Red Blood Cell(RBC),White Blood Cell(WBC),Platelet(PLT)

Table 1: Comparing complete blood count (CBC) between open and laparoscopic groups

As regard Comparing complete blood count (CBC) there is no substantial variation in both groups (table.2)

	Group I (n=10)	Group II (n=10)	P
Min. – Max.	0.05-0.15	0.45-0.75	
Mean ± SD.	0.09±0.029	0.6 ± 0.122	0.00*
Median	0.1	0.5	

P value significant as regard blood loss between both groups

Table 3: Comparasion of blood loss between both groups

Accessory splenules were found at the hilum in (2cases) & in the greater omentum (5cases) and removed with ligasure in patients of group I. (Table. 3)

	Group I (n=10)	Group II (n=10)	P
Min. – Max.	110 – 171.0	65.0 – 112.0	
Mean ± SD.	130.3 ± 18.5	83.7 ± 15.1	0.00*
Median	122.5	62.5	

(P=0.000) P value is significant reduction in operation time between open and lap cases.

Table 4: Comparasion of operation time between open and laparoscopic groups

There is significant reduction in operation time between both groups operation time in group II less than group I. (table 4)

	NSAID (diclofenaic sodium)\day	Morphia (pethidine)\day
Lap Cases	150mg	10mg
Open Cases	250mg	20mg

Table 5: Comparasion of post-operative analgesics between both groups
There is significant reduction in analgesics doses between both groups. (Table 5)

	Group A (n=10)	Group B (n=10)	P
Min. – Max.	1.0-3.0	3.0-4.0	
Mean ± SD.	1.3-0.7	3.2-0.4	0.00*
Median	2.0	3.0	

Table 6: Comparison of the post-operative hospital stay between both groups
There is significant reduction in the hospital stay between both group (P=0.00). Patients in lap group were released from the hospital on the second postoperative day (8cases), but (2cases) were discharged on the 3rd day as they were converted to open surgery with median stay in hospital 1.3 days. (Table 6)

DISCUSSION

With the improvement of laparoscopic technique, splenomegaly was previously regarded as a contraindication to laparoscopic splenectomy. The procedures in LS become exceedingly difficult because the operational region is crammed with enlarged spleen, the peri-splenic ligaments are relatively shorter, and the splenic hilum is deeply concealed in the enlarged spleen. In this condition, dissecting the spleen's dorsal and upper pole ligaments is difficult. A splenic capsule break and splenic pedicle bleeding are major reasons for converting LS to surgical splenectomy in splenomegaly. We discovered in our research that the right lateral approach is very beneficial for patients with splenomegaly.[5]

Operative time is one of the main points that should be considered when performing surgery for patients with splenomegaly and low platelet count, and the HALS technique offers relatively short operative time when performing surgery for massive and supra-massive splenomegaly, as mostly these cases has a higher rate of conversion when being performed with the conventional laparoscopic technique [6].

In our study, operation duration ranges from 110 to 171 minutes and had a median of 122.5 minutes in LS Cases and ranged from 65 to 112minutes in Open Cases and had a mean of 83.7minutes, which is comparable with, or even better than, those of previous similar studies. The operative time in a study made by Targarona had a median of 177 minutes[7].

In the current study, blood loss ranged from 50 to 150 ml with a mean of 90.6 ml in LS Cases, and blood loss ranged from 450 to 750ml with mean of 600ml in Open cases. This blood loss is low when compared with studies like that done by Rosen which had a mean blood loss value of 602ml and that of Hellman who reported blood loss that ranged from 300 to 5200ml [6,8] .

Again, in the current study, two cases out of ten cases need converting to an open approach, as the splenic vein was injured and the bleeding was poorly controlled. Exposure of the field was difficult and it was felt that persistence with a HALS approach was unsafe. While some previous workers did not mention their rate of conversion, only Hellman reported one conversion out of his seven cases [8] .

In the study by Rosen five out of 14 patients developed post-operative problems. Two mild problems occurred: one patient had a superficial wound infection at the port site, and another had to be readmitted due to a fever and diarrhea that subsided with hydration [6] .

The median stay in hospital was 1.3 days in LS cases and 3.2days in Open cases, which is less than other studies which was 3.5 days .

In our study the main cause to covert the laparoscopic splenectomy to open surgery was uncontrolled bleeding from sizeable blood vessel e.g. short gastric vessels in one case and the main splenic vessels in two cases with average conversion rate 20%. The conversion rate of 20% observed in this research was reduced than reported in similar investigations [9].

Regardless of the operational location, a main axis of spleen more than 17 cm measured by B-ultrasound in vitro improves the difficulties and danger of intraoperative hemorrhage during LS, lengthening the procedure and increasing the incidence of conversion to open splenectomy.

The primary significant outcome was detected in the 1st week post-operative by improvement of the blood picture. The mean was 70% of lap group and 65% of open group with no substantial variation in the two study groups. However, patients' postoperative hospitalization in group I were reduced and their satisfactions as regards the minimal, disabling, less painful wounds, were better than patients in group II.

CONCLUSION

LS are efficient in producing the desired therapeutic response in patients with suitable indication for splenectomy. The operative times for Laparoscopic splenectomy are longer than those for OS but they tend to decrease with experience. The intraoperative blood loss and complications of LS are generally better than those reported for OS.

Conflict of interest : none

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