Evaluation of the outcomes of laparoscopic splenectomy in non-traumatic pathological splenic disorders

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Abstract

Background: Indications for laparoscopic splenectomy are the same as those of open splenectomy, except for the trauma cases, where the role of laparoscopy is still debatable. More studies are needed to determine the real value of laparoscopy in massive splenomegaly.

Objectives: The aim of the work is evaluation of the outcomes, safety and efficacy of laparoscopic splenectomy in non-traumatic splenic disorders.

Patients and methods: This prospective study conducted on patients with hematological disorders indicated for splenectomy for one year.

Results: We operated 20 patients of laparoscopic splenectomy, 70% were females, their mean of age by years were 18.9 ± 9.1. No post-operative complications the mean of operation time by hours was3.2 ± 0.7, while the mean of hospital stay was 2.3 ± 0.2 days. The total intra-operative blood loss was about 50–600 ml**.**

Conclusion: Laparoscopic splenectomy for elective operations of the spleen is a safe method associated with a lower risk of peri-operative complications, less mortality and morbidity.

Keywords: Laparoscopic splenectomy - Idiopathic thrombocytopenic purpura-total leucocytic count.

Introduction

Splenectomy is satisfactory method for idiopathic hypertrophy, malarial hypertrophy, splenic anemia, leukemia, cysts, and tuberculosis, with mortality rate of 13% **(Vera and Metaplasia, 2019).**Minimal invasive surgical techniques have been widely used for several operations in general surgery with less intra-operative bleeding, less post-operative pain, shorter hospitalization period and good cosmetic results (Monodey, 2019).

The first recorded splenectomy was performed by **Zaccarelli in 1549** for a young women with malaria who survived at least 6 hours post-operatively **(Pence and Oldham, 1996).Quittenbaum in 1826** operated the initial well documented splenectomy in a young woman with probable portal hypertension and splenomegaly **(Pointer and Slakey, 2019).**

Contraindications for laparoscopic splenectomy have become less significant due to the advances in surgical techniques and other used instrumentation**(Navarrete, 2021).**

In general, laparoscopic splenectomy indications are identical to that of open splenectomy, except for the trauma cases, where the use of laparoscopy is still debatable**(Triantafyllidis and Fuks, 2021).**

The introduction of advanced laparoscopic tools for ligation, dissection and vessels sealing devices resulted in less operative time and less intra-operative complications. However, some well-known contraindications still applied, more studies are required to determine the real value and benefits of laparoscopy in massive splenomegaly **(Milosavljevic et al., 2019).**The aim of the work was to evaluate the outcomes, safety and efficacy of laparoscopic splenectomy in non-traumatic splenic disorders.

Patients and methods

This prospective study was conducted on 20 patients, prepared for splenectomy in the gastrointestinal and laparoscopic surgery unit, Qena university hospitals.

We prepared 20 patients with blood diseases indicated for laparoscopic splenectomy. All cases were undergone laparoscopic splenectomy at Qena University Hospitals from June 2019 to February 2021.

Type of the study: Prospective interventional non controlled study.

For all patients the following were done

A- **Preoperative workup:** History taking including previous attacks of hematemesis in cases of portal hypertension, history of petechial haemorrhage or any bleeding tendency in cases of idiopathic thrombocytopenic purpure (ITP) and manifestation of anaemia in cases of autoimmune haemolytic anaemia, laboratory investigations: CBC, liver functions, renal functions, fasting and postprandial blood sugar, prothrombin time and activity, hepatitis B and C markers and manual platelet count, ultrasonography, endoscopy in cirrhotic patients and bone marrow aspiration.

B- **Preoperative preparations:** Thrombocytopenic cases maintained with a platelet number above 30,000/cml, while internal bleeding is uncommon unless there are persistent counts less than 5000. In patients with ITP, platelets transfusion done after inflow vascular isolation. If it is essential to raise platelet count in these cases before the operation, a steroids bolus dose or parenteral intravenous immunoglobulin (IG) can increase platelet count before surgery. Hemoglobin level would be at least 10 g/dl before surgery.

The pre-operative investigations included the upper GIT endoscopy and bone marrow aspiration and biopsy. Four of the selected patients had grade I esophageal varices with hypercellular bone marrow and the other patients had normal upper endoscopy and normo-cellular bone marrow.

Ethical considerations: All risks during the study weredeclared to the participants, bleeding and infection which may occur can be prevented by proper sterilized techniques, fine dissection and good hemostasis. Privacy of participants and confidentiality of data was maintained, and every patient had a file with privacy code number including all investigations. All pictures will be taken only on sites of surgery, covering of the face. Any pictures were assured by patient privacy.

All our patients received vaccination against the encapsulated bacteria Streptococcus pneumoniae, Hemophilus influenza and Neisseria meningitidis two weeks before the operation and long life every 5-6 years.A written informed consent was taken from all patients after full explanation of benefits and risks. Results of investigation were collected, tabulated, and statistically analysed for scientific purposes only.

Surgical technique: The insertion of a 12-mm trocar was done supraumbilical and to the left. A 12-mmvisi-port was introduced, and pneumo-peritoneum was done, followed by introduction of the 30’ camera. A 5-mm port was inserted below the costal margin on the left mid-clavicular line for the left working hand. A 12-mm port was located along the anterior axillary line in the left sub-costal region for the right working hand, **Fig.1.** All ports were located 30-40 mm below the inferior pole of the spleen to permit suitable working space for visualization, secure instrument exchange and improve exposure of splenic hilum. Dissection of the spleno-colic ligament was done.

Laparoscopic cholecystectomy was done in two patients with chronic calcular cholecystitis before laparoscopic splenectomy. After insertion of the trocars, laparoscopic cholecystectomy was done in the standard fashion, tilting the operating table to the left and in the anti-Trendelenburg position. Division of the cystic duct at the junction with the gall bladder neck. The table was tilted in the right lateral position, and splenectomy was started.

Lateral peritoneal attachments of the spleen were dissected. The retraction forceps grasped the peritoneal cuff and moved the spleen medially or was located below the inferior pole to raise it.

Fig.1. ports sites and position.

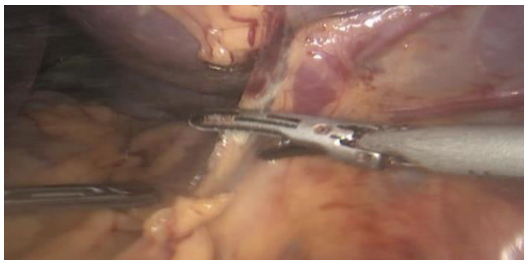

Fig.2. Dissection of the splenic hilum.

Dissection of the splenic hilum was done from the lower pole, **Fig.2**. At the lower pole of the spleen, blood vessels were often present and were dissected and ligated between clips or via usage of ultrasonic dissector or ligasure.

Fig.3. Hilar control using intracorporeal ligation

The Short gastric blood vessels were dissected and separated by the ultrasonic dissector, ligasure orhemoclips. Several methods were applied for splenic hilum control including the endovascular staplers, intra-corporeal ligation and clips, **Fig.3**.

Pfannestiel incision was done for spleen extraction. Drain at the splenic bed was inserted. The specimen was sent for histo-pathological examination, **Fig.4**. All our patients were nursed post-operatively in semi-sitting position and chest exercise was performed from the first hours of recovery to avoid lung atelectasis by heavy percussion on the back. Intravenous fluids were commenced till enteral feeding was resumed gradually. The patients received strong analgesics in the form of non-steroid anti-inflammatory drugs. All the patients received prophylactic antibiotics in the form of 3rd generation half an hour cephalosporin before the intervention.

Fig.4. The specimen.

Follow up: Each of our patients was followed up in the general surgery out-patient clinic. In the first week, the wound was examined for any wound complications (seroma, infection, hematoma, disruption) and complete blood count was done.

Statistical analysis: Data were verified, coded by the researcher and analyzed using IBM-SPSS 21.0 (IBM-SPSS Inc., Chicago, IL, USA) *. Descriptive statistics: Means, standard deviations, medians, ranges and percentages, frequencies were calculated.

Results

30% of the participant was males (6) and 70% were females, their mean of age by years were 18.9 ± 9.1,**(Table.1)**

There were no post-operative complications, but one case had intra operative complications in the form of intra-operative bleeding, **(Table.2).**

The total intra-operative blood loss was 50–600 ml. Hemoglobin level was measured pre and post-operatively. Preoperatively, it was ranging from 8.5 to 13 gm/dl with a mean of 10.5. Post-operative hemoglobin ranging from 9.1 to 13 gm/dl with a mean 11.48 and SD 1.11 with a statistically significant relation was found between pre and post hemoglobin level t=2.992 and p value = 0.007,**(Table.3)**

Total Leucocytic Count was measured pre and post-operatively. Pre-operative TLC was ranging from 1200 to 10000/cm with a mean of 5850 and SD 2.52. Post-operative TLC ranged from 4900 to 12500/cm with a mean of 8300 and SD 2.31 with a statistically significant relation was found between pre and post TLC level t=5.697 and p value = 0.001.There weren't any postoperative complications but 5% of the cases had intra-operative complications, **Fig.5**.

75% of participants needed post-operative analgesia the mean of pain (VAS) 48 h was 2.1 ± 1.01, **Fig.6**.

Table 1. age and sex distribution between the studied groups:

Variable	Frequency	Percent
Gender		
Male	6	30%
Female	14	70%
Age	Mean ± STD	
	18.9 ± 9.1	

Table 2. Intra and post-operative complications

VARIABLE		Frequency	Percent
Intra-operative complications	**no**	19	95%
	yes	1	5%
Bleeding	**Yes**	1	5%
	No	19	95%
post-operative complications	**No**	20%	100%
	Yes	0	0%

Table 3. Comparison between pre and post-operative Hemoglobin level

Hb level mg/dl	Preoperative	Percentage	Postoperative	Percentage
Above 8-9	3	15%	0	**0%**
Above 9-10	5	0%	2	**10%**
Above 10-11	2	5%	3	**15%**
Above 11-12	3	15%	6	**30%**
Above 12-13	4	20%	6	**30%**
Above 13	4	15%	3	**15%**
Total	20	100%	20	**100%**

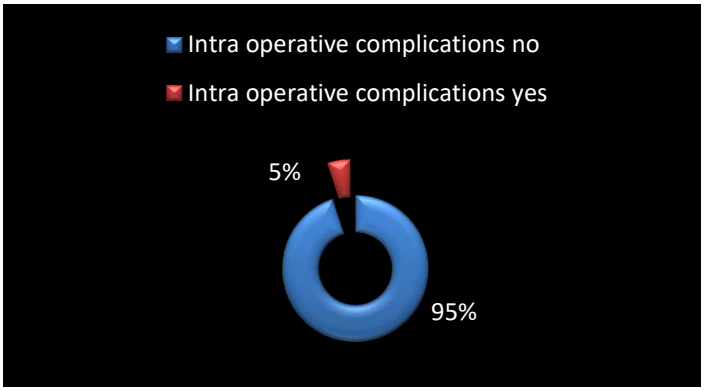

Fig.5. Intra operative complications

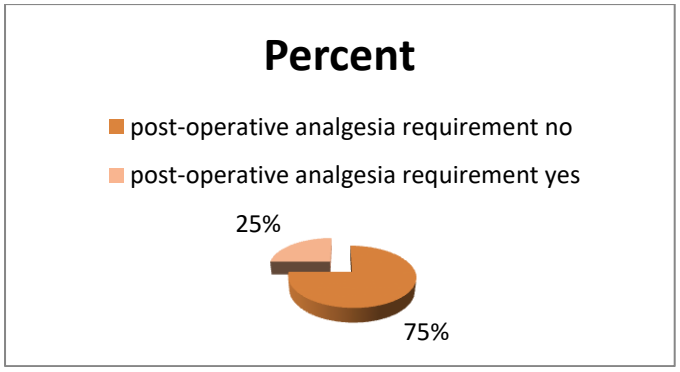

Fig.6.post-operative analgesia requirement

Discussion:

These data in our study indicate that elective laparoscopic splenectomy (LS) for hematologic diseases may be performed with efficacy, morbidity, and mortality rates better than those of open splenectomy for the same indications.

LS causes less trauma and ensures a faster recovery than open splenectomy, and it is a safe and effective method **(Heet al., 2018).**

The spleen located in a deep position, had a friable consistency, and the pancreatic tail is located near the spleen**(Takla, 2021).**

LS is a highly risky, difficult, and challenging surgery for most surgeons but, the introduction of advanced laparoscopic tools for ligation, dissection and vessels sealing devices resulted in less operative time and less intra-operative complications**(Hashizume and Akahoshi, 2019).**

Initial separation of the splenic artery is suggested to avoid massive haemorrhage during surgery, followed by transection of the splenocolic ligament, opening of the lienorenal ligament, and ligation of the splenic artery branches near the surface of the spleen. Endo-GIA or ligasure may be used for this process**(He et al., 2018).**

Intra-operative complication occurred in one case in the form of intra-operative bleeding. The bleeding was controlled by usage of hemoclip and ligasure. The case not converted to open. This match with study done by Hassan at 2014**(Hassan and Ali, 2014).** There were 22 female and 10 male

patients, there was one case had intra-operative complication in the laparoscopic splenectomy group. It was due to incomplete closure of the staples that resulted in incomplete haemostasis, which was controlled with a tissue sealing device The total intra-operative blood loss was 50–600 ml. In the study done by **Cavaliere**, blood loss was 100-800 ml**(Cavaliere et al., 2018).** The mean of operation time (skin to skin) by hours was3.2 ± 0.7. This match with study done by**Hassan,** the mean operative time was 180 min**(Hassan and Ali, 2014).**

There were no post-operative complications, no postoperative haemorrhage, abdominal infections, other complications or death occurred.

In the study done at 2018, there was no post-operative haemorrhage, abdominal infections, pancreatic fistula or other complications. One patient developed subcutaneous emphysema that did not require special treatment and one patient developed infection of the main surgical incision but completely recovered following repeated dressing **(He et al., 2018).**

In our study , the mean of hospital stay was 2.3 ± 0.2 days, this match with study done by **Vecchio (Vecchio et al., 2014).** The hospital stay ranged from 4 to 8 days.

Average return of gastrointestinal function occurred less than 24 hours. Most patients were able to tolerate a regular diet one day after surgery.

Naso-gastric tubes were used routinely to avoid post-operative gastric distension and the possibility of haemorrhage from the short gastric vessels for one day.

Vomiting or gastric distension did not develop in any patient and no patient required postoperative insertion of a nasogastric tube.

Normal activity in these cases was defined as return of usual household activities, driving and return to previous employment. Most patients were capable of these activities between 10 and 14 days postoperatively.

Formal objective analysis of postoperative pain in patients undergoing laparoscopic splenectomy was performed. Patients often required parenteral narcotics or patient-controlled analgesia for 24 to 36 hours.

There was no attempt to select patients with normal sized spleens, normal platelet counts or lack of co-morbid diseases.

The wide spread performance of laparoscopic splenectomy has been delayed by several factors.

Laparoscopic splenectomy is a technically demanding operation that requires a surgeon and assistants skilled in advanced laparoscopic techniques.

Unlike cholecystectomy, splenectomy is performed relatively infrequently by the average general surgeon and thus, operator experience is gained more slowly. Qualified assistants are not always readily available.

In our study, cholecystectomy was done as the first step in all patients without intra-operative or postoperative complications.

In our study we don't detect accessory spleen. In literatures, The challenge of laparoscopic splenectomy is the inability to detect the presence of accessory splenic tissue**(Cadiere et al., 1994).**.

The lack of tactile sensation and difficulty with retraction and exposure of the retroperitoneum make detection of small objects such as accessory spleens difficult. Accessory spleens often are freely mobile and may be buried in omental fat or covered by bowel loops or mesentery; they are especially difficult to find in obese patients.

Laparoscopic detection of accessory splenic tissue is further hindered by the fact that the accessory spleens may be multiple and occur nearly anywhere in the abdomen or pelvis.

Extraction of the specimen can be a significant technical challenge during laparoscopic splenectomy**(Bagdasarian, 2000).**

In our study, all specimens extracted from Pfanenstiel incision as the referral outpatient clinic of hematology asked for histo-pathologicl examination for all specimens.

The procedure appears to be associated with benefits such as rapid return of gastrointestinal function, less postoperative pain, shorter hospitalization,and more rapid return to normal activity, but further prospective data will be necessary to confirm these observations.

Conclusion

Laparoscopic splenectomy for elective operations of the spleen is a safe method associated with a lower risk of peri-operative complications, less mortality and morbidity.

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