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Original article

Feasibility and Outcomes of Laparoscopic Splenectomy in Huge Splenomegaly

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Abstract:

Background: laparoscopic splenectomy is performed for massive splenomegaly. It reduces blood loss, wound related complications, less postoperative pain Aim: evaluation the feasibility and outcomes and lack of open technique's complications in laparoscopic splenectomy. **Methods:** The study is a prospective observational study was carried out on 30 patients with huge splenomegaly. **Results** the operation time ranged from 101 to 210 min with a mean of 143.87± 31.82 min. The intraoperative blood loss ranged from 100 to 800 ml with mean of 430± 196.78 ml. Among the patients studied, 2 (6.67%) patients required blood transfusion, and 3 (10%) patients underwent open conversion, The hospital stay ranged from 2 to 7 days with a mean of 4.23± 1.72 days. Regarding the complication, Chest infection occurred in 1 (3.33%) patient and pancreatic leakage occurred in 1 (3.33%) patient. Wound infection, portal of splenic vein thrombosis, postoperative bleeding and pleural effusion were not reported in any of the studied patients. **Conclusion:** Laparoscopic splenectomy is a safe and feasible procedure that is associated with a reduced risk of postoperative complications, a shorter hospital stays, and less intraoperative blood loss than open splenectomy for large splenomegaly.

Keywords: Huge Splenomegaly; ITP; Laparoscopic Splenectomy

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Introduction

Spleen is the primary organ of the lymphoreticular system. Immune protection and hematopoiesis are its primary functions. It works as a filter for blood cells that are abnormally shaped and certain metabolic products. In addition to being the focus of surgical intervention in many cases, it can constrict and hold blood in reaction to sudden changes in blood volume caused by trauma. Phagocytes, which are responsible for the removal of exhausted erythrocytes and foreign bodies from the blood, are present in the spleen, which serves as a significant blood reservoir. Risk of contracting specific infections is elevated in the absence of the spleen[(1)].

Splenectomies are necessary for illnesses that require haemolysis. Sickle cell anaemia, thalassaemia, autoimmune haemolytic anaemia, traumatic splenic rupture, secondary hypersplenism, splenic nodules, elliptocytosis, spherocytosis, splenic artery aneurysm, and splenic vein thrombosis are all classified under this category [(2)].

With a low risk of remote incisional hernias, laparoscopic splenectomy offers numerous benefits over an open approach, such as an earlier hospital discharge, reduced blood loss, wound-related complications, less postoperative discomfort, enhanced pulmonary function, and a quicker recovery [(3, 4)]

As per the clinical practice standards of the European Association for Endoscopic Surgery (EAES), splenomegaly is defined in metric terms by preoperative imaging. Splenomegaly is diagnosed when maximum spleen diameter is larger than 15 cm, with massive splenomegaly (MS) having a maximum diameter greater than 20 cm [(5, 6).]

The laparoscopic splenectomy (LS) was initially described in 1992, after it was performed by Delaitre and Maignien in 1991. The advantages of a minimally invasive approach in comparison to open splenectomy (OS) have been extensively documented in numerous studies. These advantages include shorter hospital stays, expedited recovery, reduced blood loss, and an improved quality of life [(7, 8)]

Supporters of laparoscopic surgery have shown that large splenomegaly can be successfully removed via this method. For patients with extensive splenomegaly, the laparoscopic splenectomy should be performed with caution due to the significant challenges associated with manipulating the large organ, controlling hemorrhage, and retrieving the specimen [(9).]

Hypothesis: The authors were motivated to conduct this study by the ongoing debate regarding the feasibility and outcomes of laparoscopic splenectomy in the context of large splenomegaly**.**

Patients and methods:

Study design

The study is a prospective observational study was carried out on 30 patients with huge splenomegaly who were conducted at the surgery departments of Benha university hospital, Faculty of medicine, throughout the period from March 2024 until May 2025.

After approval of Research Ethics Committee of Benha University, Egypt. Informed written consent was obtained from all patients prior to enrolment.

Approval code: MS 32-5-2024

Inclusion criteria

Patients with huge splenomegaly aged (15 to 60) due to hematological diseases as immune thrombocytopenic purpura, hereditary spherocytosis, splenic lymphoma and eligible for splenectomy, splenomegaly in cases with portal hypertension, in patients with child A classification. **[(10)]** **.**

Exclusion criteria

Exclusion criteria included patients with cardiopulmonary contraindications to laparoscopic surgery, coagulopathy, incidental splenectomy performed during other significant procedures, and those

undergoing splenectomy for trauma or bleeding varices.

All patients were subjected to full history taking, examination, laboratory investigation and imaging (pelvic abdominal US and CT) [11].

Procedure

- ***Preoperative preparation*** [12]

Each patient's anatomical features and splenic size are the primary factors that influence the operational strategy. A laparoscopic procedure is typically administered to patients. In rare instances, an open splenectomy has been done to facilitate the implementation of concomitant procedures, such as a megaspleen in the context of coagulopathy or a nephrectomy for malignancy. As previously indicated, the spleen's size was estimated by conducting a physical examination in relation to the patient's body habitus. We used computed tomography (CT) when we thought someone might have splenomegaly. If you have huge splenomegaly, lymphadenopathy in the splenic hilum, or large perisplenic varices, you may want to consider a hand-assist technique. This leads to changes in both the patient's posture and the insertion of the catheter.

- **Fully laparoscopic splenectomy**

○ Patient positioning and trocar placement

Decompressing the stomach is done using a Nasogastric tube prior to positioning the patient. With pressure points cushioned and the angle at about 70 degrees, the patient is placed in the right lateral decubitus position. The table is bent, resulting in a greater distance between the costal border and the iliac crest. In the reverse Trendelenburg position, the exposure to the left upper quadrant is increased. Across from the associate on the operating platform, the surgeon is located. In conjunction with three 5-mm and one 12-mm trocars, a 5-mm 30 laparoscopic trocar is employed. The initial 12-mm trocar should be positioned approximately 5 cm below the anterior costal margin by drawing a line from the umbilicus to the costal margin. This is accomplished through an open method.

The last step is to insert the linear cutting tool through this interface for hilar control and specimen retrieval. When dealing with an enlarged spleen, it is crucial to position the initial trocar below the spleen's level to prevent trocar injuries. An injection of a long-acting local anesthetic is administered through the suggested incisions. Typically, a pneumoperitoneum pressure of 12 mm Hg is adequate. Two 5-mm trocars are inserted into the upper abdomen under direct laparoscopic vision--one towards the costal margin (subxiphoid) and one in the midline (midepigastric). The third 5-mm trocar is located on the opposite side of the first trocar, a few millimeters below the costal margin. The colonic attachments are often mobilized before this fourth overall trocar is inserted. The size of the spleen will determine whether any changes to the trocar's placement are required.

○ Search for accessory spleens

While the 12-mm port is used to hold the camera, the physician operates through the two upper apertures. Before dissection begins, the perisplenic tissue and medial and lateral surfaces of the spleen are checked for accessory spleens, which are removed immediately upon discovery.

○ Entry into lesser sac and division of the short gastric vessels

An instrument is inserted through the lateral orifice to delicately retract the spleen laterally. A precise retraction without harming the parenchyma is made possible by positioning the instrument's axis along the spleen and its tip at the diaphragm. With their left hand, the surgeon will draw the stomach in, and then, at the lower splenic pole, where the gastrosplenic ligament is at its narrowest and widest along the greater curve of the stomach, they will cut it. By doing so, they will be able to reach the lesser sac. This ligament encases gastroepiploic and short gastric arteries.

Usually, ultrasonic technology is used to dissect the ligament. At its tip, the gastrosplenic ligament forms the closest connection between the stomach and spleen. As the stomach gradually retracts medially and the spleen laterally, the top pole of the spleen becomes visible. When working with the uppermost short gastric vessels, it is crucial to avoid damaging the stomach. The vessels might be very delicate and easily damaged if the ultrasonic energy device applies too much traction. An approach to identify the hilar branches involves elevating the spleen tip at its upper pole, which exposes the posterior layer of the gastrosplenic ligament. The ligament is then dilated (Figure -Figure).

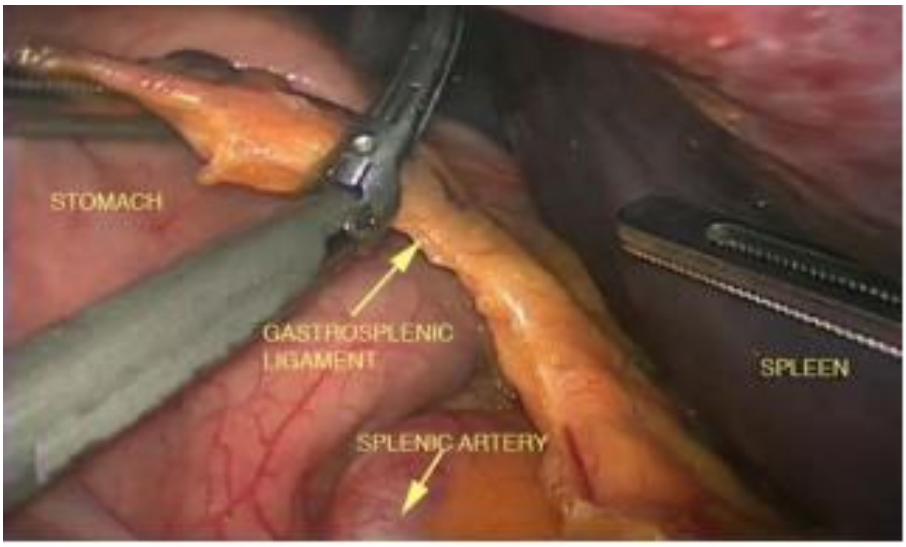

Figure 1: Medial dissection with entry into lesser sac and division of the short gastric vessels. The gastrosplenic omentum is widest inferiorly and then gets narrower at the upper pole of the spleen where the short gastric vessels are shortest

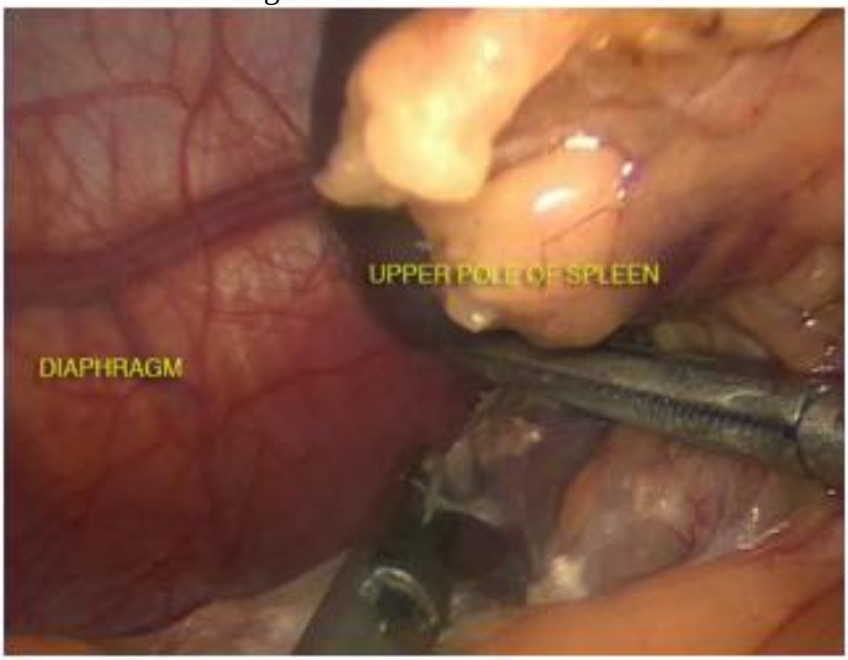

Figure 2: Dissection of posterior layer of gastrosplenic ligament at upper pole of the spleen. Dissection of this layer from the medial aspect facilitates entry into the lesser sac when the lateral dissection is undertaken

Unless the patient is very plump, the hilar vessels and pancreatic tail are usually visible after the lesser sac is opened. There is a lot of variation and irregularity in the branching patterns of the splenic artery. In cases of severe splenomegaly, a big locking clip can be utilized to isolate the primary splenic artery from its surrounding tissue. This procedure reduces the splenic volume and the risk of hemorrhage. The artery can be found along the pancreatic upper border. Ultrasound is used to control the dissection of the gastroepiploic arteries once the lower pole of the spleen is gently elevated.

- Dissection of lateral attachments

After moving the scope to the lateral port, surgeons have access to the two center channels for surgery. To reveal the spleen's lateral peritoneal attachments, the surgeon carefully draws it in with the shaft of a blunt-tipped device with his left hand. These are progressively incised layer by layer using monopolar hook electrosurgery or ultrasonic energy as they move toward the left crus of the diaphragm. It is imperative to maintain a distance of 1–2 cm from the spleen's margin as it begins to descend medially, rather than continuing in a lateral trajectory, as the spleen is mobilized (Figure).

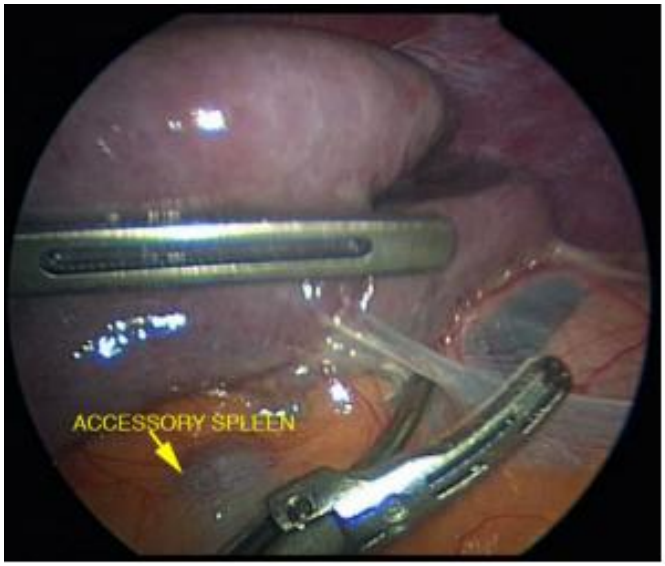

Figure 3: Dissection of lateral attachments of the spleen. Note the presence of an accessory spleen over the tail of the pancreas

The upper portion of the spleen is elevated by holding the peritoneum border with the left hand, which provides access to the posterior layer of the gastrosplenic ligament. To access the lesser sac from the spleen's side and completely release the upper pole, this must be opened. But there might be other parallel branches in this layer that energy devices can't reach. However, in most cases, a larger-than-these-vessels aperture can be successfully opened and accessed by means of the smaller sac. To control the hilar vessels with the linear cutting stapler, it is necessary to mobilize the upper pole, which greatly simplifies the process of spleen manipulation (Figure).

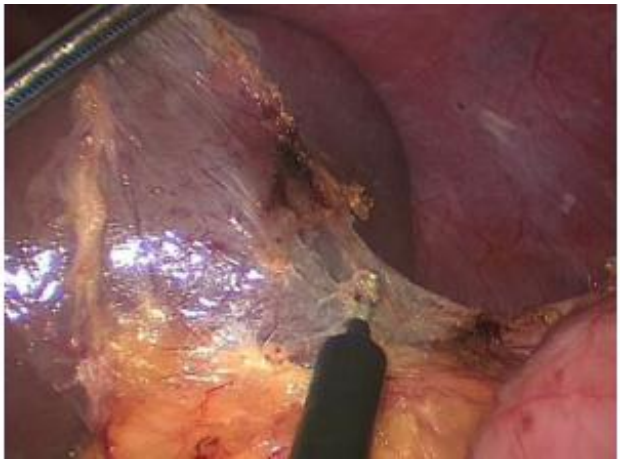

Figure 4: Elevation of the upper pole with a handle of peritoneum allows for exposure of the posterior layer of the gastrosplenic ligament which is opened to reenter the lesser sac from lateral to medial

- Control of the hilar vessels

The linear cutting instrument will be used to control and divide the splenic vessels into bulk. The pancreas is identified before the stapler is applied. The pancreas is situated near the spleen in most cases, and pancreatic injury frequently leads to a fistula. Before identifying the tail of the pancreas, the spleen is raised by grabbing the border of the peritoneum that is still attached to the spleen after the lateral dissection. The extra connective tissue covering the pancreatic and splenic hilar veins must be carefully dissected using a monopolar hook. To facilitate safer stapling, electrosurgery is used to increase the space between the pancreas and spleen (Figure). This dissection can be facilitated by switching to a hand-assist technique if that becomes necessary.

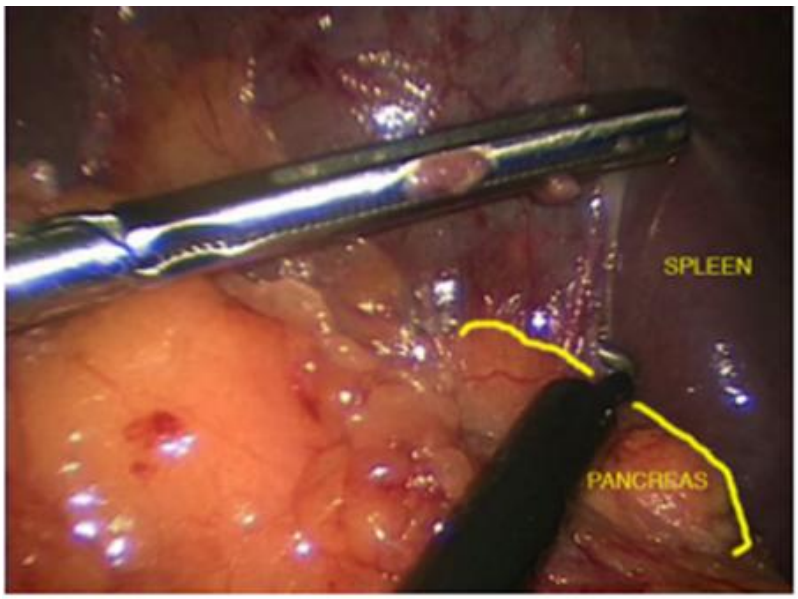

Figure 5: The pancreas often lies very close to the spleen, and hook dissection is helpful in freeing these attachments superficially, taking care not to cause bleeding from the hilar vessels below. The goal is to create enough space to safely pass a linear cutting stapler

The hilum is regulated by a linear cutting stapler after the spleen has been fully mobilized,
with 2.5-mm staples being the most frequently used. Even more precautions against pancreatic damage are taken by angling the stapler such that it follows the spleen closely. The stapler is maneuvered into position with caution to prevent injury to the splenic parenchyma or hilar vessels. The secure application of the stapler is significantly facilitated by the complete mobilization of the spleen, particularly the upper pole. If the stapler is challenging to manipulate around the hilum, it may be necessary to switch to a hand-assist technique. Once the stapler is closed in place, the spleen is manipulated to ensure proper stapler positioning and facilitate medial visualization. Stapler discharge occurs thereafter.
Several staples reload may be necessary to complete the hilar transection. The staple line is examined for any significant hemorrhage. Typically, a metal fastener can be used to regulate small circulating vessels that are located along the staple line. Oxidized cellulose or fibrin adhesive are typically effective in managing more diffuse leakage. Suturing is seldom required.

- Extraction of the spleen

Following laparoscopic mobilization, the spleen is extracted in its entirety through the Pfannenstiel incision and deposited in a retrieval bag.

- Inspection and haemostasis

To make sure there is no bleeding after removing the specimen, the dissection site is checked again, and the abdomen is reinsufflated. We examine the staple lines, diaphragmatic surface, and more pronounced stomach curves. Plasma, platelet, or other blood product transfusions may be helpful in cases of diffuse leakage for some patients who have coagulopathies or severe thrombocytopenias. Adjunctive hemostatic agents, like tissue glues or sealants, can also fix this. In cases where the pancreas sustains damage or is transected, a closed suction drain may be implanted; however, this procedure is rarely performed routinely.

- **Postoperative care** [13]

After anesthesia recovery, oral intake with fluids can be initiated and progressed at a rate that is well-tolerated. If there is no hematologic contraindication, NSAIDs are effective adjuncts for multimodal analgesia. Pharmacologic DVT prophylaxis is administered unless a hematologic contraindication is present. Although a median 2-day hospital stay is required following splenectomy for a small spleen, approximately 30% of patients are discharged after an overnight admission in the absence of adverse events. One week after surgery, a Doppler abdominal ultrasound can identify splenic vein and portal thrombosis that are asymptomatic.
For patients who presented with a reduced haemoglobin percentage and a low platelet count, the blood picture was altered.

- Red blood cell transfusion for individuals with a low hemoglobin percentage with the objective of increasing their level to at least 10 grams per deciliter.
- To elevate the platelet count to 70,000/dl, patients with autoimmune haemolytic anaemia and ITP were administered a 30-40 mg dose of Prednisolone twice daily and a high dose of immunoglobulin G (400 mg/kg per day) 3-5 days prior to surgery.
- Two weeks prior to surgery, the patient received vaccinations against pneumococcal PPV 23, meningococcal C, and H. influenza b.
- Antibiotic prophylaxis via intravenous administration of a 1.5 g single-dose ampicillin sulbactam vial prior to surgery.
- The preoperative preparation of packaged RBCs units and FFP units to facilitate unexpected intraoperative haemorrhage.
- The fasting period was between six and eight hours.

Outcomes

- The primary outcome was successful surgery for huge splenomegaly with laparoscopic method with minimal postoperative complications.
- The secondary outcomes were time of recovery, hospital stay, need for postoperative blood transfusion and lack open technique's complications such as wound complications and incisional hernia.

Statistical Analysis

- For Spearman's correlation at a level of α=0.05 (5%), the sample size needed to achieve a power of 1-β=0.80 (80%) with these assumptions is 50 (G*power, version 3.1).
- Data was entered using SPSS version 23 once it had been modified, coded, and collected. Quantitative data was represented by means, standard deviations, and ranges; qualitative data was represented by percentages and numbers. With a P value less than 0.05, statistical significance was established [14].

Results

This study included 30 patients with huge splenomegaly with a mean age of 37.37± 11.28, the mean BMI of the included patients was 27.47 ± 3.63, among included patients 30 % were Diabetic, and 36.67% were hypertensive and other sociodemographic data were reported in **table 1**

Regarding the diagnosis, 3 (10%) patients had hereditary spherocytosis, 2 (6.67%) patients had hematological diseases (as immune thrombocytopenic purpura), 10 (33.33%) patients had thalassemia major, and 15 (50%) patients had post-hepatitis cirrhosis. **table ٢**

The Hb concentration ranged from 9.6 to 15.4 g/dL with a mean of 12.04± 1.75 g/dL. The WBCs count ranged from 6.7 to 15.3 ×109/L with a mean of 11.1± 2.74 ×109/L. The platelet count ranged from 203-338 ×109/L with a mean of 266.03± 46.22 ×109/L. INR ranged from 0.9 to 1.7 with a mean of 1.34± 0.25. **table ٣**

The mean operation time was 143.87± 31.82 minutes, with a range of 101 to 210 minutes. The mean intraoperative blood loss was 430± 196.78 ml, with a range of 100 to 800 ml. Two patients (6.67%) needed blood transfusions, while three patients (10%) underwent open conversions. The hospital stay's mean was 4.23± 1.72 days, with a range of 2 to 7 days. **table ٤**

Regarding the complication, Chest infection occurred in 1 (3.33%) patient and pancreatic leakage occurred in 1 (3.33%) patient. Wound infection, portal of splenic vein thrombosis, postoperative bleeding and pleural effusion were not reported in any of the studied patient**s. table ٥**

Table ١: Baseline characteristics and comorbidities of the patients studied

		Total (n=30)
Age (years)	**Mean± SD**	37.37± 11.28
	Range	21-58
Sex	**Male**	17 (56.67%)
	Female	13 (43.33%)
Weight (Kg)	**Mean± SD**	77.13± 9.35
	Range	60-95
Height (m)	**Mean± SD**	1.68± 0.05
	Range	1.6-1.75
BMI (Kg/m^2)	**Mean± SD**	27.47± 3.63
	Range	21.77-34.38
DM	9 (30%)	
HTN	11 (36.67%)	
IHDs	٦(20%)	
Chest disease	٤(13.33%)	
DVT	١(3.33%)	

DM: Diabetes mellitus, HTN: Hypertension, IHDs:Ischemic heart disease, DVT:deep vein thrombosis

Table ٢: Diagnosis of the studied patients

	Total (n=30)
Hereditary spherocytosis	3 (10%)
Haematological diseases (as immune thrombocytopenic purpura)	2 (6.67%)
Thalassemia major	10 (33.33%)
Post-hepatitis cirrhosis	15 (50%)

Table ٣: Laboratory investigation of the patients studied

		Total (n=30)
Hb (g/dL)	**Mean± SD**	12.04± 1.75
	Range	9.6-15.4
WBCs ($\times 10^9$/L)	**Mean± SD**	11.1± 2.74
	Range	6.7-15.3
Platelets ($\times 10^9$/L)	**Mean± SD**	266.03± 46.22
	Range	203-338
INR	**Mean± SD**	1.34± 0.25
	Range	0.9-1.7

Hb: Hemoglobin, WBCs: White blood cells, PLT: Platelets Count. INR: international normalized ratio.

Table ٤: Operative data and hospital stay of the patients studied

		Total (n=30)
Operation time (min)	**Mean± SD**	143.87± 31.82
	Range	101-210
Blood loss (ml)	**Mean± SD**	430± 196.78
	Range	100-800
Transfusion	**Yes**	2 (6.67%)
	No	28 (93.33%)
Open conversion	**Yes**	3 (10%)
	No	27 (90%)
Hospital stays (days)	**Mean± SD**	4.23± 1.72
	Range	2-7

Table ٥: Complication of the patients studied

		Total (n=30)
Complication	**Chest infection**	1 (3.33%)
	wound infection	0 (0%)
	Portal of splenic vein thrombosis	0 (0%)
	Pancreatic leakage	1 (3.33%)
	Postoperative bleeding	0 (0%)
	Pleural effusion	0 (0%)

Discussion:

Huge splenomegaly, also known as massive splenomegaly, is a more severe form characterized by a spleen that extends well beyond the left costal margin, often reaching the iliac fossa or crossing the midline. It is typically defined radiologically as a spleen weighing more than 1000–1500 grams or measuring more than 20 cm in length. This degree of enlargement is usually associated with

chronic conditions such as myeloproliferative neoplasms, chronic malaria, or certain storage diseases. Huge splenomegaly presents unique clinical challenges and may lead to complications such as hypersplenism, cytopenia, and increased risk of splenic rupture.

The aim of our study is to evaluate the feasibility (regarding time of surgery, manipulation during surgery, amount of blood, accessibility, intraoperative difficulties, extraction of spleen,) and outcomes (regarding time of recovery, hospital stay, need for blood transfusion and lack of open technique's complications as wound complications and incisional hernia) of laparoscopic splenectomy in huge splenomegaly.

The Surgery Department of Benha University Hospital, Faculty of Medicine, admitted 30 patients with considerable splenomegaly for the purpose of this investigation.

Regarding the diagnosis, 3 (10%) patients had hereditary spherocytosis, 2 (6.67%) patients had hematological diseases (as immune thrombocytopenic purpura), 10 (33.33%) patients had thalassemia major, and 15 (50%) patients had post-hepatitis cirrhosis.

These results are supported by Chapman et al., [15] who discovered that cirrhosis and hepatitis are common causes of massive splenomegaly: The spleen enlarges due to elevated blood pressure, a symptom of parenchymal liver disease. Lymphomas, leukemias, and myeloproliferative disorders are tumors of the blood and blood vessels. Splenomegaly is caused by the infiltration of neoplastic cells into the spleen.

In our study, the operation time ranged from 101 to 210 min with mean of 143.87± 31.82 min. These results are in accordance with Hussein et al., [16] who reported in 20 patients of laparoscopic splenectomy, the mean of operation time by hours was3.2 ± 0.7.

The mean intraoperative blood loss was 430±196.78 ml, with a range of 100 to 800 ml. Two patients (6.67% of the total) needed blood transfusions, and three (10%) had open conversion procedures. These results are in accordance with Hussein et al., [16] The total intra-operative blood loss was about 50–600 ml. Also, this match with study done by Hassan et al., [17] The laparoscopic splenectomy group had one case of intra-operative complication out of twenty-two female and ten male patients. The issue stemmed from insufficient staple closure, which resulted in incomplete hemostasis; however, the tissue sealing device was used to manage it. It was a successful operation with a total intraoperative blood loss of 50-600 ml and an average operating time of 180 minutes.

Further, in the study done by Cavaliere et al., [18] there was a mean of 3.2 ± 0.7 hours of skin-to-skin operation time, and the blood loss ranged from 100 to 800 ml.

Moreover, Abohabib et al., [19] informed that in 10 cases of laparoscopic splenectomy, the operation lasted an average of 122.5 minutes and the blood loss was between 50 and 150 ml, with a mean of 90.6 ml.

Our results state that the hospital stay ranged from 2 to 7 days with a mean of 4.23± 1.72 days.

These results are similar with Hussein et al., [16] who reported in 20 patients of laparoscopic splenectomy, the mean of hospital stay was 2.3 ± 0.2 days.

Furthermore, this match with study done by Vecchio et al., [2] The hospital stay ranged from 4 to 8 days. It is to be noted that this study was conducted in the period between May 2004 to October 2012, so we must consider the remarkable revolution in the use of laparoscopic tools and advancement in hemostatic techniques and tools which reflected on the time of surgery, and time of recovery remarkably as we managed to mention in our study

Additionally, Abohabib et al., [19] declared that the median stay in hospital was 1.3 days in 10 laparoscopic splenectomy cases .

Regarding conversion to open, in our study 3 patients converted to open (10%). The reason for conversion in two of them was severe adhesions around the spleen and the hilum. We believed that it was unsafe to proceed with the laparoscopy in this case. And the third patient for intraoperative bleeding was difficult to control laparoscopically, this match with Hassan et al., in which there is one patient converted to open but from total of 12 patients in laparoscopic group.

In our study we depended on Pfannenstiel incision to extract the spleen otherwise what was done by Vecchio et al., [(2)] After that, the spleen was placed in a plastic laparoscopic bag and then removed after it had been fragmented. The bag was then pulled through the Hasson trocar site. This research focused on spleens of a medium size. The referral outpatient hematology clinic requested histopathological examination for all specimens, and the large size of the spleen rendered this method inappropriate for our study.

Regarding the complication, chest infection occurred in 1 (3.33%) patients and pancreatic leakage occurred in 1 (3.33%) patient. wound infection, portal of splenic vein thrombosis, postoperative bleeding and pleural effusion were not reported in any of the patients studied.

Postoperative hemorrhage, abdominal infections, pancreatic fistula, and other complications were not observed in the 2018 study. A patient who experienced subcutaneous emphysema did not necessitate any specific treatment, while another patient who had an infection of the primary surgical incision entirely recovered after numerous dressing changes [(20)].

Furtherly, Misiakos et al., [(21)] indicated the preoperative hemorrhage, subphrenic collections or abscesses, deep vein thrombosis, splenoportal axis thrombosis, pneumonia, atelectasis, ileus, infections of the abdominal wall, hematomas and hernias of the abdominal wall, pancreatitis, and ileus are among the early postoperative complications that can occur after a laparoscopic splenectomy, according to the research.

As well, Zhou et [(22)] At our institution, laparoscopic splenectomy was performed on 33 patients with massive splenomegaly, 29 patients in group 2 underwent open splenectomy, and 48 patients in group 3 had spleens of normal size removed. This came to light while the investigation was underway. Researchers found that laparoscopic splenectomy was a safe and effective way to treat splenomegaly.

Added to that, Hussein et al., [(16)] After peri-operative complications, mortality, and morbidity were reduced, the authors concluded that laparoscopic splenectomy is a safe procedure for elective splenectomy operations. This conclusion was based on their operations on 20 patients, which confirmed our findings.

Conclusion:

Laparoscopic splenectomy is a safe and feasible procedure that is associated with a reduced risk of postoperative complications, a shorter hospital stays, and less intraoperative blood loss than open splenectomy for large splenomegaly.

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