Laparoscopic splenectomy versus open splenectomy in the treatment of some hematological disorders.

Thesis

Submitted by

Wael Naeem Thabet Aziz
MBBCh.,(Cairo) MSc.,(Cairo)

For complete fulfillment of MD degree in general surgery

Supervised by

Prof.Dr.Maged Samy Barsoom
Professor of general surgery,Cairo Univeristy

Prof .Dr. Hady Gobran
Professor of internal medicine &hematology,Cairo Univeristy

Prof.Dr.Salah Aly Shaheen
Professor of general surgery,Cairo Univeristy

Cairo

2008

Abstract

The purpose of this study is to evaluate the visibility of laparoscopic splenectomy in the treatment of some hematological disorders. We operated on 30 patients with hematological diseases in whom splenectomy were indicated, 15 patients (study group) underwent laparoscopic splenectomy, the other 15 patients (control group) underwent open splenectomy

The following patients were excluded from this study:

1. Patients with a history of bleeding tendency apart from those caused directly by platelet disorders.
2. Patients with previous upper laparotomies.
3. Diagnosis of heart, kidney, liver diseases that contraindicates laparoscopic or open surgical maneuvers.
4. Huge splenomegaly
5. Pregnancy.

Pre operative preparations of these patients were taken in the hematology department and routine laboratory investigations were done in the form of C.B.C., liver and kidney functions& bone marrow morphology.

Abdominal ultrasound imaging to assess splenic major long access &other intra abdominal pathology was done to all cases preoperatively

We used the harmonic scalpel, which is dissecting and haemostatic vessel sealing tool, to the laparoscopic procedures as it operates on the base of ultrasound wave vibrations that are transmitted from it to the tissue causing cutting and haemostasis simultaneously.

The use of harmonic scalpel &legasure in laparoscopic splenectomy were safe and effective as they improved haemostasis($p<0.001$), ease of dissection, lessens the operative time, briefs hospitalization with rapid return to work and hence better long term results.

Although the clinical implications of laparoscopic splenectomy in the treatment of some hematological disorders are not frequently observed in practice, this study suggests that laparoscopic splenectomy is ideal in the treatment of some hematological disorders as compared to open surgery as regard less operative time, brief hospitalization and hence better long term outcome in expert well trained hands in well equipped centers.

Acknowledgement

I would like to express my deepest gratitude and thanks to Prof. Dr. Magid Samy Barsoum, professor of general surgery, faculty of medicine, Cairo University, for his paternal guidance, moral support and help. Frankly I am very lucky and honored to work under his supervision.

My highest appreciation to Prof. Dr. Salah Aly Shahen, professor of general surgery faculty of medicine, Cairo University, for his unlimited support, generous care, and continuous observation thorough all phases of the work.

This study was supported by grants from Prof. Dr. Hady Gobran professor of internal medicine & haematology. Cairo University. Who spent a lot of time with me to get the results of this thesis.

I would like to express my deepest gratitude and respect to Dr.Moheb Samir Kamel lecturer of general surgery, faculty of medicine, Cairo University,who supported me &revised the thesis to be in the best form.

Finally,I would like to express my deepest gratitude and respect to my family, who sacrificed great deal of his valuable time in meticulously revising this work, guiding and support me all through and for whom no words or praise are sufficient.

List of abbreviation

- Tcm^{99}----------$technichum^{99}$
- ITP----------idiopathic thrombocytopenic purpura
- HS----------hereditary spherocytosis
- W.B.Cs----------white blood corpuscles.
- R.B.Cs----------red blood corpuscles
- LS----------laparoscopic splenectomy
- Endo GIA ----------endoscopic gastrointestinal anastemosis
- IgG----------immunoglobuline G
- IgM---------- immunoglobuline M
- IL----------interleukine
- OPSI----------Over whelming postsplenectomy infection
- ATP----------adenosine triphosphate
- 2,3-DPG---------- 2,3-diphosphoglycerate
- DNA----------deoxyribo nucleic acid
- Hb----------Hemoglobin
- HLA----------human leucocyte antigen
- MCV----------mean corpuscular volume
- MCH---------- mean corpuscular hemoglobin
- AIHAs---------- Autoimmune haemolytic anemias
- AIHAs---------- Autoimmune haemolytic anemias
- Fc----------fixation component
- HIV----------human immune deficiency virus
- WAS----------Wiskott-Aldrich syndrome
- SLE----------systemic lupus erythematosus
- CLL ----------chronic lymphocytic leukaemia
- GP---------- glycoprotein
- AIDS----------acquired immunodeficiency syndrome

List of figures

List of tables

❑ ***INTRODUCTION :***

The spleen is a hematopoietic organ which is capable of supporting elements of the erythroid, myeloid, megakaryocytic, lymphoid, and monocyte-macrophage (i.e., reticuloendothelial) systems [68].

Accordingly, the spleen participates in cellular and humoral immunity through its lymphoid elements and is involved with the removal of senescent red blood cells, bacteria, and other particulates from the circulation (monocyte-macrophage system). An increase in this function (i.e. hypersplenism) may be associated with varying degrees of cytopenia, while removal of the spleen may render the patient susceptible to bacterial sepsis, especially with encapsulated organisms.[51,68]

Normally, about one-third of circulating platelets are sequestered in the spleen, where they are in equilibrium with the circulating platelets.

Under abnormal circumstances, the spleen may become the site of extramedullary hematopoiesis, and contain developing erythroid, myeloid, and megakaryocytic precursors.)[51]

Since splenectomy was initially described for hereditary spherocytosis (HS) by Sutherland and Burghard in 1910 and for idiopathic thrombocytopenic purpura (ITP) by Kaznelson in 1916, it has been well recognized as an effective cure for some hematologic disorders. [54,57]
.

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 **[8]**

Referrals for splenectomy have been limited by the perceived risk of open surgery, despite the well-known adverse consequences of longstanding steroid use .With the advancement of laparoscopic skills and technology, the minimally invasive approach was applied to many open procedures, including splenectomy.[19]

With accumulating data and increased experience, laparoscopic splenectomy is emerging as the gold standard for the management of various hematological disorders.[29]

Since the first laparoscopic splenectomy was reported in 1991, laparoscopic splenectomy has been preformed and recommended for a wide variety of indications of benign splenic diseases when the spleen's largest diameter doesn't exceed 20-22 cm, including immune thrombocytopenia, hemolytic anemia, lymphoma and splenic artery aneurysm [(27)]

Laparoscopic splenectomy is ill advised in patients with large spleen with its major long access more than 17 cm including those with hypersplenism, in patients with major traumatic splenic injuries with hemodynamic instability and uncontrolled bleeding disorders[(27)]

As laparoscopic splenectomy is a relatively new procedure there is limited outcome analysis of data available for review, published data suggests that laparoscopic splenectomy is somewhat longer operation than the open procedure with average operating time between two to three hours, however more recent studies by experienced surgeons report operative time comparable to open surgery if the spleen is of normal size or slightly enlarged [(34)]

The original interest in the laparoscopic splenectomy somewhat diminished in the mid nineties due to lack of acceptable conversion rate as it was approaching 40 % in 1991 mainly due to bleeding, but with the advance of laparoscopic techniques the rate has dropped to 19% in 1995 to eventually reach almost zero % in 1998 [(34)]

As with cholecystectomy and antireflux surgery, the laparoscopic approach to splenectomy hastens postoperative recovery by reducing pain and improving pulmonary function, leading to diminished hospital stay and reduced disability[(43)]

The advance of medical technology applied the use of harmonic scalpel, and legasure which are dissecting and haemostatic vessel sealing tools ,to the laparoscopic procedures as they operate on the base of ultrasound wave vibrations that are transmitted from it to the tissue causing cutting and haemostasis simultaneously[(55)].

Widening the range of indications for laparoscopic procedures increases the need for harmonic scalpel and the legasure to seal vessels

not more than three mm in diameter in the first &up to five mm in the second with minimal collateral tissue injury: less than one mm [63]

The use of harmonic scalpel &legasure in laparoscopic splenectomy are safe and effective as it improves haemostasis, ease of dissection, lessens operative time, briefs hospitalization and hence better long term results [55].

➢ ***AIM OF WORK:***

The aim of this study is to compare laparoscopic to open splenectomy in patients in whom splenectomy was indicated for the treatment of some hematological disorders as in hereditary spherocytosis and auto- immune haemolytic anemia & ITP, which were refractory to medical treatment.

The study would evaluate the benefits, feasibility and safety of harmonic scalpel and legasure in laparoscopic splenectomy and their impact on the surgical outcome, short hospitalization, less cost and hence early return to physical activates and employment

Anatomy of the spleen

The spleen is an abdominal organ of dull red color, roughly the size and shape of a clenched fist . The spleen lies within the peritoneal cavity in the posterior portion of the left upper quadrant, below the diaphragm and adjacent to the left 9th to the left 11th ribs, stomach, colon, and left kidney, with its hilum in close approximation to the tail of the pancreas[(30)].

The spleen is a firm, mobile, highly vascular organ & weighs 80 to 200 grams and 70 to 180 grams in the normal adult male and female, respectively, averaging about 150 grams, or approximately 0.2 percent of body weight. It is not usually palpable, but may be felt in children, adolescents, and some adults, especially those of asthenic build.[(30,39)].

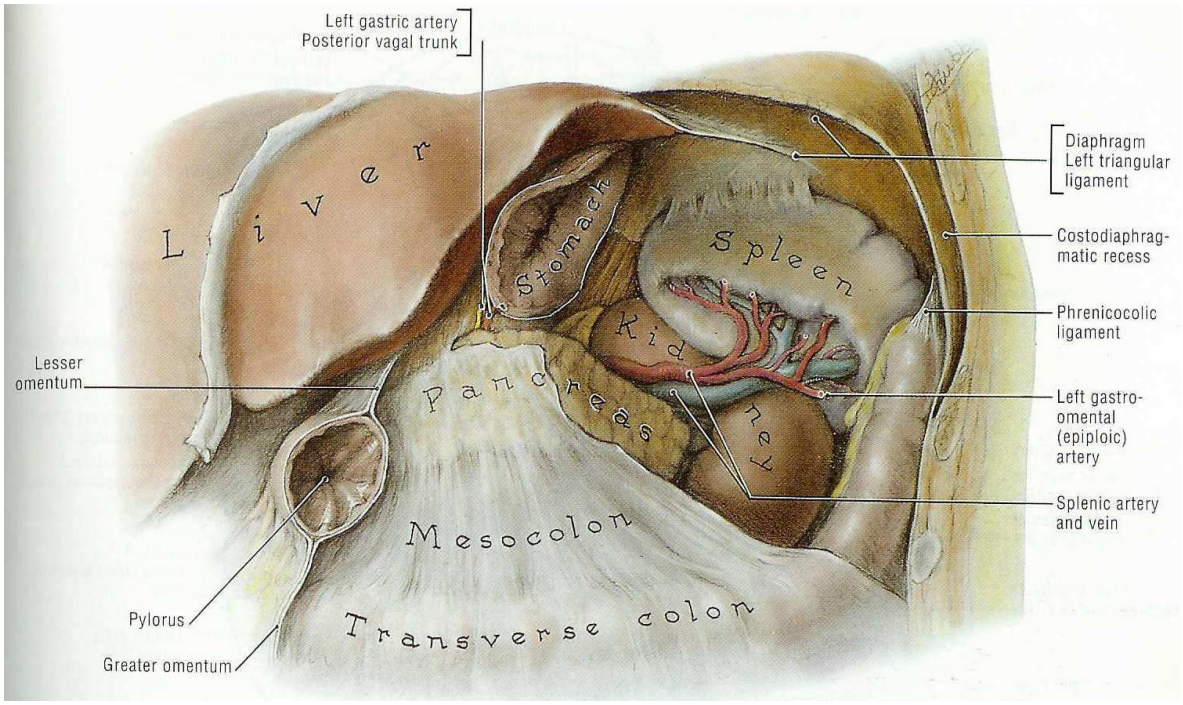

Fig: 1-1 Peritoneal attachments of the spleen. *Inset:* Hilum of the spleen, showing the short gastric and gastroepiploic vessels in the gastrosplenic ligament.(Modified from Skandalakis JE, Gray SW, Rowe JS Jr. Anatomical Complications in General Surgery. New York: McGraw-Hill, 1983; with permission.)

The spleen is characterized by notched anterior border. The convex parietal surface is in contact with the diaphragm deep to the left 9th, 10th and 11th ribs. Its long axis follows the left 10th rib up to the midaxillary line. Through the diaphragm, the spleen is related to the pleural recess and to the thin inferior border of the left lung. The visceral surface of the spleen is shared by the stomach, left kidney and colon[(30)].

Development:

Normal Development

The mesoderm is responsible for the genesis of the spleen. Around the fifth week of gestation, mesenchymal cells between the leaflets of the dorsal mesogastrium and the cells of the coelomic epithelium of the dorsal mesentery form the early spleen. The dorsal mesogastrium (Fig. 1-2), which supports the embryonic stomach, expands around the fifth to sixth weeks to form the greater omentum. [(4)]

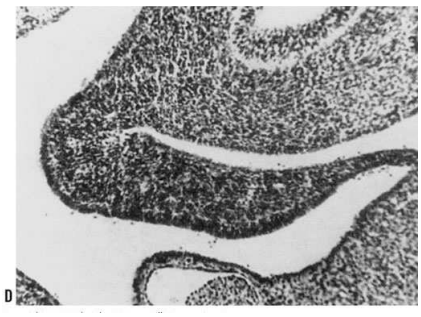

Fig 1-2Development of the spleen. **A.** The splenic primordium as it appears on the left side of the dorsal mesogastrium at 6 weeks. **B.** At 2 months. **C.** At 4 months. **D.** Angiogenesis is beginning in the early splenic primordia. (**A-C,** Modified from: Arey LB. Developmental Anatomy [6th ed]. Philadelphia: WB Saunders, 1954; **D,** from Ivemark BI. Implications of agenesis of the spleen on the pathogenesis of cono-truncus anomalies in childhood. Acta Paediatr 1955; 44[suppl 104]:1-110; with permission.)

The spleen remains within the mesenteric expansion and is located between the leaves of the dorsal mesogastrium, and occupies this location in adult life (Fig. 1-2). All these embryogenic mechanisms take place on the left side of the dorsal mesogastrium, at the left upper quadrant, which will be the permanent home of the spleen. The organ's origin is neither midline nor bilateral.[4,30]

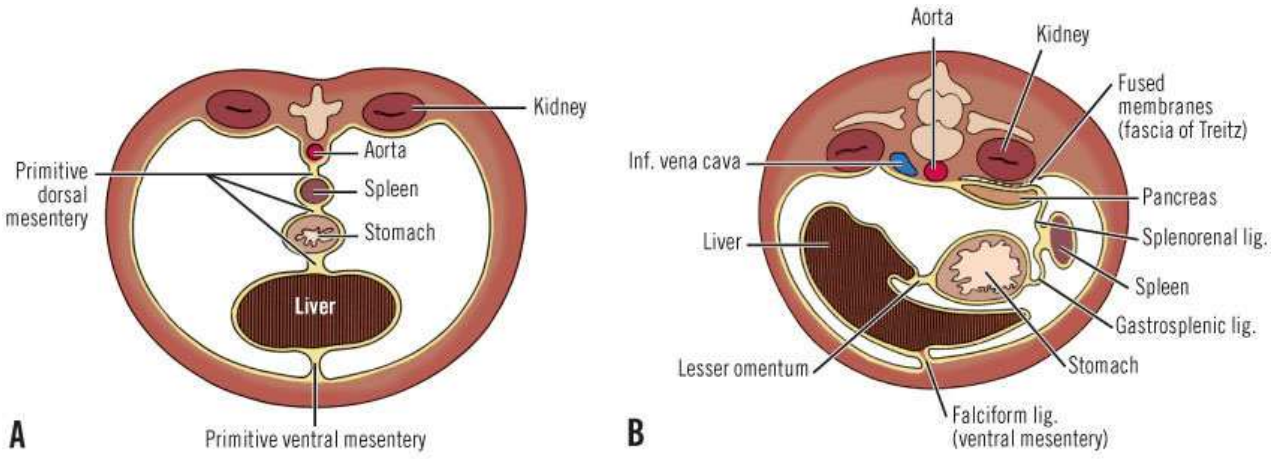

Fig. 1-3 Peritoneal reflections of the spleen develop from the primitive dorsal mesentery. **A.** Relationships during the primitive embryonic stage. **B.** Relationships in the adult. (Modified from Skandalakis JE, Gray SW, Rowe JS Jr. Anatomical Complications in General Surgery. New York: McGraw-Hill, 1983; with permission.)

The left side of the dorsal mesogastrium gives rise to the splenic ligaments (Fig. 1-3). With the possible rotation of the stomach, the left surface of the mesogastrium becomes fused to the peritoneum over the left kidney. The splenic artery is found posterior to the lesser sac and anterior to the left kidney. It is enveloped by the lienorenal ligament [4]

At 10 to 20 days, differentiation to true epithelium with visible basement membrane is evident. Clefts of mesenchymal origin (sinusoids without endothelial lining) are present at 29 to 30 days; they show evidence of communication with the capillaries.[4]

Splenic lobules form around the central arteries in the first weeks of the second trimester. The red pulp develops at the periphery of the lobules. There is also an accumulation of lymphocytes, monocytes, and macrophages during the second trimester; this is the white pulp, which forms around the central arteries.(142)

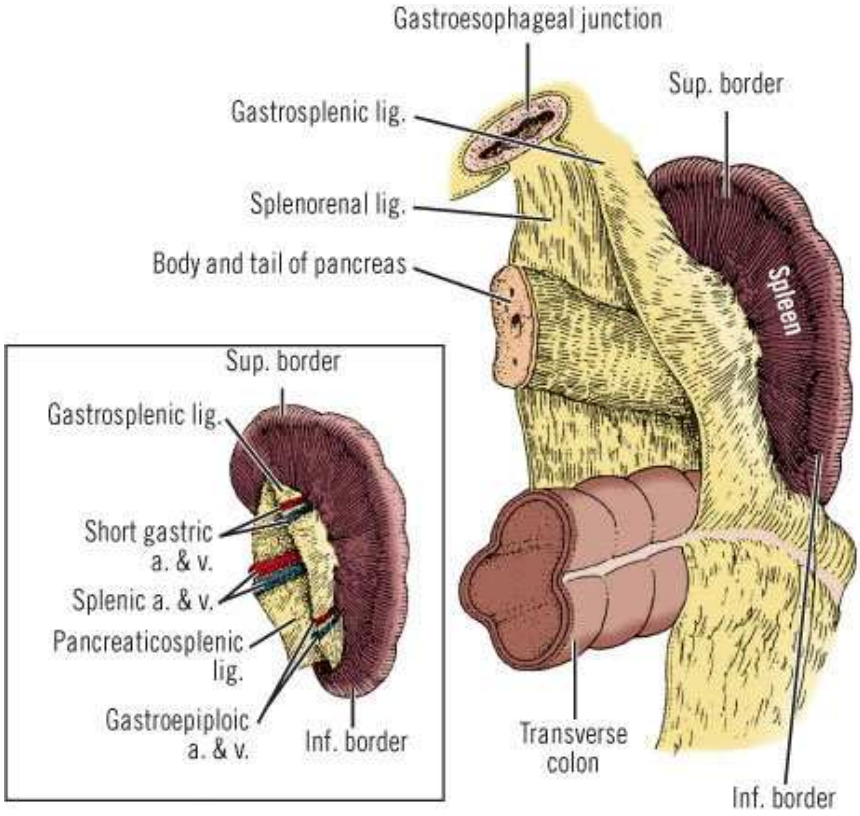

Fig .1-4 Peritoneal attachments of the spleen. *Inset:* Hilum of the spleen, showing the short gastric and gastroepiploic vessels in the gastrosplenic ligament.(Modified from Skandalakis JE, Gray SW, Rowe JS Jr. Anatomical Complications in General Surgery. New York: McGraw-Hill, 1983; with permission.)

Six ligaments (gastrosplenic, splenorenal, splenophrenic, splenocolic, and pancreatosplenic ligaments, and presplenic fold) are directly associated with the spleen. Two others (pancreaticocolic and phrenicocolic) are indirectly associated with the spleen.(1,3)

Most of the literature holds the gastrosplenic, splenorenal, and phrenicocolic ligaments responsible for ptosis of the spleen. Allen et al.[2]