LAPAROSCOPIC SPLENECTOMY

Essay
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To ...

My Father..
My Mother..
My Wife..
My Son..

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List of abbreviations

AAL	Anterior axillary line
AML	Acute Myeloid leukemia
AcS	Accessory spleen(s)
CLL	Chronic Lymphocytic Leukemia
CML	Chronic Myelogenous Leukemia
CT	Computed Tomography
DVT	Deep Vein Thrombosis
DTI	Direct trocar insertion
GIA	Gastrointestinal anastomosis
HALS	Hand-assisted laparoscopic splenectomy
ITP	Idiopathic/Immune Thrombocytopenic purpura
IVIG	Intravenous Immunoglobulins
LICS	Left lower inter-costal space
LMWH	Low-molecular-weight heparin
LS	Laparoscopic splenectomy
MCL	Mid-clavicular line
MPD	Myeloproliferative Disorders
MRI	Magnetic resonance imaging
OPSS	Overwhelming post splenectomy sepsis
PPV	Polyvalent Pneumococcal vaccine
PVT	Portal Vein Thrombosis
RBCs	Red blood cells
SPA	Single port access
SAE	Splenic artery embolization
SUF	Sub-umbilical fold
TTP	Thrombotic thrombocytopenic purpura
VNI	Veress needle insertion

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Introduction

Introduction

For many years it was thought that the spleen was an unnecessary organ, like the appendix. Galen wrote it was "an organ full of mystery." Therefore, the spleen was removed whenever it was injured. In the Middle Ages it was removed as a way to rid the body of evil humors.

The spleen serves a valuable role in immune function because it purifies the blood and helps the immune system with recognize and attack foreign antibodies and disease.

It is also known to function as a site for the development of new red blood cells from their hematopoietic stem cell precursors, and particularly in situations in which the bone marrow, the normal site for this process, has been compromised by a disorder such as leukemia.

The first splenectomy was performed by Andirano Zaccarello in 1549 on a young woman with an enlarged spleen who survived for 6 years after surgery. **(Uranues S. et al., 2005)**

Traditionally, surgical removal of the spleen was done by an open approach using either an upper midline or left subcostal incision. With the advent of minimally invasive techniques, laparoscopic splenectomy has become a standard procedure for elective removal of the spleen for most indications since the first report of laparoscopic splenectomy by Delaitre and Maignien in 1991.**(Delaitre B. et al., 1991)**

Because of the bulk and vascularity of the spleen, laparoscopic splenectomy is one of the most challenging laparoscopic procedures.

Many comparative clinical studies have documented the effectiveness and safety of laparoscopic splenectomy versus laparotomy. Laparoscopic splenectomy is believed to be superior to open splenectomy due to its minimal invasiveness, which manifests as minimal intraoperative bleeding, less pain, expedited postoperative recovery, shorter hospital stay, and lower complication rate. **(Kucuk C. et al., 2005)**

Most patients currently scheduled for splenectomy undergo laparoscopic splenectomy via the anterior approach. This approach

provides laparoscopic surgeons with a direct view of the spleen anatomy, similar to that in conventional open splenectomy.**(Choi SH. et al., 2011)**

Alternatively, laparoscopic splenectomy can be performed using a lateral approach, in which patients are usually placed in the right lateral decubitus position for better exposure of the spleen. **(Kuriansky J. et al., 1998)**

Contraindications to laparoscopic splenectomy are similar to contraindications for all laparoscopic surgeries.They include the inability to tolerate general anesthesia, uncontrollable coagulopathy, and the need for laparotomy for associated procedures.

Although reports on the safety of laparoscopic splenectomy in patients with cirrhosis and portal hypertension have been published **(Wang Y. et al., 2010)** , many consider this an absolute contraindication to laparoscopic splenectomy. **(Habermalz B. et al., 2008)**

Chapter 1

“Review”
Embryology, Anatomy, Histology and Function of the Spleen

Anatomy of the Spleen

The spleen is an organ shaped like a shoe that lies relative to the 9th and 11th ribs and is located in the left hypochondrium and partly in the epigastrium. Thus, the spleen is situated between the fundus of the stomach and the diaphragm. The spleen is very vascular and reddish purple in color; its size and weight vary. A healthy spleen is not palpable.

Development

The spleen develops in the cephalic part of dorsal mesogastrium (from its left layer; during the sixth week of intrauterine life) into a number of nodules that fuse and form a lobulated spleen. Notching of the superior border of the adult spleen is evidence of its multiple origin **(Lippincott Williams & Wilkins; 2009)**

Gross Anatomy

The spleen's 2 ends are the anterior and posterior end. The anterior end of the spleen is expanded and is more like a border; it is directed forward and downward to reach the mid-axillary line. The posterior end is rounded and is directed upward and backward; it rests on the upper pole of the left kidney.

The spleen's 3 borders are the superior, inferior, and intermediate. The superior border of the spleen is notched by the anterior end. The inferior border is rounded. The intermediate border directs toward the right.

The 2 surfaces of the spleen are the diaphragmatic and visceral. The diaphragmatic surface is smooth and convex, and the visceral surface is irregular and concave and has impressions. The gastric impression is for the fundus of the stomach, which is the largest and most concave impression on the spleen. The renal impression is for the left kidney and lies between the inferior and intermediate borders. The colic impression is for the splenic flexure of the colon; its lower part is related to the phrenicocolic ligament. The pancreatic impression for the tail of the pancreas lies between the hilum and colic impression. **(Lippincott, Williams & Wilkins; 2007)**

Hilum

The hilum can be found on the inferomedial part of the gastric impression. The hilum transmits the splenic vessels and nerves and provides attachment to the gastrosplenic and splenorenal (lienorenal) ligaments.

Peritoneal relations

The spleen is surrounded by peritoneum and is suspended by multiple ligaments, as follows:

The gastrosplenic ligament extends from the hilum of the spleen to the greater curvature of the stomach; it contains short gastric vessels and associated lymphatics and sympathetic nerves.

The splenorenal ligament extends from the hilum of the spleen to the anterior surface of the left kidney; it contains the tail of the pancreas and splenic vessels.

The phrenicocolic ligament is a horizontal fold of peritoneum that extends from the splenic flexure of the colon to the diaphragm along the midaxillary line; it forms the upper end of the left paracolic gutter.

Visceral relations

The visceral surface of the spleen contacts the following organs:

- Anterior surface of the left kidney
- Splenic flexure of the colon
- The fundus of the stomach
- Tail of the pancreas

The diaphragmatic surface is related to the diaphragm; the diaphragm separates the spleen from the pleura and the lung.

Vascular supply

- The splenic artery supplies blood to the spleen. This artery is the largest branch of the celiac trunk and reaches the spleen's hilum by passing through the splenorenal ligament. It divides into multiple branches at the hilum. It divides into straight vessels called penicillin, ellipsoids, and arterial capillaries in the spleen.
- When the splenic artery divides terminally near the spleen (~1-2 cm from the hilus) it is called a magistral splenic. This occurs in about 30% of individuals. When the division of the splenic occur earlier, as in about 70% of individuals, in the prepancreatic segment, it is called a distributing splenic.
- The variations of the splenic artery are numerous. It may divide into two branches that reunite, the splenic vein passing through the loop thus formed. It may give rise to branches normally derived from other vessels, such as the left gastric, middle colic, and left hepatic. **(Garcia-Porrero et al.; 1988)**
- The splenic artery supplies four to six (more or less) gastric vasa brevia arteries. These are terminal or end arteries. It can arise from the