Current Perspective of Laparoscopic Splenectomy

Essay

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INTRODUCTION

The spleen is an organ found in almost all vertebrate animals. It mainly acts as a filter for purifying the blood. It is also an important organ in the immune system, producing the white blood cells that fight infection and synthesize antibodies. Although the spleen is important for many functions in the body, the spleen is not vital to survival and it is possible to live without a spleen. Without the spleen, other organs in the body (particularly the liver) adapt and increase their ability to fight infection and remove redundant red blood cells**.**

(Poulin. et al., 1995)

The spleen combines the innate and adaptive immune system in a uniquely organized way. The structure of the spleen enables it to remove older erythrocytes from the circulation and leads to the efficient removal of blood-borne microorganisms and cellular debris. This function, in combination with a highly organized lymphoid compartment, makes the spleen the most important organ for antibacterial and antifungal immune reactivity**.**

(Kraal., 1992)

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, and since the first report of laparoscopic splenectomy by Delaitre and Maignien in 1991, it has been increasingly used; however, several technical challenges remain related to removing this fragile, well-vascularized organ that lies close to the stomach, colon, pancreas, and kidney**.**

(Delaitre, et al .,1992)

Laparoscopic splenectomy (LS) has become the standard approach to splenectomy for elective removal of the spleen for most indications as benign and malignant hematologic diseases despite a Paucity of high-level evidence. The procedure requires expertise in laparoscopic surgical techniques and meticulous dissection of the spleen. LS is associated with a low morbidity and mortality; when compared to laparotomy. There are a variety of laparoscopic approaches; the hand-assisted technique and newer coagulating devices have facilitated the operative technique leading to increasing acceptance of laparoscopy as the preferred approach - even in patients with malignant hematologic disease and/or massive splenomegaly**.**

(Chir., 2009)

Minimal access surgery (laparoscopic surgery) offers dramatic advantages in terms of the quality of life after the operation, Postoperative pain is reduced, which decreases postoperative narcotic use and its complications. This also aids in lower pulmonary complications, smaller wounds are associated with fewer wound complications, less scarring, and better cosmesis, results in reduction of postoperative adhesions, Patients stay in the hospital for a shorter period and recover faster**.**

(Tam., 2000)

Indications for laparoscopic splenectomy are the same for open splenectomy except when emergent splenectomy and exploratory laparotomy for traumatic injuries are needed. Laparoscopic splenectomy is indicated for various benign hematologic diseases, malignant hematologic diseases, secondary hypersplenism, and other anatomical disorders of the spleen.

(Habermalz, et al.,2009)

Disadvantages of Minimal Access Surgery as, Initial capital cost is associated with laparoscopy because new equipment and training are necessary, Loss of tactile sensation occurs, which is perhaps the major disadvantage of minimal access surgery, Controlling bleeding laparoscopically is difficult**.**

(Chen, et al .,1996)

Problems regarding the procedure concerning the learning curve with the technique are still hazardous and restricted to expert surgeons with advanced laparoscopic skills. Also the cost for the use of laparoscopic vascular staplers is still high and prohibitive for community hospitals.

(Park, et al., 1997)

Aim of the work

The aim of this work is to review the current reported potential benefits of laparoscopic splenectomy.

المقدمة

الطحال هو عضو يوجد تقريبا في جميع الفقاريات . وهو يعمل بشكل رئيسي كعامل تصفية لتنقية الدم. بل هو أيضا جهاز هام في الجهاز المناعي و فى إنتاج خلايا الدم البيضاء التي تحارب العدوى وتجمع الأجسام المضادة. على الرغم من أن الطحال مهم بالنسبة للعديد من الوظائف في الجسم فانه ليس حيويا للبقاء على قيد الحياه وأنه من الممكن أن نعيش بدون الطحال. دون الطحال فأن الأجهزة الأخرى في الجسم (خاصة الكبد) تتكيف وتزيد قدرتها على مكافحة العدوى وإزالة خلايا الدم الحمراء الزائدة عن الحاجة.

الطحال يجمع بين نظام المناعة الفطرية والتكيفية في طريقة تنظيميه فريده. هيكل الطحال يمكنه من إزالة الكريات الحمراء القديمة من الدوره الدمويه ويؤدي إلى إزاله الكائنات الحية الدقيقة التي يحملها الدم والحطام الخلوي. هذه الوظيفة في توليفة مع الجهاز اللمفاوي فى درجة عالية من التنظيم مما يجعل الطحال أهم جهاز للتفاعل المناعي ضد الجراثيم و الفطريات.

تقليديا الاستئصال الجراحي للطحال باستخدام إما شق خط الوسط أو اليسار العلوي تحت الضلع. مع ظهور تقنيات اكثر اصبح استئصال الطحال بالمنظار الإجراء القياسي لإستئصال الطحال . ولا تزال هناك العديد من التحديات التقنية المتعلقة بإزالة هذا الجهاز الهش الدموى الذى يقع على مقربة من المعدة والقولون والبنكرياس والكلى.

استئصال الطحال بالمنظار أصبح نهج موحد لمعظم الأمراض الدموية الحميدة والخبيثة. هذه العمليه تتطلب خبرة في التقنيات الجراحية بالمنظار وتشريح دقيق للطحال. ويرتبط استئصال الطحال بالمنظار بمعدلات اعتلال ووفيات منخفضة بالمقارنة مع الاستئصال الجراحى . وهناك مجموعة متنوعة من النهج بالمنظار مثل تقنية مساعدة اليد وأجهزة التخثر الحديثه التى سهلت طريقه عمليه تؤدي إلى زيادة قبول التدخل بالمنظار كأفضل وسيله حتى في المرضى الذين يعانون من امرض الدم الخبيثه أو تضخم الطحال.

مؤشرات استئصال الطحال بالمنظار هي نفسها مؤشرات استئصال الطحال جراحيا إلا عندما تكون هناك حاجة طارئة لاستئصال الطحال مثل العمليات الاستكشافية لإصابات البطن . استئصال الطحال بالمنظار هو الامثل لمختلف الأمراض الدموية الحميدة والأمراض الدموية الخبيثة و فرط نشاط الطحال الثانوي والاضطرابات التشريحية الأخرى فى الطحال.

الجراحات بالمنظار تقدم مزايا من حيث نوعية الحياة بعد العملية حيث يتم تقليل الألم بعد الجراحة مما يقلل استخدام المسكنات المخدرة بعد العملية الجراحية ومضاعفاتها. هذا يساعد أيضا في تقليل المضاعفات الرئوية وترتبط الجروح الصغيرة مع مضاعفات أقل للجرح وأقل تندب وأفضل تجميليا و الحد من الالتصاقات بعد العملية الجراحية وبقاء المرضى في المستشفى لفترة أقصر والتعافي بشكل أسرع.

مساوئ جراحات المنظار مثل التكلفة الماليه المرتفعه ويرتبط مع المنظار بسبب المعدات الجديده والتدريب ووقت التشغيل الأطول ونسبة المضاعفات الأعلى خلال منحنى التعلم من هذا الإجراء و فقدان الاحساس باللمس والذي هو ربما العيب الرئيسي فى جراحات المناظير وصعوبه السيطرة على النزيف عن طريق المنظار.

المشاكل المتعلقة بجراحات المنظار بالنسبه لمنحنى التعلم لا تزال خطرة ويقتصر على الجراحين الخبراء من ذوي المهارات التنظيرية المتقدمة. و أيضا تكلفة استخدام دباسات الأوعية الدموية بالمنظار لا تزال مرتفعة وباهظة للمستشفيات.

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Mahmoud mohyElden Mohamed

ANATOMY AND FUNCTION OF THE SPLEEN

Anatomy of the Spleen

Embryology

The mesoderm is responsible for the genesis of the spleen, the largest of the lymphatic organs. 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, which supports the embryonic stomach, expands around the fifth to sixth weeks to form the greater omentum. The spleen remains within the mesenteric expansion but does not follow the downward formation of the omentum. In other words, the spleen is located between the leaves of the dorsal mesogastrium, and occupies this location in adult life (fig.1). ***(Skandalakis et al., 2004)***

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. The left side of the dorsal mesogastrium gives rise to the splenic ligaments. 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 splenorenal ligament, which is the posterior portion of the dorsal mesogastrium. 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. Fetal lobulation normally disappears late in the prenatal period. The spleen cannot be considered a giant lymph node, since there is no connection of the splenic lymphatic’s with other lymph vessels. ***(Skandalakis et al., 2004)***

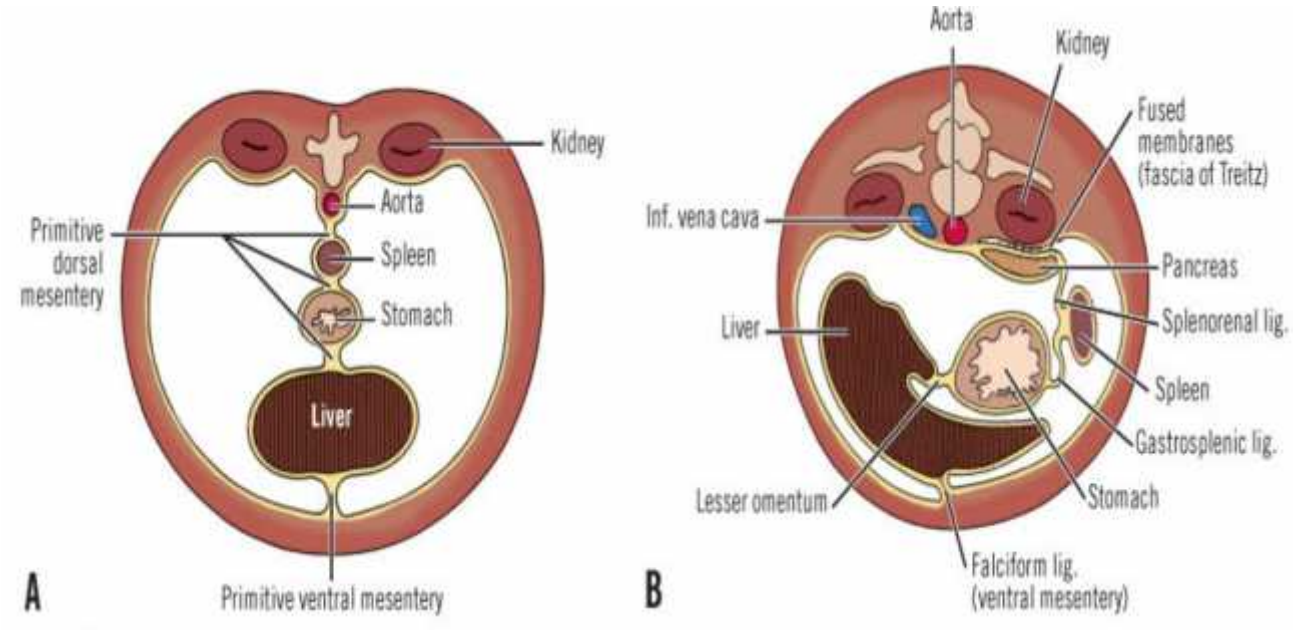

Figure (1): Peritoneal reflections of the spleen develop from the primitive dorsal mesentery. **A.** Relationships during the primitive embryonic stage. **B.** Relationships in the adult.

(Skandalakis et al., 2004)

Congenital anomalies of the spleen

1. Accessory spleen (Fig. 2) which is the most common anomaly, Present in up to 20% of the population, one or more accessory spleens may also occur in up to 30% of patients with hematologic disease. Over 80% of accessory spleens are found in the region of the splenic hilum and vascular pedicle. Other locations for accessory spleens in descending order of frequency are the gastrocolic ligament, the pancreas tail, the greater omentum, the stomach's greater curve, the splenocolic ligament, the small and large bowel mesentery, the left broad ligament in women, and the left spermatic cord in men. Failure to identify and remove these at the time of splenectomy may give rise to persistent disease.

(Charles et al., 2010)

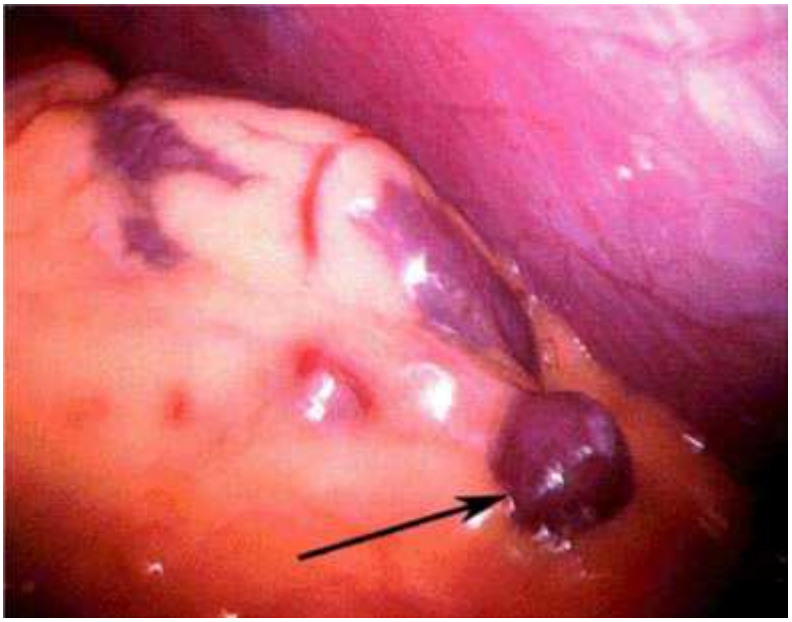

Figure (2): Accessory spleen at lower pole of splenic hilum.

(Steven D.et al., 2007)

2. Splenic lobulation (In blunt trauma it should be kept in mind that the anatomical variation of splenic lobulation might mimic a rupture of the spleen when we do sonographic examination of the spleen in emergency.

(Mouaaouy A.et al., 1991)

Other rare conditions, such as:

1- Splenic agenesis which is rare but is present in 10% of children with congenital heart disease

2- Hamartomas which vary in size from 1 cm in diameter to masses large enough to produce an abdominal swelling.

3- True splenic cysts (Fig. 3), formed from embryonal rests and include dermoid and mesenchymal inclusion cysts.

(James O, 2004)

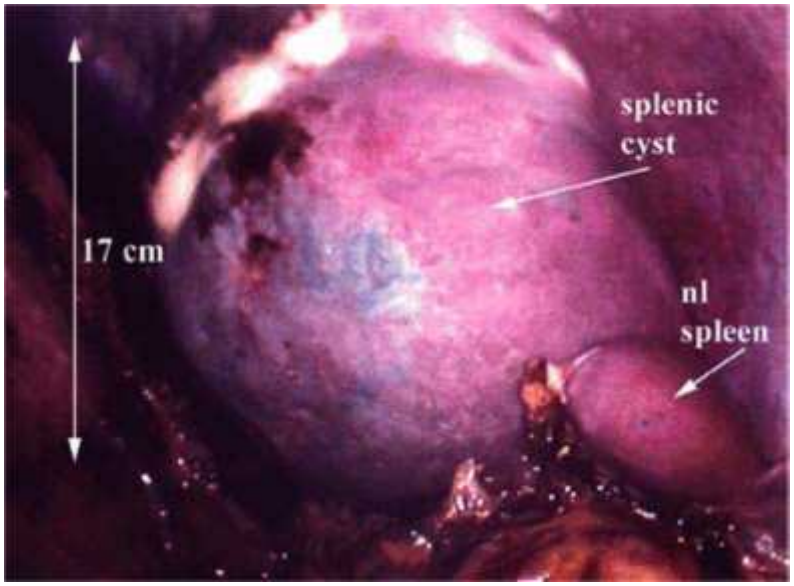

Figure (3): Laparoscopic approach to splenic cyst.

(Steven D. et al, 2007)

3. Polysplenia syndrome: This is a rare disease that occurs in patients with two or more spleens of identical sizes and various organ anomalies. The most of patients with Polysplenia syndrome die before 5 years of age because the disease is often associated with congenital anomalies such as cardiovascular anomalies. Some patients with Polysplenia syndrome have a normal heart or only minor cardiac defects, are often diagnosed incidentally in patients being treated for other disease.

(Hyung-Il Seo etal., 2008)

4. Wandering spleen: This is characterized by the anomalous position of the spleen, caused by the absence or laxity of its suspensory ligaments. The most common symptoms are usually due to intermittent or complete torsion of the splenic pedicle with subsequent infarction.

(Castellón-Pavón et al.,2006)

5. Splenogonadal fusion: developmental anomaly, resulting from abnormal fusion of the splenic and gonadal primordia during prenatal development.

(Varga et al., 2009)

Surgical anatomy of the Spleen

Topography

The spleen consists of a large encapsulated mass of vascular and lymphoid tissue situated in the upper left quadrant of the abdominal cavity between the fundus of the stomach and the diaphragm (Fig. 4). Its shape varies from a slightly curved wedge to a ‘domed' tetrahedron. The shape is mostly determined by its relations to neighbouring structures during development. Its long axis lies approximately in the plane of the tenth rib. Its posterior border is approximately 4 cm from the mid-dorsal line at the level of the tenth thoracic vertebral spine. Its anterior border usually reaches the midaxilary line.

(Susan s.et al., 2008)

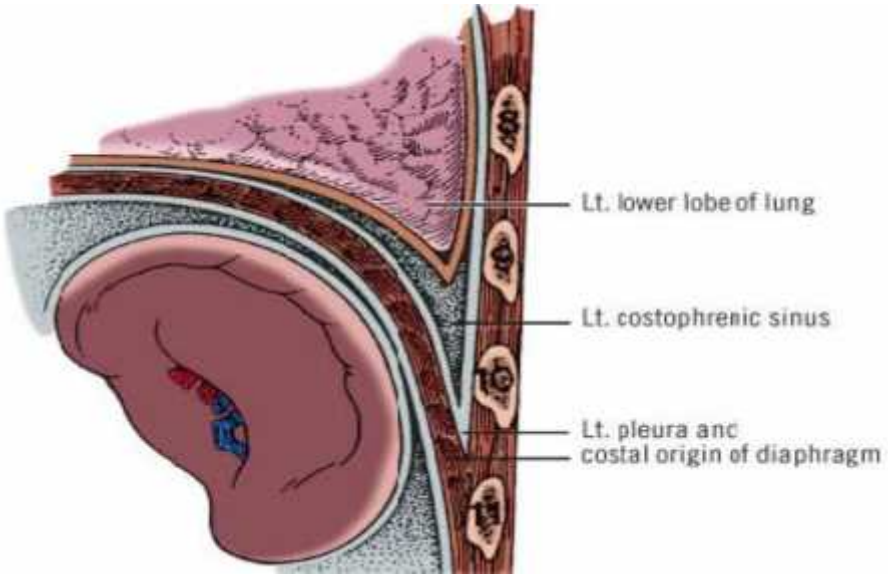

Figure (4): Location of the spleen.

(Skandalakis et al., 2004)

Size of the Spleen

The size and weight of the spleen vary with age and sex. It can also vary slightly in the same individual under different conditions. In the adult it is usually 12 cm long, 7 cm broad, and 3–4 cm wide. It is comparatively largest in the young child, and although its weight increases during puberty, by adulthood it is relatively smaller in comparison to the

neighbouring organs. It tends to diminish in size and weight in senescence. Its average adult weight is about 150 g, although the normal range is wide, between 80 g and 300 g, in part reflecting the amount of blood it contains. The normalized adult spleen fits comfortably in a cupped hand; the spleen has to be at least three times its normal size before it can be palpated.

(Pouline EC et al.,2007)

Splenomegaly was considered if spleen over 500 gms, massive splenomegaly between 1000 and 1500 gms, and giant splenomegaly above 1500 gm.

(Charles Brunicardi et al., 2010)

Normal spleen size (<13 cm), moderate splenomegaly (13 to 20 cm), and severe splenomegaly (> 20 cm).a fourth category for spleens longer than 30 cm or heavier than 3 kg, which called mega spleens.

(Poulin et al., 2007)

Surfaces and relations of the spleen

The spleen has a superolateral diaphragmatic and an inferomedial visceral surface. There are superior and inferior borders and anterior and posterior extremities or poles.

1. The diaphragmatic surface, which is convex and smooth and faces mostly superiorly and laterally although the posterior part may face posteriorly and almost medially. The diaphragmatic surface is related to the left dome of the diaphragm which separates it from the basal pleura, the lower lobe of the left lung and the ninth to eleventh left ribs. The pleural costodiaphragmatic recess extends down as far as its inferior border.

(Susan S.et al., 2008)

2. The visceral surface (Fig 5), which faces inferomedially towards the abdominal cavity, and is irregular and marked by gastric, renal, pancreatic and colic impressions. The gastric impression faces anteromedially and is broad and concave. It is separated from the stomach by a peritoneal recess, which is limited by the gastrosplenic ligament. The renal impression is slightly concave and lies on the lowest part of the visceral surface, separated from the gastric impression above by a raised strip of splenic tissue and the splenic hilum. It faces inferomedially and slightly backwards, being related to the upper and lateral area of the anterior surface of the left kidney and sometimes to the superior pole of the left suprarenal gland. The colic impression lies at the inferior pole of the spleen and is usually flat. It is related to the splenic flexure of the colon and the phrenicocolic ligament. The pancreatic impression is often small when present and lies between the colic impression and the lateral part of the hilum. It is related to the tail of the pancreas which lies in the splenorenal ligament. The hilum of the spleen is a long fissure pierced by several irregular apertures through which the branches of the splenic artery and vein as well as nerves and lymphatic's enter and leave the spleen.

(Susan S.et al., 2008)

3. The superior border separates the diaphragmatic surface from the gastric impression and is usually convex. Near the anterior extremity there may be one or two notches that have persisted from the lobulated form of the spleen in early fetal life. However, they are often absent and are not a reliable guide to the identification of the spleen during clinical examination.

(SusanS. et al., 2008)

4. The inferior border separates the renal impression from the diaphragmatic surface and lies between the diaphragm and the upper part of the lateral border of the left kidney. It is more blunt and rounded than the superior border and corresponds in position to the lower margin of the eleventh rib.

(Susan S.et al., 2008)