SURGICAL MANAGEMENT OF TRAUMATIC RUPTUR OF SPLEEN IN CHILDREN

ESSAY
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Master Degree in General Surgery

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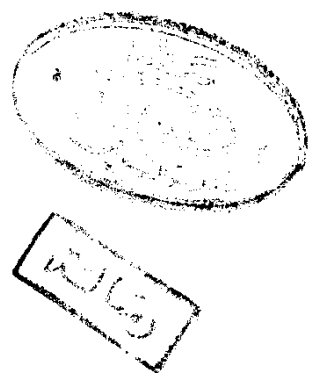

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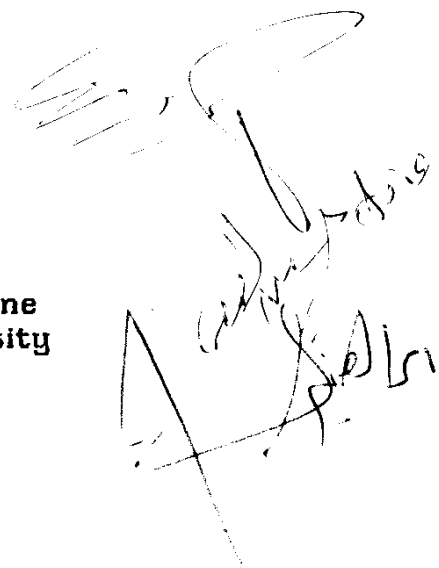

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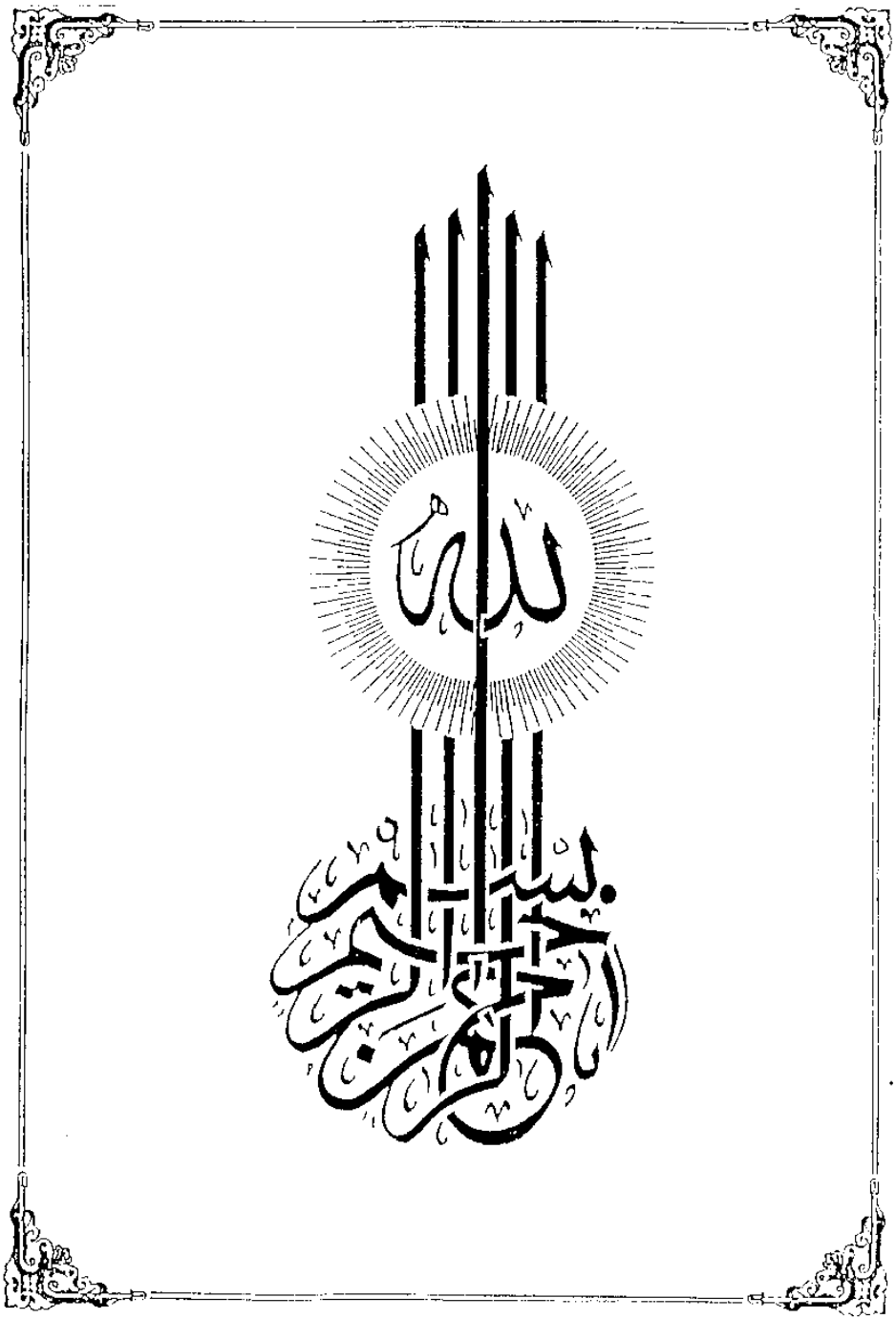

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INTRODUCTION

Overwhelming postsplenectomy infection (OPSI) is a well documented complication of splenectomy in infants and children.

For this reason, surgeons have come to recognize the importance of preserving the spleen and its function. As a result, the management of splenic trauma has undergone reevaluation. Some authors have advocated nonoperative management of splenic trauma in children. Others have demonstrated successful repair of the injured spleen in selected patients. Splenic autotransplantation remains a third alternative.

Aim of the Work :

To study and evaluate the different modalities of diagnosis and management of splenic rupture in children.

1- Surgical anatomy of the Spleen

I development and embryogenesis of the spleen

- Accessory spleens

II Topographic anatomy of the spleen

- Relations of the spleen and the tail of pancreas
- Peritoneal Reflections

III Morphology of the spleen

- General anatomy
- The blood supply of the spleen

IV Segmental anatomy of the spleen

ANATOMY OF THE SPLEEN

I. Development

The evolution of splenic immune and hematologic function is dependent on the development of vascular channels, the influx of reticular cells to form the filtering network, the influx of cells from the thymus and bone marrow to form the bulk of mature spleen, and the maturation of transient and resident cell populations. The spleen first appears as a thickening in the coelomic epithelium of the dorsal mesogastrium at 6 weeks of gastation. The bulk of the early spleen is formed by a branching network of connective tissue and reticular cells. AT 8½ weeks of gestation, blood vessels appear as thin walled vascular loops. Vasculogenesis proceeds from a closed-loop system to the formation of endothelium-lined sinuses. Vessel maturation and reticular cell development are independent processes that allow for the development of areas destined to become the red and white pulp. At 7 weeks of gestation, precursors of red blood cells can be seen. In the first trimester, the spleen has an erythropoietic function. Later, the bone marrow and liver are the major erythropoietic organs. Granulocytes and macrophages arrive in the spleen before lymphocytes. Lymphocytes appear in the spleen at 13 to 15 weeks of gestation; (6 to 7 weeks after their appearance in thymus and blood). Throughout gesta-

tion, B cells predominate over T cells in the spleen. At birth the spleen is larger in relation to body weight than at any other time during life; however, it is histologically immature. Few lymphoid follicles and no germinal centers are present at birth. Germinal centers begin to appear 3 weeks after birth. During the first year of life, the white pulp, follicles, and germinal centers mature, and the spleen assumes adult histologic appearance **(Baesl and Eiller, 1985).**

Accessory Spleens

The average frequency of accessory spleens is an estimated 11 % to 18 % of those requiring splenectomy for hematological disorders. An 50 % frequency of accessory spleens was observed in children in the first decade of life, 39 % occurred between the ages of 11 to 20 years, and the rest in adults. This fact might indicate the progressive atrophy of accessory spleens in the more advanced stages of life **(Rudowski, 1985).**

Imperfect fusion of the separate splenic masses is undoubtedly the basic mechanism of the formation of accessory spleens. Another possible explanation is that some splenic tissue becomes pinched off the main mass during development.

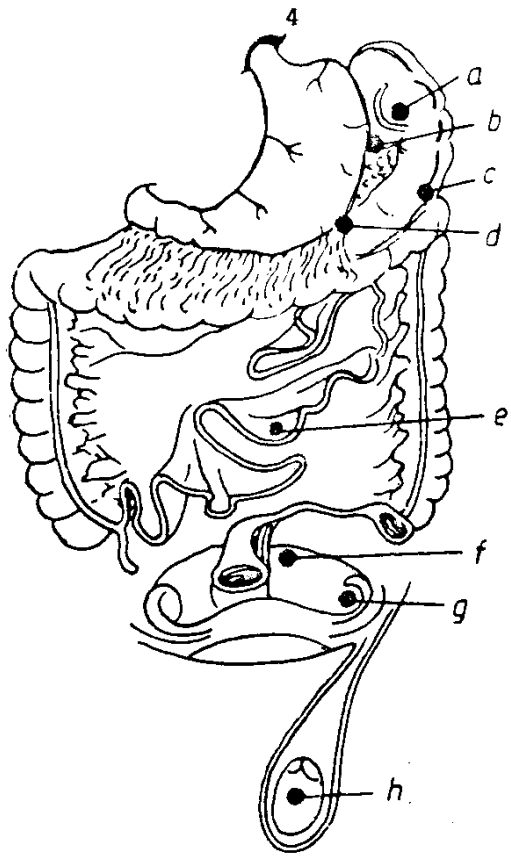

Fig 1 Anatomical localization of the accessory spleen: (a) hilus of the spleen; (b) along the splenic vessels; (c) spleno-colic ligament: (d) omentum majus; (e) mesentery; (f) presacral region; (g) adrenal region; (h) left testicular region.

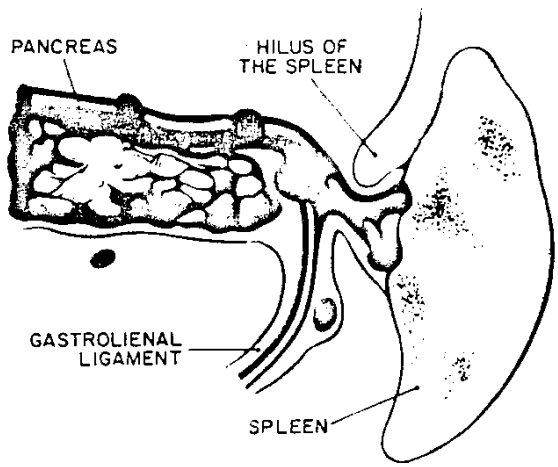

Fig. 2. Common surgical topography of the accessory spleen.

From (Wilold J. Rudowski, 1985)

Anatomical localization of the accessory spleens:

(1) Hilus of the spleen;

(2) Vascular pedicle of the spleen;

(3) Retroperitoneally in the region of the tail of the pancreas;

(4) Greater omentum along the greater curvature of the stomach;

(5) Mesentery of the small and large intestine;

(6) Left broad ligament in women;

(7) Pauch of Douglas; and

(8) Neighborhood of the left testis. (Fig. 1,2).

In 85 per cent of the cases there is only one accessory spleen, in 14 per cent, two, and in 1 per cent three accessory spleens are distributed along a line from the splenic hilus and vascular pedicle to the greater omentum **(Rudowski, 1985).**

II. Topographic Anatomy of the Spleen

Relations of the Spleen and the Tail of the Pancreas

The hilus of the spleen and the tail of the pancreas touch one another in about one-third of subjects and are within 1 cm in about one-half. In 50 per cent of subjects, the closest approach of the pancreas is at the middle of the spleen. In 42 per cent, the closet approach is near the inferior pole. The major artery limiting mobilization of the pancreas away from the spleen is the great

pancreatic artery, which usually arises from the second or third segment of the splenic artery. In addition, if there are caudal pancreatic arteries arising from terminal branches of the splenic artery, they may be ruptured if the tail of the pancreas is too vigorously mobilized. The tail of the pancreas can be dissected back 3.5 to 5 cm. There is no evidence for the presence of extrapancreatic pancreatic ducts near the hilus of the spleen **(Shandalakis et al., 1983).**

Peritoneal Reflections

The spleen is completely covered by peritoneum, which is fixed firmly to the splenic capsule. The capsule and the organ itself are friable and easily injured. There are a number of attachments to be considered. The two chief ligaments of the spleen are portions of the embryonic dorsal mesentery (mesogastrium), the leaves of which separate to surround the spleen. (Fig. 3,4).

The Gastrosplenic Ligament

The gastrosplenic ligament is the portion of the dorsal mesentery between the stomach and the spleen. This ligament is best thought of as a triangle, two sides of which are the upper portion of the greater curvature of the stomach and the medial border of the spleen. AT the apex of this triangle, the superior pole of the spleen lies close to the stomach and is occasionally fixed to it, while

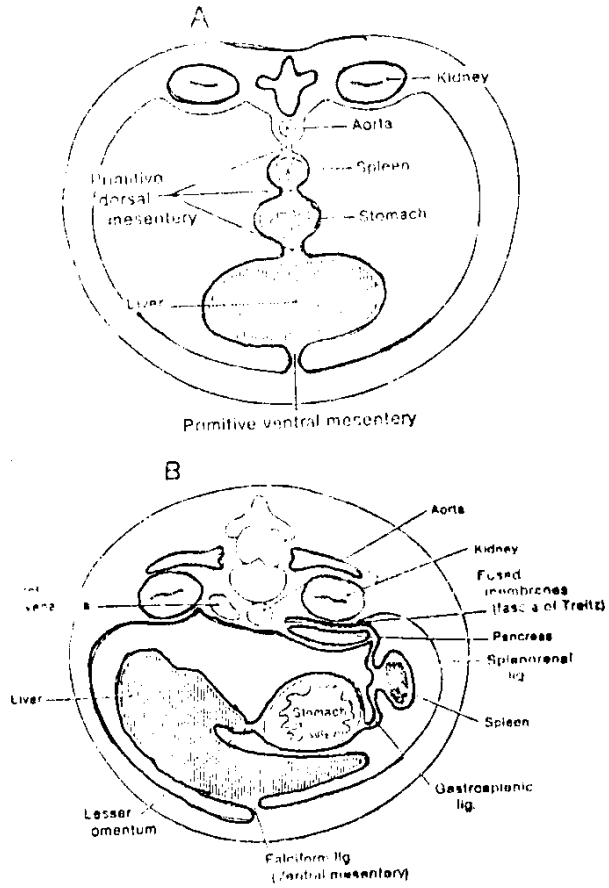

Figure 3. The peritoneal reflections of the spleen are developed from the primitive dorsal mesentery; A. diagram of primitive embryonic relations, B. diagram of adult relations.

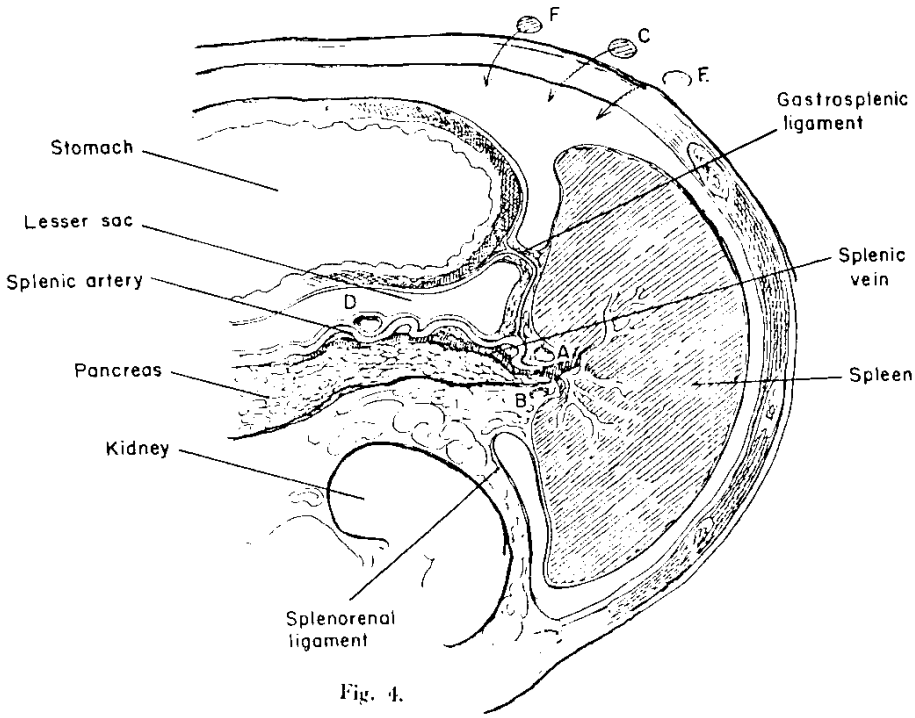

Fig. 4.

at the base, the inferior pole lies from 5 to 7 cm from the stomach. The gastrosplenic ligament contains the short gastric arteries above and the left gastroepiploic vessels below. The ligament should be incised only between clamps. Transfixion sutures may be used. At the apex of the triangle just described, the leaves of the mesentery are reflected to the posterior body wall and the inferior surface of the diaphragm, the splenophrenic ligament. There is smooth-muscle fibers in this ligament that passed from the cardia to the superior pole in 80 per cent of subjects examined. It was well-developed in some subjects and attenuated in others.Division of these muscle fibers will mobilize the superior pole of the spleen **(Skandalakis et al., 1983).**

The Splenorenal Ligament

The splenorenal ligament is the posterior portion of the primitive dorsal mesogastrium. It envelops the splenic vessels and the tail of pancreas. Incision of the peritoneal layer of this ligament, together with mobilization of the tail of pancreas, will re-establish the primitive condition. The outer layer of the splenorenal ligament forms the posterior layer of the gastrosplenic ligament, so careless division of the former may injure the short gastric vessels. The splenorenal ligament itself is nearly avascular and may be incised. It is curious that the existence of the splenorenal ligament is often over-

looked **(Skandalakis et al., 1983).**

The splenic pedicle may be narrow or wide, depending on the extent to which the primitive dorsal mesogastrium was absorbed into the body wall. The degree of effective mobilization of the spleen depends not on the splenorenal ligament, but on the length of the splenic vessels after incision of the ligament. A short splenic artery may make it impossible to deliver the spleen out of the abdomen. Gently pushing the tail of the pancreas away from the hilus of the spleen may increase splenic mobility **(Skandalakis et al., 1983).**

Minor Splenic Ligaments

The Splenophrenic Ligament

The splenophrenic ligament is an extension to the diaphragm of the splenorenal ligament.It is usually avascular, but it should be inspected for possible bleeding after section.

The Splenocolic Ligament

The splenocolic ligament is a remnant of the extreme left end of the transverse mesocolon that develops a secondary attachment to the spleen during embryonic fixation of the colon to the body wall. Since it is a secondary attachment,one would expect it to contain no large blood vessels, but tortuous or aberrant inferior polar vessels or a

left gastroepiploic artery may lie close enough to be injured by carelessincision of the ligament, with resulting massive bleeding. It should be incised between clamps.

The Presplenic Fold

The presplenic fold may be found anterior to the gastrosplenic ligament. The fold is usually free on its lateral border, but in a large pathologic spleen, it may be attached. The presplenic fold often contains the left gastroepiploic vessels. Excessive traction on this fold during upper abdominal surgery can result in a tear in the splenic capsule **(Skandalakis et al., 1983).**

III. Morphology of the Spleen

General Anatomy

The normal spleen varies in size from 80 to 300 g. The spleen has been shown to be wedge-shaped (segment of organ) in 44 per cent of individuals, tetrahedral in 42 per cent, or triangular in 14 per cent **(Skandalakis et al., 1983).**

More important than the shape of the organ is the distinction of two types proposed over 50 years ago by **Ssoson-Jaroschewitsch (1927).** The first type is a compact spleen with even borders and a narrows hilus. The splenic artery is long, and the branches are few and large, arising close to the hilus. They enter the spleen through less than