OPERATIVE STRATEGY IN LAPAROSCOPIC SPLENECTOMY

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BACKGROUND: **Laparoscopic splenectomy was attempted in 17 consecutive patients and was successful in 15.**

STUDY DESIGN: **This study is a critical analysis of the operative strategy in laparoscopic splenectomy, as reviewed in the operative video recordings and operative summaries of the 17 patients discussed.**

RESULTS: **The 15 successful laparoscopic splenectomies were all conducted according to the same strategy: mobilization of both the upper and lower pole of the spleen, division of the short gastric vessels close to the spleen, and dissection and separate ligation of the main trunk of the splenic artery and vein. An erroneous strategy that diverged from the one proposed, resulted in parenchymatous hemorrhage and open conversion in two patients.**

CONCLUSIONS: **In this series of 15 successful laparoscopic splenectomies, the most important technical aspect seems to be full mobilization of the spleen before the hilum is dissected.** ***J. Am. Coll. Surg.*****, 1994, 179: 668-672.**

THE SPLEEN is located high in the left upper quadrant beneath the dome of the diaphragm and is covered by the lower three ribs of the chest wall. This location in a deep recess of the abdominal cavity makes adequate exposure of this organ difficult by laparotomy. The spleen can easily be exposed through a left thoracotomy incision, but this causes much postoperative discomfort and obviates adequate exploration of the abdominal cavity in search of accessory spleens. Therefore, splenectomy by laparoscopy seems an attractive alternative.

PATIENTS AND METHODS

Between January 1992 and December 1993, 17 consecutive patients (seven males and ten females) underwent laparoscopic splenectomy. Ages of the patients ranged between 11 and 80 years (median of 34 years). Indications for splenectomy were medication resistant idiopathic thrombocytopenic purpura (ITP) in eight patients, human immunodeficiency virus (HIV)-related in three patients, spherocytosis in two patients, necrosis of a wandering spleen in one patient, suspected splenic tumor in one patient, splenic polycystosis in one patient, and sickle cell trait with splenic infarction in one patient. In view of the operation in patients with thrombocytopenia, high-dose immunoglobulins were given intravenously, which increased their platelet count to a median level of 108.10^9 per mm^3 (range of 17.10^9 to 237.10^9 per mm^3). Antibiotics were given up to one month postvaccination by pneumococcal vaccine. Four patients had an American Society of Anesthesiology (ASA) scale I status, seven patients had an ASA II status, four patients had an ASA III status, and one patient had an ASA IV status. Six patients had a history of previous abdominal operation. Preoperative sonography estimated spleen volumes as ranging between 90 and 1,200 mL, with a median of 300 mL. Six spleens had an estimated volume of more than 300 mL.

TECHNIQUE

The patient receives general anesthesia with endotracheal intubation. A nasogastric sump tube (No. 18F) is inserted. The patient lies in the supine position, with thighs fully abducted and slightly bent (Fig. 1). The operating table has a 20 degree reversed Trendelenburg tilt and a 45 degree lateral tilt to the right. The surgeon stands between the legs of the patient, the first assistant stands on the left side of the patient, and the second assistant stands on the right side. Five trocars (Ethicon, Inc., Somerville, NJ) are positioned as for a Nissen fundoplication procedure, as described elsewhere (1) (Fig. 2): a 10 mm trocar well above the umbilicus, a 5 mm trocar in the right subcostal area, a 5 mm trocar in the left subcostal area, a 10 mm trocar between the first and the third trocar, and a 10 mm trocar under the xiphoid appendix. An optical system, 30 degree angled (Olympus optical, Tokyo, Japan), a probe to retract the liver and the stomach, a grasping forceps, a coagulation hook, and a second grasping forceps are introduced.

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FIG. 1. Position of patient and surgical team.

The second assistant retracts the stomach. The first step of the procedure is the dissection of the splenocolic ligament and the lower part of the posterior leaf of the pancreaticosplenic ligament, which frees the lower pole of the spleen. The dissection of the anterior leaf of the gastrosplenic ligament is begun from there, one-half inch away from the medial edge of the spleen and is pursued upward, gradually closing up to the spleen (Fig. 3). The splenophrenic ligament is reached and severed, which liberates the upper pole of the spleen. The short gastric vessels are dissected free, clipped, and divided close to the spleen (Fig. 4). The hilar vessels are isolated from the pancreatic tail and from one another and ligated separately with 2.0 resorbable sutures, using an intracorporeal knotting technique (Fig. 5). The middle part of the posterior leaf of the pancreaticosplenic ligament, which is the only remaining attachment of the spleen, is divided. The spleen is introduced into a plastic bag. The bag is closed by tightening the pursestring at its top and is partially pulled out of the abdomen through the lower left trocar site. The pursestring is loosened and the spleen morcellated within the bag and removed with the help of a forceps and a powerful suction device. No drains are left.

RESULTS

The duration of the operation ranged from 90 minutes to six hours (median of 180 minutes) (Table I). Laparoscopic splenectomy was successfully performed in 15 cases. Two conversions to

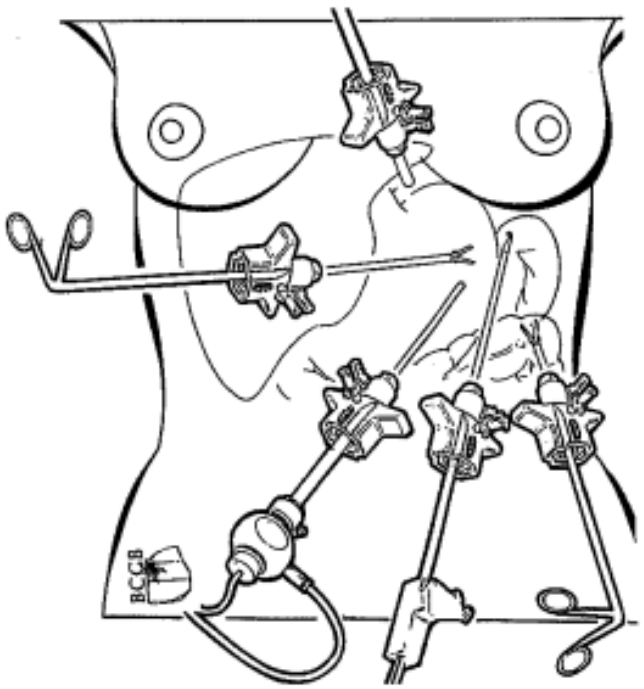

FIG. 2. Trocar positioning and tools placement for laparoscopic splenectomy.

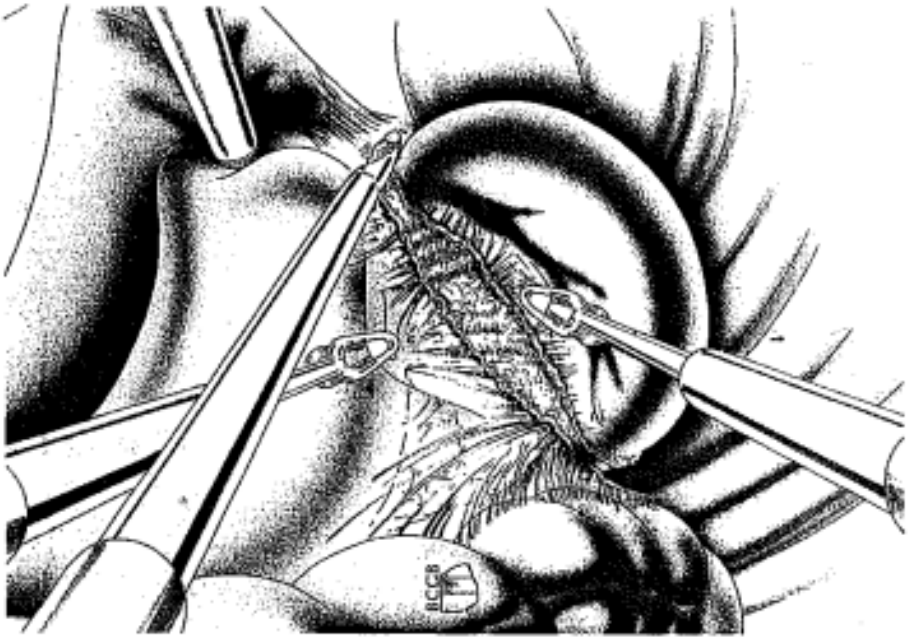

FIG. 3. The first step of the procedure is an incision of the anterior leaf of the gastrosplenic ligament, severance of splenocolic and splenophrenic ligaments.

laparotomy were necessary because of continuous uncontrollable bleeding caused by parenchymal injury, one in a case of splenomegaly, and one in the patient with a cavernous hemangioma. In three cases, injury to a sizable blood vessel was controlled laparoscopically by initial compression with adjacent tissue, followed by placement of a clip. Blood loss ranged between 50 to 1,500 mL (median of 200 mL). Accessory spleens were searched for systematically. They were found in two patients and removed successfully. One was located in the splenocolic ligament and one in the omental bursa. In 11 of 15 cases of successful laparoscopic splenectomy, the immediate postoperative course was uneventful. Two operative complications occurred: one evisceration of an omental fringe and one left pneumothorax for which a chest tube had to be placed. There were two medical complications: confusion and agitation in one patient and bronchitis in another. Bowel sounds were present as of the first postoperative day in all patients. The postoperative hospitalization period ranged between two and 16 days (median of three days).

DISCUSSION

A major argument against laparoscopic splenectomy, in cases of ITP, is the risk of overlooking

TABLE 1.—OPERATIVE COURSE IN 17 CONSECUTIVE PATIENTS WITH LAPAROSCOPIC SPLENECTOMY

Patient No.	*Indication*	*Preoperative platelet count, $\times 10^9$/mm^3*	*Blood loss, mL*	*Perioperative accident*	*Estimated spleen volume, mL*	*Conversion to laparotomy*	*Operating time, min*
1	HIV, ITP	60,000	400	—	300	—	240
2	HIV, ITP	128,000	500	—	300	—	300
3	ITP	108,000	600	Splenic vein injury	230	—	300
4	ITP	79,000	100	—	200	—	240
5	ITP	122,000	50	—	182	—	150
6	ITP	127,000	50	—	200	—	150
7	ITP	160,000	450	—	300	—	240
8	Splenic tumor	168,000	750	Visceral injury	430	Yes	180
9	ITP	57,000	1,500	Visceral injury	500	Yes	150
10	Spherocytosis	102,000	100	—	900	—	240
11	ITP	237,000	100	—	150	—	180
12	Wandering spleen	216,000	100	—	300	—	90
13	ITP	63,000	350	—	90	—	120
14	Spherocytosis	299,000	50	—	150	—	180
15	Polycystosis	250,000	200	Short gastric vessel injury	800	—	180
16	HIV, ITP	17,000	250	Splenic artery injury	500	—	300
17	Sickle cell anemia	368,000	400	Pleural laceration	1,200	—	380

No., Number; min., minute; HIV, human immunodeficiency virus; and ITP, idiopathic thrombocytopenic purpura.

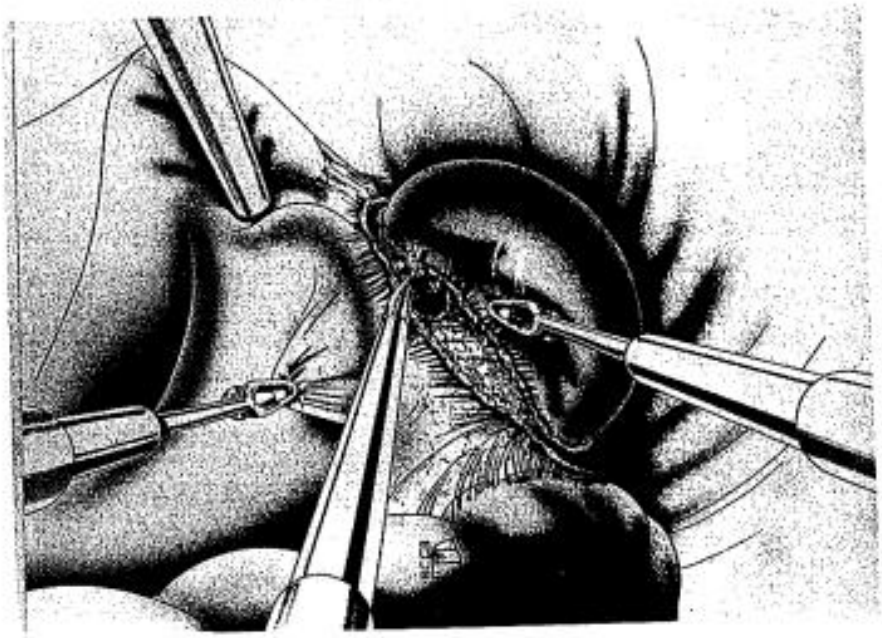

FIG. 4

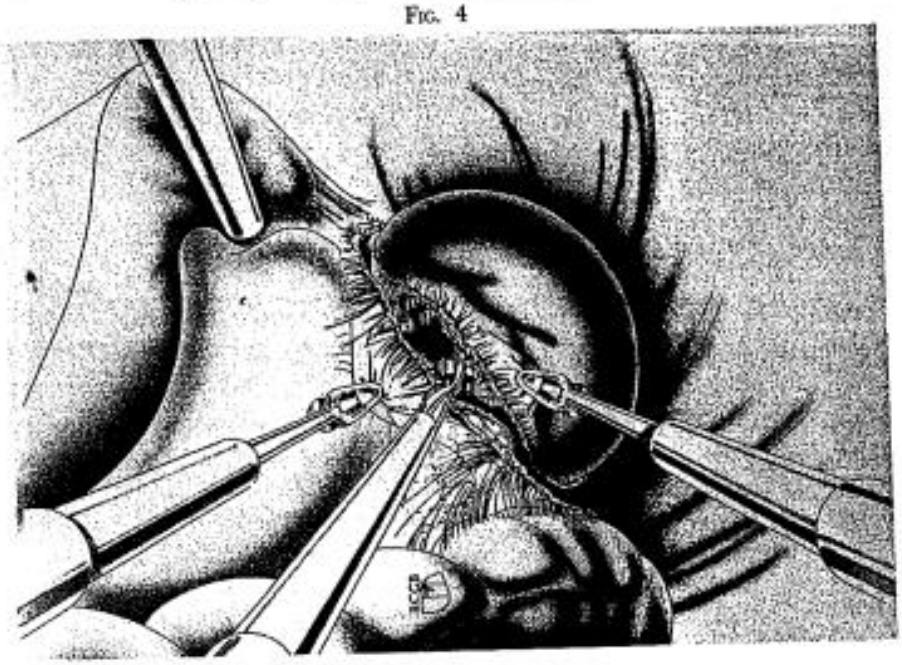

FIG. 5

FIG. 4. Division of short gastric vessels.
FIG. 5. Isolation, ligation, and severance of the hilar vessels.

accessory spleens. Rudowski (2) found recurrences of ITP most frequently in the period between six and 48 months after the initial procedure. In a series of 177 splenectomies, 16 of 19 late recurrences were due to an accessory spleen as suggested by isotopic scanning methods. Therefore, only long-term follow-up evaluation will provide evidence if laparoscopic exploration is as reliable as open surgery in the search for accessory spleens.

In patients infected with HIV, the laparoscopic approach exposes the surgical team to fewer chances of injury by sharp instruments and of contamination by blood and body fluids. Although the advantages over open abdominal procedures seem obvious, strict application of the universal precautions against contamination is mandatory (3, 4).

The only reason for the two conversions in our series was parenchymal laceration. This

caused dramatic bleeding and could have been a source of splenosis (5). Laceration could have been avoided by delaying dissection of the hilar vessels until later in the procedure, when good exposure would have been possible without forceful traction on the spleen. Unlike Cuschieri and associates (6), we prefer to divide the short gastric vessels close to the spleen, as opposed to near the greater curvature. This saves us from having to deal with a flap of omentum, which will constantly fall in the operative field. Perfect visualization of the hilus is necessary to identify possible anatomic variations of the main splenic vessels. Careful dissection of the artery and vein and separate ligation of the main trunks provides better control, reduces the risk of massive hemorrhage, and saves time.

In many cases, the pancreatic tail is closely related to the splenic hilus. Unlike Delaitre and co-workers (7), we think that mass stapling of the entire splenic hilus is dangerous and can result in inadvertent pancreatic injury. Moreover, the use of sutures rather than staples decreases the cost of this laparoscopic procedure. Bleeding from vessel injury need not result in open conversion because, in all cases in our experience, bleeding could be controlled by compression with surrounding tissue, followed by placement of a clip.

In our series of 15 successful laparoscopic splenectomies, the most important aspect in which our technique differs from that of most others already described (7, 8), is that full mobilization of the spleen has to be performed before the hilus is dealt with. We think that this step is essential in this advanced laparoscopic procedure.

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