

The Lateral Approach to Laparoscopic Splenectomy

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BACKGROUND: Laparoscopic splenectomy has been shown to result in shorter hospital stays and a quicker return to work than conventional splenectomy. Having tried the anterior 5 trocar approach, we developed a 4 trocar lateral approach and now present our experience with 22 cases.

METHODS: All patients were placed in the right lateral decubitus position. A 10-mm trocar was inserted in the left subcostal region, 2 in the flank, and a 5-mm trocar dorsally. A 30° laparoscope was used. Splenectomy was performed for varying pathologies.

RESULTS: Operating room (OR) time averaged 169 minutes, spleen weight 513 grams, and postoperative (post-op) stays 5.4 days (median 3 days). One patient was converted to laparotomy. There were no deaths, post-op abscesses, pancreatic injuries, or bleeding complications.

CONCLUSIONS: The lateral approach affords superior exposure, allowing easier dissection of splenic hilar structures. Over varying patient habitus and spleen size it has been demonstrated to be the approach of choice for laparoscopic splenectomy. *Am J Surg.* 1997;173:126-130. © 1997 by Excerpta Medica, Inc.

The advantages of laparoscopic splenectomy over conventional splenectomy have been suggested in early reports.¹⁻³ Limited series to date from the United States,^{1,4,5} Canada,^{3,6} and Japan⁷ have largely involved a 5 trocar anterior approach to laparoscopic splenectomy. In 1992 our initial experience with laparoscopic splenectomy also involved the anterior approach. As with others, we found the exposure difficult and visualization suboptimal, leading potentially to a significant risk of bleeding or trauma to the tail of the pancreas.

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From our experience using the lateral approach for laparoscopic adrenalectomy, we found that the spleen was better visualized and could be more easily retracted than with the anterior approach. This offered superior exposure of and access to the vascular pedicle and tail of the pancreas. We described our initial experience with the lateral approach to splenectomy⁸ and now present our experience with 22 cases.

PATIENTS AND METHODS

Between December 1992 and March 1995, 22 patients underwent laparoscopy for splenectomy. The 13 females and 9 males ranged in age from 6 to 73. Splenectomy was performed for idiopathic thrombocytopenia purpura, lymphoma (Hodgkin's and non-Hodgkin's), autoimmune hemolytic anemia, thrombotic thrombocytopenia purpura, hereditary spherocytosis, Evan's syndrome, hairy cell leukemia, and hypersplenism secondary portal hypertension (Table I). Each patient received antipneumococcal, meningococcal, and *Haemophilus* flu vaccinations at least 1 week preoperatively. Only 1 patient (portal hypertensive with hypersplenism) underwent preoperative splenic artery embolization.

Operative Technique

Under general endotracheal anesthesia, all patients were placed in the full right lateral decubitus position (Figure 1). The initial 10-mm incision was made in the left subcostal position, mid axillary line. A Verres needle was introduced and CO₂ pneumoperitoneum achieved once an orogastric tube was in place to decompress the stomach. A 10-mm trocar was then introduced, followed by the 30° laparoscope. The Hassan trocar technique of entry was also used in patients with multiple previous abdominal surgeries. Under direct vision, the second and third 10-mm incisions were made lower in the mid axillary line and toward the left anterior axillary line respectively (Figure 1). There was some variation in port positioning based on spleen size and patient habitus.

Dissection was commenced laterally by mobilizing the splenic flexure of the colon. This facilitated the introduction of the 5-mm dorsal or flank trocar. This final trocar was positioned under direct vision between the iliac crest and twelfth rib in the mid to posterior axillary line. Continuing superiorly, the lateral peritoneal attachments of the spleen, splenorenal, and splenophrenic ligaments were incised (Figure 2). In doing so, a 1-cm cuff of peritoneum was left along the lateral aspect of the spleen. Using a grasping forceps, via the lumbar port, the cuff was grasped and the spleen was retracted medially. The spleen is thus mobilized in the same manner and sequence as in open splenectomy.

TABLE 1

Splenic Pathology	
Idiopathic thrombocytopenia purpura	8
Lymphoma—Hodgkin's	2
—non-Hodgkin's	2
Autoimmune hemolytic anemia	4
Thrombotic thrombocytopenia purpura	2
Hereditary spherocytosis	1
Evan's syndrome	1
Hairy cell leukemia	1
Hypersplenism secondary portal hypertension	1

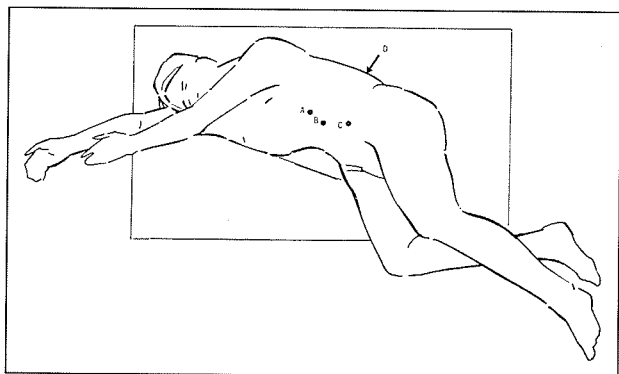


Figure 1. Patient positioning for lateral approach to laparoscopic splenectomy. Table is flexed and kidney rest is raised. Port sites A, B, C are 10-mm, port D is 5-mm in diameter.

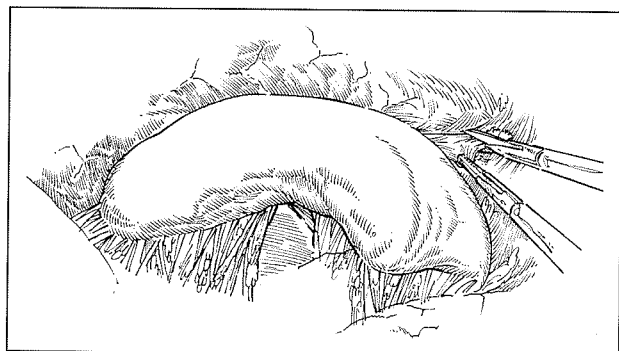


Figure 2. Division of lateral attachments to spleen, leaving a peritoneal cuff.

Dissection of the splenic hilum was approached from the lower pole and continued in a cephalad progression. Whether the splenic artery is of a magistral or distributed configuration,⁹ a lower pole vessel is usually present. This was divided between clips, and freed the lower pole of the spleen. Again via the dorsal port, a blunt instrument was passed underneath the lower pole of the spleen and the spleen was elevated (**Figure 3**), providing a clear view of the splenic pedicle and the tail of the pancreas. The splenic artery was dissected free and divided using clips or the Endoscopic Linear Cutter (EZ35W-Ethicon, Cincinnati, Ohio, USA). The splenic vein was divided separately. As an alternative, ligatures can be placed around each vessel and tied intra- or extracorporeally. We have found that the vascular staples do work well, however, occasionally an extra clip on the vessel stump is required.



Figure 3. Elevation of lower pole of spleen. Division of vascular pedicle.

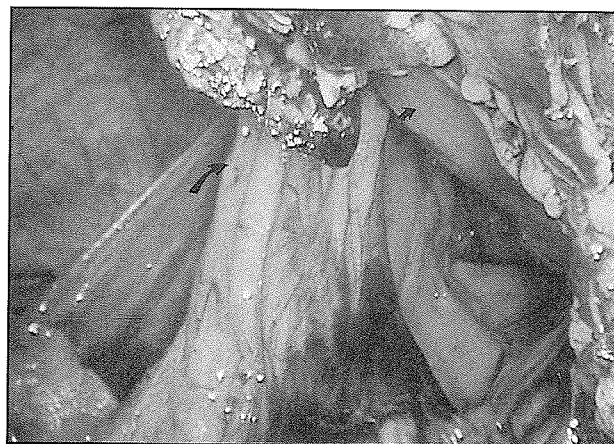


Figure 4. Short gastric vessels (large arrow) tented up to elevated spleen (small arrow).



Figure 5. Division of short gastric vessels using endovascular stapler.

As the lesser sac is entered this approach affords a superb view of the short gastric vessels as they are tented up to the elevated spleen (**Figure 4**). These are divided, either using clips or the endovascular stapler (**Figure 5**). The Harmonic Scalpel (L.C.S.-UltraCision Inc., Smithfield, Rhode Island, USA) has also been used to divide the short gastric vessels.¹⁰ One can easily identify and access only those short

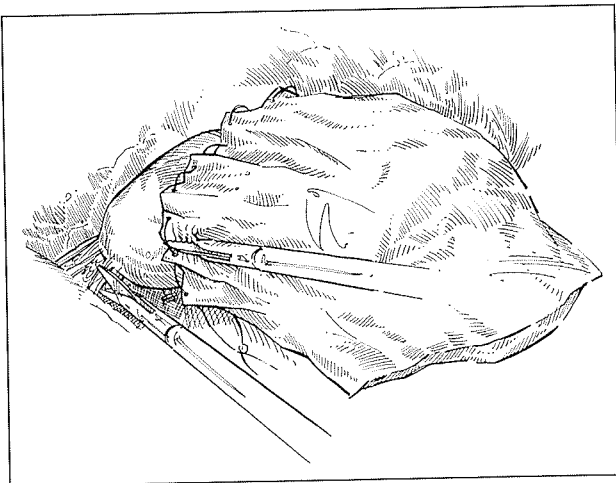


Figure 6. Placement of spleen into sac.

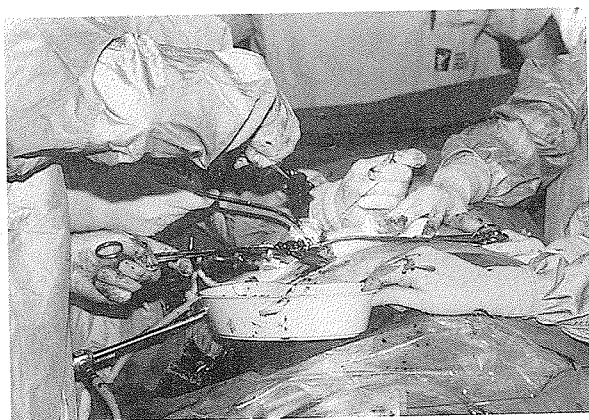


Figure 7. Extraction of large fragments of spleen via dilated 10-mm port site.

gastric vessels that need to be divided. There is no need for extensive dissection of the greater curve of the stomach.

The superior pole splenophrenic attachments are divided last. Care must be taken to divide these attachments between clips, particularly on the supromedial aspect of the spleen because they can be quite vascular. A few avascular strands are left intact, once the entire spleen is mobilized and otherwise detached. This will greatly facilitate the process of placing the spleen into a durable nylon Lapsac (Cook Inc., Bloomington, Indiana, USA) intracorporeally (Figure 6). In our early experience, placing a completely detached spleen into a sac proved a formidable challenge, particularly with large spleens. By leaving some superior pole attachment intact, the bag can be maneuvered much more effectively over the spleen. The attachments are then divided and the draw string on the sac is closed. The neck of the sac is then withdrawn through the mid axillary line trocar site. Within the sac the spleen is morcellated and extracted piecemeal, using a sponge forceps. Once the splenic capsule is adequately disrupted, large fragments of spleen can be extracted intact (Figure 7).

RESULTS

Spleen size ranged from 7 to 26 cm in greatest dimension. In the 2 patients with the largest spleens in this series, an

TABLE II

Summary of Results—Laparoscopic Splenectomy

All patients (N = 22)	
Variable	Mean (range)
Age (years)	44.1 (6–73)
OR time (minutes)	169 (75–315)
Blood loss (cc)	212 (50–1500)
Spleen weight (grams)	513 (62–4313)
Post-op stay (days)	5.4 (2–21)
Conversion to laparotomy	1

TABLE III

Summary of Results—Laparoscopic Splenectomy

Spleens $\leq$ 180 grams (N = 11)	
Variable	Mean (range)
Age (years)	44.6 (15–72)
OR time (minutes)	151.4 (75–255)
Blood loss (cc)	123 (50–500)
Spleen weight (grams)	109.5 (62–180)
Post-op stay (days)	3.5 (2–7)
Conversion to laparotomy	0

8- to 10-cm incision was made to deliver the organ, because there were no available sacs large enough to facilitate the normal bagging and morcellation process. Other variables such as patient age, operative time, blood lost, and post-operative (post-op) stay are summarized in Table II. The mean spleen weight in this series is 513 grams. This figure reflects the varied underlying pathologies listed in Table I. When reviewing these same variables for spleens at or below the upper limit of normal weight (180 grams) some differences are seen (Table III). Mean operative time drops from 169 minutes to 151 minutes, blood loss from 212 cc to 123 cc, and post-op stay from 5.4 to 3.5 days. The most prolonged post-op stay involved a 65-year-old woman who had a laparoscopic splenectomy and concomitant laparoscopic small bowel resection for lymphoma (post-op stay 21 days). One patient with hypersplenism secondary to portal hypertension was converted to laparotomy caused by difficulty in dissecting very dense and vascular adhesions between the superior pole of the spleen and the diaphragm (post-op stay 17 days). This was the only patient in whom preoperative splenic artery embolization was performed. Instead of facilitating dissection, the embolization of the splenic artery appeared to have incited local inflammatory changes rendering the dissection more difficult.

A total of four accessory spleens were excised in two patients.

There were no perioperative nor post-op deaths. One patient developed a deep venous thrombosis (DVT) postoperatively. This patient had not received DVT prophylaxis. It is now our practice to prophylax all patients preoperatively with Heparin 5000 units sc. Another patient had a transient left plural effusion. There were no abscesses, bleeding complications nor pancreatic injuries recorded.

DISCUSSION

With the introduction of laparoscopic cholecystectomy in 1985,¹¹ there has followed a period of rapid progression in

techniques of minimally invasive surgery. This has led to the adaptation of most extirpative and reparative abdominal procedures to a laparoscopic approach. Almost inevitably, splenectomy has been included in the domain of the laparoscopic surgeon. There is a particular theoretical appeal in the laparoscopic approach to procedures such as cholecystectomy and splenectomy, where much of the perioperative morbidity and certainly the patient's recovery relate directly to the mode of access used to facilitate removal of the organ. After splenectomy, the patient has simply to recover from the incisions. It may be postulated that three 10-mm incisions and one 5-mm incision would contribute to a more rapid post-op recovery than either an upper midline or left subcostal incision. This appears to be borne out in the early reports from limited series of laparoscopic splenectomy.^{1-5,12}

The advantages of laparoscopic over open splenectomy include less post-op pain and morbidity, shorter hospital stay, more rapid return to normal activities, and more cosmetic incisions.¹³ The anterior approach to laparoscopic splenectomy affords better visualization of the splenic hilar structures than is usually the case with open splenectomy. The lateral approach offers even more advantages, including superior exposure, a more natural sequence, and ease of dissection and minimal invasion.

With the patient in the left lateral decubitus and slight reverse Trendelenberg position, the stomach, colon, and small bowel are drawn out of the operative field without the need for retracting instruments. Whereas lateral¹⁴ or semirecumbent positioning has also been reported, our technique of port placement is unique and affords better exposure of hilar structures. In particular, the lumbar or dorsal 5-mm port accommodates a blunt grasper that is used to either grasp the peritoneal cuff and draw the spleen medially, or to elevate the lower pole of the spleen. In this manner, the spleen is never directly grasped or manipulated and the risk of bleeding thus diminished. The actual sequence of resection of the spleen, beginning with the medial mobilization and then control of hilar vessels using the lateral approach, more closely approximates the technique of conventional open splenectomy and thus feels somewhat more intuitive and familiar to the surgeon.

Barnoffsky demonstrated in his cadaveric anatomic series that the tail of the pancreas lies within 1 cm of the splenic hilum 75% of the time^{15,16} and confirmed Michels' finding that it actually abuts the spleen in 30% of patients.^{9,16} Using the lateral approach, and with the spleen elevated, the surgeon has a clear view of the pancreas and thus can avoid injury to the tail of the pancreas more easily than with the anterior approach. Some authors in early reports found exposure difficult and blood loss significant and have proposed the use of routine pre-op splenic artery embolization.^{5,6} We were not in the practice of routine pre-op splenic artery embolization with open splenectomy and feel that the attendant risks and costs are not justified, given the ease of dissection and minimal blood loss associated with the lateral approach.

There remain certain difficulties in dissection using either laparoscopic technique. Dense, vascular superior pole splenic attachments, particularly in large or barrel-chested men, can be hard to visualize and access. Short, proximal short gastric arteries can be problematic to isolate and di-

vide between clips or ligatures. The Harmonic Scalpel has been used with success⁷ and may see wider use in this application. As with open splenectomy, an inflamed pancreas, often encountered with an obliterated lesser sac, can render the dissection more difficult. If bleeding occurs and cannot be controlled with clips or staples, then—with an endoscopic grasper placed to maintain vascular control—conversion to laparotomy can be accomplished rapidly and safely. This requires that with every laparoscopic splenectomy set up instruments for conversion to laparotomy are also immediately available.

In terms of minimal invasion, we use 4 instead of 5 trocars. The 5-mm port is placed well laterally in the flank. This may impart some cosmetic advantage.

Laparoscopic staging procedures of Hodgkin's disease have been described.^{17,18} The lateral approach lends itself well to the performance of staging procedures. Para-aortic nodes are accessed by mobilizing the spleen more medially before dividing the splenic pedicle. The dissection is continued inferomedially right to the level of the aorta where the nodes are biopsied. Porta hepatis nodes can easily be sampled by rotating the operating table, bringing the patient to a semirecumbent, or even supine position. (By rotating the patient in this way and slightly modifying trocar placement and adding 2 extra 5-mm ports, we have combined laparoscopic splenectomy with laparoscopic cholecystectomy.) Procuring a liver biopsy laparoscopically is straight forward.

The issue of laparoscopically retrieving an adequate tissue sample for pathologic examination has been raised.¹⁹ We have found that when the spleen is morcellated in a durable sac, and once the splenic capsule is disrupted, it is possible to extract intact, large portions of spleen through a dilated-10 mm trocar incision (Figure 7). It is important to emphasize the need for a robust sac within which the spleen is morcellated for extraction. Perforation of a less durable sac during this process could result in spillage leading to splenosis.

The average spleen weight of 513 grams reflects the number of enlarged spleens included in this series. With large spleens, predictably, retraction is more cumbersome and operative times and blood loss may be increased. It is in the case of massive splenomegaly (spleen greater than or equal to 20 cm) that the advantage of the lateral approach over the anterior approach²⁰ is particularly evident, in terms of improved exposure. Although no patients are excluded as candidates for laparoscopic approach, spleen size in relation to the size of the patient's peritoneal cavity is a major consideration in the feasibility of the procedure.

With the exception of stapling devices, all instruments used in these procedures are nondisposable. With increasing experience in this technique, operative time and hospital stays are diminishing. An early study comparing costs between open and laparoscopic splenectomy suggests economic benefit accruing to the latter approach.²¹

CONCLUSION

The lateral approach to laparoscopic splenectomy affords superior exposure of splenic hilar structures facilitating easier dissection, even with large spleens. Over a wide range of pathology, spleen size, and patient habitus, this approach has been demonstrated to be feasible and reliable, and is the approach of choice for laparoscopic splenectomy.

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