Laparoscopic Splenectomy in a Minimal Resource Setting
A Case Series From the Caribbean

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Abstract: This study examines the perioperative outcome of laparoscopic splenectomy in a minimal resources setting in the Caribbean. Seventeen consecutive patients who underwent elective laparoscopic splenectomies by a single surgeon from August 2003 to December 2008 were studied. Data collected included patients' demographics, indications for surgery, operative time, complications, and outcome. 88% were females, the median age being 33.3 years. Idiopathic thrombocytopenic purpura was the most common indication (82%) in majority of the cases. Other indications included hereditary spherocytosis, hypersplenism, and metastatic disease. The mean operative time was 88.8 minutes and the mean hospital length of stay was 3.3 days. One case was converted to open splenectomy. Five patients experienced postoperative complications. There was no mortality. Despite limited blood banking facilities and hematology support, laparoscopic splenectomy may be safe in minimal resources setting, if cases are selected carefully and performed by an experienced surgeon with short operative times.

Key Words: laparoscopic splenectomy, minimal resources, Caribbean

(*Surg Laparosc Endosc Percutan Tech* 2010;20:e125–e128)

S plenectomy is commonly performed for a variety of indications, either on an emergent or elective basis. The highly vascular nature of this organ, its relatively difficult anatomic accessibility, and the patients' underlying hematologic disorders render splenectomy one of the procedures requiring meticulous attention to prevent excessive perioperative bleeding. Historically, splenectomies were performed through an open approach.

However, as the laparoscopic approach was described in 1991 by Delaitre and Maignien[1] for elective splenectomy, this procedure has been adopted in many centers with evolving success. Numerous case series have been published from around the world currently, which advocate the laparoscopic approach for elective splenectomy.[2–4]

Although there are few randomized control trials to clearly establish the benefits of laparoscopic splenectomy (LS) over open splenectomy (OS), it is a well-known fact that minimally invasive surgery is gaining popularity throughout the world.

Many patients requiring elective splenectomy may be thrombocytopenic and/or may have other hematologic disorders. Idiopathic thrombocytopenic purpura (ITP) is one of the major indications for elective splenectomy.[5] If bleeding should occur during the minimally invasive approach, the developed world has the luxury of access to blood components and other modalities to manage the event immediately and effectively without compromising patient safety. However, in a developing world situation such as ours, the blood banks are still not very well equipped with many facilities. With this background, this study seeks to assess the patient outcome and thereby the safety of performing LS in a Caribbean island with limited resources.

METHODS
Approval was obtained from the Institutional Review Board of the South West Regional Health Authority. All patients who had elective LS during the time period between August 2003 and December 2008 in San Fernando General Hospital were included in the study. All surgeries were performed by a single surgeon (first author). All patients underwent a preoperative ultrasound examination to determine the size of the spleen and the size of the spleens were classified as mildly, moderately, or severely enlarged (> 20 cm); patients with massive splenomegaly were not considered for the laparoscopic approach. All patients had preoperative complete blood counts which included platelet counts. Additional investigations were requested as deemed appropriate. Patients who were known to have ITP were administered steroids on a routine basis, in the form of intravenous hydrocortisone. Preoperative platelet counts were optimized with the assistance of a hematologist using steroids or immunosuppression. All patients received Hemophilus Influenza-type B, meningococcal, and pneumococcal vaccines at least 2 weeks before surgery.

Operative Procedure
All procedures were performed using the traditional laparoscopic technique described by Delaitre and Maignien.[1] After general endotracheal anesthesia with controlled ventilation, the patient was positioned in supine position with a semilateral tilt using a brace under the left loin. A nasogastric tube and a urinary catheter were inserted.

A 15 mm Hg pneumoperitoneum was created through the open Hassan port technique and the intra-abdominal cavity explored. The splenic fossa was specifically visualized for the presence of an accessory spleen, especially in ITP patients.

A 3-port technique was used. An open Hassan port was placed supra-umbilically and a 5 mm port in the epigastrium. A 12 mm port was placed in the left anterior

axillary line. The spleno-renal and colo-splenic ligaments were transected using the Harmonic Scalpel. The inferior aspect of the spleen was lifted superiorly and the tail of the pancreas identified. Dissection was continued superiorly and laterally to mobilize the entire spleen. A laparoscopic linear cutter with a vascular staple was used to transect the vessels at the hilum. If the splenic artery was distributive in its division, then each branch of the artery was individually transected with either clips or staples. Once the vessels at the splenic hilum were safely transected, the short gastric arteries at the superior end of the spleen and the phrenic ligament were divided with the Harmonic Scalpel, permitting the spleen to lie completely free in the peritoneal cavity.

The spleen was then placed in a Cook's endobag. The specimen retrieval bag was closed and brought through the anterior abdominal wall through the umbilical port. The bag was opened so that the spleen could be morcellated with a sponge-holding forceps to allow for piecemeal removal. The ports were removed and incision sites closed. A drain was left in-situ in all cases.

Data recorded included demographics such as age, sex, and ethnicity; clinical data included indications for surgery, perioperative investigations, operative procedures including duration and blood loss, complications, postoperative recovery, and morbidity. Surgical duration was recorded as the time from incision of the first port to the completion of skin closure. Postoperative platelet counts were obtained on the first postoperative day and repeated on a daily basis for inpatients.

RESULTS

Seventeen patients who underwent LS during the study period were included. Of these, 88% patients were females. The age ranged from 11 to 75 years and the mean age was 33.3 years. The most common indication for the LS was ITP in 14 patients (82.3%). Of these 6 LS were done for failure of medical therapy and 8 were done for complications of steroids. Other indications included hereditary spherocytosis, hypersplenism in sickle cell disease (SCD), and splenic metastatic deposits arising from squamous cell carcinoma of the ovary. The mean preoperative platelet count was 97,600/μL (range: 5 to 235,000/μL); 5 patients had platelet counts below 50,000/μL. For patients with ITP, the mean preoperative platelet count was 90,000/μL and the mean postoperative count was 225,000/μL (range: 5 to 727,000/μL). Fifteen patients had normal to mildly enlarged spleens and 2 had moderately enlarged spleens. These 2 patients required open incision to remove the spleens as the bag available was too small. Thirteen patients had body mass index (BMI) less than 30, 2 patients had BMI greater than 40, and 2 had within the range of 30 to 40. Three patients had cholecystectomy performed in association with splenectomy. The mean operating time, including those with associated procedures, was 88.8 minutes (range: 62 to 120 min). The mean estimated blood loss was 315.8 mL.

Two cases had a blood loss above 500 mL. One was a morbidly obese patient with a platelet count of 5000/μL, whose anatomy was complicated by numerous adhesions; conversion to laparotomy was necessitated because of these difficulties. This was the only patient who had a conversion to open procedure. The other case involved malfunction of the linear stapler resulting in an improperly applied vascular staple, leading to inadequate control of the vascular pedicle at the hilum. Notwithstanding this, the procedure was completed laparoscopically in this patient. Both these patients required blood transfusion intraoperatively. No other blood products were transfused in any other patients.

The spleen was removed through the Hassan port except in 2 patients, who required extended incisions for removal. Both these patients had moderate-sized spleens. In 1 patient, an accessory spleen was found, which was removed laparoscopically.

The mean hospital stay was 3.3 days (range: 1 to 11 d). Postoperative complications occurred in 5 patients (29.4%). These included wound-site infection (1), pneumonia (1), ileus (2), and incisional hernia (1). Fifteen patients (88.2%) were started on oral feeding within 24 to 48 hours of surgery. Feeding was delayed in 2 patients because of postoperative ileus which resolved with conservative management. The patient who developed pneumonia and pleural effusion had a history of SCD. This patient stayed postoperatively in the general ward for 11 days, but had a complete recovery without the need for an intensive care unit admission. If this patient is excluded, the mean hospital stay was 2.1 days. The patients were followed up until a minimum of 4 weeks. The majority of patients had a very good response to splenectomy except one patient whose platelet counts continued to be 35,000/μL. This was a 75-year-old male patient with a preoperative platelet count of 5000/μL and who failed to respond to high doses of steroids and immunosuppression. The hematologist was satisfied with the 7-fold increase postoperatively as this was the highest platelet count the patient had achieved in several years. There was no mortality in this case series.

DISCUSSION

The main finding of this study is the good perioperative outcome of patients undergoing LS, despite the unavailability of adequate resources. Laparoscopic techniques have revolutionized surgical practice and have gained wide clinical acceptance in the management of surgical patients.[6,7] Improved dexterity in laparoscopic skills and technologic advances have allowed for a wider range of minimally invasive procedures being performed. However, these techniques are less commonly practiced in the developing world. Although there are 3 major public hospitals in Trinidad, San Fernando General Hospital, the study hospital is the only institution which undertakes advanced laparoscopic procedures accepting referrals from the other institutions as well.

Splenectomy has been recognized as an accepted modality of management for many hematologic conditions.[6] After the first description of LS in 1991, the technique has undergone significant refinements and is now considered the gold standard for elective splenectomy.[7] The claimed advantages include less postoperative pain, shorter hospital stay, and associated lower costs.[8] In the Caribbean, splenectomy has been traditionally performed through an open approach. To our knowledge, there are no published reports from the Caribbean comparing laparoscopic and open splenectomies. Before 2003, hematologists in Trinidad managed the majority of ITP patients conservatively as there was reluctance among surgeons to operate on these high-risk patients in the setting of minimal access to blood products. As a result, there is limited published data or numbers in our setting likely to make a meaningful comparison. When compared with other reports of OS, our study does reveal that we are as safe with the added benefits of minimal invasive surgery. From Jamaica, Duncan et al[9] reported a

series of OS patients, operated for SCD. Their average operating time was 60 minutes and the most common complication was acute chest syndrome. However, because the indication for surgery was different, it is difficult to compare their data with ours.

The indications for splenectomy generally encompass conditions that cause splenic hypertrophy and thus rendering the organ dysfunctional. These conditions include ITP, SCD, and malaria. In this study, the most common indication for splenectomy was ITP, accounting for 82.3% of cases. Although, SCD is very common in the Caribbean, the major indication and its proportion in our study are comparable with international data.[4]

The overall complication rate in this study was 17.6%. Much of the perioperative morbidity seen in patients undergoing splenectomy is dictated by specific features associated with the underlying hematologic disease such as thrombocytopenia and also the immunocompromised state of the patients. Indeed, adequate perioperative hematologic measurements and surveillance are essential to minimize the risks of associated complications such as excessive bleeding and opportunistic infections.[9] The avoidance of a large surgical incision in laparoscopic procedures may be attributed for the lesser wound-related complications; the relatively lesser postoperative pain allows for earlier return to function.[7,10] The wound infection rate in our study was also low (5.9%) and most of our patients returned to work early.

Operative time and hospital length of stay are factors that may determine the efficacy of a surgical procedure. In this study, the mean operative time was considerably lesser (88 min) than that of other studies which reported mean operative times in the range of 134 to 188 minutes.[11–14] Most studies report longer operating times for LS compared with OS. Rescorla et al[8] described an average operating time of 115 minutes for LS compared with 83 minutes for OS. Franciosi et al[14] reported a difference of 51 minutes and attributed the difference to the learning curve. Several factors may have influenced the operative time including BMI (only 2 patients with > 40), previous surgery, splenic size (15 of the 17 patients had normal to mildly increased size), and surgeon's experience. All cases in this study were performed by the first author who is a well-experienced and senior laparoscopic surgeon. It is of note that the overall mean operative time in our study was skewed by the fact that simultaneous cholecystectomy was performed in 3 patients. The overall shorter operating times in our study might have contributed to the good perioperative outcome of our patients.

The overall conversion rate to open procedures is also quite low in this study (5.9%). The average length of stay was comparable with other studies, although this included a patient who developed postoperative complications due to SCD.[12,13] We used drains liberally, although we recognize that this has probably minimal benefits once there are no injuries to the stomach or pancreas and a good hemostasis is achieved.

The spleen's rich vascularity and its intimate relationship to other intra-abdominal organs predispose any splenic procedure to a significant risk. One of the major complications of LS is intraoperative bleeding. The average blood loss in our study is comparable with that reported by Chowbey et al[13] (306 mL) (range: 40 to 640 mL). Although we had 2 patients who had blood loss more than 500 mL, only one required conversion to open surgery because of preoperative very low platelet count and difficult anatomy.

It should be admitted that the bleeding encountered was surgical and not directly due to thrombocytopenia. This patient had only blood transfusion because a good hemostasis was achieved after the spleen was dissected out. The other case involved malfunction of the linear stapler resulting in an improperly applied vascular staple. Unique to a developing world setting, it is common in our hospital to resterilize and reuse the disposable staplers as a cost-saving measure. Surgeons who reuse the disposable staplers should look for and be prepared to manage stapler malfunction. It is important to prepare these patients maximally preoperatively especially in a limited resources setting as ours. The surgeon should also be as meticulous as possible to ensure minimal blood loss as possible to provide the best outcome. Although high-risk patients may be better operated in a highly resourceful setting, this is inaccessible for patients in the third world. In our situation, we do explain the possible adverse outcomes, obtain an informed consent, and offer the best available treatment.

The use of the laparoscopic approach in patients with neoplastic disorders poses certain challenges. Splenic neoplasms (primary or secondary) are rare. Invariably, they are usually associated with massive splenomegaly.[15,16] One of our patients did have splenic metastatic deposits from an ovarian tumor. She had had a prior surgery for the primary tumor and presented months later with an isolated splenic lesion. Pathologic analysis of this lesion after splenectomy confirmed it to be a metastatic deposit. This patient recovered without any morbidity.

One of the major limitations of this study is the smaller sample size and lack of control group. Many patients with larger spleens were not considered for LS. However, with the emergence of hand-assisted laparoscopic surgery, the ability to remove larger spleens through a mostly minimally invasive approach is evolving and signifies promising future prospects.[17] With the development of the minimally invasive technique in our institution, more patients are being referred for therapeutic splenectomies currently, which may reflect an increasing confidence in this procedure amongst other practitioners.

In conclusion, LS could be performed in limited resources setting if cases are carefully selected, meticulously optimized preoperatively, and surgery is performed meticulously by experienced surgeons with short operative times. The risk of complications, morbidity, and mortality are comparable to international standards if attention is paid to these considerations.

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