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Minimal-Access Splenectomy: a Viable Alternative to Laparoscopic Splenectomy in Massive Splenomegaly

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ABSTRACT

Background: Laparoscopic splenectomy of normal-sized spleens or in moderate splenomegaly is performed with increasing frequency. By using a modification of the open laparotomy, minimal-access splenectomy is an attractive alternative in severe splenomegaly.

Methods: Between September 2002 and October 2003, 9 patients (mean age, 58.8 years; range, 41 to 72) with severe splenomegaly (mean length, 27.9 cm; range, 23 to 32) underwent minimal-access splenectomy. Indications for splenectomy were non-Hodgkin's lymphoma in 5 cases and idiopathic myelofibrosis in 4.

Results: Minimal-access splenectomy was successfully completed in all patients. Mean operative time was 124 minutes (range, 75 to 165). Postoperative complications occurred in 2 cases; one perioperative death occurred in a patient with idiopathic myelofibrosis as a consequence of a secondary blast crisis. Median postoperative hospital stay was 9.1 days (range, 6 to 15).

Conclusions: Minimal-access splenectomy seems to be a viable alternative to laparoscopic splenectomy in cases of severe splenomegaly. It combines the advantages of hand assistance like shorter operative times and increased safety of the procedure to the classical benefits of minimally invasive surgery.

Key Words: Minimally invasive surgery, Minimal access, Laparoscopic splenectomy, Massive splenomegaly.

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INTRODUCTION

The laparoscopic extirpation of normal-sized spleens has become more common in the last few years. Since the first attempts less than a decade ago,[1,2] several reports have described the challenges associated with this type of surgery.[3–5]

Contraindications to a laparoscopic approach include severe portal hypertension, uncorrectable coagulopathy, severe ascites, and most traumatic injuries to the spleen. Extreme splenomegaly remains a relative contraindication as well.

Ultrasonography is performed to determine the size of the spleen. Spleen size is expressed in terms of the maximum interpole length and is generally classified into 3 categories: normal spleen size (<11 cm); moderate splenomegaly (11 cm to 20 cm); and severe or massive splenomegaly (>20 cm).[6]

Extremely large spleens present special technical problems that test the current limits of laparoscopic surgery. However, as laparoscopic techniques, surgical skills, and instrumentation have improved, so have the safety and efficacy of this procedure even in the presence of splenomegaly.[7–10] We consider all patients with massive splenomegaly as potential candidates for laparoscopic splenectomy. Since June 1997, 82 laparoscopic splenectomies have been performed for hematologic pathologies including malignancies. All patients having massive splenomegaly were treated by laparoscopy. Starting in September 2003, we attempted a new approach in cases of severe splenomegaly.

We report a technique of splenectomy through minimal access. The purpose of the study was to examine the safety and efficacy of minimal-access splenectomy (MAS) in the setting of massive splenomegaly.

METHODS

Patients

Between September 2002 and October 2003, 9 patients were identified as having massive splenomegaly poten-

tially treatable through a minimal access approach. Patient and disease characteristics are summarized in **Table 1**. Six male and 3 female patients underwent MAS for the following disorders: non-Hodgkin's lymphoma in 5 cases and idiopathic myelofibrosis in 4. Mean age and BMI (Body Mass Index) of the patients were respectively 58.8 years (range, 41 to 72) and 24.3 (range, 21.4 to 26).

Preoperative ultrasonography performed to determine the size of the spleen showed a median interpole length of 27.9 cm (range, 23 to 32). The indications for splenectomy included persistent thrombocytopenia and anemia due to hypersplenism, as well as continuous steroid medication. The subjective symptoms of all the patients included abdominal distension and fullness, difficulty in lying on the left side and left-sided upper quadrant pain.

Four patients affected by non-Hodgkin's lymphoma had chemotherapy before surgery. Preoperatively, the patients were categorized as American Association of Anesthesiology (ASA) class II (5 patients) and class III (4 patients).

The preoperative hemoglobin count averaged 10 g/L (range, 7.8 to 15.4). Two patients required transfusion before surgery.

Only 1 patient had a normal platelet count; the others had thrombocytopenia, with an average count of 65 400/mm^3 (range, 8000 to 140 000/mm^3). Three of the patients received a thrombocyte infusion immediately before the operation.

Surgical Technique

The patients were placed in the supine decubitus position with a sandbag under the left flank. A left 14-cm incision was made under the costal margin. The operation was conducted under direct vision. Field exposure was achieved by conventional abdominal wall retractors. The Ultrasonic dissector was the only laparoscopic instrument necessary for the operation. Optional laparoscopic tools consisted of a clip applier and a vascular stapler.

First, the stomach was retracted medially to expose the spleen. A thorough search was then made for accessory spleens. Any accessory spleens found were removed immediately. An incision was carried slightly into the left side of the gastrocolic ligament. This step afforded access to the gastrosplenic ligament and the opening of the lesser sac in its lateral portion.

Next, the short gastric vessels were divided by using the Ultrasonic dissector or eventually over clips **(Figure 1)**. The uppermost vessels of the gastrosplenic ligament are very short and enlarged in splenomegaly, and they are located in the immediate vicinity of the diaphragm. Access to these vessels required combined dislocation of the stomach to the right and gentle retraction of the upper splenic pole to the left.

Then the dissection reached the hilum and the vessels could be isolated from the pancreas and the surrounding tissues by combining a careful digital dissection with the use of the Ultrasonic dissector.

If a distributed anatomy was present, the splenic branches were usually dissected and divided between silk ligatures or clipped. In case of magistral anatomy, after providing that the tail of the pancreas is identified and dissected away, we performed separate silk ligation of the splenic vessels with a delayed ligature of the vein, to achieve a volumetric reduction of the spleen.

Table 1.
Patient and Disease Characteristics

Characteristic	Minimal-access Splenectomy N=9 Mean±SD; Range
Age, years	58.8±11; 41–72
Male:female	6:3
Body mass index	24.3±3.1; 21.4–26
Spleen size, cm	27.9±3.5; 23–32
Preoperative platelet count, 10^3/mm^3	108±135; 8–457
Hematologic diagnosis	non-Hodgkin's Lymphoma: 5 idiopathic myelofibrosis: 4

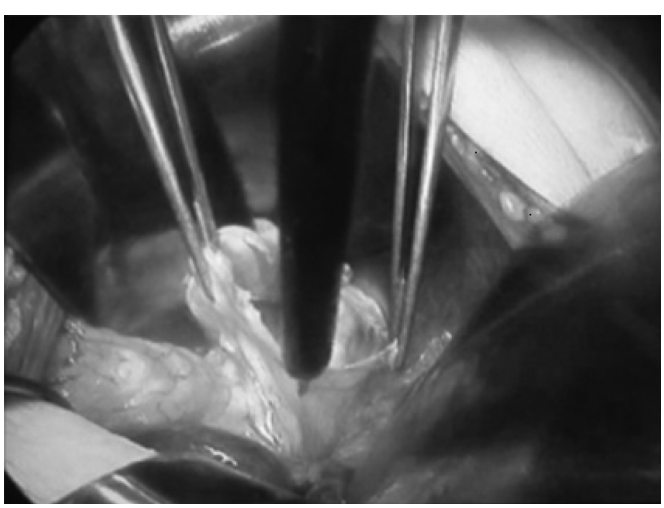

Figure 1. Division of the short gastric vessels by using the Ultrasonic dissection.

Then the splenic flexure was partially mobilized by incising the splenocolic ligament, the lower part of the phrenicocolic ligament, and the sustentaculum lienis. Finally, the phrenicocolic ligament was incised all the way to the left crus of the diaphragm by the Ultrasonic dissector. A sterile organ-retrieval bag was used for the extraction of the spleen. This bag was introduced into the abdominal cavity, and the spleen was manually slipped inside to prevent splenosis during the subsequent manipulations. Grasping forceps were used to hold the edges of the bag and to effect partial closure. At the end of the procedure, a nasogastric tube and an abdominal drain in the left hypochondrium were left in place.

RESULTS

Perioperative features are summarized in **Table 2**. The operative time ranged from 75 minutes to 165 minutes (mean, 124). Two accessory spleens were detected and removed in 1 patient. The average weight of the spleen was 2500 g (range, 1700 to 3200). The average intraoperative blood loss was 572 mL (range, 150 to 1000). Five patients received an average of 3U of packed red cells, and 4 of the splenectomies were performed without such a transfusion. In all patients, a nasogastric tube was left in and removed on the first postoperative day. Oral intake was assured from the second to the sixth postoperative day (mean, 3). Postoperative complications occurred in 2 cases: one patient had pleural effusion and another patient developed pneumonia, which were treated medically. One perioperative death occurred 15 days after the operation in a patient with idiopathic myelofibrosis as a consequence of a secondary blast crisis.

Mean postoperative hospital stay was 9.1 days (range, 6 to 15). The average preoperative platelet count was 108 911/mm^3 (range, 8000 to 457 000). The average postoperative platelet count was 479 111/mm^3 (range, 6,000 to 1 262 000). The average improvement in platelet count at discharge was 370 200/mm^3.

Table 2.
Perioperative Features of Patients Who Underwent Minimal-Access Splenectomy (n=9)

Factor	Mean±SD; Range
Operative time (min)	124±8; 75–165
Estimated blood loss (mL)	572±346; 150–1000
Oral resumption, (PO day)	3±1; 2–6
Length of stay, (days)	9.1±3.1; 6–15
Morbidity (n)	2 (22.22%)
Deaths (n)	1 (11.11%)

DISCUSSION

Massive splenectomy virtually always relates to hematological malignancies. In these patients, the local discomfort from massive splenomegaly and the risks of refractable thrombocytopenia and anemia are conventional indications for splenectomy.[11,12] Open splenectomy has been associated with substantial morbidity and mortality, and the rates may be higher in patients with splenomegaly, patients with myeloproliferative disorders, and the elderly.[13,14]

We consider all patients with massive splenomegaly as potential candidates for laparoscopic splenectomy, and the laparoscopic approach has been used since June 1997. Starting in September 2002, in cases of massive splenomegaly, we have adopted the MAS technique for 2 reasons. First, in the laparoscopic approach, a service minilaparotomy is always performed when pathologic examination of the surgical specimen is required to document the hematological disease. Second, laparoscopic-assisted removal of the entire spleen via an accessory mini-laparotomy does not affect the duration of surgery, rate of complications, or length of hospital stay.[15,16]

Concerning the technical aspects of the operation, Ultrasonic dissection is essential. Its use is advocated in every step of the procedure: from the dissection of the splenocolic to the gastrosplenic ligament, from the dissection of the hilar vessels to the spleno-diaphragmatic ligament. The use of a clip applier or a vascular stapler was necessary in only a few cases. Separate ligation of the hilar vessels was performed whenever possible.

Once the lesser sac is opened, the next step is the identification and ligation of the splenic artery. We found that the early ligation of this vessel is really advantageous. Volumetric reduction of the spleen after this manoeuvre is important, thus enabling the surgeon to perform the next steps of the dissection more easily.

Manual handling succeeds in creating a working space that would be difficult to achieve with the simple manipulation of the laparoscopic instruments.

Furthermore, hand assistance, by regaining tactile feedback, also increases the safety of the procedure, because it enables the surgeon to rapidly identify vascular structures and, in the case of accidental bleeding, allows immediate hemostatic control by digital compression.

Postoperative morbidity was low; no pancreatitis was observed because dissection in the MAS technique tends to identify and dissect away the tail of the pancreas. A severe blast crisis not directly related to surgery was responsible for the only perioperative death that occurred in a patient affected by idiopathic myelofibrosis. Median length of hospital stay for the rest of the patients was 7.5 days. In regard to massive splenomegaly in malignancies, this value is comparable to that reported in the literature and to that of our historic patients treated with a fully laparoscopic approach.[9,15,17,18]

We believe that experience with laparoscopic splenectomy is necessary to perform MAS; in fact, the laparoscopic skills of the surgeon greatly facilitate dissection with this approach.

CONCLUSION

MAS in patients with severe splenomegaly represents a viable option, because it is feasible and effective. The main concern of this study is the limited number of patients. A larger series is needed to confirm the reported results.

We found MAS to be an attractive alternative to laparoscopy in cases of massive splenomegaly. It combines the advantages of hand assistance, shorter operative times, and increased safety of the procedure with the classical benefits of minimally invasive surgery.

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