Laparoscopic Splenectomy as Compared with Open Splenectomy for Hematologic Diseases

Koji MATSUMOTO, Minoru FUJISAWA, Hiroyuki SUGO, Kunimi SUZUKI, Kuniaki KOJIMA, Masaki FUKASAWA and Tomoe BEPPU

Second Department of Surgery, Juntendo University, School of Medicine

The surgical technique for idiopathic thrombocytopenic purpura (ITP) and hereditary spherocytosis (HS) has been changing from conventional open splenectomy (OS) to laparoscopic splenectomy (LS).

In this study, we evaluated the usefulness of LS in comparison with OS. The subjects were 15 patients (14 with ITP and 1 with HS) who underwent surgery at our department. OS was performed in 5 patients (OS group), and LS was performed in 10 patients (LS group), of whom 2 underwent hand-assisted surgery. The perioperative parameters evaluated were: operative time, blood loss during operation, splenic weight, accessory spleens identified during operation, and conversion to open splenectomy. The postoperative parameters evaluated were: frequency of pain medication, duration until oral diet intake (days), interval of drainage (days), postoperative stay (days), residual accessory spleens, and complications. Conversion to open splenectomy was not observed in any patient. Blood loss was similar between the OS and LS groups. The operative time was significantly longer \((p<0.05)\) in the LS group (mean, 232 \(\pm\) 57 minutes) than in the OS group (mean, 155 \(\pm\) 55 minutes), and the splenic weight was significantly lower \((p<0.05)\) in the LS group \((114 \pm 86 \text{ g})\) than in the OS group \((221 \pm 76 \text{ g})\). Accessory spleens were identified during operation in only 1 patient in the OS group. The frequency of pain medication was significantly lower \((p<0.05)\) in the LS group \((2.3 \pm 1.3 \text{ vials})\) than in the OS group \((7.4 \pm 1.1 \text{ vials})\), and the postoperative stay was significantly shorter \((p<0.05)\) in the LS group \((13.0 \pm 5.4 \text{ days})\) than in the OS group \((22.0 \pm 7.1 \text{ days})\).

Evaluation of long-term results 1 year or more after operation showed no change in 3 patients, but no significant differences were observed between LS and OS. LS may be more useful than OS because of better aesthetic results, less invasion, and shorter hospital stay despite some problems such as differences in surgical skills among surgeons and a longer operative time.

Key Words: Laparoscopic splenectomy, Open splenectomy, Accessory spleen

Introduction

With recent advances in apparatuses and techniques, laparoscopic surgery (LS) has become increasingly performed for various organs. In diseases such as idiopathic thrombocytopenic purpura (ITP) and hereditary spherocytosis (HS), for which one of the treatment choices is splenectomy, the indications for LS have been expanded because of small surgical wounds, slight pain, and early recovery compared with OS. We evaluated the usefulness of LS performed in 9 patients with ITP and 1 with HS in comparison with OS.

Patients and Methods

Patients

The subjects were 14 patients with ITP and 1 with HS who underwent splenectomy at our department between November 1990 and December 2001. LS was performed in 10 patients (2 males and 8 females; mean age 37.
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6 ± 18.4 years), of whom 2 underwent hand-assisted LS. OS was performed in 5 females (mean age, 50.4 ± 16.9 years). There was no coexisting disease in any patient (Table 1).

### Methods

#### Surgical techniques

In patients with ITP, when the preoperative platelet level was 10.0 × 10⁴/ul or less, surgery was performed after increasing the platelet level by high-dose γ-globulin therapy. The patient was immobilized in the right semi-decubitus position on an adjustable bed, and the surgeon stood on the right side of the patient. A trocar was inserted (12mm) into the site immediately above the navel (a) by the open laparoscopy method, and pneumoperitoneum was performed with carbon dioxide. Subsequently, by the puncture method, trocars were inserted into the following sites: (b) below the costal arch on the left midclavicular line (10mm), (c) below the costal arch on the left axillary line (10mm), and (d) below the xiphoid process (10mm). After trocar insertion, the patient was placed in the right decubitus position with the head elevated. First, the splenocolic ligament and the splenorenal ligament at the inferior edge of the spleen were sectioned along the spleen toward the superior edge from the inferior edge to the phrenosplenic ligament using laparoscopic coagulating shears (LCS). Next, the short gastric arteries and veins were divided along the gastroepiploic ligament, pancreatosplenic ligament, and the spleen. Finally, a snake retractor was inserted from the dorsal area of the spleen so that it wrapped the spleen, and the hilum lienens was ventrally raised and cut using a linear cutter with care not to damage the pancreatic tail. The resected spleen was placed in an Endocatch in the abdominal cavity, fragmented in the pouch with care to avoid leakage, and removed out of the abdominal cavity. A Penrose drain was placed in the left subphrenic area, and the operation was completed.

In 2 patients, the hand assist method was performed by the following procedure. An upper abdominal median incision (about 6 cm) was made caudally from 4 fingerbreadths below the xiphoid process, and a disposable hand port-type wound retractor (Smith & Nephew KK) was applied to the incision. The surgeon put a surgical sleeve on his left hand, and LS was performed with a left hand assist while maintaining air-tightness.

#### Surgical results

Four parameters (operative time, blood loss during operation, splenic weight, and accessory spleens identified) were compared between the OS and LS groups. In the LS group, conversion to open splenectomy was also evaluated.

#### Postoperative evaluation

Six parameters (frequency of pain medication, duration until oral diet intake, interval of drainage, postoperative stay, residual accessory spleens, and complications) were compared between the OS and LS groups.

#### Evaluation of effects

Changes in the platelet count after splenectomy including those immediately after operation and 1 year or more after operation

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<table>
<thead>
<tr>
<th>Variables</th>
<th>LS (n=10)</th>
<th>OS (n=5)</th>
<th>p value</th>
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<td>Diagnosis</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>*ITP</td>
<td>9</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>**HS</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>Female</td>
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<td>5</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>37.6±18.4</td>
<td>50.4±16.9</td>
<td>NS</td>
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</table>

*ITP: idiopathic thrombocytopenic purpura
**HS: hereditary spherocytosis
OS: open splenectomy
LS: laparoscopic splenectomy
were classified into 3 categories according to the criteria for the evaluation of the effects on ITP: complete response, platelets ≥ 10.0 × 10^4/ ul without treatment; improvement, platelets = 5.0 - 9.9 × 10^4/ ul (increased by ≥ 2.0 × 10^4/ ul compared with preoperative value); no change, changes ≤ 2.0 × 10^4/ ul compared with the preoperative value. Treatment effects were compared between the OS and LS groups.

Statistical analysis
The t-test was performed, and p < 0.05 was considered to be significant.

Results

Surgical results
The operative time was significantly longer (p < 0.05) in the LS group (mean, 232 ± 57 minutes) than in the OS group (mean, 155 ± 55 minutes), and the splenic weight was significantly lower (p < 0.05) in the LS group (114 ± 86 g) than in the OS group (221 ± 76 g). Blood loss was slightly lower in the LS group (mean, 251 ± 325 ml) than in the OS group (362 ± 168 ml). Accessory spleens were identified only in 1 patient in the OS group. Conversion to open splenectomy was not observed in any patient in the LS group (Table 2).

Postoperative evaluation

The frequency of pain medication was significantly lower (p < 0.05) in the LS group (mean, 2.3 ± 1.3 vials) than in the OS group (7.4 ± 1.1 vials), and the postoperative stay was significantly shorter (p < 0.05) in the LS group (13.0 ± 5.4 days) than in the OS group (22.0 ± 7.1 days). No significant difference was observed in the duration until oral diet intake or the interval of drainage between the LS group (mean, 1.9 ± 0.9 days and 8.3 ± 3.8 days, respectively) and the OS group (2.8 ± 1.1 days and 12.8 ± 8.9 days). In 1 patient in the LS group, residual accessory spleen were observed after operation and resected by open operation. As postoperative complications, in 1 patient in the OS group, left subphrenic abscess was observed but improved after conservative therapy (Table 3).

Evaluation of effects
Immediately after operation, a complete response or improvement was observed in all patients with ITP. However, concerning long-term results (≥ 1 year after operation), 3 patients (2 in the LS group and 1 in the OS group) showed no change (Fig. 1); the number of patients did not significantly differ between the two groups (Table 4).

Case presentation
A patient with ITP who underwent re-opera-

<table>
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<tr>
<th>Variables</th>
<th>LS (n=10)</th>
<th>OS (n=5)</th>
<th>p value</th>
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<td>Operative time (min)</td>
<td>232±57</td>
<td>155±55</td>
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<tr>
<td>Blood loss (ml)</td>
<td>251±325</td>
<td>362±168</td>
<td>NS</td>
</tr>
<tr>
<td>Splenic weight (g)</td>
<td>114±86</td>
<td>221±76</td>
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</tr>
<tr>
<td>Conversion</td>
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<td>–</td>
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</table>

LS: laparoscopic splenectomy, OS: open splenectomy

<table>
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<tr>
<th>Variables</th>
<th>LS (n=10)</th>
<th>OS (n=5)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain medication (No. of vials)</td>
<td>2.3±1.3</td>
<td>7.4±1.1</td>
<td>p&lt;0.05</td>
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<td>Diet intake (days)</td>
<td>1.9±0.9</td>
<td>2.8±1.1</td>
<td>NS</td>
</tr>
<tr>
<td>Interval of drainage (days)</td>
<td>8.3±3.8</td>
<td>12.8±8.9</td>
<td>NS</td>
</tr>
<tr>
<td>Postoperative stay (days)</td>
<td>13.0±5.4</td>
<td>22.0±7.1</td>
<td>p&lt;0.05</td>
</tr>
<tr>
<td>Residual accessory spleen</td>
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</tr>
<tr>
<td>Complication</td>
<td>0</td>
<td>1</td>
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</tbody>
</table>

LS: laparoscopic splenectomy, OS: open splenectomy
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The patient was a 20-year-old male with purpura without remarkable previous or family history. At age 5, he fell when playing soccer and developed purpura all over the body. He was brought to a local hospital and diagnosed as having ITP. After steroid therapy, ITP transiently improved but recurred and became unresponsive to steroids. Due to a decrease in the platelet count, he was admitted for surgery. On August 13, 2001, LS was performed. His postoperative course was favorable, and the platelet count increased to 20.8 × 10⁴/ul, showing a complete response. He was discharged, but the platelet count decreased again to 0.6 × 10⁴/ul (Fig. 2). ⁹⁹mTcSn colloid scintigraphy (Fig. 3) revealed accumulation in the left upper abdomen, suggesting residual accessory spleen. On March 20, 2002, open accessory splenectomy...
was performed, and 2 accessory spleens (1.0 cm in diameter) that surrounded by fat tissue around the pancreatic tail were observed (Fig. 4). The removal of the accessory spleens was difficult even by open operation, and their identification and resection appeared to be impossible by LS. Postoperative scintigraphy revealed no accumulation. However, even at present (June 2002), the platelet count is unstable (Fig. 2), and his course is being observed on an outpatient basis.

Discussion

Since the first report of LS by Caroll et al in 1992, LS has become widely performed as a standard technique for diseases such as ITP and HS for which splenectomy is one of the treatment choices. In ITP, splenectomy is indicated in patients who do not respond to or are contraindicated for steroids, or who are difficult to treat with steroids due to side effects. At present, the ITP remission rate after steroid therapy alone is only 10-30%2). For patients unresponsive to steroids, LS has been increasingly performed due also to minimum invasion and excellent aesthetic results. However, problems such as intraoperative bleeding, recurrence due to residual accessory spleens and lack of long-term response have been reported.

Concerning bleeding, to perioperatively increase the platelet count to the safe range, high-dose \( \gamma \)-globulin therapy is performed from the preoperative period, and platelets transiently increase in about 75%3) of patients. In this study, the perioperative platelet count was maintained at \( 5.0 \times 10^4/ul \) in 11 (78.6%) of the 14 patients. In addition, intraoperative control of bleeding has become possible due to advances in medical instruments such as the LCS used for ligament division or the linear cutter used for division of the hilum lienis. In this study, blood loss did not significantly differ between LS and OS.

The incidence of accessory spleens is considered to be 15-30%4). Removal of accessory spleens is important in obtaining good results in splenectomy for ITP. Residual accessory spleens may cause recurrence. The reported detection rate of accessory spleens during LS is 6-41%5), which was similar to the detection rate in OS (10-30%)6) in many studies. The most frequent sites of accessory spleens are the hilum lienis, gastrocolic ligament, pancreatic tail, greater omentum, greater curvature of the stomach, splenocolic ligament, small intestine, mesocolon, and the broad ligament of the uterus in females and the deferent duct in males7). As preoperative examinations for accessory spleens, abdominal ultrasonography, abdominal CT scanning, and splenic scintigraphy have been reported to be useful7'-9). However, a preoperative diagnosis rate of about 30%6) was also reported, and the preoperative diagnosis rate in this study was also inadequate. Park et al11), described the importance of habitual observation of the most frequent sites before description of accessory spleens except the pelvic cavity and mesenterium, which are difficult to observe, in the decubitus position during LS. In all patients who underwent reoperation in previous studies, the site of accessory spleens was the peri-splenic area in the left upper abdomen. Therefore, adequate intraoperative examination of this area may be important. In this study, accessory spleens could be identified during OS in 1 patient. In 1 patient who underwent LS, residual accessory spleens were observed, and though their sites were faintly visible on preoperative images, the residual accessory spleens were surrounded by fat tissue around the pancreatic tail and were difficult to identify even by open operation. Further studies in patients with accessory spleens are necessary.
There are some studies\textsuperscript{12} on the short-term effects immediately after splenectomy based on changes in the platelet count, but only a few studies that compared long-term effects between LS and OS. In this study, a complete response or improvement was observed immediately after operation in all 14 patients with ITP. However, 1 year or more after operation, recurrence was observed in 3 patients (21.4%), who were considered to have no change. This percentage is lower than the 69% and 67% reported by Thompson\textsuperscript{13,14} and Jiji\textsuperscript{15} et al. We speculated that recurrence after LS was due to residual accessory spleens and splenosis\textsuperscript{7,8} caused by intraperitoneal dissemination of splenic tissue, but there may be no significant difference between LS and OS as the number of treated patients was low.

Compared with OS, LS is time-consuming and has the risk of residual accessory spleen. However, LS significantly reduced postoperative pain, shortened postoperative stay, and produced results similar to those of OS in terms of long-term effects and complications. With an increase in cases treated by LS, the operation time may be further reduced. LS is also aesthetically superior to OS. In the future, LS may become the preferred method of treatment for ITP and HS.

References