Laparoscopic Splenectomy in Pediatric Patients with Hematologic Diseases

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ABSTRACT

Objective: The aim of this study was to evaluate our experience with laparoscopic splenectomy in pediatric patients with hematologic diseases.

Methods: A retrospective chart review was performed to analyze the following: indication for splenectomy, pre- and peri-operative management, surgical technique, complications, duration of hospitalization, and outcome.

Results: Eleven patients underwent laparoscopic splenectomy for the following indications: recurrent thrombocytopenia (<10,000) in seven with chronic immune thrombocytopenic purpura; anemia in two with hereditary spherocytosis; and hypersplenism in one and recurrent splenic sequestration in another with homozygous hemoglobin S. The six girls and five boys had a median age of 7 years. The median operative time was 180 minutes, and the median hospitalization was 72 hours. Among the patients with immune thrombocytopenic purpura (median platelet count, 153,000), those patients (n=3) with platelet counts of <100,000 did not suffer any bleeding complications. The patient with hypersplenism and homozygous hemoglobin S required a small incision in the left lower quadrant to facilitate removal of a 558-gram spleen. This patient also underwent cholecystectomy for cholelithiasis. The operative time was 295 minutes, and he was hospitalized for 5 days because of atelectasis.

Conclusions: Laparoscopic splenectomy is a safe and effective procedure in children with hematological disorders.

Key Words: Hematologic diseases, Splenectomy, Laparoscopic surgery, Child, Adolescence.

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INTRODUCTION

With the advent of minimally invasive techniques, laparoscopic splenectomy has emerged as the treatment of choice for patients with hematologic diseases (immune thrombocytopenic purpura [ITP], hereditary spherocytosis [HS], autoimmune hemolytic anemia, and homozygous hemoglobin S [SS] disease). Although the operative time is longer using laparoscopic techniques, the need for postoperative analgesics is reduced, and hospitalizations are shorter.[1] Moreover, cosmetic results are excellent, and patients can resume normal activities sooner. One obstacle to laparoscopic splenectomy is the detection of accessory spleens and splenosis.[2,3] But, with meticulous technique, this obstacle can be minimized. In the present report, we describe our single-institution experience with laparoscopic splenectomy in pediatric patients with hematologic diseases.

PATIENTS AND METHODS

Between August 1996 and February 1999, 11 patients with hematological disorders underwent laparoscopic splenectomy performed by one pediatric surgeon (GS). There were six females and five males. Their median age was 7 years (range, 3.5 to 19 years) at the time of surgery. The indications for splenectomy were as follows: recurrent thrombocytopenia (<10,000) in ITP (n=7), anemia and hemolysis in HS (n=2), and hypersplenism (n=1) and recurrent splenic sequestration (n=1) in SS. Preoperative ultrasonography was done in all patients with hemolytic disorders to exclude cholelithiasis. Gallstones were encountered in one patient, who subsequently underwent cholecystectomy performed concurrently with splenectomy.

Operative Procedure

The operation was performed with the patient under general anesthesia in the right lateral decubitus position. This position allowed for the spleen to be suspended in the left upper quadrant by the splenic ligaments. At least three ports, as always required, were used for this procedure: a 5-mm port in the epigastrium, a 12-mm port in the left lower quadrant, and a 5-mm port in between.

The 12-mm port was utilized to introduce the automatic endoscopic stapler (Endo GIA 30; U.S. Surgical Corporation, Norwalk, CT) and subsequently to place the plastic specimen-retrieval bag (Endo Catch; U.S. Surgical Corporation) to remove the spleen. A fourth port was needed in some cases to manipulate the spleen (it could be a mini 3-mm port or a 5-mm port) and was placed in the left flank posteriorly to dissect behind the spleen. In most cases, bipolar cutting forceps (Everest Medical Corporation, Minneapolis, MN) were used, while in a few cases the ultrasonic scalpel (U.S. Surgical Corporation) was used. The use of surgical clips was kept to a minimum whenever possible because they could interfere with the automatic stapler and cause bleeding.

The gastrosplenic ligament was divided at first. Initially, only the division of ligaments that was needed to expose the splenic hilum was performed. The remaining ligaments were preserved until the end of the operation in order to keep the spleen suspended in the left upper quadrant. The first branch of the blood supply from the gastroepiploic artery to the lower pole of the spleen was then divided. The splenic hilum was divided close to the spleen with the Endo GIA 30-2.0 vascular staples. Generally, two or three applications were necessary to completely divide the blood supply, including the short gastric vessels; in some cases, the remaining short gastric vessels could be divided with the bipolar cautery or ultrasonic scalpel. During application of the stapler, care was exercised to avoid the tail of the pancreas and the greater gastric curvature. After the blood supply had been divided, all the ligaments were transected with the bipolar forceps or ultrasonic scalpel.

The spleen was placed inside the Endo Catch, and the opening of the bag was pulled out through the 12-mm port. The spleen was fragmented inside the bag with the finger or a ring blunt clamp and suction. This part of the procedure required careful attention to prevent rupture of the bag, which was watched from the inside. The spleen could be removed in small pieces. After the spleen was removed, care was taken to avoid contamination of the wounds or abdomen with splenic tissue in order to prevent splenosis.

At the beginning and at the end of the operation, a careful and methodical search was done to exclude accessory spleens. Long-acting local anesthesia (bupivacaine) was applied in all ports, and, finally, the ports were closed in the usual manner.

RESULTS

Laparoscopic splenectomy was achieved in all patients, with no conversions to an open procedure needed. There were no operative complications. Blood loss was generally <20 mL in all patients. The median operative time was 180 minutes (range, 110 to 295 minutes). In addition to undergoing splenectomy, one of the patients with SS also had a cholecystectomy (total operative time, 295 minutes). The median hospitalization was 72 hours (range, 48 to 120 hours). The patient hospitalized for 120 hours had hypersplenism and SS and developed right upper lobe atelectasis postoperatively. This was the only postoperative complication in our series.

The patients with ITP had a median platelet count of 153,000 (range, 52,000 to 296,000) prior to surgery. In order to achieve the best possible platelet count, intravenous immunoglobulin (IVIG) with methylprednisolone and IVIG alone in two cases each and IVIG followed by prednisone, anti-D with prednisone, and anti-D alone in one case each were administered one to two weeks prior to splenectomy. Noteworthy was the fact that the patients with platelet counts of 52,000, 58,000, and 91,000 did not suffer any intra- or postoperative bleeding complications.

In the patient with hypersplenism and SS, a small incision in the left lower quadrant was needed to facilitate the removal of a 558-gram spleen measuring 18 x 13 x 6 cm that extended 14 cm below the left costal margin. The patient with recurrent sequestrative crises and SS had a 120-gram spleen measuring 13 x 10 x 5 cm which extended 6 cm below the left costal margin and which was easily removed through the trocar.

Two patients with chronic ITP have not yet achieved normal platelet counts postsplenectomy (24 months and 4 months). One patient has required treatment with IVIG at three different times because of platelet counts <15,000. This patient had an accessory spleen removed at the time of laparoscopy. A heat-damaged red cell study demonstrated no evidence of accessory splenic tissue. The other patient has had platelet counts ranging from 30,000 to 40,000, and, with the exception of a few petechiae, is asymptomatic. In both patients with HS, the anemia and reticulocytosis resolved.

DISCUSSION

Laparoscopic splenectomy has become the treatment of choice for pediatric patients with hematologic diseases. Compared with open splenectomy, its advantages include shorter hospitalization, reduced need for postoperative narcotic analgesia, and excellent cosmetic results.

In seven reports of pediatric laparoscopic splenectomy, the median duration of hospitalization ranged from 1.4 days to 3.6 days.[4-10] In four studies,[6,8-10] the hospitalization was shorter when compared to open splenectomy, and in one study there was no difference.[5] In our series, the median hospitalization time of 3 days was no different from that of other published series. Perhaps more aggressive postoperative care and physician evaluation the day after discharge may shorten the hospitalization even further.

Patients with chronic ITP may require splenectomy because of thrombocytopenia refractory to medical management. In some of these patients, it may not be possible to achieve a normal platelet count preoperatively. In three of our seven patients with chronic ITP, the platelet counts were <100,000 (52,000, 58,000, and 91,000). None of these three patients suffered any bleeding complications during or after splenectomy. Tulman et al[4] described a patient with refractory chronic ITP who underwent an uncomplicated laparoscopic splenectomy with a platelet count of 20,000. In a study by Gigot et al,[7] two pediatric patients had preoperative platelet counts of <60,000. Neither of these two patients experienced any hemorrhagic complications. Therefore, a normal platelet count may not be necessary when performing a laparoscopic splenectomy. Although a safe platelet count has not yet been determined, a value near 50,000 may be adequate.

In our series, one patient with homozygous SS disease developed acute chest syndrome after a combined laparoscopic cholecystectomy and splenectomy. This patient was transfused with two units of packed red blood cells preoperatively (hemoglobin 8.8 g/dL increased to 13.2 g/dL). The patient was hospitalized for 5 days after the procedure. The patient had a history of acute chest syndrome 18 months prior to surgery. Perhaps the rise in the hemoglobin may have contributed to this event.

In a study by Farah et al,[9] 6 of 13 patients with sickle cell disease developed acute chest syndrome after splenecto-my (four after laparoscopic and two after open procedures). These patients were hospitalized for seven to nine days postoperatively. Only six of the 13 sickle cell patients (two in the laparoscopic group and four in the open group) received preoperative blood transfusions; however, it is not clear which patients developed acute chest syndrome. Although patients with sickle cell disease experience more painful crises and episodes of acute chest syndrome postsplenectomy, the operation does not increase the risk of death or bacteremic illness and should not be deferred for these reasons.[11] In accordance with a recent study,[12] patients with sickle cell disease should receive a blood transfusion to increase the hemoglobin level to 10 g/dL. Adherence to these guidelines may prevent postoperative morbidity in these patients.

Residual splenic function is a concern after laparoscopic splenectomy. This may result from splenosis or undetected accessory spleens.[2,3] Improvements in technique and surgical instruments may reduce the incidence of residual splenic function. In one of our ITP cases, an accessory spleen was discovered laparoscopically. The patient's ITP recurred three months postoperatively. A heat-damaged red cell study demonstrated no evidence of accessory splenic tissue. Currently, this patient has a normal platelet count.

CONCLUSIONS

Laparoscopic splenectomy provides safe and effective treatment in pediatric patients with hematologic diseases. Platelet counts of <100,000 should not deter a surgeon from operating laparoscopically. Patients with sickle cell disease must be monitored for the occurrence of acute chest syndrome. Furthermore, to ensure good outcomes, meticulous surgical technique may decrease the incidence of residual splenic tissue.

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