Short Communication

Laparoscopic Partial Splenectomy for Splenic Hemangioma: Experience of a Single Center in Six Cases

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Introduction

Despite a higher incidence of postoperative complications, splenectomy is a commonly performed procedure for splenic space-occupying lesions. A retrospective analysis of 2796 splenectomy patients showed that 119 patients (4.25%) had postoperative bacterial infections, and 71 (60%) died due to infections.[1] Therefore, emphasis on the preservation of splenic function has been raised that is, at least 25% of the spleen's weight must be retained to maintain splenic immunologic functions, with the prerequisite of adequate arterial blood supply. After the partial splenectomy was firstly performed in 1980s, the first case of laparoscopic partial splenectomy was reported in the literature in 1990s.[2] Laparoscopic partial splenectomy has currently become a common option for many spleen diseases. However, laparoscopic partial splenectomy specific for solid hemangioma, which is at a high risk of bleeding, is not commonly reported in the literature. This study reviewed the six cases of laparoscopic partial splenectomy for the splenic hemangioma to evaluate whether the surgical procedure was feasible and safe.

Methods

Six patients (3 males and 3 females) aged from 30 to 47 years old (mean 39.7 years old) at Peking Union Medical College Hospital from August 2012 to June 2013 were included in this study. One patient complained of upper left abdominal pain. The others presented no obvious symptoms but were diagnosed with splenic space-occupying lesions by physical examination during clinical visits. Five patients who had solid heterogeneous tumors with abundant blood supply were considered as highly-possible hemangiomas prior to the surgery. They underwent surgeries shortly after the detection of the tumors. One patient, who had cystic lesion revealed by imaging, underwent a surgery after a 2 years follow-up due to the increase of the lesion size. All patients were examined by enhanced computed tomography (CT) or magnetic resonance imaging (MRI) to verify the nature of the mass and its relationship with the neighboring tissues, especially the relationship between the hilar vessels of the spleen and the mass as well as the residual spleen [Figure 1]. The inclusion criteria were as follows: having solid mass or cystic mass in the spleen (benign lesions revealed by preoperative CT or MRI) with an increase in size. Patients with malignant space-occupying lesion (primary or metastatic) in the spleen were excluded.

The patient was induced under general anesthesia and raised head high with a slight elevation of the left side. The surgeon stood on the right side of the patient. A 10-mm port was inserted above or below the umbilicus depending on the size of the tumor. The pneumoperitoneum was established at a pressure of 12–14 mmHg, a 30° laparoscope was used. A 5-mm trocar was inserted parallel to the umbilicus in the left anterior axillary line. A 5-mm trocar was inserted just below and to the left of the xiphoid cartilage. A 12-mm trocar was inserted at lower left abdomen. Gastro colic ligament was opened, and splenocolic ligament was severed to make the colon down for easy performance. The spleen was fully exposed for the exploration of the mass. The hilum of the spleen was exposed by careful dissection according to preoperative imaging data. Branches of the splenic artery to the upper or the lower pole containing lesion were identified and dissected. Branches of the splenic artery to the spleen that was to be conserved were explored to ensure its blood supply. Branches of the splenic artery to the lesion were severed after being clipped by Hem-O-Block (Teleflex, USA). Ischemic area on the surface of the spleen was observed, and an ischemic line was marked. The spleen was severed by a Harmonic (Johnson and Johnson, USA) or

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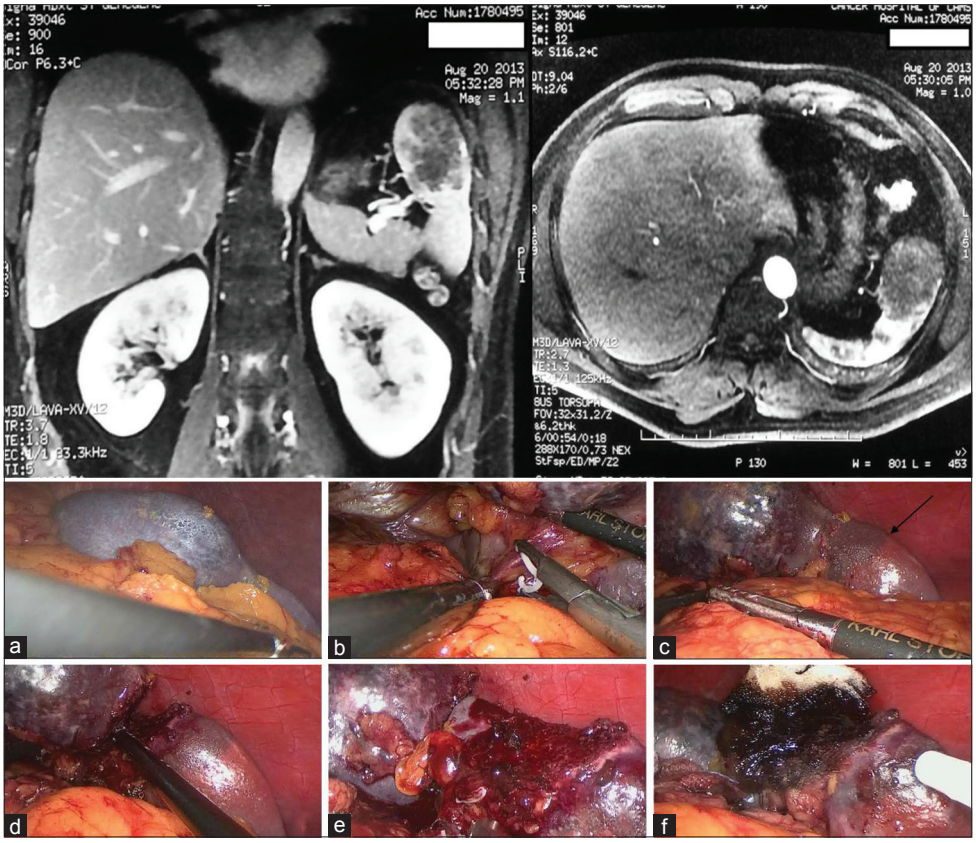

Figure 1: The solid mass in the upper and intermediate pole of the spleen revealed by preoperative magnetic resonance imaging and clearly visible position of the vessels dominating the tumor relative to hilar vessels (upper two panels). (a) The mass was located in the upper and intermediate pole of the spleen in exogenous growth. (b) The Hilar vessels dominating the position where the mass was located were severed and occluded after being crippled, disposable isolated splenic vascular tumor site after clipping off. (c) An ischemic demarcation line appeared (arrow). (d) The mass and part of normal spleen were resected along the ischemia line. (e) No active bleeding in the wound after the resection. (f) The wound was treated by medical adhesive bandages and hemostatic gauze.

LigaSure (Covidien, USA) along the ischemic line. A regular partial resection of the spleen was performed. If the tumor was large, not localized within the upper or lower pole, an irregular partial resection was performed along the edge of the mass after the dissection of the vessels dominating the corresponding polar. The transection of the spleen was performed after exposing the splenic artery by dissection of posterior peritoneum at the superior border of the pancreas and temporarily occluding it in order to reduce the bleeding of the wound. The partial spleen containing the mass was transected after the dissection of the ligaments neighboring the spleen. The color of the residual spleen was observed to make sure that the blood supply worked properly. The wound was treated by medical adhesive bandages and hemostatic gauze after the hemostasis by electrocoagulation or a Harmonic [Figure 1]. The specimen was introduced into a bag and exteriorized through the port on left abdomen. Hemorrhage was observed after washing. A silicon fossa drainage placed at the splenic recess was introduced and positioned through the port on the left of the umbilicus.

Results

All of the six surgeries were completed by laparoscopy between 100 and 225 minutes (mean 168 minutes) without laparotomy. During the operation, 100–1200 ml (mean 383 ml) blood was lost. All were performed as irregular partial resection, no segmental splenectomy. No complications such as pancreatic injury and hemorrhage occurred during the procedure. One patient was treated only by medical adhesive bandages, the five others by medical adhesive bandages and hemostatic gauze. The average estimated remnant volume was 56.7%. After the procedure, spleen fossa drainage was maintained for 3–9 days (mean 5.3 days). The mean length of hospital stay was 7.8 days (range 6–11 days). No complications such as spleen fossa infection and pancreatic fistula occurred. Postoperative pathology: five patients had hemangioma, one had cavernous hemangioma. The condition of the six patients during the perioperative period was presented in Table 1. The number of the platelets (data not shown) increased but within the normal range (100–300 × 10^9/L) during the hospital stay in contrast to the preoperative period. None of the patients used anti-platelet drugs. No thrombotic complications occurred. The six patients were followed-up for 1–19 months (mean 15 months), and none of them showed recurrence during the follow-up period.

Discussions

Autopsy series suggests the incidence of the splenic hemangioma between 0.02% and 0.16%.[3] However, they

Table 1: Descriptions of the six patients during the perioperative period

Patient number	Operation duration (minutes)	Blood lost (ml)	The treatment of the wound	Estimated remnant volume (%)	Duration of drainage (days)	Postoperative hospitalization stay (days)	Pathology	Follow-up (months)
1	205	400	Medical adhesive bandages and hemostatic gauze	60	5	7	Hemangioma	19
2	185	100	Medical adhesive bandages and hemostatic gauze	50	5	6	Hemangioma	7
3	225	1200	Medical adhesive bandages and hemostatic gauze	65	6	8	Hemangioma	17
4	195	400	Hemostatic gauze	75	9	11	Hemangioma	15
5	100	100	Medical adhesive bandages and hemostatic gauze	50	3	8	Cavernous hemangioma	5
6	100	100	Medical adhesive bandages and hemostatic gauze	40	4	7	Hemangioma	1

are the most common benign neoplasms of the spleen. Hemangioma is slow-growing neoplasms consisting of an overgrowth of new blood vessels. Although benign growth usually implies that the organ affected would not require removal, splenectomy is recommended irrespective of the size of the hemangioma because of the concentration of blood vessels located in the spleen and its susceptibility to blunt trauma.

Hemangioma is dysplasias with excessive vascular proliferation. Diffuse hemangiomatosis of the spleen is a very rare variant. In this case, the normal architecture of the spleen was replaced by blood vessels of varying caliber and associated with generalized angiomatosis of other hematopoietic organs like bone marrow and liver. Although reported as benign, it had potential to develop the angiosarcoma asymptomatically in 80% of cases, especially when the spleen was big in size.[4] Presentation of abdominal pain, dyspnea, diarrhea, and constipation were common, while hematological abnormalities only presented in diffuse hemangiomatosis. Clinically, splenomegaly was present in 10% of cases. Complications like spontaneous rupture with life-threatening hemorrhage can occur in 25% of patient especially when the tumor size exceeds 4 cm. Most patients with the splenic hemangioma presented no obvious symptoms, only one of the patients in the study presented with upper left abdominal pain. With advances in imaging techniques such as ultrasound, CT and MRI, more patients with the splenic hemangioma are detected.

Available treatments include the splenectomy to antiangiogenic therapy. Large hemangioma is at high risk of hemorrhage due to possible rupture. Despite the successful treatment with embolization of the specific splenic arterial branch to the hemangioma or with radiotherapy and with antiangiogenic therapy, the best results are achieved with splenectomy either by laparotomy or laparoscopy.[5] With the growing knowledge on the immunological function of the spleen and severe infection after a complete resection of the spleen, the performance of partial splenectomy is widely recommended. The indications of partial splenectomy suggested by literature include:[6] (1) under the age of 60; (2) Grade II, III traumatic rupture; (3) benign diseases of the spleen (splenic hemangioma, aneurysm, arteriovenous malformation). Partial splenectomy includes regular splenectomy (in which the vessels are severed on the basis of the vascular distribution before the resection of the corresponding splenic segment, lobe or half the spleen) and irregular splenectomy (in which an irregular splenic resection is performed according to the blood supply and vitality of the spleen tissues). Segmental splenectomy is considered to be performed especially on the young people when the single benign tumor is small in size and located in the upper or lower pole or limited within a certain segment or at the edge of the spleen. Therefore, the splenic function can be preserved as much as possible, and the occurrence of overwhelming infection after splenectomy can be lowered. The splenic function preservation should be considered since the mean age of the patients in the study was 39.7 years. Our findings that is, no complications (severe infection, thrombotic events and spleen necrosis) occurred during the follow-up, suggested that the function of the spleen may be well preserved after partial splenectomy.

With the advances in minimally invasive techniques such as laparoscope, laparoscopic partial splenectomy has gradually been applied in the clinical especially for the treatment of hereditary spherocytosis.[7] The resection of other cystic or solid tumors was also occasionally reported in the literature.[8] Supported by literature review, our hospital has gradually performed the surgical procedure for appropriate patients. Laparoscopy, with the significant advantages of less trauma, clear exposure and quick postoperative recovery in contrast to the open partial splenectomy, requires surgeons to have quite skilled experience in upper abdominal laparoscopic surgery and to be quite familiar with the anatomy of the splenic hilar vessels. During the operations, we firstly exposed the splenic hilar vessels very carefully, which was the key step, once any vessel injured, serious blood loss might happened and no clear vision, transform to open would be the only choice. Surgeon could check the vessels supporting to the tumor and peripheral normal spleen tissue when exposed clearly, once successful clipping off finished, the important ischemic line, which was the navigator for dissection would be seen. So, we thought our procedures were irregular splenectomy. The average estimated remnant volume was 56.7% higher than the 25% demonstrated in previous studies and was enough for the function preserved. The follow-up without any complication verified that.

The most blood loss was 1200 ml in one patient, because of the tight abdominal adhesions around the spleen. When we reviewed the disease history postoperation, the patient said

that she sustained intermittent upper left abdominal pain after the cesarean section 18 years ago. So we presumed that some chronic inflammation had existed around the tumor and spleen for a long time, resulted in the tight adhesions. That was a warning for us when we faced the situation like this, it was necessary to consider the balance of risk and benefit. If the adhesion was difficult to dissect, transform to open might be the better choice.

Laparoscopy, although not suitable for all the spleen tumors, is especially performed on the tumors in exogenous growth at the edge of the spleen or in the upper or lower pole of the spleen. A laparoscopic surgery is not necessary to be performed if the tumor is huge resulting in limited space and hard to be exteriorized. In addition, intraoperative massive hemorrhage is prone to occur if there is much adhesion between the spleen and the neighboring organs with an unclear boundary. So the splenic artery should be severed and temporarily occluded. If the dissection is difficult, the laparotomy should be performed without delay. The pursuit of the minimally invasive incision would result in inner large trauma such as massive hemorrhage, which should not be encouraged.

In conclusion, laparoscopic partial splenectomy is safe for patients with the splenic hemangioma, but it is necessary to consider the size and location of the tumor and the conditions of the patients.

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