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Laparoscopic middle segment splenectomy for central splenic hemangioma: A case report

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ABSTRACT

INTRODUCTION: Laparoscopic surgery plays an important role in the treatment of splenic hemangioma pathologies and solid lesions. Splenic hemangioma is the most common benign tumor of the spleen. In patients with benign splenic space-occupying lesions, laparoscopic partial splenectomy (LPS) has a lower incidence of postoperative complications than laparoscopic total splenectomy (LTS). Currently, no uniform standard for the indication of LPS is available.

PRESENTATION OF CASE: Herein, we report a case of hemangioma in a 23-year-old woman treated with LPS. After multidisciplinary evaluation, laparoscopic splenectomy was indicated in this case; upon evaluating the age of the patient and the affected spleen portion, a middle segment splenectomy was proposed, with preservation of the upper and lower pole. The intraoperative frozen section of the specimen was negative for malignancies.

DISCUSSION: Surgery remains the first choice in the treatment of solid lesions of the spleen. In this case, the volume of splenic hemangioma was large and accumulated in the upper and lower segments of the spleen. After the middle branch of splenic artery was cut off, the tumor was completely contained in the middle of upper and lower ischemic lines splenic segment. We think that the central type of benign splenic space occupying is not an absolute contraindication of LPS. For the patients whose splenic artery bifurcation point is far from the splenic hilus parenchyma and in those cases where the blood supply of the upper and lower poles of the splenic segments can be ensured, when the splenic tumor is resected, performing LPS and retaining some parts of the upper and lower splenic segments is possible to ensure sufficient residual spleen.

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1. Introduction

The spleen is an important immune organ of the human body and has anti-infection and immunity functions. Post-splenectomy fatal infection refers to a fatal infection caused by decreased immunity following splenectomy. The pathogenic bacteria mainly include *Streptococcus pneumoniae*, *Haemophilus influenzae* type B and *Neisseria meningitidis*. Some studies have pointed out that the probability of fatal infection in patients after splenectomy (including short-term and long-term) is about 5 %, and the mortality rate is 200 times higher than that of normal people [1]. At the same time, secondary thrombocytosis and hemodynamic changes after splenectomy also increase the risk of thrombosis in splenic vein, portal vein and mesenteric vein system [2]. There-

fore, the preservation of spleen function has been paid more and more attention by surgeons, and several surgical methods to preserve spleen function have emerged. Partial splenectomy, which was proposed by Professor Morgenstern in the 1980s [3], has been widely used in various splenic surgical diseases, including splenic space-occupying lesions, splenic abscesses, and some hematological diseases. The Third Hospital of Peking University started performing laparoscopic partial splenectomy (LPS) as early as 2008, and these cases were reported in China [4]. This work is reported in line with the SCARE criteria [5].

2. Presentation of case

A 23-year-old woman presented with a solid splenic mass. The patient did not exhibit nausea, vomiting, or diarrhea, and normal defecation was reported. No history of diabetes or prediabetes, obesity, abdominal trauma, gallstones, or any surgical history was reported. On physical examination, good nutritional status and no signs of anemia were noted, and the spleen was not palpable. Pre-operative laboratory examination showed a normal red blood cell

Abbreviations: CT, computed tomography; LPS, laparoscopic partial splenectomy; LTS, laparoscopic total splenectomy.

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Table 1
Hematology and coagulation tests.

Parameter	–1 day	Operation day (0)	1 day	4 days	7 days	1 month	3 months	6 months	12 months
WBC	5.67	6.09	7.21	6.41	6.00	6.47	4.82	5.00	5.80
RBC	5.09	4.01	4.5	5.01	5.05	4.03	5.09	4.98	4.99
HGB	110	105	107	109	109	107	110	109	110
PLT	230	215	250	270	263	287	290	251	231
LYMPH%	30	34.8	37	40	38.2	41.1	37.7	32.5	33.2
Neut%	57	55.2	60	59	55	57.5	55.9	57.1	56.9
PCT	0.30	0.26	0.29	0.27	0.21	0.28	0.30	0.29	0.30
PDW	16	15.7	14.1	13	14.7	13.9	16.1	16.2	15.9
PT	11	12.3	10	9.28	9.03	9.01	10.2	11.2	11.1
INR	1.1	1.15	1.0	1.02	1.05	1.01	1.08	1.03	1.08
D-dimer	0.028	0.04	0.036	0.02	0.06	0.07	0.03	0.022	0.016

WBC: white blood cell $3.5\text{--}9.5 \times 10^9/\text{L}$; RBC: red blood cell $3.8\text{--}5.1 \times 10^{12}/\text{L}$; HGB: hemoglobin 115–150 g/L; PLT: platelet $125\text{--}350 \times 10^9/\text{L}$; LYMPH%: percentage of lymphocytes 20–50; Neut%: percentage of neutrophils 40–75; PCT: platelet crit 0.17–0.35; PDW: platelet volume distribution width 9–17; PT: prothrombin time 8.8–12.8; INR: international standard ratio 0.8–1.2; D-dimer: 0–0.5.

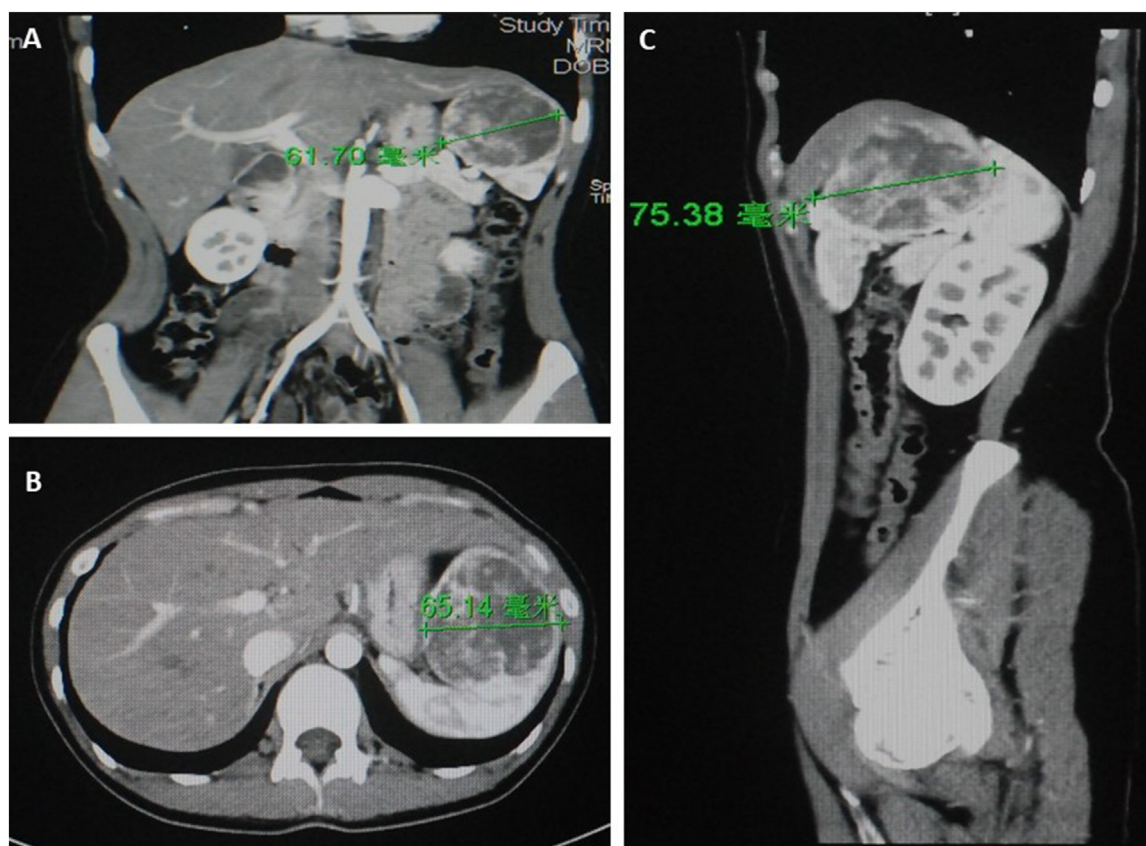


Fig. 1. XXX.

count, white blood cell count, platelet count, white blood cell classification, and coagulation function (Table 1).

Abdominal enhanced computed tomography (CT) was performed for further investigation of the lesion. A 6.1 cm × 6.5 cm × 7.5 cm mixed density mass was detected in the spleen with clear boundary, no enhancement area, no lymph node enlargement in the splenic hilum, and no effusion in the abdominal and pelvic cavity (Fig. 1).

After multidisciplinary evaluation and professional group discussion, laparoscopic splenectomy was indicated. On evaluation of the patient's age and affected spleen portion, a middle segment splenectomy was proposed, with preservation of the upper and lower pole prior to frozen section histological examination during surgery to exclude any form of malignancy. The intraoperative frozen section of the specimen was negative for malignancies, and middle segment splenectomy was performed.

The patient was placed in the right semi-lateral decubitus position; a 10-mm optical trocar was placed in the left pararectal region on the transverse umbilical line. Three more trocars were positioned according to a concave line along the left subcostal margin 5 cm from the costal arch.

Inspection of the abdominal cavity was performed. The spleen was dissected using an ultrasound scalpel. The section and sealing of segmental splenic vessels was performed using scalpel plus titanium clips. Parenchymal transection was performed using bipolar forceps and an ultrasound scalpel. The middle section of the spleen was removed, maintaining a margin of approximately 0.5 cm from the lesion. The upper and lower poles of the spleen and the segmental vessels to the upper and lower poles were maintained completely. Lastly, the specimen was removed via an endobag through the umbilical port enlarged to 3 cm in size. Accurate hemostasis of the line of transection was achieved (Fig. 2).

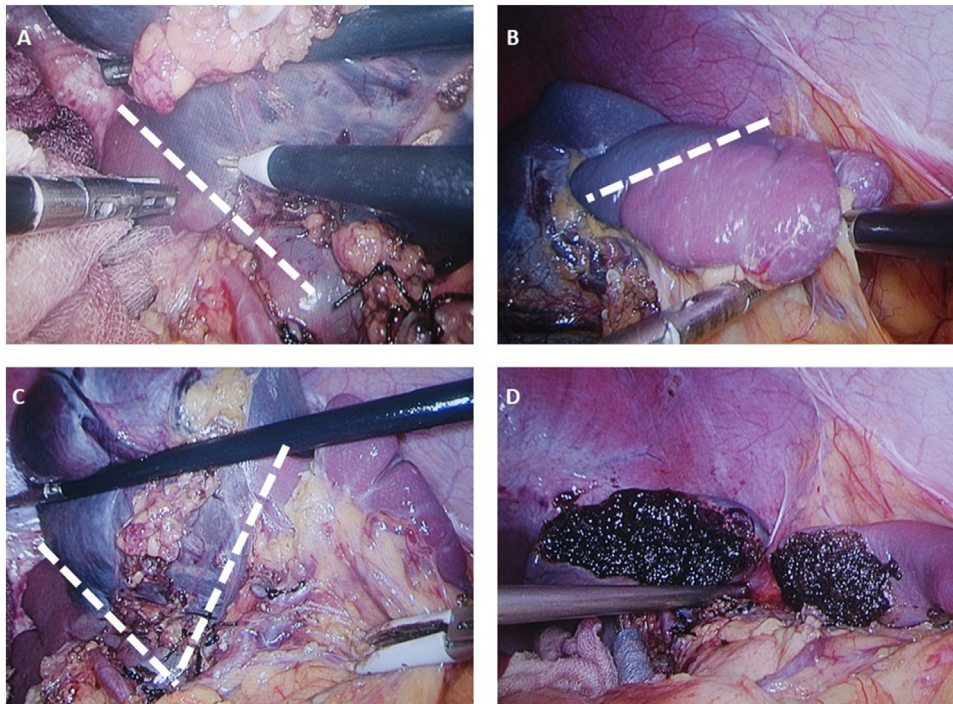


Fig. 2. XXX.



Fig. 3. XXX.

No change in the patient’s platelet count was noted after the surgery, and the results of remaining blood tests were within normal ranges. Refeeding was started on postoperative day 1, and adequate pain control was obtained with routinely used analgesics. Postoperative recovery was smooth, platelet count did not exceed normal level, and the postoperative daily drainage volume was less than 10 mL. The drainage tube was removed 4 days after the surgery and abdominal enhanced CT performed on postoperative day 28 revealed that the remaining spleen had good blood supply, and no displacement and torsion occurred until 28 days after the surgery (Fig. 3).

During the pathological examination, the specimen was represented by a 7 cm × 7 cm × 5 cm sized splenic parenchyma. The nodule inside the specimen had a diameter of 6.5 cm × 6.5 cm × 5 cm (Fig. 4). The preoperative diagnosis of splenic hemangioma was confirmed. The patient underwent physical examination and blood tests every 3 months after discharge. The patient’s platelet count has been in the normal range 1 year since the surgery (Table 1), and no Howell–Jolly bodies were detected.

3. Discussion

Splenic hemangioma is the most common benign tumor of the spleen [6]. Traditionally, total splenectomy is indicated in patients with a large diameter, spontaneous rupture tendency, and symptomatic patients.

According to the characteristics of splenic blood supply, most of the spleen can be divided into two–three splenic lobes and three–five splenic segments. There are few vascular anastomoses in the branches to form a vascular free area, which provides an anatomical basis for safe partial splenectomy [7–9]. In 1980, Morgenstern et al. successfully performed open partial splenectomy for the first time, and Poulin et al. performed LPS in 1995. With the in-depth study on the anatomical characteristics of the spleen and the progress of laparoscopic technology, increased number of surgeons believe that LPS is a safe and effective method for the treatment of benign splenic space-occupying lesions [10–14].

In patients with benign splenic space-occupying lesions, LPS has a lower incidence of postoperative complications, such as thrombocytosis and portal vein thrombosis, than laparoscopic total

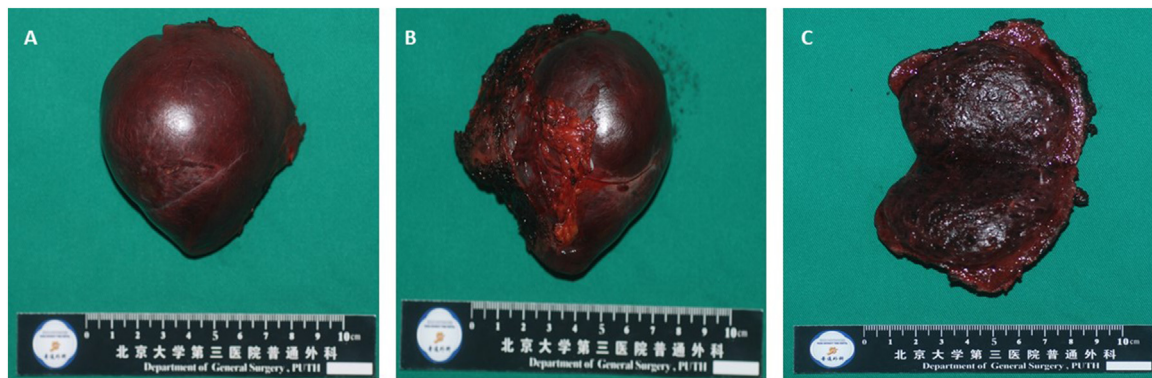


Fig. 4. XXX.

splenectomy (LTS) [10,15]. Currently, no uniform standard for the indication of LPS operation is available.

Partial splenectomy requires space-occupying lesions to be limited to the upper or lower pole of the spleen or to the peripheral zone of the spleen, and the residual spleen volume should be 25–30% [16–19]. In a study by Manciu et al. [20], four patients with space-occupying lesions in the center of the spleen with scattered splenic portal vessels were treated with partial splenectomy, and only a part of the splenic segment of the upper or lower pole was reserved.

In this case, the volume of splenic hemangioma was large and was accumulated in the upper and lower segments of the spleen. Preoperative enhanced CT showed that the branches of the splenic artery were far away from the splenic hilus, and the branches of the splenic artery were the upper, middle, and lower branches. After the middle branch of the splenic artery was excised during the surgery, the tumor was completely contained in the middle of the upper and lower ischemic line splenic segments (Fig. 2).

Although the time of surgery was closely related to the fine separation of splenic portal vessels and two splenic parenchyma separations, the principle blood flow of the splenic artery was not interrupted, and the upper and lower pole splenic parenchyma was not ischemic. The postoperative recovery was smooth, except for the pain of surgical incision, and no other discomfort was noted. Semi-liquid food was restored on postoperative day 1, and the drainage tube was removed on the postoperative day 4. No significant difference between the postoperative hospital stay compared to that of other research reports was noted [4,10,12,20]. Two weeks after the surgery, enhanced CT showed that the upper and lower residual spleen blood supply was normal, the spleen parenchyma was normal, and no thrombus in the portal vein system was detected.

Prior to the surgery, the patient underwent conventional abdominal enhanced CT without CT angiography, which could not directly display the distribution of splenic portal vessels. Therefore, it is necessary to carefully evaluate the vascular distribution and the relationship between the splenic portal vessels and tumor. Compared with conventional LPS, the splenic wound was larger and the risk of perioperative bleeding was higher. During the surgery, regular resection was performed on the medial side of the ischemic line, and hemostasis by electrocoagulation was achieved. On the day of surgery, the operation was strictly in bed, and the patient's activity of getting out of bed gradually resumed on the second day after the surgery. If the ligaments of the spleen, kidney, and stomach were not separated during the surgery, it could prevent the residual torsion of the spleen and the occlusion of splenic portal vessels.

Based on this case, we assumed that the central type of benign splenic space-occupying lesion is not an absolute contraindication of LPS.

4. Conclusion

In patients with splenic artery bifurcation point far from the splenic hilus parenchyma and in those cases where the blood supply of the upper and lower pole splenic segments can be ensured, when the splenic tumor is resected, performing LPS and retaining some upper and lower splenic segments is possible to ensure sufficient residual spleen.

Declaration of Competing Interest

The authors report no declarations of interest.

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Ethical approval

This study was approved by Peking University Third Hospital Medical Science Research Ethics Committee.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

B.Y.T. and Y.C.H. performed the described studies, analyzed data, and prepared the manuscript. X.D.R. and A.S. advised on study design and prepared the manuscript.

Guarantor

Yuntao Bing accept full responsibility for the work.

Provenance and peer review

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