Surg Endosc (1999) 13: 1083–1086

Surgical Endoscopy
Ultrasound and
Interventional Techniques

Laparoscopic splenectomy for idiopathic thrombocytopenic purpura (ITP)

A five-year experience

C. J. Stanton

Department of Surgery, Sacred Heart Medical Center, 1255 Hilyard Street, Eugene, OR 97401, USA

Received: 11 October 1998/Accepted: 19 February 1999

Abstract
Background: Laparoscopic splenectomy (LS) has rapidly become the preferred surgical treatment for idiopathic thrombocytopenic purpura (ITP), but its long-term efficacy for this disorder is unproved. This report documents the author's 5-year experience with, and long-term follow-up of, LS for ITP.
Methods: Between September 1992 and September 1997, 30 patients with clinical ITP and intractable thrombocytopenia were referred as surgical candidates. Two of them (7%) were converted to open, and the other 28 underwent successful LS. The operative approach evolved from a supine lithotomy to right lateral decubitus position, and the harmonic scalpel became the primary dissection tool in the later part of the study.
Results: The 28 successful LS patients constituted the study group. Accessory spleens were identified and resected in six patients (21%). Surgical times and blood loss averaged 2.4 h and 170 cc, respectively. The typical hospital stay was 2 days. Initial reversal of thrombocytopenia and ultimate cessation of oral steroids was achieved in 25 of 28 patients (89%). There were no deaths, but two patients had major complications (bleeding and pneumonia). All but two patients experienced a return to full activity and/or employment by 3 weeks post-LS. In the three cases that failed LS, none had residual splenic tissue on subsequent radionuclide scan. Long-term follow-up (2–60 months) was obtained in 22 of 28 patients (79%). The only death (at 13 months) resulted from oncologic disease. Twenty-one patients had lasting clinical remission of ITP. A positive preoperative response to oral steroids was the best predictor of success.
Conclusions: This 5-year experience with LS supports its use for the surgical treatment of ITP. The procedure is safe and efficacious, resulting in brief hospitalization, minimal recovery time, and excellent long-term results.

Key words: Spleen — Splenectomy — Laparoscopy — ITP — Thrombocytopenic purpura

Total splenectomy is considered the treatment of choice for medically refractory idiopathic thrombocytopenic purpura (ITP). Response rates of 60–90% are commonly documented for open splenectomy [1, 2, 5, 6]. Most adults who contract the disease will ultimately require surgery.

The ITP-involved spleen is generally normal in size and vascularity, making a laparoscopic approach particularly appealing. Laparoscopic splenectomy (LS) was first described by Delaitre and Maignien in 1991 [7], and several studies have now documented its utility in splenic disorders such as ITP, hereditary spherocytosis, and hemolytic anemia [8–10, 14, 23, 24]. As compared to open splenectomy, LS for ITP is associated with reductions in hospital costs, postoperative pain, length of stay, and disability, while attaining similar early clinical remission rates. Adequate resection of accessory splenic tissue and acceptable long-term results are still areas of controversy. This retrospective study of 28 patients with ITP who were managed by LS was undertaken to evaluate an extended experience with the procedure and to document the long-term clinical outcomes.

Materials and methods

Between September 1992 and September 1997, 30 consecutive patients with clinical ITP and intractable severe thrombocytopenia were referred for surgical treatment. Age, gender, medical history, symptoms at presentation, duration of disease, and nadir/preoperative platelet counts were recorded. All patients underwent medical treatment prior to LS, with at least 20,000/mm^3 platelets as a goal. All but two patients received pre- and perioperative oral and parenteral steroids, and all were immunized with polyvalent

Presented at the annual meeting of the Society of American Gastrointestinal Endoscopic Surgeons (SAGES), Seattle, Washington, USA, 1–4 April 1998

Correspondence to: C. J. Stanton, 1200 Hilyard Street, Suite S-450, Eugene, OR 97401, USA

Table 1. Patient characteristics/presentation/indications for surgery

Patient population	$n = 28$	
Duration of ITP	1–144 mo (31 ± 41.6)	
Presentation	Petechial rash/purpura	23
	Acute bleeding	5
Indications for surgery	Recurrent episodes of ITP	18
	Steroid-intolerant	4
	Steroid-resistant ITP	4
	Acute hemorrhage	2

pneumococcal vaccine. Operative time, estimated blood loss, splenic weight and accessory tissue, major and minor complications, length of stay, and return to activity were monitored. Initial postoperative platelet counts were obtained within 2 weeks of LS. Late follow-up occurred 2–60 months after LS, with platelet counts and clinical outcomes compared to perioperative values.

Statistical analysis was done using Student's *t*-test, with results reported as mean ± SEM.

The operative approach for LS underwent significant evolution during the study period. Initially, the procedure was performed with the patient in the supine lithotomy position, with early ligation of the splenic artery in the lesser sac, and bag extraction via a limited suprapubic incision. In the latter part of the study, the right lateral decubitus position was utilized, with extensive use of the ultrasonic dissecting shears, late division of the splenic hilum, and Ziplock bag extraction of the spleen at a subcostal trocar site.

The left upper quadrant, splenocolic ligament, splenic hilum, and lesser sac were routinely explored for accessory spleens. Ultrasonic dissection of retrosplenic peritoneal attachments, splenophrenic ligament, and the short gastric vessels allowed anteromedial mobilization of the spleen. Once elevated, the splenic hilum was divided by linear cutting stapler, and the organ was placed in the extraction bag, with emphasis on minimal parenchymal handling. The specimen was mechanically fracture-morcellated via the exteriorized extraction bag. Care was taken to not spill any tissue fragments. After adequate hemostasis, bupivacaine was injected into each trocar site, and the fascia and wounds were closed.

Results

LS was attempted in 30 and completed in 28 patients. The finding of portal hypertension and parenchymal bleeding necessitated open conversion in two cases. Twenty women and eight men with a mean age of 43 ± 20 years (range, 7–75) comprised the study group. Mean duration of disease was 31 ± 42 months with a wide range (1–144 months). The presence of purpura and/or petechial rash was the most common presentation, and recurrent episodes of ITP was the primary indication for surgery (Table 1). Comorbid illnesses included hypertension/coronary artery disease (CAD) (five patients), diabetes (two patients), lupus (two patients), chronic lymphocytic leukemia (CLL) (one patient), and Hodgkin's disease (one patient). The nadir platelet count at presentation was 12.3K ± 9.8K/mm^3. The majority of patients required oral steroids or IV anti-D (Rhogam) as the sole preoperative medical treatment, but in some cases (six patients), supplemental IVIgG and/or platelet transfusions were required to bring platelet counts up to an acceptable level for surgery (Table 2).

Surgical results are shown in Table 3. Single accessory spleens were resected in six patients (21%). Length of stay (LOS) was 2.3 ± 0.8 days. The two major complications (7%) included hemorrhage requiring transfusion and pneumonia. The two minor complications were trocar site infection and hernia. The average operative times (150 ± 48 min) improved as the study progressed. This improvement was believed to be due to the learning curve and to the use of the harmonic scalpel.

Table 2. Surgical results related to preoperative treatment and platelet count

Preop tx	Remission rate
Oral steroids	20/20 (100%)
Rhogam/IVIgG	2/2 (100%)
Steroid + IVIgG	2/4 (50%)
Steroid + IVIgG + platelets	1/2 (50%)
Preop platelet count	
>25,000	23/23 (100%)
<25,000	3/5 (60%)

Table 3. Surgical results and complications

OR time (min)	150 ± 48	(range, 60–240)
Est. blood loss (ml)	175 ± 135	(range, 50–500)
Spleen weight (g)	167 ± 97	(range, 50–406)[a]
Length of stay (days)	2.3 ± 0.8	(range, 1–5)
Major complications	2 (7%)	
Minor complications	2 (7%)	

[a] Accessory spleens × 6 (21%) included

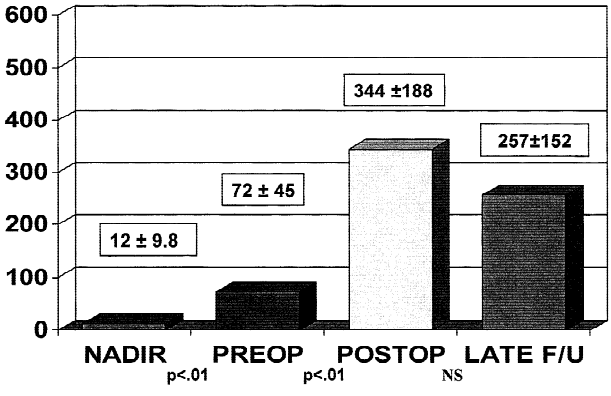

Fig. 1. Pre- and postoperative platelet counts. (×1,000/mm^3).

Three patients failed to respond to LS with postoperative thrombocytosis. Radionuclide scans were performed in each patient, and no residual splenic tissue was found. Two patients responded to medical treatment with clinical remission. Twenty-five of 28 patients (89%) had a rapid postoperative response to LS, with significant thrombocytosis compared to preoperative levels (Fig. 1).

The initial remission rates were correlated with each preoperative treatment group. Every patient successfully treated with steroids alone prior to surgery responded to LS. If additional treatment with IVIgG or IVIgG and platelets was required to induce adequate thrombocytosis, the clinical remission rate dropped to 50% (Table 2). The majority of patients did respond to preoperative treatment and were able to attain platelet counts >25,000/mm^3 at the time of surgery. LS was uniformly successful in inducing clinical remission in this group. In the five patients with counts that remained <25,000/mm^3 in spite of aggressive medical treatment, the effectiveness of LS fell to 60%.

Long-term follow-up (mean, 30 months; range, 2–60 months) was accomplished in 22 patients, including the three that initially failed to respond to LS. The two initial

Table 4. Collected series of laparoscopic splenectomy (LS) for idiopathic thrombocytopenic purpura (ITP)

Investigator (yr)	LS attempted/completed (%)	Response (%)	Average follow-up (mo)
Gigot et al. (1994)	8/7 (88%)	7/7 (100%)	5
Emmermann et al. (1995)	20/16 (80%)	15/16 (94%)	14
Yee et al. (1995)	16/14 (88%)	11/14 (79%)	<1
Friedman et al. (1996)	31/29 (94%)	27/29 (93%)	2
Tsiotos & Schlinkert (1997)	18/18 (100%)	17/18 (94%)	15
Stanton (present series)	30/28 (93%)	25/28 (89%)	30

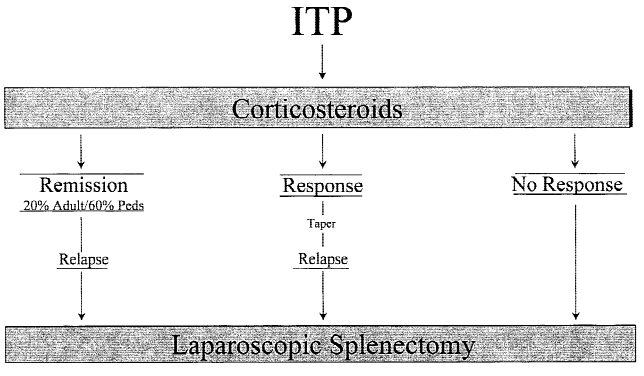

Fig. 2. Management algorithm for patients who fail steroid treatment, relapse during steroid tapering, or relapse after initial response to medical treatment.

surgical failures that responded to medical intervention remained in clinical remission during the study period. One patient who was in clinical remission died of related oncologic disease 13 months post-LS. Five were lost to extended follow-up. Thus, 21 of 22 surviving patients (95%) had lasting clinical remission of ITP. Mean platelet counts at the time of follow-up were 257,000 ± 152,000/mm^3, not statistically significant when compared to the immediate post-LS counts (Fig. 1). When those patients who had initially failed LS were excluded, the long-term surgical cure rate was 89%.

Discussion

The abbreviation "ITP" has traditionally stood for idiopathic thrombocytopenic purpura but is perhaps better described as immune thrombocytopenic purpura. In 1951, Harrington and Minnich showed that the transfused plasma of ITP patients was capable of inducing thrombocytopenia in normal recipients [12]. Confirmatory studies by Schulman et al. and others established that thrombocytopenia was mediated by circulating antibodies that generated enhanced uptake and destruction in the spleen [3, 18]. Although antiplatelet antibodies are present in two-thirds of patients with ITP, the inability to quantify specific antibodies has been a major obstacle in efforts to further study the disease and develop definitive medical treatments [12]. The primary goal of treatment has been to blunt the antiplatelet effect with immunodepressors such as corticosteroids and danocrine or intravenous immune gamma globulin (IVIgG) and intravenous anti-D (IV anti-D) [2, 4]. ITP can occur as a secondary process in diseases exhibiting immunodeficiency, specifically systemic lupus erythematosir (SLE), CLL, HIV, and other lymphoproliferative disorders. This was the case in four of the 28 patients (14%) in this series.

The natural history of ITP differs in adults and children. Spontaneous remission, independent of treatment, occurs in >80% of children with the disease. When necessary, splenectomy is nearly always curative [4, 6, 13]. Medical treatment in adults is less effective, and permanent remission is unusual. In all, 70–80% will ultimately come to splenectomy, with a response rate that has been documented at 60–90% for the open procedure [1, 2, 5]. The majority of patients who present for surgical treatment do so after one or more courses of treatment with corticosteroids or other agents, such as IVIgG. Surgical success rates appear to be highest in individuals who respond to preoperative medical treatment [2, 6], but these results have not been uniform [1]. The results of this study support the assertion, for laparoscopic splenectomy, that remission rates are positively related to the degree of preoperative thrombocytosis induced by medical treatment.

Laparoscopic splenectomy (LS) was initially reported in 1991 [1]. Numerous studies since that time have documented the utility of LS for ITP and other splenic disorders [8–10, 15, 19, 21, 23]. In general, shorter hospital stays, reduced postoperative pain, faster recovery, and importantly, initial remission rates equal to the open procedure have been documented (Table 4). Several studies have directly compared LS and open splenectomy (OS) in terms of the above noted variables. Although the cost savings with LS are debatable, shortened hospital stays and fewer complications have frequently been documented [9, 14, 22]. This report, while not a comparative study, documents hospital stays of 2 days, few complications, and rapid return to normal function. Although not reported in the results, OR times steadily fell as experience was gained and began to approach those seen with OS. The use of the harmonic dissecting scissors, as described by Rothenberg [16], has resulted in significant reductions in surgery times and blood loss.

LS has been suggested as the gold standard for ITP [9], but significant concerns remain. Accessory spleens have been documented in 18–28% of open splenectomy patients [1, 5, 6]. Up to 60% of clinical failures of ITP are due to retained splenic tissue; frequently, accessory spleens are missed at surgery and found subsequently on radionuclide scans. In one large series of OS for ITP, a recurrence rate of

9% was directly related to unrecognized accessory spleens [17]. There is some concern that since the laparoscope limits tactile information and optical field of view, the risk of missed ectopic splenic tissue will be increased. Studies that have directly compared LS to OS have been inconclusive [9, 20, 23], but in general, detection of accessory spleens has been lower for LS than OS. One recent study documented accessory splenic tissue in >40% of patients on radionuclide scans done subsequent to LS for hematologic disease [11]. The clinical importance of these findings is unclear, but they imply an increased rate of both missed spleens and spilled splenic tissue with organ extraction during LS. The present study documents an accessory spleen rate of 21%, which is consistent with the findings of most open splenectomy reports. A thorough exploration of the splenic hilum, lateral lesser sac, pancreatic tail, and splenocolic and gastrosplenic ligaments was the routine during this study, and it should be considered a mandatory part of the procedure if missed accessory spleens are to be avoided.

Long-term follow-up is the only way to determine if viable spleen is left behind by LS. The 30-month mean follow-up in this study, with no late failures in 22 patients, supports the argument that the identification and resection of clinically significant splenic tissue is achievable with LS. Surgical failures can occur up to 18 years out [1, 5, 13], so perhaps longer follow-up of LS for ITP is needed. Most recurrences, however, do occur within 2 years of surgery, and the current study is consistent with that time frame.

The results of this 5-year study support the use of LS as the primary surgical approach for the treatment of ITP. A management algorithm is suggested for the adult patient who fails initial steroid treatment, relapses during steroid tapering, or responds to medical treatment only to relapse at a later time (Fig. 2). In conclusion, laparoscopic splenectomy appears to have short- and long-term results equivalent to open surgery, as well as lower rates of major complications. An increased risk of missed accessory splenic tissue was not documented in this study. The procedure is safe and results in short hospital stays, minimal postoperative discomfort, and rapid recovery.

References

1. Akwari OE, Itan KMF, Coleman RE, Rosse WF (1987) Splenectomy for primary and recurrent immune thrombocytopenic purpura (ITP). Ann Surg 206: 529–541
2. Breenan MF, Rappeport JM, Moloney WC (1975) Correlation between response to corticosteroids and splenectomy for adult idiopathic thrombocytopenic purpura. Am J Surg 129: 490–492
3. Bussel JB (1990) Autoimmune thrombocytopenic purpura. Hematol Oncol Clin North Am 4: 179–191
4. Cheung NV, Hilgartner MW, Schulman I (1983) Platelet-associated IgG in childhood idiopathic thrombocytopenic purpura. J Pediatr 102: 366–370
5. Cola B, Tonielli E, Sacco S (1986) Surgical treatment of chronic idiopathic thrombocytopenic purpura: results in 107 cases. Int Surg 71: 195–198
6. David PW, Williams DA, Shamberger RC (1991) Immune thrombocytopenia: surgical therapy and predictors of response. J Pediatr Surg 26: 407–413
7. Delaitre B, Maignien B (1991) Splenectomy by the coelioscopic approach: report of a case. Presse Med 20: 2263
8. Emmermann A, Zornig C, Peiper M, Weh HJ, Broelsch CH (1995) Laparoscopic splenectomy: technique and results in a series of 27 patients. Surg Endosc 9: 924–927
9. Friedman RL, Fallas MJ, Carroll BJ, Hiatt JR, Phillips EH (1996) Laparoscopic splenectomy for ITP: the gold standard. Surg Endosc 10: 991–995
10. Gigot JF, Healy ML, Ferrant A, Michaux JL, Njinou B, Kestens PJ (1994) Laparoscopic splenectomy for idiopathic thrombocytopenic purpura. Br J Surg 81: 1171–1172
11. Gigot JF, Jamar F, Ferrant A, vanBeers BE, Lengele B, Pauwels S, Pringot J, Kestens PJ, Gianello P, Detry R (1998) Inadequate detection of accessory spleens and splenosis with laparoscopic splenectomy. Surg Endosc 12: 101–106
12. Harrington WJ, Minnich V (1951) Demonstration of a thrombocytopenic factor in the blood of patients with thrombocytopenic purpura. J Lab Clin Med 38: 1
13. Jacir NN, Robertson FM, Crombleholme TM, Harris BH (1996) Recurrence of immune thrombocytopenic purpura after splenectomy. J Pediatr Surg 31: 115–116
14. Janu FG, Rogers DA, Lobe TE (1996) A comparison of laparoscopic and traditional open splenectomy in childhood. J Pediatr Surg 31: 109–114
15. Lefor AT, Melvin WS, Bailey RW, Flowers JL (1993) Laparoscopic splenectomy in the management of immune thrombocytopenic purpura. Surgery 114: 613–618
16. Rothenberg SS (1996) Laparoscopic splenectomy using the harmonic scalpel. J Laparoendosc Surg 6: S61–S63
17. Rudowski WJ (1995) Accessory spleens: clinical significance with particular reference to the recurrence of idiopathic thrombocytopenic purpura. World J Surg 9: 422–430
18. Shulman NR, Weinrach RS, Libre EP (1965) The role of the reticuloendothelial system in the pathogenesis of idiopathic thrombocytopenic purpura. Trans Assoc Am Phys 78: 374–378
19. Stanton CJ (1996) Laparoscopic splenectomy for ITP: a three year experience. Presented at the First International Symposium on Advances in Diagnosis and Treatment of Splenic Disorders, Los Angeles, California, USA, 10 February 1996
20. Tarragona EM, Espert JJ, Balague C, Sugranes G, Ayuso C, Lomena F, Bosch F, Trias M (1998) Residual splenic function after laparoscopic splenectomy. Arch Surg 133: 56–60
21. Tsiotos G, Schlinkert RT (1997) Laparoscopic splenectomy for immune thrombocytopenic purpura. Arch Surg 132: 642–646
22. Waldhausen JHT, Tapper D (1997) Is pediatric laparoscopic splenectomy safe and cost effective? Arch Surg 132: 822–824
23. Yee LF, Carvajal SH, DeLorimier A, Mulvihill SJ (1995) Laparoscopic splenectomy: an initial experience at UCSF. Arch Surg 130: 874–878
24. Yoshida K, Yamazaki Y, Mizuno R, Yamadera H, Hara A, Yoshizawa J, Kanai M (1995) Laparoscopic splenectomy in children. Surg Endosc 9: 1279–1282