

# Laparoscopic Splenectomy for Immune Thrombocytopenic Purpura (ITP)

Muhammad Arham<sup>1</sup>, Jahangir Sarwar Khan<sup>2</sup>, Muhammad Umer Fayyaz<sup>2</sup>, Usman Qureshi<sup>2</sup>, Gohar Rasheed<sup>2</sup>, Usama Jalil<sup>2</sup>, Salman Shafique<sup>2</sup>, Sarosh Afzal Farouqi<sup>2</sup>

1. Medical Student, Rawalpindi Medical University, Rawalpindi; 2. Department of Surgery, Holy Family Hospital and Rawalpindi Medical University, Rawalpindi

## Abstract

**Background:** To determine operating time, blood loss, postoperative rise in platelet count, need of conversion to open surgery, postoperative hospital stay and postoperative complications in ITP patients undergoing laparoscopic splenectomy.

**Methods:** In this cross-sectional study patients diagnosed with ITP undergoing laparoscopic splenectomy were included. Patient characteristics regarding operating time, blood loss, postoperative hospital stay, conversion to open surgery, postoperative complications and postoperative rise in platelet count were analyzed.

**Results:** Out of 23 patients, 9 were males and 14 were females. The mean age of the patients was 31±7 years. There was 1 conversion to open surgery. The mean operating time was 90±22 mins and mean blood loss 131±55 ml. 21 out of 23 (91.3%) patients showed a positive response of rise in platelet count after surgery. There was no postoperative complication in any patient. The mean postoperative hospital stay was 3±1 days.

**Conclusion:** Laparoscopic splenectomy is associated with less operating time, postoperative hospital stay, blood loss and postoperative complications. It produces adequate postoperative rise in platelet count.

**Key Words:** Laparoscopic splenectomy, Immune Thrombocytopenic Purpura, ITP, Operative time

these antibodies are directed against the platelet glycoprotein IIb/IIIa.<sup>6</sup> Recent studies suggest that T cells also have a role in the pathogenesis of immune thrombocytopenia.<sup>7,8</sup> ITP occurs in about 4 per 100,000 people per year<sup>7</sup> and may cause fatal hemorrhage.<sup>9</sup> Patients usually present with petechiae, purpura and bruising.<sup>10</sup> Risk of death due to bleeding is around 1.6-3.9% per year.<sup>11</sup>

Corticosteroids are being used as a first-line treatment in ITP since 1950s, when it was first introduced.<sup>7,12</sup> However, a long-term response is seen in only 20-40% of patients.<sup>13</sup> Therefore, splenectomy is considered as a second-line therapy for those who do not respond to steroids, or if steroids are contraindicated in the patient.<sup>14,15</sup> In contrast to steroids, splenectomy produces better results with an early response rate of 85-88%.<sup>16</sup>

There are two methods of splenectomy; open and laparoscopic.<sup>1,2</sup> Delaitre<sup>17</sup> documented the first laparoscopic splenectomy in early 1990s and since then it is considered to be a safe procedure.<sup>17,18</sup> It is preferred over open splenectomy because it is associated with less postoperative pain, shorter hospital stay, less blood loss and fewer complications.<sup>9,19,20</sup> With laparoscopic splenectomy being considered as a better treatment for ITP and preferred over open approach by many surgeons, developing countries like Pakistan, where traditional procedures are still widely practiced, should take a note.<sup>19</sup>

## Introduction

Immune thrombocytopenia (ITP) is an autoimmune disease resulting in increased platelet degradation with platelet count lower than 100,000/ $\mu$ L.<sup>1-3</sup> The widely accepted mechanism involved is opsonization of the platelets by autoantibodies followed by engulfment and subsequent degradation of platelets by the macrophages, mainly in the spleen.<sup>4</sup> Spleen is the predominant site where these autoantibodies are produced.<sup>5</sup> Serologic techniques have revealed that

## Patients and Methods

This cross-sectional study was conducted in the surgery department of Holy Family Hospital, Rawalpindi and Bilal Hospital, Rawalpindi from 2010 till 2017. The subjects of this study were 23 patients who underwent laparoscopic splenectomy for ITP at the two above mentioned hospitals. All these patients were non-responders to steroid therapy and each case was discussed with haematologists and physicians for the decision of splenectomy (which was laparoscopic

splenectomy in all cases). Patient characteristics were studied and data regarding operating time, blood loss, postoperative hospital stay, conversion to open surgery, postoperative complications and postoperative rise in platelet count. Each candidate for laparoscopic splenectomy had a platelet count < 50,000/ $\mu$ L before surgery. A postoperative platelet count  $\geq$  100,000/ $\mu$ L was considered to be a positive response.

All patients were given a course of vaccination against Pneumococcus, Meningococcus and H. influenzae two weeks before surgery. Platelet transfusions were avoided before surgery unless clearly indicated. Laparoscopic splenectomy was performed with the patient placed in reverse Trendelenburg position, with elevation of left side. The surgeon and the laparoscopist stood on the right side of the patient and the assistant on the left side. Colosplenic, gastrosplenic and splenophrenic ligaments were separated using harmonic scalpel technology (figure 1.) and hilar vessels clipped carefully, avoiding injury to the pancreatic tail (figure 2.).



Figure 1. Ligation of splenic ligaments with harmonic scalpel



Figure 2. Ligation of splenic vessels



Figure 3. Extracting spleen with endo catch



Figure 4. Using gloves to extract spleen

At the time of splenic artery ligation, platelets were transfused. The resected spleen was then placed into an Endo-Catch II self-expanding bag (figure 3.). In some cases sterile gloves were used to deliver spleen (figure 4.). The bag was partially pulled out and the spleen crushed and removed.

## Results

Out of 23 patients undergoing laparoscopic splenectomy, 9 were males and 14 were females. The age of the patients ranged from 17 - 45 years and the mean age was 31 $\pm$ 7 years (Table 1). There was only 1 case in which conversion to open splenectomy became necessary due to excessive blood loss (>250 ml). The mean operating time was 90 $\pm$ 22 mins and mean blood loss 131 $\pm$ 55 ml. 21 out of 23 (91.3%) patients showed a positive response of rise in platelet count after surgery. There was no postoperative complication in any patient. The mean postoperative hospital stay was 3 $\pm$ 1 days (Table 2).

Table 1: Demographic data of patients

	No. of patients	Percentage (%)
Gender		
Male	9	39.1
Female	14	60.9
Age of patients (years)		
17 - 22	2	8.7
23 - 28	4	17.4
29 - 34	11	47.8
35 - 40	4	17.4
41 - 46	2	8.7

Table 2: Clinical characteristics and surgical profile of patients

Characteristic	No (%)
Operating Time (minutes)	
35-59	2 (8.7)
60-84	8 (34.8)
85-109	9 (39.1)
110-134	3 (13.0)
135-159	1 (4.4)
Blood loss (ml)	
55-99	8 (34.8)
100-144	7 (30.4)
145-189	3 (13.0)
190-234	4 (17.4)
235-279	1 (4.4)
Conversion to open surgery	
Yes	1 (4.3)
No	22 (95.7)
Platelet count response	
Positive ( $\geq$ 100,000/ul)	21 (91.3)
Negative ( $\leq$ 100,000/ul)	2 (8.7)
Hospital stay (days)	
1-2	8 (34.8)
3-4	15 (65.2)

## Discussion

After 1980s when use of laparoscopy in surgery was introduced, the laparoscopic instruments and techniques have advanced rapidly.<sup>21,22</sup> Now the use of laparoscopy has become common for various intra-abdominal surgeries,<sup>23</sup> including the removal of spleen.<sup>20,23</sup> In ITP the spleen is small with no hypervascularity, making it ideal for laparoscopic removal.<sup>18,22,24</sup> There are several studies which demonstrated superiority of laparoscopy over open surgeries in terms of post operative pain, reduced hospital stay, lesser morbidity and overall early recovery.<sup>9, 19, 20</sup> Gurdeep S. Matharoo also demonstrated lesser hospital stay and overall reduced morbidity and mortality in laparoscopic group compared to open splenectomy.<sup>30</sup>

We have demonstrated less operating time, reduced blood loss and postoperative hospital stay and offered 91.3% positive postoperative platelet response. According to many studies conducted in Asia,<sup>9,20,22,23</sup> the mean operating time for laparoscopic splenectomy ranges from 138-210 mins, which is more than the mean operative time of our study (i.e. 90 mins).

Many articles suggest that laparoscopic splenectomy is more time consuming than open splenectomy, but several authors have reported that with the increase in experience, laparoscopic splenectomy is becoming a faster procedure.<sup>1,9,25</sup> The mean operative time of our study is 90±22 mins whereas Qu Y et al reported a mean operative time of 98±31 mins for open splenectomy.<sup>9</sup> This supports the claim that laparoscopic splenectomy is becoming more time efficient.

The mean hospital stay after laparoscopic splenectomy ranges from 6.3-8.9 days according to studies conducted in Asian hospitals.<sup>9, 20,22,23</sup> However, we have achieved a shorter mean hospital stay of 3±1 days in our hospitals.

Laparoscopic splenectomy offers lesser operating time, blood loss and hospital stay than open splenectomy. Moreover, it also shows that the mean operating time and postoperative hospital stay was lower in our study as compared to the laparoscopic group of Tada K et al. However, we observed more mean blood loss in our patients. The postoperative platelet response is comparable in our cases and the open splenectomy group of Tada K et al (Table 3).<sup>24</sup>

According to a study by Chand et al there is a 15% incidence of pancreatic injury following a laparoscopic splenectomy.<sup>26</sup> Complication rates are 12.9% with open splenectomy and 9.6% with laparoscopic

splenectomy as reported by a systematic review including 47 case series.<sup>27</sup> However, there was no postoperative complication in any of our patient.

Among the intraoperative complications of laparoscopic splenectomy, bleeding is the main reason to consider a conversion to open surgery,<sup>18</sup> specially when the bleeding cannot be safely and promptly controlled.<sup>28</sup> We had to convert 1 case to open surgery due to excessive bleeding. Generally, such conversions become necessary in 0-22% of cases, but do not affect the hematological outcome of the surgery.<sup>3,29</sup>

Laparoscopic splenectomy is now considered to be a standard procedure for the secondary treatment of ITP.<sup>1,3,24</sup> It is a safe and feasible procedure and produces better cosmetic results than open splenectomy.<sup>18</sup> Hence, we wish to encourage liaison with hematologist and physicians to promote a culture of routine laparoscopic surgeries for ITP patients and also promote the use of laparoscopy in cases of splenomegaly, for which laparoscopic surgery is currently not widely accepted.

**Table 3: Laparoscopic versus open splenectomy**<sup>24</sup>

Factor	Present Study	Laparoscopic splenectomy group	Open splenectomy group
No of patients	23	22	10
Male/Female	9/14	8/14	2/8
Operating time (mins)	90±22	150±54	104±23
Blood loss (ml)	131±55	67±101	400±245
Conversion to open	1	None	-----
Rise in platelet count	21 (91%)	17 (77%)	9 (90%)
Hospital stay (days)	3±1	9±3	23±10
Complications	None	1(pancreatitis)	None

## Conclusion

1. Laparoscopic splenectomy is associated with less operating time, postoperative hospital stay, blood loss and postoperative complications.
2. Laparoscopic splenectomy produces adequate postoperative rise in platelet count.

## References

1. Vecchio R, Marchese S, Intagliata E, Swehli E, Ferla F, Cacciola E. Long-term results after splenectomy in adult

- idiopathic thrombocytopenic purpura: comparison between open and laparoscopic procedures. *J Laparoendosc Adv Surg Tech A* 2013; 23(3):192–98.
2. Qu Y, Ren S, Li C, Qian S, Liu P. Management of postoperative complications following splenectomy. *Int Surg* 2013;98(1):55–60.
  3. Rijcken E, Mees S, Bisping G, Krueger K, Bruewer M, Senninger N et al. Laparoscopic splenectomy for medically refractory immune thrombocytopenia (ITP): A retrospective cohort study on longtime response predicting factors based on consensus criteria. *International Journal of Surgery*. 2014;12(12):1428–33.
  4. Neunert C.E., Current management of immune thrombocytopenia, *Hematology Am Soc of Hematol Educ Program.*, 2013, 276–82.
  5. Kuwana M, Okazaki Y, Kaburaki J, Kawakami Y, Ikeda Y. Spleen is a primary site for activation of platelet-reactive T and B cells in patients with immune thrombocytopenic purpura. *J Immunol*. 2002;168(7):3675–82.
  6. Stockelberg D, Hou M, Jacobsson S, Kuttij, Wadenvik H. Detection of platelet antibodies in chronic idiopathic thrombocytopenic purpura (ITP). A comparative study using flow cytometry, a whole platelet ELISA, and an antigen capture ELISA. *Eur J Haematol*. 1996;56(1-2):72–77.
  7. Provan D, Stasi R, Newland AC, Blanchette VS, Bolton-Maggs P. International consensus report on the investigation and management of primary immune thrombocytopenia. *Blood*. 2010;115:168–86.
  8. Chow L, Aslam R, Speck ER. A murine model of severe immune thrombocytopenia is induced by antibody- and CD8 $\beta$  T cell-mediated responses that are differentially sensitive to therapy. *Blood*. 2010;115(6):1247–53.
  9. Qu Y, Xu J, Jiao C, Cheng Z, Ren S. Long-Term Outcomes of Laparoscopic Splenectomy Versus Open Splenectomy for Idiopathic Thrombocytopenic purpura. *International Surgery*. 2014;99(3):286–90.
  10. Provan D, Newland A. Current management of primary immune thrombocytopenia. *Advances in Therapy*. 2015;32(10):875–87.
  11. Cohen YC, Djulbegovic B, Shamai-Lubovitz O, Mozes B. The bleeding risk and natural history of idiopathic thrombocytopenic purpura in patients with persistent low platelet counts. *Arch Intern Med*. 2000;160:1630–38.
  12. Abadi U, Yarchovsky-Dolberg O, Ellis M. Immune Thrombocytopenia. *Clinical and Applied Thrombosis/Hemostasis*. 2014;21(5):397–404.
  13. Rodeghiero F. Idiopathic thrombocytopenic purpura: an old disease revisited in the era of evidence-based medicine. *Haematologica* 2003; 88: 1081–87
  14. Cordera F, Long KH, Nagorney DM, McMurtry EK. Open versus laparoscopic splenectomy for idiopathic thrombocytopenic purpura: clinical and economic analysis. *Surgery*. 2003;134:45–52.
  15. Chater C, Terriou L, Duhamel A, Launay D, Chambon JP. Reemergence of splenectomy for ITP second-line treatment? *Ann Surg*. 2016;264:772–77.
  16. Vianelli N, Galli M, de Vivo A, Intermesoli T, Giannini B, Mazzucconi MG, et al. Efficacy and safety of splenectomy in immune thrombocytopenic purpura: long-term results of 402 cases. *Haematologica*. 2005;90:72–77.
  17. Delaitre B, Maignien B. Splenectomy by laparoscopic approach: report of a case. *Press Med*. 1991;20:2263–66.
  18. Misiakos E, Bagias G, Liakakos T, Machairas A. Laparoscopic splenectomy: Current concepts. *World Journal of Gastrointestinal Endoscopy*. 2017;9(9):428–31.
  19. Zheng D, Huang C, Huang S, Zheng C. Laparoscopic splenectomy for primary immune thrombocytopenia: Current status and challenges. *World Journal of Gastrointestinal Endoscopy*. 2016;8(17):610–14.
  20. Wu Z, Zhou J, Pankaj P, Peng B. Laparoscopic splenectomy for immune thrombocytopenia (ITP) patients with platelet counts lower than  $1 \times 10^9/L$ . *International Journal of Hematology*. 2011;94(6):533–38.
  21. Reddick EJ, Olsen DO. Laparoscopic laser cholecystectomy: a comparison with minilap cholecystectomy. *Surg Endosc*. 1989; 3: 44–48
  22. Shimomatsuya T, Horiuchi T. Laparoscopic splenectomy for treatment of patients with idiopathic thrombocytopenic purpura. *Surgical Endoscopy*. 1999;13(6):563–66.
  23. Kim D, Chung J. Long-term results of laparoscopic splenectomy in pediatric chronic immune thrombocytopenic purpura. *Annals of Surgical Treatment and Research*. 2014;86(6):314–17.
  24. Tada K, Ohta M, Saga K, Takayama H, Hirashita T. Long-term outcomes of laparoscopic versus open splenectomy for immune thrombocytopenia. *Surgery Today*. 2017;48(2):180–85.
  25. Mohamed SY, Abdel-Nabi I, Inam A, Bakr M, El Tayeb K. Systemic thromboembolic complications after laparoscopic splenectomy for idiopathic thrombocytopenic purpura in comparison to open surgery in the absence of anticoagulant prophylaxis. *Hematol Oncol Stem Cell Ther* 2010; 3(2):71–77
  26. Chand B, Walsh RM, Ponsky J, Brody F. Pancreatic complications following laparoscopic splenectomy. *SurgEndosc*2001; 15: 1273–76
  27. Kojouri K, Vesely SK, Terrell DR, George JN. Splenectomy for adult patients with idiopathic thrombocytopenic purpura: a systematic review to assess long-term platelet count responses, prediction of response, and surgical complications. *Blood* 2004; 104: 2623–34
  28. Habermalz B, Sauerland S, Decker G, Delaitre B, Gigot JF. Laparoscopic splenectomy: the clinical practice guidelines of the European Association for Endoscopic Surgery (EAES). *SurgEndosc*2008; 22: 821–48
  29. J. Mikhael, K. Northridge, K. Lindquist, C. Kessler, R. Deuson, M. Danese, Short-term and long-term failure of laparoscopic splenectomy in adult immune thrombocytopenic purpura patients: a systematic review, *Am. J. Hematol*. 84. 2009; 743e748.
  30. Matharoo GS, Afthinos JN, Gibbs KE. Trends in Splenectomy: Where Does Laparoscopy Stand? *JLSL : Journal of the Society of Laparoendoscopic Surgeons*. 2014;18(4):e2014.00239. doi:10.4293/JLSL.2014.00239.