

# A Retrospective Observational Study on Laparoscopic Splenectomy for Haematological Conditions with Better Peri-Operative Outcomes

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Received: 15/01/2016

Revised: 19/01/2016

Accepted: 21/01/2016

## 1. ABSTRACT

**1.1 Background:** Splenectomy is the surgical removal of the spleen, traditionally accomplished by one large commonly left subcostal or a left upper paramedian incision. The use of smaller incisions with laparoscopic techniques leads to less pain after surgery, less time spent in the hospital and quicker return to the work. Morbidity, mortality, hospital stay, operative time, blood loss, time to oral fluid intake, postoperative pain and complication, were analysed and overall outcome of the laparoscopic splenectomy were observed for a series of haematological cases for whom splenectomy is indicated.

**1.2 Methods:** Retrospective review of 25 patients who had undergone elective splenectomies between April 2012 and May 2015 were included. Preoperative evaluation was done by haematologist. General anesthesia was given for all patients. Most laparoscopic splenectomise were performed in right lateral position. Local infiltration with 0.5% bupivacaine was given at trocar and port site at the end of the surgery. Intravenous Fentanyl and tramadol were used for post operative pain relief.

**1.3 RESULTS :** The mean operating time was 74 minutes (range 45min to 90min) in LS alone cases;. The overall mean estimated blood loss was 159.3 ml (range: 50ml to 500ml. The mean hospital stay was 4.83 days (range: 3to12 days). All patients were ambulatory and started oral feeding on first post-operative day. Deep vein thrombosis and pulmonary complication were nil. Mortality was nil in this series. Pain intensity and analgesic (opioids) consumption were less during post-operative period.

**1.4 Conclusion :**In conclusion LS is a technically difficult but feasible procedure that could be performed safely in carefully selected patients, with adequate optimization and skilled surgical and anesthesiologist team even in a small setting with limited resources, with efficacy morbidity and mortality rates similar to those of traditional splenectomy for the same indications.

**Keywords:** laparoscopic splenectomy, idiopathic thrombocytopenic purpura, opioids, verbal pain scores (VPS), platelet count.

## 2. INTRODUCTION

Splenectomy is the surgical removal of the spleen, traditionally

accomplished by one large commonly left subcostal or a left upper paramedian incision. The use of smaller incisions with

laparoscopic techniques leads to less pain after surgery, less time spent in the hospital and quicker return to the work. Minimal invasive surgery has several advantages over open surgery. The most important are reduced intra-operative stress and faster return to normal daily activities. Laparoscopic splenectomy (LS) surgery was first reported in the year 1991 by French surgeons delaitre and maignien, since then it has been recognised as an accepted procedure for elective splenectomies in the management of various haematological as well as neoplastic conditions. [1] In the last two decades, laparoscopic splenectomy has become gold standard for spleen removal for various conditions. It has been reported by many authors that postoperative stay in hospital and recovery time are shorter with laparoscopic surgeries. [2] Indication for splenectomy are 1. HEMATOLOGICAL CONDITIONS - hereditary spherocytosis, Idiopathic and Thrombotic thrombocytopenic purpura (ITP and TTP), hypersplenism 2. SPLENIC TRAUMA- both blunt and penetrating trauma of the chest and abdomen can rupture the spleen alone or in association with other organs. 3. SPLENIC CARCINOMA - although reported, but it is a relative contraindication for laparoscopic approach due to risk of dissemination. 4. MISCELLANEOUS CONDITION - these may include, splenic abscess, ruptured splenic artery, staging of hodgkins disease, myelofibrosis. [3] we are reporting a case series of laparoscopic splenectomies performed by the same team of laparoscopic surgeon and anaesthesiologist over a period of 3 years with minimum follow up of 2 months and a maximum follow up of 2 years and 10months. One of major observation in this series was its better outcome in terms of operative time, intra-operative blood loss, less peri-operative complication, less hospital stay and need of less opioids for pain relief.

### 3. METHODS AND MATERIALS

Retrospective observational stud of 25 patients who had undergone elective splenectomies between April 2012 and May 2015 were included. Morbidity, mortality, hospital stay, operative time, blood loss, time to oral fluid intake, postoperative pain and complication, were analysed. All laparoscopic splenectomy were performed by the same surgical and anaesthesiologist team. All patients were fully evaluated and referred by our consultant haematologist. pre-operative evaluation includes ultrasound scan abdomen to assess spleen size, complete blood counts including platlet count and coagulation profile. Intravenous hydrocortisone was administered on routine basis for all the patients with ITP. Pre-operative platlet counts were optimised by our haematologist in all, but 6 patients who had steroid refractory ITP. Among these 6 refractory ITP cases, 2 patients undergone surgery with a platelet count between 10000 and 20000 as quasi-emergency. All these patients received pneumococcal, meningococcal and hemophilus influenza type B vaccines 2 weeks before surgery.

#### 3.1 Intra-Operative Procedures

With intravenous glycopyrolate and midazolam as premedication, general anesthesia was induced with intravenous propofol and intravenous fentanyl 1- 2 mcg/kg was used for analgesia and muscle relaxant atracurium 0.5mg/kg loading dose was used. Intubated with cuffed endotracheal tube and patients mechanically ventilated with intermittent positive pressure. Anesthesia was maintained with 2:1 ratio of nitous oxide and oxygen, with isoflurane as volatile agent, nasogastric tube inserted routinely for all patients. Routine monitors 5 lead electrocardiogram, non-invasive blood pressure, pulse oximeter, and capnography were used. A single dose of prophylactic intravenous antibiotic and hydrocortisone were administered immediately before induction of anesthesia.

23 patients with normal size to moderate splenomegaly were operated in right lateral position using four ports. 2 patient with hereditary spherocytosis with approximate spleen size of 21x12x10 cm was operated in supine position using four ports .1 unit of whole blood reserved for all patients. At the end of the surgery, trocar and port site were infiltrated with 0.5% bupivacaine. All patients were extubated at the end of surgery and observed in PACU (post anesthesia care unit) for first 4 hrs after surgery and send to their respective room thereafter. The post- operative pain intensity was assessed using a verbal pain score (VPS) ranging from 0-5 ,where 0- no pain and 1- mild, 2 - discomfort ,3- distressing, 4- horrible and 5 - excruciating pain. Pain scores were obtained on arrival to PACU and 1, 2, 3, 4<sup>th</sup> hr and then every 4<sup>th</sup> hrly on the day of surgery and every 6<sup>th</sup> hrly on first postoperative day.

Demographic data recorded were age and sex of the patients. Clinical data recorded includes indications for surgery, combined surgical procedures, duration of surgery, intra operative and post operative events and complications, need for blood and product transfusions, postoperative recovery, pain scores, morbidity and mortality.

#### **4. RESULTS**

25 patients who had undergone laparoscopic splenectomy (LS) between April 2012 and May 2015 were retrospectively analyzed. Of these 40% patients were females. The age ranged from 15 years to 75 years and the mean age was 37 years. The most common indication was ITP (18 patients). Of these 12 surgeries were done for complications of steroid and 6 were done for refractory ITPs (refractory to steroids and immunosuppressants). Other indications include hereditary spherocytosis, autoimmune hemolytic anemia and splenectomy as biopsy for lymphoproliferative disorders. The mean

pre-operative platelet count in ITP patients was 48700 (range 10000 to 130000). 23 patients had normal to mildly enlarged spleens and 2 patients had moderate to severe splenomegaly. These two patients received open incisions for retrieval of specimens apart from one patient who was opened for an intra-operative bleeding control. 15 patients had BMI of less than 30, 7 patients had BMI between 30 and 40 and 3 had a BMI above 40. One patient had a simultaneous umbilical hernia repair by open method along with LS (on-lay mesh repair). The mean operating time was 74 minutes (range 45min to 90min) in LS alone cases; 130 min in patient with combined umbilical repair. The overall mean estimated blood loss was 159.3 ml (range: 50ml to 500ml). Excluding the patient with an uncontrollable bleed and a patient with combined umbilical hernia repair it becomes drastically reduced to 114.6ml. The patient in whom there was an uncontrollable bleed from the pancreatic tail region, the blood loss was 500ml which necessitated opening by a 10 cm incision in the left hypochondrium. Only two patients received blood transfusion intra-operatively, one was the patient with an uncontrollable bleed mentioned above and the other was the patient with hereditary spherocytosis who had extensive peri-splenic adhesions and low pre-operative hemoglobin. Only 2 quasi emergency patients were given platlet transfusion during intra-operative period. 4 ITP patients with pre-operative platelet counts of 10000 received pre-operative platelet transfusion, 2 units each during the initial phase of this case series. Later on none of our patients were given blood or blood products. The specimen was removed through a small incision of around 5 cm made by joining the lateral-most ports in two patients with moderate to severe splenomegaly. None of the patients in this series had accessory spleen. The mean hospital stay was 4.83 days (range: 3to12 days). Restoration of oral feeding was done on the first post

operative day for all except three patients with ITP with complications of long term steroids, who developed prolonged ileus. Oral feeding was started on the 3rd post-operative day for these ileus patients. Intra-operatively 0.5% bupivacaine infiltration given in laparoscopic trocar and port site. Intravenous fentanyl and tramadol were used for Post-operative pain relief. Pain intensity and analgesic (opioids) consumption were less during post-operative period. Verbal pain score (VPS) was between 0-1 for all patient and all were comfortable and pain relief was satisfactory during post operative period. All patients were ambulatory on first post-operative day. Deep vein thrombosis and pulmonary complication were nil. Mortality was nil in this series. Postoperative complications occurred in 5 patients, wound sepsis in 3; septic collection of around 6ml in the region of the spleen in 1, and the patient with mesh repair for umbilical hernia had excessive seroma that lasted for 2 months. This patient stayed in the ward for 12 days and got discharged with the suction drain which was removed on the 19th POD. After removal of the drain tube this patient continued to have seroma which lasted for 2 months before resolving. All the patients were followed up for minimum of 2 months. All the ITP patients except one had a very good response pertaining to the improvement in platelet count. A 40 year old male with refractory ITP had a rise to a lifetime maximum of 40000, (preoperative value was 10000) and continued to maintain at that level during follow-up.

## 5. DISCUSSION

Due to the presence of a Hematologist in our hospital we use to get many referrals for hematological conditions. As in any other laparoscopic procedures, LS also is associated with less postoperative pain and less hospital stay which is translated into less costs. [3] In our hospital, splenectomy was being done from 1986 and all the procedures were

open splenectomies before 2012. The most common indication for splenectomy in this series was ITP, accounting for about 73 % of the cases. This is comparable to the international data. [4] A severe splenomegaly was defined as one with a maximum dimension of 20cm. [5] Two cases with moderate to severe splenomegaly, an autoimmune hemolytic anemia and a hereditary spherocytosis were operated in this study. The overall complication rate in this study was 20%. All the complications were minor complications like wound sepsis, and minimal intra-abdominal collection. The entire wound related complications occurred in those patients who required an incision to retrieve the spleen. Wound sepsis was managed conservatively. Intra-abdominal collection was aspirated once and sent for fluid culture sensitivity, which grew E.coli sensitive to Amikacin. Most of the pos-toperative morbidity in these patients seems to be as a result of the immunocompromized state and the use of steroids. Adequate optimization of the patients before surgery and strict aseptic measures in the post-operative period is essential to minimize the morbidity. Return to work was relatively early in most of our patients in view of the laparoscopic approach.

Operative times, indirectly translating into less time under anaesthesia and less hospital stay are the factors that determine the efficacy of any surgical procedure. The mean operative time in this study was 74 minutes which becomes reduced to 65.3 minutes, if the sole patient with combined umbilical hernia surgery was not included. This low mean operative time was considerably lesser than that of other studies which reported mean operative times in the range of 88 minutes to 188 minutes. [6] Comparing the international studies on open splenectomy, LS has a longer operative time. [7] A study by Rescorla et al describes an average operating time of 115 minutes for LS compared to 83 minutes for OS, which in

any case longer than the operating time for LS in this study. [3] Several factors like BMI, previous surgery, splenic size and surgeon's experience, might influence the operative time. The reduction in operative time in this study may be attributed to the use of vessel sealing device, in addition to the small splenic size in most of the patients (range 60gm- 160gm in 13 patients; 900gm and 1550gm in two patients respectively) and only few patients with high BMI. All the surgeries were performed by a single well experienced senior laparoscopic surgeon. Only one patient was converted (overall conversion rate was 0.15%) for an uncontrollable bleed which is attributed to the failure of the energy device and diffuse nature of the bleed in the tail of the pancreas. Bleeding from splenic hilum and bleeding due to enlarged lymph nodes in the splenic hilar region were reported as causes for conversion to open in few studies. [6,7] None of the patients in this series had re-laparotomies as a result of postoperative bleeding as it was reported in few studies. [2] The average length of stay was comparable with other studies, excluding the one patient with combined umbilical hernia repair. Though we have used drains liberally for the first 12 cases, we stopped using drains for the rest of our patients in whom we were stringent in avoidance of injury to the stomach and pancreas as well as achieving hemostasis. Though it was said that, there is significant risk of bleeding due to spleen's rich vascularity and intimate relationship with adjacent organs, LS could be carried out with less blood loss if care is taken to the anatomical details and usage of modern equipment. The average blood loss in this series of patients was 159ml which is comparatively lesser than other published studies. [10] As reported by Dan et al, it should be admitted that the bleeding that led to the conversion in this series was surgical and not directly due to thrombocytopenia. [6] This is one of the two patients who required blood

transfusions in this series. The other case was a severe splenomegaly with perisplenic adhesions due to hereditary spherocytosis with anemia. The need for meticulous dissection and the availability of appropriate equipment could not be overemphasized for the performance of successful and event-free LS.

In laparoscopic procedures decreased postoperative pain scores and less analgesic consumption after local infiltration have been reported. [8,9] Local anesthetics induce antinociception by acting on nerve membranes however they affect many membrane associated proteins in any tissue, and can inhibit release and actions of agents (e.g. prostaglandins or lysosomal enzymes) that sensitise or stimulate the nociceptors and contribute to inflammation. [10] The choice of bupivacaine for local anesthetic infiltration were based on reports of improved postoperative analgesia using this approach. [10] In three studies, while using trocar and port site infiltration of local anesthetics supplemental analgesic consumption was significantly reduced to between 60% - 80% during post-operative observational periods of 4-24hr. [8-10] Good pain relief with minimal use of opioids facilitates early mobility and less pulmonary complication.

## 6. CONCLUSION

In conclusion, LS is a technically difficult but feasible procedure that could be performed safely in carefully selected patients, with adequate optimization, especially by a hematologist for haematological indication and carried out by a skilled laparoscopic surgeon and anaesthesiologist team, even in a small setting with limited resources, with efficacy morbidity and mortality rates similar to those of traditional splenectomy for the same indications. These procedures appears to be associated with other laparoscopic patient benefits such as rapid return of gastrointestinal function, less post-operative pain, and decreased wound

infection and less post operative pulmonary complication, shorter hospitalization, and more rapid return to normal activity. Thus LS for selected hematologic disorders should be considered the technique of choice when surgery is indicated.

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How to cite this article: Sivakumar S, Jayabal VA. A retrospective observational study on laparoscopic splenectomy for haematological conditions with better peri-operative outcomes. *Int J Res Rev.* 2016; 3(1):31-36.

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