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ABSTRACT... Objectives: To analyze the complications following elective splenectomy. **Study Design:** Descriptive cross- sectional. **Setting and Duration:** This study was conducted in the department of surgery, Madinah Teaching Hospital, Faisalabad from January 2011 to December 2016. **Method:** After a good preoperative workup and preparation, 112 patients underwent elective open splenectomy from Jan 2011 to Dec 2016. Early postoperative complications were recorded. P value <0.05 was considered significant. **Results:** Of 112 patients, 09 patients (8%) presented with postoperative complications i.e, thrombocytosis in 4 patients (3.57%), haemorrhage in 2 patients (1.79%), chest infection in 1, meningitis in 1 (0.89%) and ileus in 1 (0.89%). Mortality was seen in 1 patient (0.89%). The two patients with fatal postoperative haemorrhage re-explored. One patient survived and other patient expired. Statistical analysis showed significance of study, a P value of 0.01. **Conclusion:** In our institution complication rate following splenectomy is equivalent to recent studies that is related to a good preoperative workup, excellent surgical technique and a vigilant postoperative care.

Key words: Elective Splenectomy, Haematological Disorders, Postoperative Complications, Haemorrhage.

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INTRODUCTION

Splenectomy is a commonly performed operation for various conditions, like trauma and benign and malignant haematological disorders.¹ By far, the two most common atraumatic indications for splenectomy are malignancy and haematological autoimmune disorders as in these condition spleen exerts a destructive effect on the blood cells causing anaemia, leucopenia, thrombocytopenia, or a combination of these effects.^{2,3,4}

Haematological disorders, particularly thalassemia major is a big health problem in Pakistan. It is the most prevalent genetically transmitted disease with a carrier rate of 5 -8 %⁵ Health experts claim that in Pakistan about 5,000 children are diagnosed with thalassemia major every year.⁶ Patient is managed by repeated blood transfusion and iron chelation therapy initially. Splenectomy is indicated when blood transfusion exceeds 250ml/kg/year. Hypersplenism & abdominal discomfort due to massive splenomegaly are

other indications of splenectomy in thalassemia patients. Splenectomy decreased the abdominal discomfort and improves the quality of life.⁷

Splenectomy is frequently performed laparoscopically; however, some patients still undergo open procedure depending on patient related factors and preference of surgeon.^{8,9,10} Splenectomy has been shown to be a safe and effective treatment option for selected conditions, however, in some haematological disorders, the operative mortality has been reported to be as high as 6.3%.

The most common complications after splenectomy reported in literature are thrombocytosis, postoperative haemorrhage, chest complications, wound problems, pancreatic injury and infectious complications (OPSI, subphrenic abscess, UTI) as well as death within 30 days.¹¹

Post splenectomy complications are a big challenge in postoperative period. A delayed or inadequate treatment is associated with high morbidity and mortality. In this study we evaluated the complications following splenectomy in our institution that may be due to surgery itself or as a consequence of the asplenic condition.

OBJECTIVE

To evaluate the complications following elective splenectomy in our hospital.

MATERIAL AND METHODS

Setting

This study was conducted at department of surgery Madinah Teaching Hospital, FSD.

Duration of study

The duration of study was 6 years (from January 2011 to Dec 2016).

Inclusion Criteria

All patients in whom elective splenectomy was done during the said period.

Exclusion Criteria

1. All patients of splenic trauma managed conservatively or as emergency splenectomy.
2. Splenectomy done for malignant cases.

Study Design

Descriptive cross sectional

Sample size

112 patients

Sampling Technique

Non probability convenient sampling was done.

Following inclusion criteria, 112 patients underwent elective open splenectomy. Preoperatively baseline investigations such as CBC, urea, RBS, hepatitis screening, LFT's, ECG and x-ray was done, paying special attention to platelet count and prothrombin time. Vaccination was done 2-3 weeks before surgery. Patients were sent to anesthetist for fitness for surgery. Prophylactic antibiotics (injectable) were started

before operation and continued for 3-5 days postoperatively. Most operations were performed by left subcostal incision, while the patients with massive splenomegaly were operated by midline or left paramedian incision. Post-operative complications were observed and recorded in performa.

Data collection and analysis Procedure

Data was entered in Microsoft excel 2007. Simple frequency and percentage were calculated for selected variables. Data tables and pie charts were used to show the results of study. Z-test was used to compare the proportions of post splenectomy complications.

RESULTS

Of the 112 patients, 64 were females and 48 were males. The mean age was 13 years (range 3-47 years). The mean hospital stay was 7 days (range 5-12 days).

The indications for elective open splenectomy in our study are shown in Table-I.

Thalassemia	93
Idiopathic thrombocytopenic purpura	9
Hereditary spherocytosis	5
Auto immune haemolytic anaemia	4
Banti disease	1

Table-I. Indications for splenectomy

The most common indication for splenectomy in our study was thalassemia because of its raised incidence in Pakistan and referral from Ali Zaib Foundation Faisalabad.

Of 112 patients, (9) patients (8%) presented with postoperative complications. Most common complication was thrombocytosis (defined as platelet count $>800 \times 10^9/l$) followed by haemorrhage, chest infection, meningitis and ileus. Mortality was seen in 1 patient. Other complications were not seen in our study. Z test of significance showed a p value of 0.01, showing highly significant results.

The complications in early postoperative period were recorded and summarized in Figure-1 & 2.

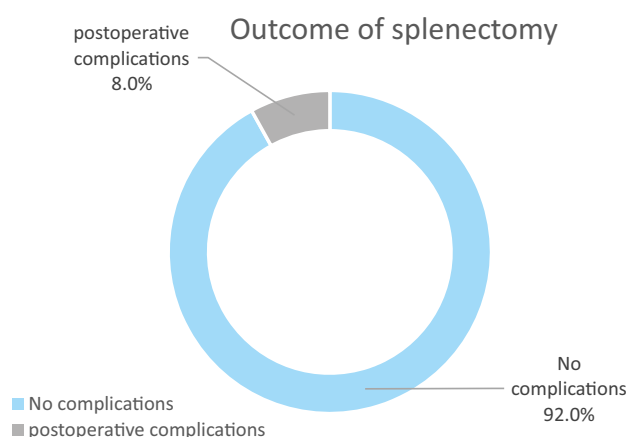


Figure-1. Outcome of splenectomy

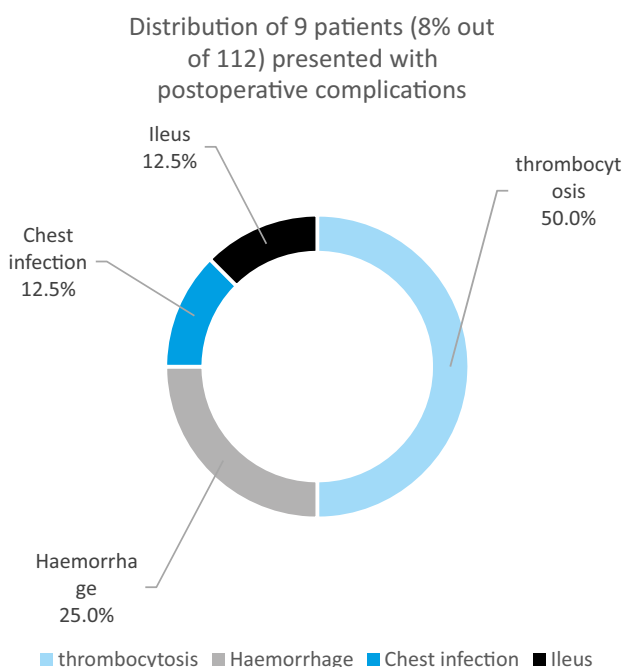


Figure-2. Distribution of patients with postoperative complications:

All the complications were managed conservatively (often physician was consulted) with the exception of haemorrhage. In most cases, there was minor blood loss mixed with saline (<100ml), so the drain was removed after 24-48 hours. In two cases, there was significant haemorrhage (>500ml) in drain. One patient was of 19 years old girl with idiopathic thrombocytopenic purpura, in whom there was continuous loss of

blood in drain (>900ml in 24 hours) so decision for re-exploration was done. There was ooze from splenic bed & no bleeding source was found. Haemostasis achieved and abdomen closed, the patient survived. The second patient was of 11 years old boy who was operated because of thalassemia major. The patient presented with postoperative haemorrhage (>500ml in drain) & patient collapsed. Immediate re-exploration was done. There was intra abdominal blood collection but no main bleeding vessel was found. There was ooze from splenic bed area. Haemostasis secured, but the patient did not survive & expired after half an hour of re-laparotomy.

DISCUSSION

Post splenectomy complications are a big challenge in postoperative period. The complications are due to surgery itself or as a consequence of the asplenic condition of the patient that increases the morbidity and mortality.¹¹ In our institution, we observed complications in 9 patients (8%) while mortality in 1 patient (0.89%). Literature shows post splenectomy complications rate ranging from 12% to 52% while mortality rates ranging from 1% to 9%. For example, Musser et al¹² reported a complication rate of 25% and mortality rate of 5%, Dawson et al¹³ reported a morbidity of 25%, and mortality of 1%, Similarly, Johansson et al¹⁴ described various complications in 14.5% patients with mortality of 1%. Recent studies show more favorable results, like Kojouri et al, in an analysis of 3386 splenectomies, reported a complication rate of 9.6% for laparoscopic splenectomy and 12.9% for open splenectomy, while associated mortality rates were very low, at 0.2% and 1% respectively.¹⁵

In our study, the commonest postoperative complication observed was thrombocytosis. Indeed, thalassaemia major and intermedia are now considered to be associated with a hyper coagulable state that may be aggravated by splenectomy.¹⁶ As main bulk of our patients comprised of cases of thalassaemia major, this was a likely complication. Fortunately, most of the cases were of mild thrombocytosis. Extreme thrombocytosis was seen infrequently and as it can lead to thrombotic events such as acute

myocardial infarction, mesenteric vein thrombosis, pulmonary embolism and DVT, so anticoagulant (Enoxaparin) was used when platelet count was greater than $500 \times 10^9/L$.^{17,18}

Postoperative haemorrhage is the most fatal and life threatening complication following splenectomy that has high mortality in immediate postoperative period. Haemorrhage is the most common (80%) cause of conversion from laparoscopic splenectomy to open splenectomy.¹⁹ Most of the postoperative haemorrhage cases occurring in first 24 hours. Also, this is the most common reason for re-laparotomy in immediate postoperative period.²⁰ In our study, the incidence is 1.79%. Among 112 patients, only two patients presented with significant haemorrhage ($>500\text{ml}/24$ hours) and re-explored. One patient was of ITP (idiopathic thrombocytopenia purpura) and the other was of thalassemia major. No definite bleeding source was found in the abdomen. Only there was ooze in the splenic bed area. One patient recovered & other patient died half an hour after re-laparotomy. So correct timing of splenectomy, good surgical technique, meticulous hemostasis and excellent postoperative care reduced the postoperative haemorrhage to 1.79% and mortality to 0.89% in our study. This is less than written in literature.¹⁹

Literature shows pancreatic injury in 1% to 3% of the patients undergoing splenectomy. These patients present with clinical features of pancreatitis and pancreatic fistula.¹⁷ This complication was not seen in our study because of careful manipulation of pancreatic tail during splenectomy.

Infective complications like chest infection and meningitis were observed in 2 of our patients. Usual investigations such as x-ray chest, CBC and sputum culture were done. Physician was consulted and patient treated with broad spectrum antibiotics. Luckily we did not observe any case with overwhelming post splenectomy infection (OPSI) which is a rare but life threatening complication of splenectomy. It is usually caused by encapsulated bacteria *Streptococcus pneumoniae*, *Haemophilus*

influenza and *Neisseria meningitidis*.¹¹ Most cases occur within two years after splenectomy. OPSI carries a mortality rate of more than 50%.²¹ This complication can be avoided by timely immunization (2-3 weeks before surgery), antibiotic prophylaxis and prompt treatment of infection.²² Guidelines for prevention of OPSI were followed in our patients along with prompt treatment of infections in the follow up period.

Improvements in surgical techniques can reduce the perioperative complications and mortality²³ as seen in our study.

CONCLUSION

Splenectomy is associated with a number of complications related to surgery and asplenic condition of the patient. In our institution, patient outcome in terms of complications is equivalent to recent studies and this favorable outcome is related to detailed pre-operative workup, good preparation of patient, vigilant postoperative care and early decision of re-exploration in case of fatal haemorrhage.



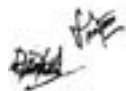
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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Irshad Ahmad	Main Author, Literature Review, Manuscript Writing, References Search	
2	Saira Saleem	Co-author Manuscript writing & arrangement	
3	Shakeel Anjum	Data collection, References Search	
4	A.G. Rehan	Supervised the study	