

### Overview of Splenectomy in Tertiary care

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### Abstract

The spleen performs a variety of immunological and hematological functions. It plays a key role in both the innate and adaptive immune systems, thereby protecting the body from invading organisms. The Overwhelming post-splenectomy infection (OPSI) is a serious complication of asplenia and is associated with encapsulated organisms, most commonly Streptococcus pneumoniae, but also Haemophilus influenzae and Neisseria meningitidis. This prospective observational study was conducted to determine the spectrum of

indications of splenectomy cases, associated morbidity and mortality. A total of 55 patients were included among them maximum number of patients were aged between 31-45 yrs of age (38.18%), and the mean age of the patients was 35.45 years and 30 were females and males were 25 with male: female ratio= 1.2. Laboratory findings and radiological findings are helpful in assessment of patient's health condition. The most common indication in our tertiary care centre was Portal HTN with a total of 17(30.9%) patients admitted with us, out of total 55 cases, 10(58.82%) patients had

Extrahepatic Portal Vein Obstruction (EHPVO), 5(29.41%) had Chronic Liver Disease (CLD) and 2(11.76%) had Non-Cirrhotic Portal Fibrosis (NCPF). The study concluded that Splenectomy is a safe procedure with a low morbidity. There was a preponderance of female patients requiring splenectomy for all non-traumatic indications, whereas all trauma related splenectomies were done in male patients only and presentation of patients depends on cause. Complete hemogram in pre-op, post-op phases and follow ups are helpful in good prognosis.

**Keywords:** Splenectomy, Indications of splenectomy, Prognosis, Mortality & morbidity, Portal hypertension.

### Introduction

Spleen is a lymphoid aggregate, lies behind ribs 9-10 in the left hypochondriac region of the abdominal cavity where a part of it lies in the epigastric region. The surgical removal, whole or partially, of the spleen is known as splenectomy, indicated in various haematological and non-haematological conditions, is being done for ages and have undergone evolutions since then.

The spleen performs a variety of immunological and haematological functions. It plays a key role in both the innate and adaptive immune systems, thereby protecting the body from invading organisms.<sup>1</sup>

Spleen is one of the most frequently injured intraperitoneal organs and management of splenic injuries may require splenectomy or, rarely, splenorrhaphy.<sup>2</sup> It's a life-saving procedure in traumatized individuals, certain haematological disorders, malignant conditions, and for the sake of diagnostic purposes.<sup>3</sup> The incidence of splenectomy is approximately 6.4-7.1 per 100,000 per annum and the

common reasons are trauma and haematological disorders.<sup>4</sup>

The Overwhelming post-splenectomy infection (OPSI) is a serious complication of asplenia and is associated with encapsulated organisms, most commonly *Streptococcus pneumoniae*, but also *Haemophilus influenzae* and *Neisseria meningitidis*.<sup>5</sup>

### Aims and Objectives of the study

The aims and objectives of study was:

- To look into the spectrum of indications for splenectomy cases.
- To assess the morbidity and mortality associated with the procedure in our subset of Patients.
- To follow Patients of Splenectomy on long term basis over a period 6 months to 2 years.

### Material and methods

This prospective observational study was conducted in the Department of Surgical Gastroenterology and Department of General Surgery, Sher-e-Kashmir Institute of Medical Sciences, Srinagar after taking the permission from institutional ethical committee from 2019-2021.

A total of 55 patients admitted under Surgical Gastroenterology were included in the study after obtaining the consent from them according to the inclusion and exclusion criteria.

### Inclusion Criteria

All patients above 14 years of age irrespective of sex, etiology, nature of surgery whether elective or emergency were included in the study.

### Exclusion Criteria

Patients who were not willing to participate.

### Procedure of data collection

Data was collected with the help of a pre-prepared proforma which contains the details (demographic

details, the indications, pre-operative assessment, intra-operative and post-operative) required for the analysis and was filled on the day of admission and subsequent days till discharge. Pre-operative assessment, detailed history, clinical examination and laboratory tests were done for all the patients. All the patients were monitored and data was filled into proforma from admission to till follow up.

Data was tabulated, organized, analyzed and interpreted in both descriptive and inferential statistics i.e. frequency and percentage distribution, by using statistical package for social science software (SPSS), version 21. Categorical variables were expressed as number and percentage.

**Observations and results**

In this prospective observational study a total of 55 patients were included, among them maximum number of patients were aged between 31-45 yrs of age (38.18%), and the mean age of the patients was 35.45 years and 30 were females and males were 25 with male: female ratio= 1.2.

Table 1: Pre-op lab investigations

Preop Findings	Minimum	Maximum	Mean
HB	6	16	9.87
PLT	5000	533000	156328
WBC	1000	14000	8750
UREA	16	80	29.38
CREAT	0.56	2.4	0.79
BIL	0.4	2.8	1.45
SGPT	41	258	102.82
PROTIEN	4	8.9	6.5
ALB	2	6	4.19
PTI	13	19	15.22
INR	1	2	1.28
APTT	28	42	31.22
	YES		NO
Hypersplenism	23 [41%]		32 [59%]

Table 1. Depicted the pre-op laboratory investigations. It was observed that 41% patients had hypersplenism

Table 2: Pre-operative radiological test

Radiological test	Frequency	Percentage
USG	55/55	100%
CECT	54/55	98.18%

Table 2 showed that Ultrasonography was the baseline investigation in all the patients and was done in all the cases. CECT was done in all the cases but not in 1 patient because of hemodynamic instability due to trauma.

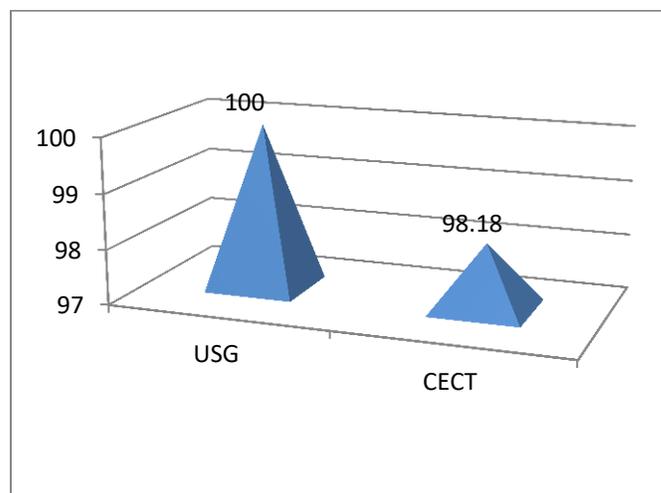


Figure 1: Pre-operative radiological test

Table 3: Radiological Findings

Radiological findings	Frequency	Percentage
Presence of splenomegaly	32	58.18%
Features of portal HTN	17	30.9%
Splenic trauma confirmed in	15	27.27%
Grading of splenic injury	Grade III –IV	[9(60%)]
	Grade-V	[6(40%)]
Features of CLD	5	9.09%

Table 3. Depicted the radiological findings. Out of 55 patients studied, 15(27.27%) of splenic trauma patients diagnosed with CECT abdomen on admission out of

which 60% had Grade III-IV and 40% had Grade-V splenic injury, however one patient with grade-v splenic trauma did not undergo CECT due to unstable hemodynamics. Other radiological findings included features of portal HTN seen in 17(30.9%), Splenomegaly was seen in 32(58.18%) and 5(9.05%) patients had features of Chronic liver disease (CLD). In cases of Portal HTN the details of the cause like EHPVO, NCPF & CLD were picked up based on CECT abdomen. A CT portovenography for details of collaterals, cavernoma, natural shunts, if any, aneurysms, if any, and pattern & size of splenic renal veins, was done.

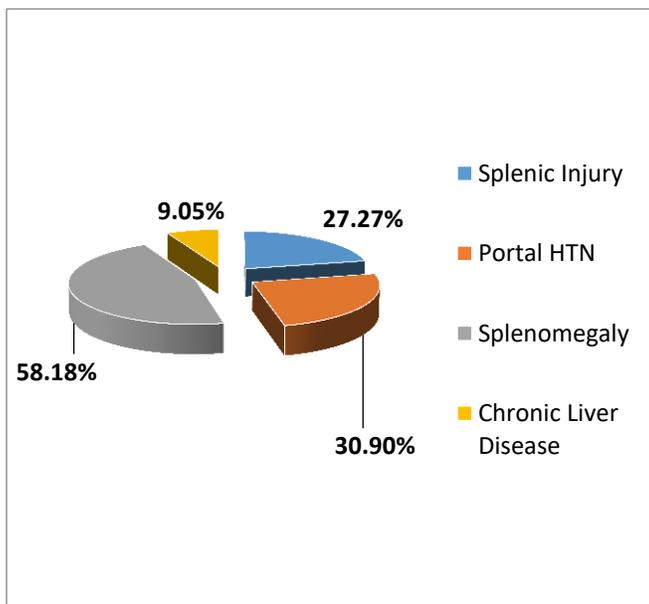


Figure 2: Radiological findings

Table 4: Indications of splenectomy

Indication	Frequency	Percentage
Portal hypertension [done along with Devascularisation or SR shunt]	17	30.09%
➤ EHPVO	10(17)	*58.82%
➤ NCPF	2(17)	*11.76%

➤ CLD	5(17)	*29.41%
Splenic trauma	15	27.27%
Hemolytic anemias	5	9.09%
AIHA	3 (60%)	
Sickle Cell Disease	2 (40%)	
Done with other procedures (distal pancreatectomy/ gastrectomy )	5	9.09%
Thrombocytopenia	4	7.27%
CHRONIC ITP	3 (75%)	
GAUCHER'S	1 (25%)	
Pancytopenia [hypersplenism ]Of unknown etiology	4	7.27%
Splenic abscess	2	3.63%
Splenic artery aneurysm	2	3.63%
Lymphoma	1	1.81%

Table 4 represents that the most common indication in our tertiary care centre was Portal HTN with a total of 17(30.9%) patients admitted with us, out of 55, out of which 10(58.82%) patients had Extrahepatic portal vein obstruction (EHPVO), 5(29.41%) had CLD and 2(11.76%) had Non-cirrhotic portal fibrosis (NCPF). Others indications included splenic trauma 15(27.27%), Hemolytic Anaemias 5(9.09%), Done with other procedures like gastrectomy, pancreatectomy, 5(9.09%), Thrombocytopenia (TP) 4(7.27%), Pancytopenia (Hypersplenism) 4(7.27%), Splenic Artery Aneurysm 2(3.63), Splenic Abscess 2(3.63) and splenic lymphoma 1(1.81%).

Table 5: Intra-operative findings

Findings	Frequency	Percentage	
Presence of splenomegaly	28	50.9%	
Presence of collaterals/ features of portal htn	17	30.09%	
Splenic injury	15	27.27%	
Features of CLD	5	9.09%	
Presence of natural shunts	3	5.45%	
Presence of associated vascular anomaly	2	3.63%	
	MIN	MA X	MEAN
Amount of blood loss	50 (ml)	200 (ml) *	155 (ml)
Duration Of Surgery (In minutes)	60	180	90

Table 5. Showed the intra-operative findings. In Intra-op findings Splenomegaly was seen in 28(50.9%) of all the cases. Splenic trauma was confirmed in 15(27.27%) cases. 17(30.9%) of the cases had features of portal HTN on table. While features of CLD were confirmed in 5(9.09%) cases, 2(3.63%) out of the total 55 cases showed presence of vascular anomaly. Presence of natural shunts was seen in 3(5.45%) cases. The mean amount of blood loss was 155 ml, which doesn't include the blood loss due to trauma. The average time taken for the procedure was 90 minutes excluding the time taken for induction and reversal of anesthesia.

Table 6: Vaccination protocol followed

Protocol	Frequency	Percentage
Hib,PCV13 two weeks prior to surgery	40	72.72%
Two weeks after the surgery	15	27.27%

Table 6. depicted that patients undergoing Elective splenectomy surgeries were vaccinated with Pneumococcal and H. Influenza vaccine 2 weeks prior to the surgeries, whereas those who underwent the emergency splenectomy received the same 2 weeks after the procedure or at the time of discharge. Booster dose of Influenza vaccine was then administered annually and Pneumococcal vaccine every 5 years was scheduled.

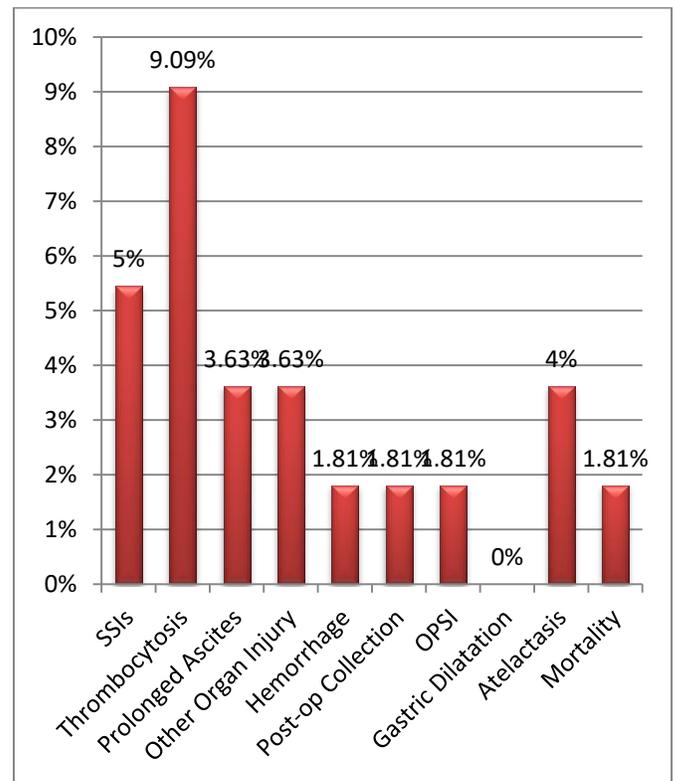


Figure 3: Post – op complications

Figure 3. Showed the most common Post-op complication encountered Thrombocytosis [Platelet count > 7.5 lacs] was seen in 5(9.09%) cases. They were managed conservatively [Aspirin, Hydroxyurea and anticoagulants were used as per indication], and no case

of any thromboembolic episode was noted. The 2<sup>nd</sup> most common Post-op complication encountered was Surgical Site Infections (SSI) with a total of 3(5.45%) out of 55 cases and they were managed as per category [Southampton] of SSIs.2(3.63%) patients suffered non-fatal injuries to other organs and those were repaired on table.2(3.63%) patients developed post-op atelectasis and those were managed with active chest physiotherapy.1 patient operated for splenic trauma developed features of sepsis on 4<sup>th</sup> post-op day and was shifted to ICU as a case of over whelming post splenectomy infections [OPSI], patient was declared dead on 9<sup>th</sup> post-op day.

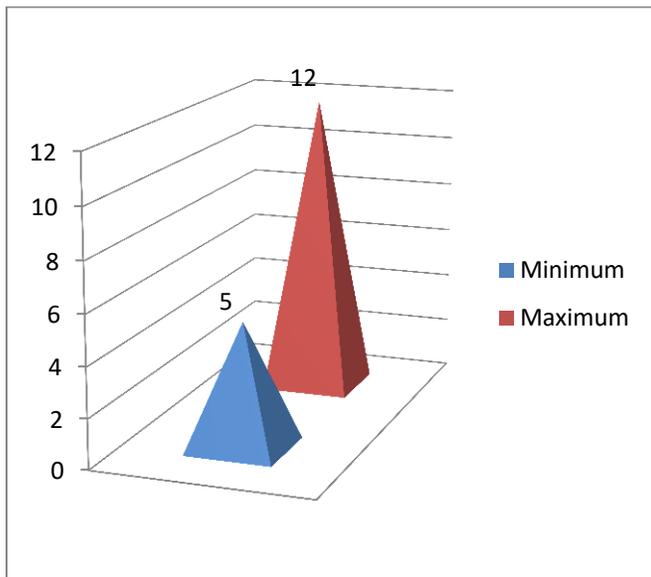


Figure 4: Duration of hospital stay

Figure 4 presented that the average duration of the Hospital stay was 8 days with minimum 5 days and maximum days of 12 days.

Table 7: Post-operative complete hemogram

Hemogram	Min	Max	Mean
At 3 <sup>rd</sup> post-op day			
HB	7	12	9.64
TLC	2200	27,000	10034.0
PLT	4000	12,33,000	6,66,320.0

At the time of discharge			
HB	9	13	10.8
TLC	6500	13000	8320
PLT	70,000	6,50,000	3,52,355
At 1 <sup>st</sup> (one week) follow-up			
HB	10.9	14.2	12.9
TLC	7200	12,500	8,960
PLT	1,20,000	5,60,000	3,74,520
At 1 month follow-up			
HB	10.2	15.2	12.3
TLC	5600	11,000	9,231
PLT	1,50,500	4,23,000	3,08,040

### Discussion

Splenectomy has been in practice since 1826 when Quittenbaum first removed a diseased spleen<sup>6</sup>, since then it has become a well-established procedure indicated in various conditions. The indications have been evolving from trauma to hematological and malignant conditions. In this study 55 patients were included. Detailed examinations and investigations were carried out in all the cases. Data was analyzed and discussed with previous literature.

The mean age of patients undergoing splenectomy was 35.45 years with females: males ratio 1.2, females being 54.54% and males were 45.45% although splenectomy done for splenic injury had 100% male patients. The most common indication for splenectomy was Portal HTN with a total number of 17 [30.09%] cases out of 55, out which 10 [58.82%] patients had EHPVO, 5 [29.41%] patients had CLD and 2 [11.76%] had NCPF. Hypersplenism in cirrhosis is not infrequent and may compromise with quality of life and therapy. Splenectomy is a therapeutic option, but information on results of splenectomy is scarce<sup>7</sup>. Not all the patients require splenectomy. Splenic injury usually results from

blunt abdominal trauma. Patients often have abdominal pain, sometimes radiating to the shoulder, and tenderness. Diagnosis is made by CT or ultrasonography. Treatment is with observation and sometimes surgical repair; rarely, splenectomy is necessary<sup>8</sup>. The number of patients of splenic trauma requiring splenectomy was 15 [27.27%]. Grade III-IV Splenic injury was confirmed in 9 [60%] and Grade-V splenic injury was confirmed in 6 [40%] of the cases. The 3<sup>rd</sup> most common indication was Hemolytic Anaemias, a total number of 5 [9.09%] patients underwent splenectomy.

There were 5 [9.09%] patients who underwent splenectomy as a part of other procedures like distal Pancreatectomy and Gastrectomy. Other indications for splenectomy were idiopathic Thrombocytopenia [4(7.27%)], patients with features and symptoms of hypersplenism [4(7.27%)], 2 [3.63%] patients each of Splenic Abscess and Splenic Artery Aneurysm were operated. 1 [1.81%] patient of splenic lymphoma was operated. In contrast to ITP being the most common indication for splenectomy in a similar study from south India from a tertiary health care center, our study had more of patients of hemolytic anemias among patients with hematological indications for splenectomy. Normal spleen serves as a major role in destruction abnormal blood cells, thereby causing anemia, leukopenia and thrombocytopenia. This is the reason; splenectomy is chosen as a management for a variety of haematological disorders in special conditions<sup>9</sup>. In our setup we operated more cases of portal HTN. There is receding trend in incidence of splenectomy due to trauma and hematological conditions which could be due to a very efficient department of Clinical Hematology in our institute. In our set of patients the features of

Hypersplenism was seen in 23 [41%] out of 55 patients in pre-op evaluation. The common presentations of patients with Hypersplenism were recurrent RTIs with Anaemia. Few patients presented with UGI bleed due to esophageal varices. USG Abdomen and CECT Abdomen along with CT portovenography were the mostly used radiological modalities for the diagnosis with accuracy of 100%. Patients selected for elective splenectomy were vaccinated [ pneumococcal and h. influenza] 2 weeks prior to the surgery and were asked to follow annual influenza booster vaccination. While the patients who underwent splenectomy in emergency were vaccinated either at the time of discharge or 2 weeks after the surgery.

The complications of the Splenectomy done at our tertiary care center were related mostly in context to basic disease and not to the splenectomy alone. In our study the most common complication encountered was Surgical Site Infection with a total number of 11[25%] cases out of 55 cases. Most of the SSIs were graded 1-3 as per Southampton classification with deep organ space involvement reported in only one case. Platelet counts after splenectomy have been reported to increase 30% to 100%, with a peak reached at 7 to 20 days postoperatively. Common complications of thrombocytosis include thrombosis and hemorrhage. Postsplenectomy venous thrombosis is usually associated with platelet counts >6 lacs to 8 lacs/dL and occurs in approximately 5% of patients. Less commonly, postsplenectomy thrombocytosis results in arterial thrombosis that leads to stroke or myocardial infarction. In the present study the Post-op Thrombocytosis was seen in 5 [9.09%] cases, all patients being asymptomatic and received prophylactic treatment with Aspirin and Hydroxyurea. Regardless of the cause,

thrombocytosis leads to platelet hyperaggregation; therefore, the first line of therapy is the administration of platelet-antiaggregating medication such as aspirin. For extreme thrombocytosis with evidence of arterial or venous thrombosis, patients may need cytoreductive agents such as hydroxyurea or anagrelide with close monitoring of platelet counts<sup>10</sup>. The mean platelets count on 3<sup>rd</sup> post-op day was 6,66,320 and mean PLT count on the day of discharge was 3,52,355. Prolonged ascites was seen in 2 [3.63%] patients and that was the result of hypoalbuminemia, which was corrected with total parenteral nutrition and i/v albumins. 2 [3.63%] patients suffered iatrogenic other organs injury which were taken care of well on table. Reactionary hemorrhage was noted in 1 [1.81%] patient. The most dreadful complication OPSI was encountered in 1 patient with fatal outcome. In our setup no patient suffered Atelectasis and gastric dilatation. The patients were asked to follow in OPD 1<sup>st</sup> after 1 week of discharge and then monthly for 6 months. The response to basic ailment was noted and it was found to be good.

### Conclusion

This prospective observational study concluded that Splenectomy is a safe procedure with a low morbidity. There was a preponderance of female patients requiring splenectomy for all non-traumatic indications, whereas all trauma related splenectomies were done in male patients only and presentation of patients depends on cause. Complete hemogram in pre-op, post-op phases and follow ups are helpful in good prognosis.

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