

**Predictors for Morbidity and
Mortality following non-traumatic
Splenectomy at the University,
Jeddah, Hospital, Saudi Arabia**

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International Surgery – 2000, 85.317-321.



Predictors for morbidity and mortality following non-traumatic splenectomy at the University Hospital, Jeddah, Saudi Arabia

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Objective: To determine the pre-operative predictors of morbidity and mortality of patients undergoing elective splenectomy for non-trauma indications.

Methods: Analysis of 123 patients who underwent splenectomy at King Abdulaziz University Hospital, Jeddah, Saudi Arabia between 1986-1996. Data collected included patients' demographic data, indication for splenectomy, laboratory data, details of operative procedure and postoperative events for morbidity and mortality. Statistical analysis was carried out using the Chi-square test.

Results: Of the patients, 69% were males and 31% females with ages ranging from 13-72 years (mean 39 years). Portal hypertension constituted 55% of the indications and benign hematological conditions 26%. The morbidity rate was 27.6% and the commonest complication was chest and wound infection in 6.6% and 5.7%, respectively. Age of >50 years, pre- and postoperative haematocrit of <33%, thoraco-abdominal approach and operative time of >120 min had P values of < 0.05, <0.002, <0.03 and <0.03, respectively for postsplenectomy mortality.

Conclusions: According to this study, age of >50 years is a significant predictor for morbidity following splenectomy, whereas age >50 years, pre- and postoperative haematocrit of <33%, thoraco-abdominal approach and operative duration >120 min were significant predictors of postsplenectomy mortality.

Key words: Splenectomy - Non-trauma - Morbidity - Mortality

In the non-traumatic setting, splenectomy is usually performed because of diagnostic and/or therapeutic indications. However, the indications for splenectomy have undergone considerable review over the last two decades,¹⁻⁴ because of recent advances in the areas of non-invasive diagnostic radiology, therapeutic modalities in management of malignant and non-malignant haematological disorders where splenectomy might be considered,

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Table 1 The indications for splenectomy (n = 123) at King Abdulaziz University Hospital 1986-1996

Indication	No of patients	%
Haematological		
Non-malignant		
Immune thrombocytopenia	19	15.4
Haemolytic anaemia	13	10.6
Malignant		
Lymphoma	6	4.9
Leukaemia	3	2.4
Subtotal	41	33.3
Non-haematological		
Portal hypertension	68	55.3
Other		
Carcinoma of stomach and oesophagus	10	8.1
Hydatid cyst of spleen	3	2.4
Carcinoma of the colon	1	0.8
Subtotal	82	66.6
Grand total	123	100

as well as the understanding of long and short-term complications of splenectomy.^{5,6}

The expected clinical benefits of splenectomy must be carefully weighed against the potential of postoperative complications,⁷⁻¹⁵ that include infections, thromboembolism, injury to adjacent organs, bleeding and death. The first report relating complications to the indications for splenectomy was presented in 1961.⁷

The purpose of this study was to examine the incidence and types of early and late postoperative complications after splenectomy was performed in non-traumatic settings at King Abdulaziz University Hospital, Jeddah, Saudi Arabia and to correlate the findings with pre-operative variables that could have predicted the morbidity and mortality events.

Patients and Methods

All patients who underwent splenectomy for indications other than trauma at the King Abdulaziz University Hospital, a 350 bed teaching hospital in Jeddah, Saudi Arabia, between 1986-1996 were included. For each patient, age, sex, primary diagnosis and indication for splenectomy were recorded. Pre-operative full blood count results and a 16-parameter basic biochemical profile were noted for each patient. The details of the splenectomy including elective or emergency, incision used, early ligation of splenic artery, operative blood loss, resection of other organs, use of drains, duration of operation and postoperative hospital

Table 2 Postoperative complications among patients who underwent splenectomy for non-trauma indication (n = 123)

Complication	No of patients	%
Chest infection	8	6.6
Wound infection	7	5.7
Sepsis	4	3.3
Bleeding	3	2.4
Subphrenic abscess	3	2.4
Pleural effusion	3	2.4
Pulmonary embolism	2	1.6
Myocardial infarction	2	1.6
Thrombophlebitis	2	1.6
Total	34	27.6

Table 3 The postoperative complications and mortality in 123 patients who underwent splenectomy

Indication	Morbidity		Mortality	
	No of patients	%	No of patients	%
Haematological				
Non-malignant				
Immune thrombocytopenia	3	8.8		
Haemolytic anaemia	2	5.9		
Malignant				
Lymphoma				
Leukaemia	1	2.9	1	10
Subtotal	6	17.6	1	10
Non-haematological				
Portal hypertension	23	67.7	8	80
Others				
Carcinoma of stomach and oesophagus	4	11.8	1	10
Hydatid cyst of spleen	1	2.9		
Carcinoma of the colon				
Subtotal	28	82.4	9	90
Grand total	34	100	10	100

days were documented. The histopathology results including accessory spleen, if any, and the weight of the spleen were recorded. Postoperative complications were defined as any sequelae not considered to be part of a normal postsplenectomy course. The cause of postoperative death was defined as the major contributing factor. Statistical analysis was performed using the Chi-square test.

Results

A total of 123 patients underwent splenectomy for non-trauma conditions during the study period; 85 males

Table 4 Morbidity and mortality rates against pre-operative variables in 123 patients who underwent splenectomy

Character	No of patients	(%)	Morbidity			Mortality		
			No of patients	(%)	P value	No of patients	(%)	P value
Age								
<50 years	95	(77)	19	(56)	0.001	5	(50)	0.05
>50 years	28	(23)	15	(44)		5	(50)	
Pre-operative haematocrit					0.3			0.005
<33	58	(47)	18	(53)		9	(90)	
>33	67	(53)	16	(47)	1	(10)		
Postoperative haematocrit					0.5			0.002
<33	53	(34)	16	(47)		9	(90)	
>33	70	(57)	18	(53)	1	(10)		
Type of incision					0.1			0.03
Abdominal	88	(71.5)	21	(62)		4	(40)	
Thoraco-abdominal	35	(28.5)	13	(38)	6	(60)		
Duration of operation					0.2			0.04
<120 min	50	(41)	11	(32)		1	(10)	
>120 min	73	(59)	23	(68)	9	(90)		
Weight of the spleen					0.2			0.5
<1000 g	102	(83)	30	(88.3)		9	(90)	
>1000 g	21	(17)	4	(11.7)	1	(10)		

and 38 females. The median age was 37 years (mean 39 years, range 13–72 years).

Table 1 shows the distribution of the patients according to the indication of splenectomy. The most common indication was portal hypertension (55%). Haematological indications constituted (33%) of the group. Table 2 depicts the postoperative complications with an overall morbidity rate of 27.6% and Table 3 displays the morbidity and mortality according to the indications of splenectomy. Mortality and morbidity was found to be statistically significant for the age of the patient, while pre-operative haematocrit is statistically significant as a predictor for postoperative mortality, but not morbidity. There was no statistically significant postoperative factors to predict morbidity but postoperative haematocrit, type of incision and duration of operation are statistically significant

parameters for mortality. As shown in Table 4, morbidity was found to be significantly higher ($P < 0.001$) for patients who were >50 years of age. Haematocrit, type of incision, duration of operation and weight of the spleen were not found to be significant predictors to morbidity following splenectomy. On the other hand, age of >50 years, pre- and postoperative haematocrit, thoraco-abdominal incision and duration of operation of more than 120 min were found to be significant predictors for postsplenectomy mortality. Table 5 shows characteristics of the 10 patients who died after the splenectomy, 80% of whom were splenectomized because of portal hypertension, 60% aged >50 years, 90% had lengthy operative time of >120 min and 10% splenic weight of >1000 g. The mortality rate in this series was 8.1%. Accessory spleen was found in 4 patients (3.2%).

Table 5 Characteristics of the 10 patients who died postsplenectomy for non-trauma indications

	Age	Sex	Diagnosis	HCT (pre)	HCT (post)	Thoraco-abdominal approach	Operative time (min)	No of days to death	Weight spleen (g)	Cause of death
1	36	M	Portal hypertension	30	14.2	Yes	287	38	500	Sepsis
2	58	M	Carcinoma of the stomach	26.4	24	Yes	315	49	130	Myocardial infarction
3	50	M	Portal hypertension	34.6	29.5	Yes	328	27	350	Gastrointestinal bleeding
4	70	M	Leukaemia	29.4	28.2	No	155	55	500	Bleeding DIC
5	55	M	Portal hypertension	29.2	25.7	No	160	19	800	Pulmonary embolism
6	35	M	Portal hypertension	24.1	18.7	Yes	356	54	1200	Sepsis
7	54	M	Portal hypertension	30.7	34.5	Yes	150	38	500	Myocardial infarction
8	47	M	Portal hypertension	31.2	29.1	No	95	16	700	Sepsis
9	32	F	Portal hypertension	15.6	25.2	No	180	34	568	Gastrointestinal bleeding
10	40	F	Portal hypertension	20	31.0	Yes	275	20	350	Myocardial infarction

Discussion

In this series, the overall morbidity rate was found to be 27.6%. Ellison and Fabri⁷ reported that the postoperative complication rate following splenectomy ranges from 15–61%. Several pre-operative factors have been reported to predict morbidity, such as indication for splenectomy,⁵ weight of the spleen¹⁶ and age of the patient.¹⁷

In our study, we found that haematological indications only predict significant postoperative morbidity compared to non-haematological indications. This finding is similar to those reported by others.⁵ We also found that patients of >50 years have significant post-operative morbidity and mortality. In this series, other variables examined were found to have no significant impact on morbidity, such as haematocrit, type of incision, duration of operation and weight of spleen. Our results are in contrast with those of Horowitz *et al.*,⁸ Danforth¹⁶ and Shaw *et al.*¹⁸ who reported the splenic size to be a significant predictor for postoperative morbidity. However, our finding is similar to that recently reported by McAneny *et al.*¹⁷ who showed that the weight of the spleen has no effect on morbidity.

Splenectomy performed for myeloproliferative disorders (MPD) has been reported to cause significant morbidity and mortality.¹¹ The small number of patients with MPD ($n = 3$), (2.4%) explains the lack of significant impact of this diagnosis on morbidity ($P = 0.6$), and mortality ($P = 0.2$) in this study.

The most common morbidity in this series was related to postoperative chest infection (6.6%), wound infection (5.7%), and subphrenic abscess (2.4%). In Dawson's series,¹ pneumonia occurred in 13% and subphrenic abscess in 0.5%.

Significant predictors for mortality following splenectomy in this study were found to be age >50 years, both pre- and postoperative haematocrit, thoraco-abdominal approach and lengthy operative time >120 min. Our results are similar to those reported by McAneny,¹⁷ who found that age is a predominant factor associated with morbidity and mortality.

The mortality rate in this study was found to be 8.1% which compares well with that reported in the literature of 5.6%.³⁶ Of our 10 patients who died, 8 had portal hypertension. The mortality rate following portal hypertension has been reported to be around 10%.¹⁹ Splenectomy contributes to the morbidity and mortality in operations for portal hypertension and may not lead to the control of bleeding. However, there are recent reports arguing against splenectomy in this situation.²⁰ All those who died in our series had one or more of the positive predictors for significant mortality rate, *i.e.* age >50 years, operative time >120 min and haematocrit

<33%. The direct cause of death in our series was bleeding in 30%, sepsis 30%, myocardial infarction in 30% and pulmonary embolism in 10%. This contrasts well with the report by Johnson,²¹ where, in a series of 36 patients who underwent splenectomy, the direct cause of mortality was sepsis in 36%.

In conclusion, our study indicates that age of >50 years is a significant predictor for morbidity following splenectomy whereas, age >50 years, pre- and post-operative haematocrit of <33%, thoraco-abdominal approach and operative time exceeding 120 min were significant predictors of postsplenectomy morbidity and mortality.

Acknowledgement

The author would like to thank Dr Sameer Sabban, consultant in family and community medicine, for his assistance in statistical analysis.

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