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General Surgery

Indications of Splenectomy and Postoperative Mortality

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Original Research Article

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Abstract: The aim of this study was to investigate the risk factors for mortality by evaluating the indications for splenectomy and postoperative mortality in patients that underwent splenectomy over a 6-year period at a general surgery department. The retrospective study included 107 patients aged over 18 years that underwent splenectomy. The patients were divided into two groups: (I) surviving and (II) no surviving. Age, gender, hospital stay, surgical procedure (elective or emergency), type of surgery (open or laparoscopic), indications for splenectomy, and the histopathological diagnosis of the splenectomy specimen were recorded for each patient. The 107 patients comprised 58 (54.2%) men and 49 (45.8%) women. Of these, 94 (87.9%) patients were in the surviving group and 13 (12.1%) were in the no surviving group. Of the 107 patients, 66 (61.7%) underwent elective surgery and 41 (38.3%) underwent emergency surgery. Mortality occurred in 4 (6%) patients that underwent elective surgery and in 9 (22%) patients that underwent emergency surgery and the risk of mortality was significantly higher in the patients that underwent emergency surgery compared to elective surgery (p<0.05). The most common indication for splenectomy was trauma (n=35; 32.7%), followed by nondramatic hematological indications (n=30; 28%) including ITP (n=15; 14%), sickle cell anemia (n=9; 8.4%), beta thalassemia (n=5; 4.7%), and hereditary spherocytosis (n=1; 0.9%). In addition, splenectomy was performed as a component of the debunking of ovarian cancer (n=28; 26.2%). Complications occurred in 19 (12%) patients, with the most common complications including isolated abdominal bleeding (n=7; 6.5%) and isolated atelectasis and pneumonia (n=6; 5.6%). Trauma is the most common indication for splenectomy in general surgery practice and benign hematological disorders are also highly common among the indications for splenectomy. In addition, emergency splenectomy is a risk factor for mortality.
Keywords: Indication, complication, mortality, splenectomy.

INTRODUCTION

Splenectomy is a surgical procedure commonly performed in the treatment of numerous curable diseases and in the clinical palliation of various diseases. In such diseases, splenectomy is indicated in cases that present with commonly known conditions such as blunt trauma, idiopathic thrombocytopenic purpura (ITP), beta thalassemia, and hereditary spherocytosis and also in cases with rare diseases such as epidermoid cyst, splenic tumor, and hydatid cyst [1–8]. In addition, splenectomy can also be indicated in cases in whom the treatment fails or the desired outcome is not achieved after the treatment, particularly in cases with controversial indications such as advanced-stage gastric cancer, hypersplenism, or in cases with splenic shunt that undergo liver transplantation [9–11]. However, splenectomy is a critical surgical procedure that has a high risk of serious complications and may result in mortality. To prevent these risks, a number of measures have been proposed that are classified as preoperative [such as vaccination), perioperative [such as local bleeding control), and postoperative measures (such as monitoring of patient vitals, lung exercises)[12–18]. In addition, in patients undergoing splenectomy, pre- and post-operative vaccinations should be administered, postoperative monitoring and follow-up of the patient should be performed, and the hematological problems caused by the changes in the numerical blood parameters should be closely monitored and treated as needed [14,19]. In this study, we aimed to investigate the risk factors for mortality by evaluating the indications for splenectomy and postoperative mortality in patients that underwent splenectomy over a 6-year period at a general surgery department.

METHODS

The retrospective study included 107 patients aged over 18 years that underwent splenectomy at Mustafa Kemal University Medical School General Surgery Department between January 2012 and January 2018. The patients were divided into two groups: (I) surviving and (II) no surviving. Patients that had traumatic indications and those who underwent elective surgery were also included in the study. Age, gender, hospital stay, surgical procedure (elective or emergency), type of surgery (open or laparoscopic), indications for splenectomy, histopathological diagnosis of the splenectomy specimen, and postoperative follow-up status until the end of the study period were recorded for each patient.

STATISTICAL ANALYSIS

Data were analyzed using SPSS 24.0 (IBM Corporation, Armonk, New York, United States). Normal distribution of data was analyzed using Shapiro-Wilk test and variance homogeneity was evaluated using Levine's test. The means of two independent groups were compared using Independent-Simples*t*-test with bootstrap results. Categorical variables were compared using Pearson's chi-square test and Fisher's Exact test. The effect sizes of the variables were compared using odds ratio. Mortality and survival were estimated using the Kaplan-Meier method (product limit method) and the log-rank test (Mantel-Coxmethod).Quantitative variables were expressed as mean standard deviation (SD), minimum, and maximum. Categorical variables were expressed as frequencies and percentages. A *p* value of <0.05 was considered significant.

RESULTS

The 107 patients included58 (54.2%) men and 49 (45.8%) women (Table 1). Of these, 94 (87.9%) patients were in the surviving group and 13 (12.1%) were in the no surviving group. Mean age was 43.9±18.9 (range, 18-88) years in the surviving group and 48.4±23.9 (range, 20-90) years in the no surviving group and no significant difference was found between the groups in terms of mean age(p>0.05).

Of the 107 patients, 66 (61.7%) underwent elective surgery and 41 (38.3%) underwent emergency surgery (Figure 1). Mortality occurred in 4 (6%) patients that underwent elective surgery and in 9 (22%) patients that underwent emergency surgery (Table 1) and the risk of mortality was significantly higher in the patients that underwent emergency surgery compared to elective surgery(p<0.05).

Open surgery was performed in 101 (94.4%) patients and laparoscopic surgery was performed in 6 (5.6%) patients (Table 1). Mortality occurred in 12 patients that underwent open surgery as opposed to 1 patient that underwent laparoscopic surgery; however, no significant difference was found between the patients with regards to the type of surgery (p>0.05).

The most common indication for splenectomy was trauma (n=35; 32.7%), followed by nondramatic hematological indications (n=30; 28%) including ITP (n=15; 14%), sickle cell anemia (n=9; 8.4%), beta thalassemia (n=5; 4.7%), and hereditary spherocytosis (n=1; 0.9%). Moreover, splenectomy was performed as a component of thedebulking of ovarian cancer (n=28; 26.2%)and was performed due to rarer indications including total gastrectomy (n=3; 2.8%), Hodgkin lymphoma(n=2; 1.9%), distal pancreatectomy (n=1; 0.9%), hairy cell leukemia(n=1; 0.9%), spontaneous splenic rupture (n=1; 0.9%), myelofibrosis(n=1; 0.9%), and splenic pseudocyst (n=1; 0.9%) (Table 2).

No postoperative complication occurred in 88 (82.2%) of the patients. However, complications occurred in 19 (12%) patients, including isolated abdominal bleeding (n=7; 6.5%), isolated atelectasis and pneumonia (n=6; 5.6%), atelectasis and pneumonia plus wound site infection (n=2; 1.9%), atelectasis and pneumonia plus abdominal abscess (n=1; 0.9%), abdominal bleeding and acute pancreatitis (n=1; 0.9%),isolated wound site infection (n=1; 0.9%),and isolated abdominal abscess (n=1; 0.9%)(Table 2).

The most common histopathological diagnosis was chronic venous congestion (n=47; 43.9%), followed by capsule laceration (n=38; 35.5%), splenic invasion (malignant) (n=13; 12.1%), hydatid cyst (n=4; 3.7%), epidermoid cyst (n=1; 0.9%), granulomatous infection (n=1; 0.9%), and splenic abscess (n=1; 0.9%) (Table 2).

Table-1: Patient characteristics in both groups

		Surviving (n=94)		No surviving (n=13)		Total (N=107)	*p*
		Mean±SD. / Min. - Max.		Mean±SD. / Min. - Max.		Mean±SD. / Min. - Max.	
Age (years)		43.9±18.9 / 18-88		48.4±23.9 / 20-90		44.4±19.6 / 18-90	0.521
		n (%)		n (%)		n (%)	
Gender							
	Female	44 (46.8)		5 (38.5)		49 (45.8)	0.768
	Male	50 (53.2)		8 (61.5)		58 (54.2)	
Surgical procedure							
	Elective	62 (66.0)		4 (30.8)		66 (61.7)	0.029
	Emergency	32 (34.0)		9 (69.2)		41 (38.3)	4.3 (1.3-22.01)*
Type of surgery							
	Open	89 (94.7)		12 (92.3)		101 (94.4)	0.549
	Laparoscopic	5 (5.3)		1 (7.7)		6 (5.6)	
Independent-samples *t*-test(Bootstrap) / Fisher's Exact Test/ Pearson's Chi-Square Test/ *Odds Ratio (95%CI)							

Table-2: Indications for splenectomy, postoperative complications, and histopathological diagnosis of the patients

		n	%	
Indications for Splenectomy				
	Trauma	35	32.7%	
	ITP	15	14.0%	28%
	Sickle cell anemia	9	8.4%	
	Beta thalassemia	5	4.7%	
	Hereditary spherocytosis	1	0.9%	
	Debulking of ovarian cancer	28	26.2%	
	Hydatid cyst	4	3.7%	
	Total gastrectomy	3	2.8%	
	Hodgkin lymphoma	2	1.9%	
	Distal pancreatectomy	1	0.9%	
	Hairy cell leukemia	1	0.9%	
	Spontaneous splenic rupture	1	0.9%	
	Myelofibrosis	1	0.9%	
	Splenic pseudocyst	1	0.9%	
Complications				
	No complication	88	82.2%	
	İsolated abdominal bleeding	7	6.5%	
	Isolated atelectasis and pneumonia	6	5.6%	
	Atelectasis and pneumonia + wound site infection	2	1.9%	
	Atelectasis and pneumonia + abdominal abscess	1	0.9%	
	Abdominal bleeding + acute pancreatitis	1	0.9%	
	Isolated wound site infection	1	0.9%	
	Isolated abdominal abscess	1	0.9%	
Histopathological Diagnosis				
	Chronic venous congestion	47	43.9%	
	Capsule laceration	38	35.5%	
	Splenic invasion (malignant)	13	12.1%	
	Hydatid cyst	4	3.7%	
	Epidermoid cyst	3	2.8%	
	Granulomatousinfection	1	0.9%	
	Splenic abscess	1	0.9%	

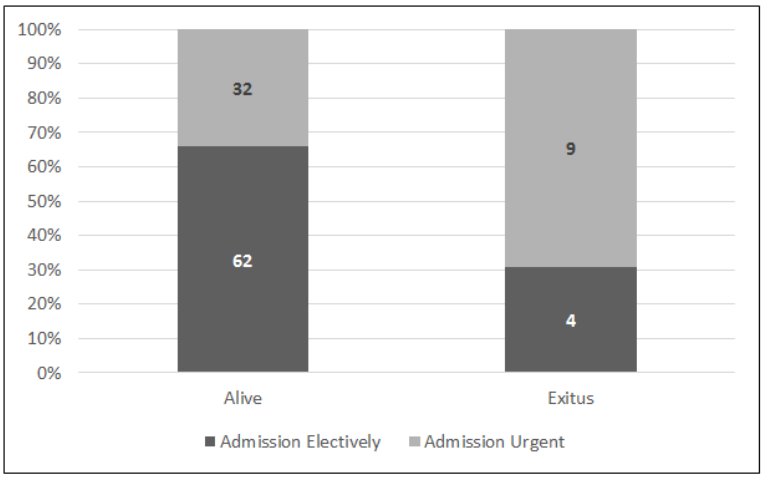

Fig-1: Type of surgical procedure in surviving and no surviving patients

DISCUSSION

Splenectomy is a common surgical procedure primarily used for the treatment of cystic, tumoral, and infectious diseases of the spleen and also used for the treatment of thrombocytopenia and traumatic splenic injuries caused by benign diseases such as erythrocyte, hemoglobin, and platelet abnormalities and by malignant diseases such as myeloproliferative disorders, Agno genic myeloid metaplasia (AMM), and leukemia [20–23].

Literature reviews indicate that traumatic splenic injury is the most common indication for splenectomy [24,25] and immune thrombocytopenic purpura (ITP) is the most common nontraumatic indication[26,27]. Similarly, in our patients, trauma was also the most common indication for splenectomy (32.7%]. In addition, since our hospital is located in the Mediterranean Region in Turkey, hereditary hematological disorders were also highly common among the indications for splenectomy, which accounted for 28% (n=30) of the cases and included ITP (n=15; 14%), sickle cell anemia (n=9; 8.4%), beta thalassemia (n=5; 4.7%), and hereditary spherocytosis (n=1; 0.9%). Moreover, splenectomy was also performed as a component of the surgical debulking of ovarian cancer (n=28; 26.2%).

Agnogenic myeloid metaplasia (AMM),which is a condition arising from bone marrow fibrosis as a result of various benign and malignant disorders, has emerged as a frequent indication for splenectomy [28,29]. However, splenectomy cannot be performed with the indication of AMM in most patients due to a lack of communication between the physicians and the surgeons performing primary treatment and follow-up care of these patients. Meaningfully, in our patients, AMM was the indication for splenectomy in only 1 patient and thus AMM seems to be an indication that is mostly overlooked in clinical practice.

Splenectomy has been shown to cause pulmonary, hemorrhagic, infection, pancreatic, and thromboembolic complications [30–32]. Of these, left lower lobe pneumonia and atelectasis are the most commonly reported complications [33–35].In our study, these two complications occurred in 9 patients, of whom 6 patients had isolated atelectasis and pneumonia. In addition, the second most common complication was abdominal bleeding.

Splenic capsule laceration is a common condition detected in gross and histopathological examinations of the spleen after external traumatic splenic injuries and iatrogenic splenic injuries [36–38]. On the other hand, chronic venous splenic congestion, which is caused by numerous disorders that lead to increased portal vein pressure or increased venous outflow resistance, is a condition that can be detected on histopathological examination and leads to congestion and/or expansion in the spleen [39–42]. In line with the literature, in our study, chronic venous congestion and capsule laceration accounted for 43.9% and 35.5% of the indications for splenectomy, respectively.

The indication of splenectomy is the most predictive risk factor for the development of post-splenectomy mortality[43–45]. However, isolated splenic injury rarely leads to mortality [46]. Moreover, although the patients undergoing splenectomy with traumatic indications often have a good prognosis, the patients undergoing emergency splenectomy due to the presence of other organ injuries have a higher mortality risk compared to patients undergoing elective splenectomy [47,48]. In our study, we did not investigate the presence of other organ injuries in the patients that died after emergency splenectomy, which could be accepted as a limitation of our study. However, we compared the patients that underwent emergency and elective splenectomy and found that the mortality rate was significantly higher in the patients that underwent emergency splenectomy (p<0.05). This

finding indicates that emergency splenectomy is a risk factor for mortality. However, we also found that age, gender, and the type of surgery (open or laparoscopic) did not constitute a risk factor for mortality ($p>0.05$).

CONCLUSION

In conclusion, trauma is the most common indication for splenectomy in general surgery practice and benign hematological disorders are also highly common among the indications for splenectomy in the region where our study was conducted, the Mediterranean Region in Turkey. In addition, although emergency splenectomy is a risk factor for mortality, age, gender, and the type of surgery (open or laparoscopic) do not constitute a risk factor for mortality.

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