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Research Article

Splenectomy: a fifteen years experience of a tertiary center in Turkey

Splenektomi: Türkiye'deki bir üçüncü basamak merkezden on beş yıllık deneyim

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Abstract

Aim: This study aimed to evaluate the clinical indications, surgical techniques, postoperative complications, and outcomes of patients who underwent splenectomy over a fifteen-year period at a tertiary center in Turkey.

Material and Methods: A retrospective review was conducted on 589 patients who underwent splenectomy between January 2008 and July 2022. Demographic data, comorbidities, operative approaches, postoperative complications, and 30-day mortality were recorded. Complications were categorized according to the Clavien-Dindo classification.

Results: The median age of patients was 48 years, with males comprising 60.1%. Trauma was the leading indication (27.0%), followed by iatrogenic causes (11.4%), immune thrombocytopenia (9.3%), and secondary malignancies (8.5%). However, the highest mortality rates were observed among patients who underwent splenectomy due to splenic infarction, spontaneous rupture, splenic artery aneurysm, or splenic necrosis. These were followed by higher-risk groups associated with secondary malignancies, iatrogenic injury, and trauma. Open splenectomy was the most performed procedure (77.8%), with higher complication (8.3%) and mortality (17.5%) rates compared to laparoscopic splenectomy (complication: 2.5%, mortality: 1.2%). Overall, 40 patients (6.8%) experienced complications, with Clavien-Dindo Grade 5 events contributing significantly to the 14.3% 30-day mortality rate.

Conclusion: This study demonstrated that splenectomy is associated with varying rates of complications and mortality depending on the indication. Trauma was the most common indication, while high-risk conditions such as malignancies and splenic artery aneurysms were associated with poorer outcomes. The lower complication and mortality rates observed with laparoscopic techniques support the potential of minimally invasive or spleen-preserving surgeries to improve patient prognosis.

Keywords: Cyst, complications, hematology, indications, mortality, splenectomy, tertiary care, trauma

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Öz

Amaç: Bu çalışma, Türkiye'deki bir üçüncü basamak merkezde 15 yıllık dönemde splenektomi uygulanan hastaların klinik endikasyonlarını, cerrahi tekniklerini, postoperatif komplikasyonlarını ve sonuçlarını değerlendirmeyi amaçladı.

Gereç ve Yöntemler: Ocak 2008 ile Temmuz 2022 tarihleri arasında splenektomi yapılan 589 hastanın retrospektif analizi yapıldı. Hastaların demografik verileri, komorbiditeleri, cerrahi yaklaşımları, postoperatif komplikasyonları ve 30 günlük mortalite oranları kaydedildi. Komplikasyonlar Clavien-Dindo sınıflamasına göre kategorize edildi.

Bulgular: Hastaların medyan yaşı 48 yıl olup, %60.1'i erkekti. En sık splenektomi endikasyonu travmaydı (%27.0), bunu iyatrojenik nedenler (%11.4), immün trombositopenik purpura (%9.3) ve sekonder maligniteler (%8.5) izledi. Ancak, splenik enfarkt, spontan rüptür, splenik arter anevrizması ve splenik nekroz gibi durumlarda mortalite oranları en yüksek bulundu. Bu yüksek risk gruplarını sekonder maligniteler, iyatrojenik yaralanmalar ve travma izledi. En sık tercih edilen cerrahi yöntem açık splenektomi (%77.8) olup, bu yöntemde komplikasyon oranları (%8.3) ve mortalite (%17.5) oranları laparoskopik splenektomiye (komplikasyon: %2.5, mortalite: %1.2) kıyasla daha yüksekti. Genel olarak, 40 hastada (%6.8) komplikasyon gelişti ve Clavien-Dindo Grade 5 komplikasyonlar, %14.3'lük 30 günlük mortalite oranına önemli ölçüde katkıda bulundu.

Sonuçlar: Bu çalışma, splenektominin farklı endikasyonlarda değişen oranlarda komplikasyon ve mortalite ile ilişkili olduğunu göstermiştir. Travma, en sık endikasyon nedeniyken, maligniteler ve splenik arter anevrizmaları gibi yüksek riskli endikasyonlar daha kötü sonuçlarla ilişkilendirilmiştir. Laparoskopik yöntemlerin daha düşük komplikasyon ve mortalite oranlarına sahip olması, minimal invaziv veya dalak koruyucu cerrahilerin hasta prognozunu iyileştirebileceğini desteklemektedir.

Anahtar Kelimeler: Kist, komplikasyonlar, hematoloji, endikasyonlar, mortalite, splenektomi, üçüncü basamak bakım, travma

Introduction

The spleen plays a pivotal role in both hematologic homeostasis and immunologic defense. It serves as the primary site of filtering and phagocytosing aged or abnormal blood cells, as well as mounting effective immune responses against encapsulated organisms such as Streptococcus pneumoniae, Haemophilus influenzae, and Neisseria meningitides [1, 2]. Additionally, its function in sequestering and recycling iron and other essential components makes it crucial for maintaining normal red blood cell turnover [3]. Given this central role, any compromise to splenic function—whether from trauma, hematological disorders, or other pathologies—may predispose patients to severe and potentially life-threatening infections and complications [4].

Despite its recognized importance in host defense and hematologic regulation, the spleen occasionally must be surgically removed. Splenectomy is often indicated for various benign and malignant hematologic conditions—including hereditary spherocytosis, autoimmune hemolytic anemia, idiopathic thrombocytopenic purpura (ITP), and certain lymphoproliferative or myeloproliferative disorders—as well as for traumatic injuries leading to splenic rupture or laceration [5, 6]. Advances in surgical techniques have transformed splenectomy from a high-risk, open procedure into one that can frequently be accomplished through minimally invasive approaches such as laparoscopy or robotics. These innovations offer advantages like reduced postoperative pain, shorter hospital stays, and improved cosmetic outcomes [7, 8]. However, the choice between open and minimally invasive splenectomy remains multifactorial, influenced by the surgeon's expertise, the patient's comorbidities, and the underlying pathology [9]. On the other hand, the procedure carries the risk of rare yet serious complications, including bleeding, infection, or anastomotic leakage caused by accidental injury to neighboring gastrointestinal structures during surgery [10, 11].

This study aims to provide a comprehensive analysis of a fifteen-year splenectomy experience at a tertiary healthcare center in Turkey, with a focus on indications, surgical techniques, and postoperative outcomes.

Material and Methods

This retrospective study was conducted on patients who underwent splenectomy at the General Surgery Department of XXXX Training and Research Hospital between January 2008 and July 2022. The study was approved by the XXX Hospital's Ethics Committee (Date: 11.07.2024, Decision No: 10/16) and was carried out in accordance with the relevant ethical guidelines and the Helsinki Declaration (2013 Brazil revision). The need for informed consent was waived under the approval of the Local Ethics Committee due to the retrospective design.

A total of 589 patients who underwent splenectomy for various indications during the study period were included in this study. Patients younger than 18 years and those with

missing data were excluded from the study. The patients' clinicopathological data (age, gender, comorbidities, indication for splenectomy), operation type, postoperative complications, and survival outcomes were retrospectively gathered from the hospital's electronic records or patient files. The Clavien-Dindo classification was used to categorize postoperative complications [12].

Statistical analysis

All analyses were conducted using IBM SPSS Statistics for Windows 20.0 (IBM Corp., Armonk, NY, USA) software. The normal distribution of numerical variables was assessed using the Kolmogorov-Smirnov test. Data exhibiting a normal distribution were presented as mean±standard deviation. Non-normally distributed data were displayed as median (interquartile range (IQR): 25-75 percentiles). Categorical variables were summarized as numbers and percentages.

Results

The median age of the 589 splenectomy patients was 48.0 years, with males comprising the majority (60.1%). Comorbid conditions were identified in 216 patients (36.7%), with cancer being the most common (18.7%), followed by cardiovascular diseases (8.7%) and diabetes mellitus (5.3%). Patient demographic characteristics are detailed in Table 1. The most common indication for splenectomy was trauma (27.0%), and all of these cases were classified as grade IV. This was followed by iatrogenic causes (11.4%), ITP (9.3%), and secondary malignancies (8.5%). Other notable indications included distal pancreatic masses (7.8%), thalassemia (6.6%), splenic cysts (6.5%), and hematological malignancies (6.3%) (Table 2).

Table 1. Demographic and comorbid conditions of patients.

Variables	All population n = 589
Age, years	48.0 (29.0-64.0)
Gender, n (%)	
Female	235 (39.9)
Male	354 (60.1)
Comorbidity, n (%)	216 (36.7)
Cancer	110 (18.7)
Cardiovascular disease	51 (8.7)
Hematology disease	42 (7.1)
Diabetes mellitus	31 (5.3)
Renal disease	11 (1.9)
Lung disease	10 (1.7)
Thyroid disease	8 (1.4)
Neurological disease	7 (1.2)
Rheumatological disease	3 (0.5)

The data are expressed as the mean ± SD or median (IQR) or number (%).

Postoperative complications were observed in 8 (5.0%) of 159 patients who underwent splenectomy due to trauma, with a 30-day mortality rate of 18.2% (29 patients). In the iatrogenic group, complications occurred in 6 patients (9.0%), and 30-day mortality reached 22.4% (15 patients). Splenic artery aneurysms had a complication rate of 25.0% and a 50.0% 30-day mortality rate. No complications were reported in the splenic necrosis or spontaneous rupture groups, but mortality rates were high (100.0% and 55.6%, respectively) (Table 2).

Open splenectomy was the most commonly performed procedure (77.8%), accounting for 38 postoperative complications (8.3%) and 80 deaths (17.5%) within 30 days. Laparoscopic splenectomy was performed electively in 81 cases (13.8%), with a lower complication rate (2.5%) and a 30-day mortality of 1.2%. Conversion from laparoscopy to an open approach occurred in 39 patients (6.6%), and among these, 2 (6.1%) died within 30 days. Organ-preserving approaches were rarely performed: splenorrhaphy (1.0%), partial splenectomy (0.3%), and partial cystectomy (0.5%) (Table 3).

Perioperative blood transfusions were administered in 351 patients (59.6%). Overall, 40 patients (6.8%) experienced postoperative complications, and 287 patients (48.7%) required an intensive care unit (ICU) stay at some point. The median length of ICU stay was 7.0 days (IQR 4.0–10.0). The 30-day mortality rate was 14.3%.

Of the 40 recorded complications, most fell under Clavien-Dindo Grade 3a or 3b. Grade 3a complications, managed with percutaneous drainage under local or radiological guidance, consisted of 2 cases of intra-abdominal ascites, 1 intra-abdominal hematoma, 3 pancreatic fistulas, 6 pleural effusions, and 3 subphrenic abscesses. Grade 3b complications, requiring relaparotomy under general anesthesia, included 1 diaphragmatic injury, 2 cases of eventration, 2 gastric injuries, 2 instances of intra-abdominal hemorrhage, and 2 subphrenic abscesses. Additionally, 15 patients were classified under Clavien-Dindo Grade 5 due to fatal complications—massive bleeding (n = 6), massive pulmonary embolism (n = 3), and sepsis following anastomotic leak (n = 6) — which contributed substantially to the overall 30-day mortality rate (Table 4).

Table 2. Indications for splenectomy and their postoperative complication and mortality rates.

Indications	All population n = 589	Complication	30 day mortality
Trauma	159 (27.0)	8 (5.0)	29 (18.2)
Fall	30 (5.1)	1 (3.3)	5 (16.7)
Traffic accident	25 (4.2)	4 (16.0)	5 (20.0)
Injury with a gun or cutting tool	104 (17.7)	3 (2.9)	19 (18.3)
Iatrogenic	67 (11.4)	6 (9.0)	15 (22.4)
Malignant conditions	37 (6.3)	4 (10.8)	10 (27.0)
Benign conditions	30 (5.1)	2 (6.7)	5 (16.7)
ITP	55 (9.3)	1 (1.8)	-
Secondary malignancies	50 (8.5)	6 (12.0)	14 (28.0)
Distal pancreatic mass	46 (7.8)	5 (10.9)	6 (13.0)
Thalassemia	39 (6.6)	6 (15.4)	-
Splenic cyst	38 (6.5)	1 (2.6)	2 (5.3)
Hematological malignancies	37 (6.3)	2 (5.4)	-
Hydatid cyst	18 (3.1)	-	-
Splenomegaly	18 (3.1)	-	2 (11.1)
Splenic abscess	16 (2.7)	1 (6.3)	1 (6.3)
Gastric cancer (D2 dissection)	12 (2.0)	-	-
Splenic infarct	10 (1.7)	3 (30.0)	5 (50.0)
Spontaneous rupture	9 (1.5)	-	5 (55.6)
Splenic artery aneurysm	4 (0.7)	1 (25.0)	2 (50.0)
Splenic necrosis	3 (0.5)	-	3 (100.0)
Autoimmune hemolytic anemia	3 (0.5)	-	-
Hereditary spherocytosis	2 (0.3)	-	-
Hemangioma	1 (0.2)	-	-
Portal hypertension	1 (0.2)	-	-
Splenic vein thrombosis	1 (0.2)	-	-

The data are expressed as number (%). The complication and 30-day mortality rates were determined according to the sample size for each indication. ITP, immune thrombocytopenic purpura

Table 3. Types of surgery and their associated postoperative complication and mortality rates.

Types of surgery	All population n = 589	Complications	30 day mortality
Open	458 (77.8)	38 (8.3)	80 (17.5)
Splenorraphy	6 (1.0)	-	1 (16.7)
Partial splenectomy	2 (0.3)	-	-
Partial cystectomy	3 (0.5)	-	-
Laparoscopy	81 (13.8)	2 (2.5)	1 (1.2)
Conversion to open surgery	39 (6.6)	-	2 (5.1)

The data are expressed as number (%). The complication and 30-day mortality rates were determined according to the sample size for surgery types.

Table 4. Postoperative complications based on Clavien-Dindo (C-D) classification.

C-D	Complication	Number of patients	Treatment
3a	Intra-abdominal ascites	2	Percutaneous drainage
	Intraabdominal hematoma	1	Percutaneous drainage
	Pancreatic fistula	3	Percutaneous drainage
	Pleural effusion	6	Percutaneous drainage
	Subphrenic abscess	3	Percutaneous drainage
3b	Diaphragmatic injury	1	Relaparotomy
	Eventration	2	Relaparotomy
	Gastric injury	2	Relaparotomy
	Intraabdominal hemorrhage	3	Relaparotomy
	Subphrenic abscess	2	Relaparotomy
5	Bleeding	6	Death
	Massive pulmonary embolism	3	Death
	Sepsis following anastamotic leak	6	Death

The data are expressed as number (%).

Discussion

Traumatic splenic injury was the leading indication for splenectomy, consistent with findings in the current literature. Although there is a growing preference for non-surgical management in such cases, studies have indicated that mortality rates remain comparable between patients undergoing splenectomy and those treated non-surgically [13-15]. In our cohort, 27.0% of patients underwent splenectomy for trauma, with a 30-day mortality rate of 18.2%. When stratified by mechanism of injury, mortality rates varied: 16.7% in fall-related trauma, 20.0% in motor vehicle accidents, and 18.3% in injuries caused by firearms or sharp objects. These findings reflect the severity of injuries requiring splenectomy and align with earlier studies reporting mortality rates ranging from 2% to 25% among individuals with severe splenic trauma requiring surgery [15-17]. The relatively high mortality in our cohort may be attributed to the severity of accompanying injuries and the physiological compromise typically observed in patients with Grade IV trauma. This highlights the critical importance of rapid resuscitative measures, judicious patient selection for operative versus non-operative management, and the need to address associated injuries when optimizing patient outcomes.

Iatrogenic splenic injury was the second most frequent indication for splenectomy in our study. Among abdominal operations, procedures in the upper left quadrant exhibit the highest incidence of iatrogenic lesions, ranging from 0.9% to 49%. In contrast, splenic injuries are least frequently observed in appendectomies and cholecystectomies [18]. Among these patients, 9% experienced complications, and 22.4% succumbed to mortality. Iatrogenic splenic injury is a known complication of abdominal surgery, associated with higher morbidity and mortality, longer operative times, and extended hospital stays [19, 20]. Common risk factors include prior abdominal surgeries (leading to adhesions), advanced patient age, obesity, and extensive dissection in the left upper quadrant, such as during mobilization of the splenic flexure or procedures involving the stomach or pancreas [21]. Early intraoperative recognition is crucial for minimizing blood loss and preserving the spleen whenever feasible. In some cases, splenorrhaphy or partial splenectomy may suffice to control hemorrhage and maintain immunological function. However, a delayed or missed diagnosis can lead to life-threatening bleeding, necessitating emergent splenectomy and potentially increasing both perioperative morbidity and mortality [20]. Consistent with other reports, our data underscore the considerable mortality risk in patients with iatrogenic splenic injuries, reflecting the severity of concurrent pathologies and the technical complexity often encountered in reoperative fields [22]. Although advanced laparoscopic and robotic platforms offer improved visualization and precision, the risk of splenic injury remains, particularly in patients with difficult anatomy or dense adhesions [23]. Meticulous surgical planning, careful mobilization of the splenic flexure, and, when appropriate, prophylactic measures such as preoperative splenic artery embolization or close proximity dissection under direct vision may further reduce inadvertent splenic damage in high-risk cases.

Hematologic pathologies comprise another major driver of

splenectomy [24]. Although therapeutic options for conditions such as ITP and hereditary spherocytosis have expanded considerably with the advent of newer medical treatments, splenectomy maintains a significant role, especially in cases that prove resistant or intolerant to medical therapy [25, 26]. Studies report ITP splenectomy success rates exceeding 60% to 80% in terms of achieving remission or partial response, underscoring the procedure's value in properly selected patients [27]. While hematologic malignancies can prompt splenectomy when the spleen is significantly enlarged or symptomatic, the ultimate impact on short- and long-term survival can be modest, highlighting the necessity of an individualized approach [28].

Non-traumatic splenic disease includes cysts, abscesses, and parasitic infestations, albeit on a less frequent basis [29, 30]. Patients who had splenectomy for hydatid cysts showed no mortality, consistent with existing studies [31]. On the other hand, splenic abscesses often arise from hematogenous spread or adjacent infection, and preexisting comorbidities like diabetes or immunosuppression heighten susceptibility [32]. Although splenectomy for abscess is generally effective, mortality can be considerable if diagnosis is delayed. In our study, 2.7% of patients had splenic abscesses, and 6.3% of these patients died. The mortality rate for splenic abscesses has been reported to range from 12.4% to 27.6% in the current literature [31]. These outcomes might be linked to the infection's local effects and the seriousness of the underlying disease.

A noteworthy subset of patients underwent splenectomy as part of combined procedures for malignancies, including gastric cancers with D2 dissections or distal pancreatic masses. Earlier work suggests that routine splenectomy for gastric cancer is no longer standard practice unless direct infiltration or significant lymphadenopathy necessitates it, due to the added morbidity and potential for infectious complications [33, 34]. Likewise, in distal pancreatectomies, surgeons may opt for spleen preservation when feasible to retain immunologic function, though it is not always technically or oncologically appropriate [35]. Our findings, which show relatively high complication rates following splenectomy, particularly pancreatic fistulas, in this group, align with meta-analyses reporting post-splenectomy pancreatic fistula rates of up to 12–30% [36, 37].

Laparoscopic splenectomy has gained favor due to reduced postoperative pain, shorter hospital stays, and fewer wound complications [38]. Although we observed a significantly lower complication rate among patients undergoing laparoscopic splenectomy, these advantages must be balanced against the need for conversion when encountering unexpected adhesions, uncontrolled hemorrhage, or massive splenic enlargement. Consistent with prior series, our conversion rate was around 4–20% [38-40]. Postoperative complications in our study were predominantly classified as Clavien-Dindo Grade 3a or 3b, requiring either radiologically guided interventions (e.g., percutaneous drainage) or surgical re-exploration (relaparotomy). While some prior literature has reported a modest risk of serious complications (e.g., hemorrhage, infection) 17, our data underscore that the procedure can still carry substantial morbidity. As in other series, fatalities (Clavien-Dindo Grade 5) predominantly arose from massive hemorrhage, pulmonary embolism, or sepsis [41].

Several limitations warrant consideration. As a retrospective analysis, our study depended on the accuracy and completeness of existing medical records. Certain nuances regarding patient selection for laparoscopic versus open approaches or extended details of comorbid conditions (e.g., severity of underlying diseases) were not captured. Additionally, the study spanned a 15-year period during which surgical techniques and perioperative care evolved substantially. Future prospective, multicenter trials with standardized protocols could offer more robust data regarding optimal patient selection and management strategies for splenectomy.

Conclusion

This study highlights the outcomes of 589 splenectomy cases over 15 years at a tertiary center, emphasizing the diverse indications and challenges of this procedure. Open splenectomy was the most common approach, but laparoscopic splenectomy showed lower complication and mortality rates, supporting its broader use when feasible. Trauma was the leading indication, yet high-risk groups like those with splenic artery aneurysms or malignancies had significantly higher complication and mortality rates. Postoperative complications, particularly Clavien-Dindo Grade 5 events, were major contributors to 30-day mortality. These findings underscore the need for careful patient selection, advanced surgical techniques, and robust perioperative management to optimize outcomes.

Conflict of Interest/ Funding

The study received no financial support from any individual or organization, and the authors declare no conflict of interest.

Conflicts of Interest: The authors declare they have no conflicts of interest.

Ethics Approval

The study was performed in accordance with the Declaration of Helsinki, and was approved by the Antalya Training and Research Hospital Clinical Research Ethics Committee (Date: 11.07.2024, Decision No: 10/16).

Informed Consent

The need for informed consent was waived under the approval of the Local Ethics Committee due to the retrospective design.

Availability of Data and Material

The data that support the findings of this study are available on request from the corresponding author.

Authors' contribution

Concept, Design, Data collection and/or processing, Analysis and/or interpretation, and Writing – M.Y.

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