

## Original Research Article

# Splenectomy, indications and outcomes: a 12-year experience in a community hospital

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## ABSTRACT

**Background:** Splenectomy volume has declined as improved imaging, nonoperative management of blunt trauma, and novel medical therapies such as rituximab and thrombopoietin receptor agonists have narrowed its indications, making elective splenectomy uncommon and raising concern about maintaining operative proficiency.

**Methods:** We conducted a single-center retrospective chart review at Flushing Hospital Medical Center in Queens, NY of patients who underwent splenectomy between October 2012 and March 2025. Eligible patients were identified by institutional record review using diagnostic codes and confirmed by chart review. Inclusion criteria were patients 18 years and older who underwent splenectomy for any indication. Patients under the age of 18 or who required transfer to another institution were excluded. Data collection included patient demographics, medications, splenectomy indication, emergent versus elective, surgical approach (laparoscopic, robotic, or open), length of stay (LOS), morbidity, and in-hospital mortality. Descriptive statistics were calculated; chi-square tests with Bonferroni correction and Fisher's exact test assessed categorical relationships, and Pearson's correlations assessed continuous variables. IRB approval was obtained.

**Results:** Twenty-two patients were included (mean age 59.2±18.7 years; 54.5% male; 63.6% Hispanic), with hypertension (45.5%) and diabetes (22.7%) the most prevalent comorbidities; 50% were on steroids and approximately one-third on immunosuppressive therapy or chemotherapy. Most cases were elective (90.9%) and open (68.2%), with robotic (18.2%) and laparoscopic (9.1%) approaches less common. Immune thrombocytopenic purpura and neoplasm were the leading indications (40.9% each), while 9.1% (n=2) were urgent or emergent for massive splenomegaly. Postoperative bleeding occurred in 22.7% (n=5/22), mean LOS was 8.4±7.3 days, readmission rate was 27.3%, and there was no mortality. Surgical indication was significantly associated with complication type ( $p<0.03$ ), and average volume was 2 cases per year.

**Conclusions:** Splenectomy has become a rare elective operation but remains highly effective and often life-saving; community and teaching surgical services should deliberately maintain minimally invasive splenectomy skills, recognizing that outcomes vary by indication.

**Keywords:** Splenectomy, Splenomegaly, Immune thrombocytopenic purpura, Minimally invasive surgery, Clinical competence, Community hospitals

## INTRODUCTION

The spleen is a lymphatic organ that has three main functions: blood cell storage, blood filtration, and immunological production.<sup>1-4</sup> The anatomical and functional structures of the spleen include: the red pulp, which supplies the innate immune system's macrophages, opsonins, and properdin that filter out and recycle iron, red blood cells, platelets, and microorganisms, as well as extramedullary hematopoiesis, erythropoiesis, and platelet and iron storage; and the white pulp, consisting of the adaptive immune system's B and T lymphocytes responsible for opsonizing and removing encapsulated bacteria.<sup>1,5,6</sup> The most frequent indication for splenectomy is a traumatic injury, although in blunt trauma there is a shift toward nonoperative management as the standard of care for hemodynamically stable patients. Historically, splenectomy has been a diagnostic and therapeutic tool for various non-traumatic spleen diseases, such as immune thrombocytopenic purpura (ITP), autoimmune hemolytic anemia, hereditary spherocytosis, Felty's syndrome, and spontaneous splenic rupture (SSR).<sup>2-7</sup> In addition, splenectomy may be required when there is a high suspicion of malignancy for staging or for palliative purposes.<sup>8</sup> Surgical indications for open splenectomy have declined, and laparoscopic splenectomy has become commonplace. The current rate of elective splenectomy in an average surgical service is low, with 6–10 cases yearly, given improved imaging, conservative management of spontaneous splenic rupture, and advances in medical therapy, such as the advent of monoclonal antibody therapy.<sup>8</sup> The purpose of our study is to present our experience with splenectomy performed in a community hospital, focusing on indications, surgical approaches, and outcomes.

## METHODS

This was a single-center retrospective chart review at Flushing Hospital Medical Center in Queens, NY of

patients who underwent splenectomy between October 2012 and March 2025. Eligible patients were identified by institutional record (Epic) review using diagnostic codes and confirmed by manual chart review. Inclusion criteria were patients 18 years and older who underwent splenectomy for any indication during the timeframe. Patients under the age of 18 or who required transfer to another institution were excluded. Data collected included patient demographics (age, sex, ethnicity, BMI), medications, indications for splenectomy, emergent versus elective context, surgical approach (laparoscopic, robotic, or open), length of stay (LOS), morbidity, and in-hospital mortality. Descriptive statistics were calculated using means, medians, and frequencies, and sample variability was assessed using standard deviation and standard error of the mean. Chi-square goodness-of-fit and chi-square tests of independence, with Bonferroni correction, and Fisher's exact test were used to assess bivariate relationships among categorical sample characteristics; Pearson's correlations were used to assess bivariate relationships among continuous sample characteristics. This study was approved by the institutional review board.

## RESULTS

Twenty-two patients with a mean age of 59.2 years (SD = 18.7) were included; 54.5% were male, the majority identifying as Hispanic (63.6%), with the remainder identifying as White (22.7%), Black (9.1%), or other (4.5%). The most prevalent comorbidities were hypertension (45.5%) and diabetes (22.7%); 50% were on steroids, and approximately one-third were on immunosuppressive therapy or chemotherapy. Most surgeries were elective (90.9%) and performed via an open approach (68.2%), with robotic (18.2%) and laparoscopic (9.1%) techniques less common. Indications for surgery were ITP (40.9%) and neoplasm (40.9%). Urgent or emergent splenectomies for massive splenomegaly accounted for 9.1% (n=2) of cases, as illustrated in Figure 1.

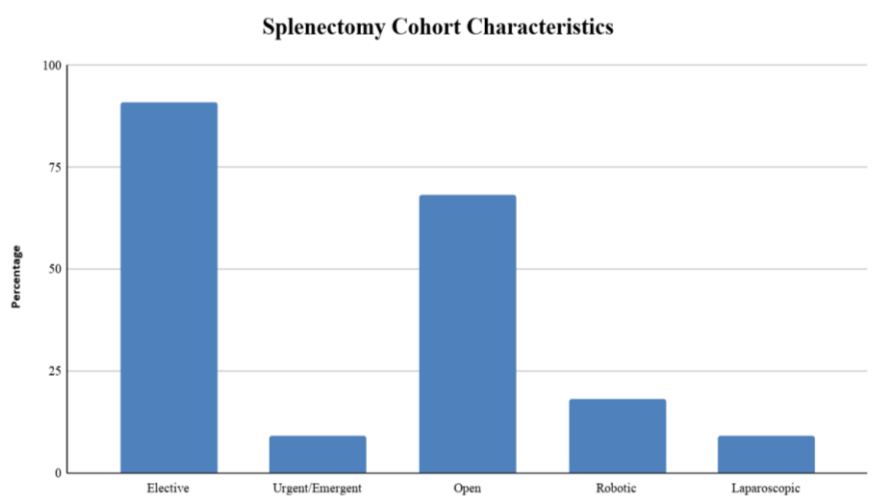


**Figure 1: Splenectomy percentages for elective versus urgent cases with percentages of surgical approach.**

Bleeding occurred postoperatively in 22.7% (n=5/22) of all patients. ITP patients experienced bleeding more frequently than other groups (44.4%, n=4/9); whereas 33% (n=3/9) of patients with neoplasm experienced postoperative pain, as illustrated in Figure 2. Other complications included postoperative ileus (n=1) and sickle cell crisis (n=1). Mean LOS was  $8.4 \pm 7.3$  days;

there was no mortality; and the readmission rate was 27.3% (n=5). Fisher's exact test demonstrated a statistically significant association between surgical indication and type of complication ( $p < 0.03$ ). The average number of splenectomy cases per year was 2, with a transition toward robotic/laparoscopic techniques in more recent years.

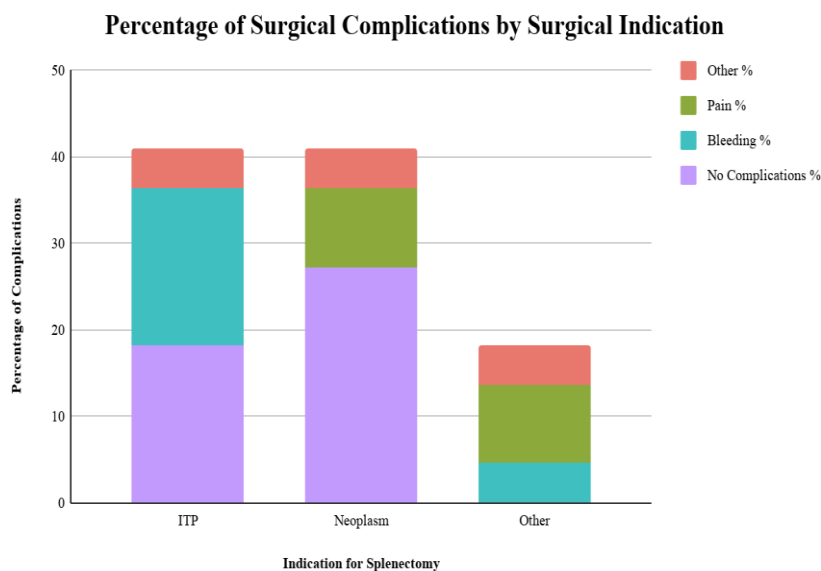


**Figure 2: Visualization of post-operative outcomes with bleeding and pain occurring most frequently.**

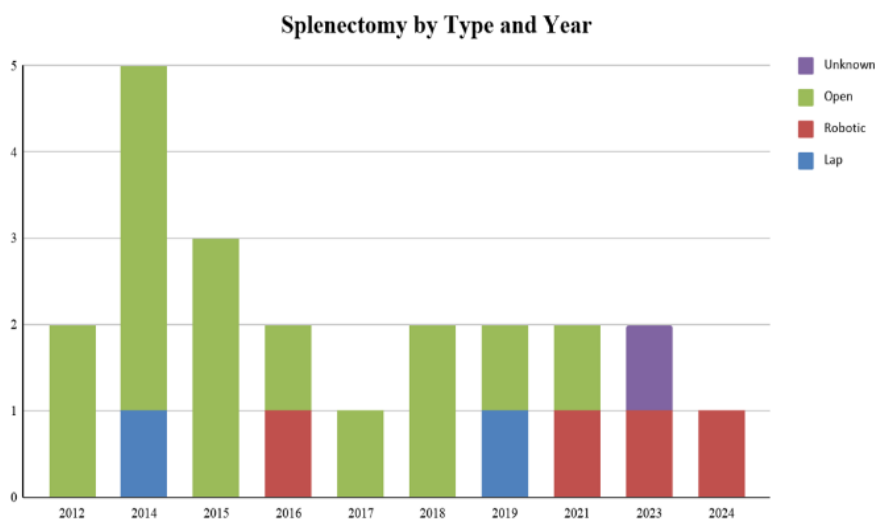


**Figure 3: Splenectomy approaches by year.**

**Table 1: Patient demographics and baseline characteristics (n=22).**

| Characteristics        | N         | %    |
|------------------------|-----------|------|
| Age, years — mean ± SD | 59.2±18.7 | —    |
| Sex                    |           |      |
| Male                   | 12        | 54.5 |
| Female                 | 10        | 45.5 |

Continued.

| Characteristics                    | N  | %    |
|------------------------------------|----|------|
| <b>Race / ethnicity</b>            |    |      |
| <b>Hispanic</b>                    | 14 | 63.6 |
| <b>White</b>                       | 5  | 22.7 |
| <b>Black</b>                       | 2  | 9.1  |
| <b>Other</b>                       | 1  | 4.5  |
| <b>Comorbidities</b>               |    |      |
| <b>Hypertension</b>                | 10 | 45.5 |
| <b>Diabetes mellitus</b>           | 5  | 22.7 |
| <b>No documented comorbidities</b> | 2  | 9.1  |

## DISCUSSION

Trauma is the most frequent indication for splenectomy, although blunt trauma is shifting toward nonoperative management as the standard of care for hemodynamically stable patients. Splenectomy is still a diagnostic and therapeutic tool for various non-traumatic spleen diseases, such as ITP, autoimmune hemolytic anemia, hereditary spherocytosis, and Felty's syndrome, and SSR.<sup>2-7</sup> A diagnostic splenectomy may be required when there is a high suspicion of malignancy for staging, and splenectomy may also be indicated for palliative purposes.<sup>8</sup> Maillot et al reviewed 142 patients who underwent splenectomy over a 10-year period and identified 20 diagnostic splenectomies performed for unexplained splenomegaly and fever of unknown origin. Other indications included cytopenia, abdominal symptoms, or suspicion of relapsing malignant hemopathies, with diffuse large B-cell lymphoma being most common.<sup>3</sup> Atraumatic splenic rupture is rare but potentially fatal, requiring emergency splenectomy. Intrasplenic tension due to cellular hyperplasia, ligamentous laxity predisposing to torsion, and increased intra-abdominal pressure have been implicated. It has been reported that 55% of patients with atraumatic rupture have underlying splenomegaly in various contexts of neoplasia, infection, or inflammation; hence, repeated or prolonged episodes of emesis and cough may result in accumulated trauma to the splenic capsule. Such patients deteriorate quickly and must have prompt access to emergency surgery.<sup>9</sup>

Fernández-Ananin et al observed a progressive yearly reduction of over 70% from 2010 to 2023 in referrals for splenectomy, particularly for hematological autoimmune diseases ( $p < 0.001$ ). They reported that ITP remains the most frequent indication, while the number of splenectomies for lymphoma persisted, mostly for diagnostic-only purposes.<sup>8</sup> In our sample, the number of splenectomies performed for ITP and lymphoma was similar. The introduction of novel medical therapies, newer diagnostic imaging methods, biological markers, and better diagnostic protocols has led to modifications in the guidelines and treatment recommendations of many hematological diseases for which splenectomy would previously have been an option.<sup>8</sup> Immunosuppressive drugs such as rituximab and thrombopoietin receptor

agonists (TPO-RAs) have shown response rates similar to splenectomy in up to 80% of cases, with long-term remission reported in 30–50% of responders with good safety; these therapies have decreased the indications for splenectomy given the irreversible risk of lifelong infectious complications and portal vein thrombosis.<sup>8</sup> Similar studies have shown that, per recent guidelines, splenectomy indications for ITP-related cases have changed from a preferred second-line option to an alternative used only when second- or third-line options fail; as a result, case rates have plummeted to less than 5% over the last 10 years.<sup>8</sup> Advances in flow cytometry and molecular biology have also decreased the necessity of splenectomy as a diagnostic approach for lymphoma. In myelofibrosis, splenectomy was performed in the context of secondary hypersplenism and symptomatic splenomegaly, but the introduction of ruxolitinib, associated with a reduction in splenomegaly in 42% of patients, has dramatically decreased the need for surgery.<sup>8</sup>

Splenectomy is traditionally performed using an exploratory laparotomy, but indications for open surgery in splenic disease have declined, given improved imaging, conservative management of spontaneous splenic rupture, and advances in medical therapy, such as the advent of monoclonal antibody therapy. The development of minimally invasive surgery (MIS) has led to laparoscopy becoming the preferred approach. Since first performed in 1992, laparoscopic splenectomy has become fairly commonplace due to decreased postoperative pain, decreased risk of infection, faster recovery, and shorter LOS.<sup>4,8,9</sup> The laparoscopic approach may be of particular interest in the frailest patients or in cases of massive splenomegaly.<sup>8</sup> The WSES guidelines do not recommend performing laparoscopic splenectomy in the early trauma scenario for bleeding patients, but 212 cases of laparoscopic splenectomy after trauma were identified in the literature between 1990 and 2018. Robotic splenectomies are known to be a safe alternative to laparoscopic splenectomy and have been associated with decreased blood loss, with a trend toward decreased conversion, increased dexterity, and decreased pain.<sup>10</sup>

However, both open and laparoscopic approaches can be associated with major complications, including intraoperative and postoperative hemorrhage, subphrenic abscess, overwhelming post-splenectomy infections,

malignancy, and thromboembolism.<sup>1,2,4,6</sup> Complications such as sepsis, portal vein thrombosis, and pulmonary hypertension are seen more often in conventional open splenectomy cases.<sup>8</sup> In the early postoperative period, infection risk is highest, with 10% of infections occurring in the first 90 days, and an approximate lifetime infection risk of 1–3%.<sup>4</sup> Overwhelming post-splenectomy infections due to encapsulated bacteria, first described in 1952, carry a lifetime risk of 5%, with a mortality rate of 30–70%.<sup>11</sup> In the first 2–5 years post-splenectomy, patients have an increased incidence of cancer and cancer-related mortality from solid neoplasms (lung, prostate, upper gastrointestinal, and hepatic malignancies) and hematologic malignancies (non-Hodgkin lymphoma, leukemia, and multiple myeloma).<sup>4</sup>

Surgical characteristics such as operative time, intraoperative blood loss, and LOS are higher in open and trauma patients compared with elective laparoscopic splenectomy.<sup>4</sup> The majority of our cases were open, and bleeding was more frequent with ITP. While planning for these cases, it may be important to acknowledge that postoperative outcomes may vary based on the indication for splenectomy. Advances in surgical techniques and improvements in anesthesia, hematology, and oncology have contributed to a decrease in the mortality and morbidity associated with splenectomy.<sup>5</sup>

As splenectomy volume declines, fewer operative opportunities remain for surgeons to build and maintain proficiency. In ACGME case logs from 1999 to 2018, open splenectomies per resident fell significantly (3.0 to 1.4,  $p < 0.05$ ) even as total case volume rose, raising concern that diminished open experience may compromise the skills needed to perform the procedure safely.<sup>12</sup> This aligns with the broader literature on surgical skill decay, in which de Andres Crepsó et al noted that operative speed and accuracy fade with time away from practice.<sup>13</sup>

## CONCLUSION

Splenectomy is performed more often for trauma than for elective reasons. Sustaining competence in an increasingly rare operation remains a real challenge. As hematologists increasingly use efficacious non-invasive therapies with excellent safety profiles, multidisciplinary discussions with surgeons around the table on splenectomy indications are now few and far between. Interestingly, though, there is an increase in laparoscopic splenectomy and even robotic approaches in trauma. However, even in community settings, where patient preferences and insurance requirements may limit hospital choice, surgical services in non-trauma community and teaching hospitals should still remain steadfast in teaching and maintaining minimally invasive team skills to perform splenectomy. Although rarely needed, splenectomy is an extremely effective therapy, often life-saving for a rapidly deteriorating patient with

atraumatic splenic rupture or when first-, second-, or third-line elective options fail.

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