

The Decline of Open, Laparoscopic, and Robotic Splenectomies: A Single Center Experience

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Rezumat

Declinul splenectomiilor prin abord deschis, laparoscopic și robotic: experiența unui singur centru

Introducere: Splenectomia este o operație cu multiple indicații, de la boli hematologice, la chisturi și tumori benigne, traumatisme splenice etc. În ultimii 20 ani însă, s-a constatat o scădere marcată a numărului de splenectomii efectuate, iar acest studiu își propune să analizeze motivele acestui declin în funcție de indicație, tipul de splenectomie și tipul de abord (deschis, laparoscopic sau robotic).

Material și Metode: Acest studiu retrospectiv al splenectomiilor efectuate într-un singur centru (Departamentul de Chirurgie Generală a Institutului Clinic Fundeni) în perioada cuprinsă între 2002 și 2023 a inclus doar intervențiile chirurgicale pentru patologie splenică, fiind excluse cele în care splenectomia a fost realizată tactic sau de necesitate.

Rezultate: Între 2002 și 2023, s-au realizat 876 de splenectomii din care majoritatea (n=245) au avut ca indicație purpura trombocitopenică imună. Celelalte indicații au fost: tumori și chisturi benigne (n=136), limfom (n=119), hipersplenismul în cadrul cirozei hepatice (n=107), microsferocitoza (n=95), sindromul mielodisplazic (n=39), traumatisme splenice (n=35) și talasemia (n=22), leucemie (n=18). Alte 60 de splenectomii au fost efectuate pentru hipersplenism de cauză necunoscută. S-au realizat 795 splenectomii totale și 81 splenectomii parțiale. Studiul arată declinul numărului de splenectomii pentru toate indicațiile menționate, dar în special în cazul celor realizate pentru purpură trombocitopenică imună, microsferocitoză și

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hipersplenismul în ciroza hepatică. Din 2020 pentru aceste indicații nu s-au mai efectuat splenectomii.

Concluzie: Odată cu descoperirea unor noi linii de tratament, cu progresele din domeniul radiologiei intervenționale și odată cu apariția splenectomiilor parțiale, s-a redus substanțial necesitatea efectuării splenectomiilor, ceea ce se reflectă în declinul numeric al acestora în ultimii 20 de ani.

Cuvinte cheie: splenectomie totală, purpură trombocitopenică imună, ciroză, splenectomie parțială, chist splenic

ABSTRACT

Background: Splenectomy has been performed for various indications from haematological diseases to benign cysts and tumours, and for splenic traumatic injuries. However, there has been a steady decline in splenectomies in the last 20 years. The aim of this study is to establish the reasons behind this decline in splenectomy and to analyse them based on indication, type of splenectomy, and manner of approach (open, laparoscopic or robotic).

Material and Methods: This is a retrospective study of a single centre experience of all the splenectomies, both total and partial, performed in the Department of General Surgery of Fundeni Clinical Institute (Bucharest) between 2002 and 2023. Only surgeries for primary splenic diseases were selected, splenic resections as part of other major operations were not included.

Results: Between 2002 and 2023, 876 splenectomies were performed in the Department of General Surgery of Fundeni Clinical Institute (Bucharest). Most splenectomies (n=245) were performed for immune thrombocytopenic purpura (ITP), followed by benign tumours and cysts (n=136), lymphoma (n=119), hypersplenism due to cirrhosis (n=107) and microspherocytosis (n=95). Other indications included myelodysplastic syndrome (n=39), trauma (n=35), thalassaemia (n=22), leukaemia (n=18) and also there were 60 splenectomies that were performed for hypersplenism of unknown cause. There were 795 total splenectomies (TS) and 81 partial splenectomies (PS). There was a decline in the number of splenectomies both TS and PS for all these indications, most notably in the case of ITP, microspherocytosis and hypersplenism due to cirrhosis with no splenectomies performed for these indications since 2020.

Conclusion: With the development of new lines of treatment, advances in interventional radiology and in surgery with the spleen parenchyma sparing options, the need for total splenectomy has been greatly reduced which is reflected in the decline in the number of splenectomies performed in the last 20 years in our clinic.

Key words: total splenectomy, immune thrombocytopenic purpura, cirrhosis, partial splenectomy, splenic cyst

Introduction

Splenectomy has been performed for various conditions for many decades, initially with the belief that the spleen is not an important organ and that it can be removed without consequence (1). With the emergence of new diseases, especially haematological ones, the

indications for splenectomy became more varied and the standard approach used to be the removal of the spleen entirely. As studies proved the importance of the spleen from an immunological point of view, especially in preventing overwhelming sepsis due to encapsulated bacteria overwhelming post splenectomy infection (OPSI)(2), a trend

towards spleen sparing methods developed (3). Surgeons imagined techniques to salvage splenic tissue and implant it in the abdominal cavity as an auto transplant, usually in the great omentum and soon after the concept of partial splenectomy was developed (3,4). However, as recent developments and discoveries in medicine appeared, there has been a decline in the number of splenectomies performed, especially for certain pathologies, most notably in haematological diseases such as immune thrombo-cytopenic purpura (ITP) and thalassemia (5) but also in trauma (6). Our aim is to show how the number of splenectomies has declined over time and to assess the factors that have influenced this decline.

Material and Methods

The data of patients with splenectomy performed in the Department of General Surgery from the Fundeni Clinical Institute (Bucharest, Romania), between 2002 and 2022 were analysed in this single centre retrospective study. Cases were divided by indication, type of splenectomy and the type of surgical approach. We excluded splenectomies that were performed as a result of intraoperative injury to the spleen such as in left hemicolectomies for example.

All data were processed using Microsoft Excel.

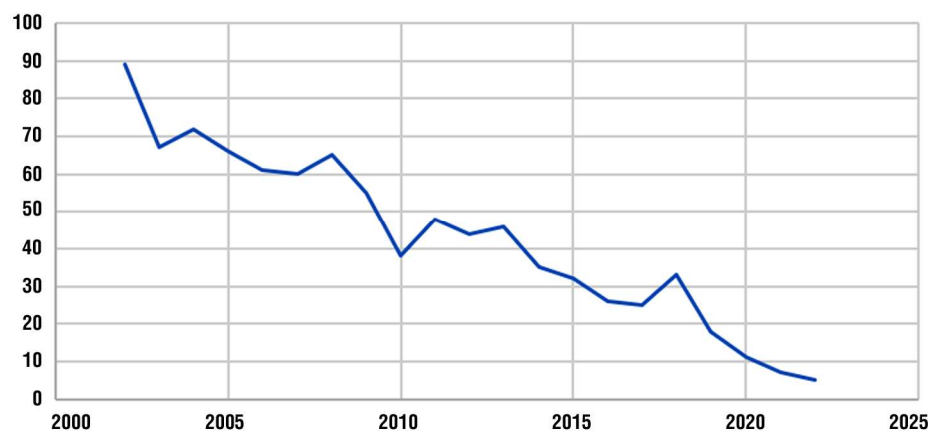
Results

There were 876 splenectomies performed in Fundeni Clinical Institute between 2002 and 2022. The main indications for splenectomy were ITP (n=245), followed by benign tumours and cysts (n=136), lymphoma (n=119), hypersplenism due to cirrhosis (n=107), and microspherocytosis (n=95). Other indications included myelodysplastic syndrome (n=39), trauma (n=35), thalassemia (n=22), leukaemia (n=18), and also there were 60 splenectomies that were performed for hypersplenism of unknown cause.

As shown in *Fig 1*, the total number of splenectomies in IC Fundeni declined drastically, and furthermore, as shown in *Fig. 2, 3* and *4*, the number of splenectomies per indication dropped significantly. The most significant decline can be observed in the case of ITP, going from 100 splenectomies between 2000 and 2005 to no splenectomies performed for this condition in the last years.

The decrease in number of splenectomies can be seen by manner of approach (*Fig. 3*), from 58 open splenectomies and 20-30 laparoscopic splenectomies per year in 2002 to less than 10 open and laparoscopic procedures respectively per year since 2019. Due to technical issues, the robotic approach was no longer possible since 2016 in our center which

Figure 1. The decline in the number of splenectomies 2000-2022



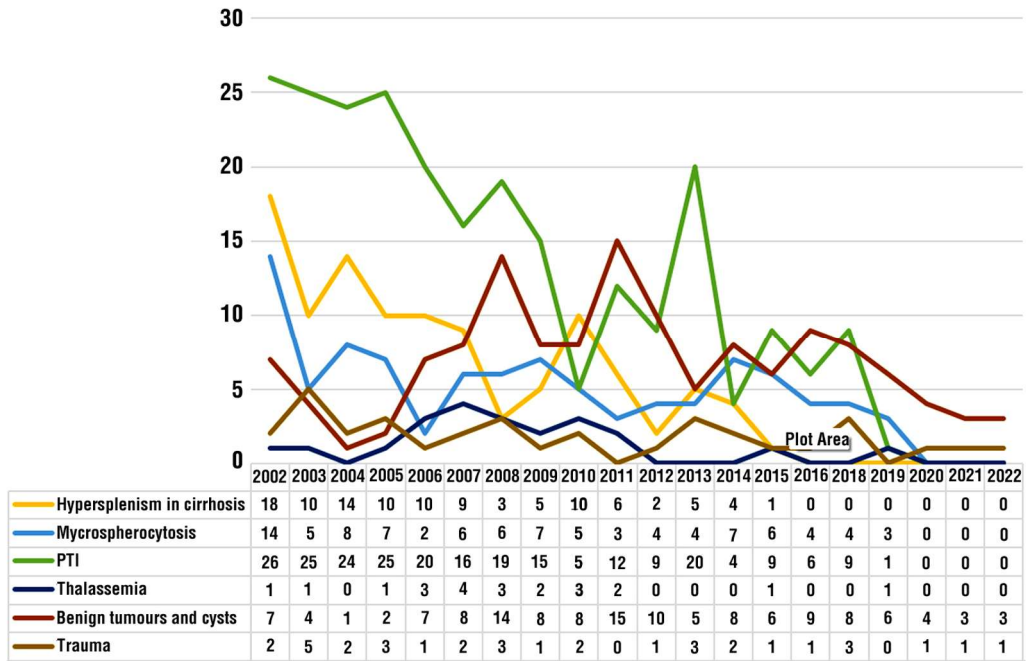


Figure 2. The decline in the number of splenectomies per indication between 2000-2022

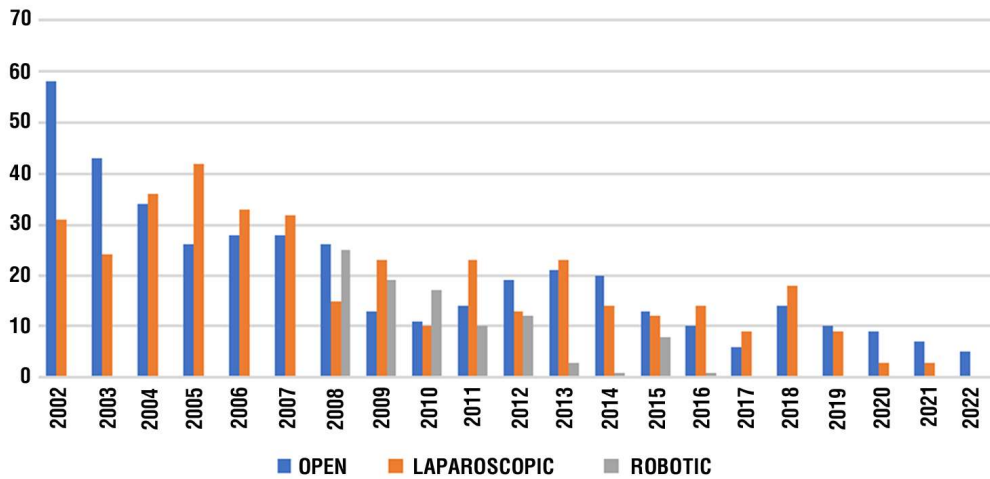


Figure 3. The decline in the number of splenectomies 2000-2022 by approach: open vs laparoscopic vs robotic

affected our statistics, resulting in no robotic splenectomies after this year.

Another notable fact is the decline in the number of PS as well, whether they be open, laparoscopic, or robotic. Of the 876 splenectomies, 81 were PS between 2002 and 2022, 14 open, 40 laparoscopic and 27 robotic. Most PS

were performed for microspherocytosis (n=51) and other haematological diseases like thalassemia (5), but also for splenic cystic tumours (n=13) or hydatid cysts (n=12). The decline in the number of PS can be seen in Fig. 4.

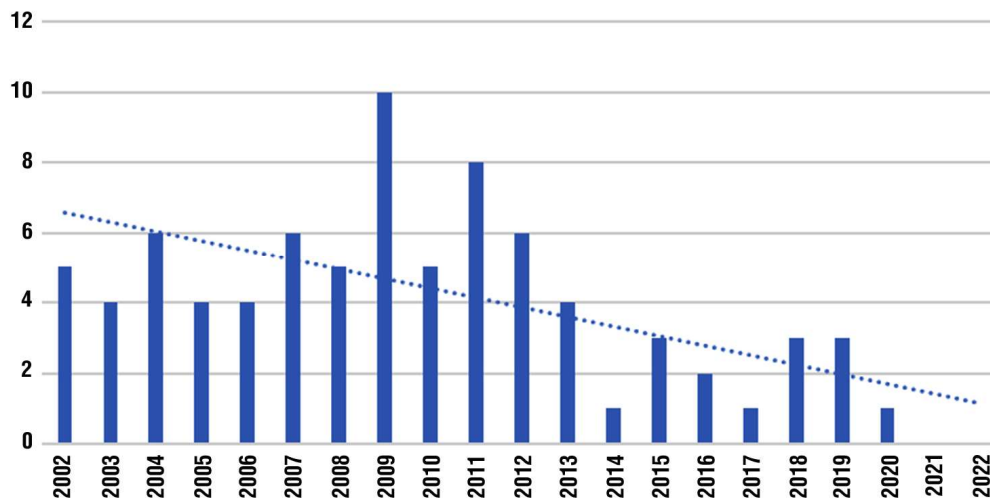


Figure 4. The decline in the number of partial splenectomies between 2000-2022

Discussion

The spleen is an abdominal organ with vital haematological and immunological role, sustaining the innate and adaptive immunity and offering protection against microbial infection. A key moment in the history of splenectomy was the discovery that total removal of spleen tissue increases the lifetime chance of developing OPSI, after which more and more effort has been put into preserving splenic parenchyma, either by partial removal of the spleen, preserving accessory spleens, or reimplantation of splenic tissue (7). In our series, initially the number of splenectomies was rather high, particularly in the MI group, because the introduction of laparoscopy and robotic surgery both spiked the surgeon's interest in performing splenectomies in an MI manner and it also increased addressability. Also, the introduction of haemostatic tools and staplers provided excellent results in both TS and PS, but especially in the latter, making it a more feasible choice of operation.

However, new lines of therapy developed especially for haematologic diseases, providing an alternative method of treatment with the possibility to preserve the spleen entirely. This happened concomitantly with more and more

studies which showed the dangers of TS and an overall trend towards avoiding it. As such, TS has been less and less performed, especially in haematologic diseases. In microspherocytosis, PS became most popular as a splenic parenchyma preserving method and soon after laparoscopic or robotic PS became a gold standard, offering both the advantages of splenic preservation and those of minimally invasive surgery (8,9).

A more important decrease in the number of splenectomies can be observed in the case of ITP, where TS was one of the main forms of treatment (10). With the development of new lines of treatment, splenectomy fell to a third or even fourth line of treatment after corticosteroids and anti-D, rituximab, or thrombopoietin receptor agonists and this decline in TS for ITP occurred even if literature provided mixed results for outcomes of surgical and nonsurgical management (11).

A similar decrease in the number of splenectomies performed for thalassemia has been reported, due to chelation protocols, improved management of the disease and stricter transfusion guidelines (12). Splenectomy is indicated when annual transfusion requirements exceed 200 ml/kg/year of pure red cells (13) and the procedure has proven safe and rendered

excellent results in the treatment of thalassemia (14). Current guidelines for blood transfusion in thalassemia, establishing a more appropriate pretransfusion haemoglobin level at around 9-10mg/dL, has reduced the indication and need for splenectomy (15). Current guidelines also recommend avoiding splenectomy in children younger than 5 years, further limiting the indication for splenectomy (12).

Primary splenic tumours are relatively infrequent and are categorised as lymphoid and nonlymphoid. Lymphoid tumours are mostly lymphomas, with primary splenic lymphomas accounting for 1-2% of all lymphomas. Nonlymphoid tumours are either benign, of which most are haemangiomas, and malignant either primary (primary hemangiosarcoma, although rare, is the most common primary malignancy of the spleen) or metastases from other cancers (most commonly melanoma, breast or lung cancer) which are also rare entities (16). As seen in our case series, the number of splenectomies for lymphoid tumours decreased, most likely because of advances in oncological treatment, the development of new lines of treatment. A study from 2019, analysing the role of splenectomy for splenic lymphomas both as a diagnostic and therapeutic procedure shows that the number of patients undergoing splenectomy for these indications decreased from 69% in 2004 to 44% in 2013 (17), and this decrease was most significant in the case of splenic marginal zone lymphoma, where rituximab showed excellent results, questioning whether splenectomy should be replaced as first line of treatment (18).

In the case of splenic nonlymphoid malignancies, either primary or secondary, there are few procedures performed, explained by the sparsity of these tumours in the first place. In the case of metastatic lesions, they rarely occur as isolated lesions, most of them occur in the context of multiple metastases and therefore the indication for splenectomy is extremely limited (16).

Spleen cysts are another category of splenic tumours, and they may be simple cysts or parasitic.

The treatment for simple cysts was TS in

the beginning but soon after, the option of PS appeared which offered promising results (19). While the number of cysts diagnosed by modern means of imaging such as CT or MRI increased, the indication for TS decreased, there has been a slight increase in the indications for partial splenectomy, but other treatment approaches such as aspiration, sclerosis, marsupialisation, partial cystectomy, are all part of a nonoperative management scheme which has limited the indication for splenectomy (20).

The same advances especially in interventional radiology and improvement of diagnostic techniques has also limited the number of splenectomies for trauma. The nonoperative management is now standard of care in haemodynamically stable patients. There is remarkable evidence in medical literature of the superior results of nonoperative over operative management in patients who are haemodynamically stable through angiography and embolisation (21). In our series there were not many splenectomies performed for traumatic injury, and such there cannot be a clear description of the trend towards splenic preservation or the decrease in the number of splenectomies. Also, embolisation for splenic trauma has not been performed in our institute, and as such no realistic or statistically significant observations can be made.

The role of splenectomy in cirrhosis has seen a demise in our lot, due to many factors such as: improvement in medical management of cirrhosis, the use of other means of treatment such as porto-systemic shunts but most notably the increase in liver transplantation may be considered. There is no clear evidence in medical literature to sustain the decrease in the number of splenectomies for hypersplenism due to liver cirrhosis, although most studies admit the danger of splenectomy in these fragile patients and advise refraining from splenectomy if possible (22,23).

The declining trend is observed also in the number of MI splenectomies, because even if MI surgery is on the rise (9,24-26), with the drastic changes observed, especially in ITP, the fall in the number of splenectomies in

general can only be reflected in the fall of MI splenectomies as well. One limitation of our study is that the number of robotic splenectomies has fallen to 0 since 2016 due to technical issues, this having nothing to do with the method itself.

Lastly, there has been a decline in the number of PS in our series, fact which cannot be backed up with data from the literature. The trend of PS followed that of the TS, due to the same reasons, which is better understanding of haematological diseases, new and improved lines of treatment and better management of disease by other means, which pushed surgery into the last therapeutic resort (7,12,15).

Conclusion

Significant advances in medicine, both in immunological treatments, improved means of radiologic diagnosis and treatment via non-operative management for certain diseases has led to the demise of splenectomies. The discovery of the immunological role of the spleen and the need for spleen preservation in order to avoid complications such as OPSI, thrombotic events, has led to a more conservative approach and the drastic decrease in the number of splenectomies.

Conflicts of Interests

The authors declared no potential conflicts of interest.

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