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The Spleen and Spleen Surgery in the Elderly

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ABSTRACT

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The spleen is a very important organ with many essential functions, not only in the defense of the organism, but also in its metabolic, immunological and haematological systems. The most common manifestations of the splenic disturbances include splenomegaly and a decrease in the number of blood elements. After the removal of the spleen, 2% of adults present severe sepsis, while more than 10% of the elderly are at risk of death due to septic conditions. Most splenic diseases can be treated conservatively. Operative procedures should be considered in special conditions, when all conservative options have been unsuccessfully depleted. Even in the presence of a severe trauma to the spleen or advanced haematological diseases, the best approach is a non-operative procedure. When the operation is unavoidable, partial and subtotal splenectomies or implants of autogenous splenic tissue onto the greater omentum should be performed. At least 25% of a normal spleen should be left with drainage to the portal system to preserve the complete efficacy of all splenic functions. The technological advances and the progressive development of new surgical devices are responsible for laparoscopy with or without robotic assistance. These surgical approaches lead to less pain, faster postoperative recovery and better cosmetic results, without decreasing the therapeutic efficacy. The conservative splenic approach, whether clinical or surgical, is the best way to prevent post-splenectomy infection, by preserving the spleen's role in immunity.

Key words: Spleen; Splenectomy; Morphology; Pathophysiology; Elderly; Conservative procedures

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In the past, the spleen was considered a superfluous organ with no important function, which could thus be removed with no major body impact[1,2]. The lack of scientific knowledge and the low interest in studies concerning the spleen were followed by the removal of the spleen, mostly due to diseases that presented no direct involvement in this organ[1,2]. By contrast, when patients undergo a total splenectomy and pass through a longer follow-up period, many complications, including severe infections, thromboembolisms, food intake disturbances, fever, a poor control of the blood elements, negative influence on the liver and bone marrow functions, as well as fever, may arise[3,4,5] (Table 1).

Table 1 Main splenic functions.

General Functions	**Specific Functions**	
Haematology and Immunity	Haematopoiesis	
	Maturation of blood elements	
	Immunoglobulin activation	
	Recirculation of lymphocytes T and B	
Production	Leukocytes	
	Peptides	
	Opsonins	immunoglobulin (IGM)
		tuftsin
		properdin
		complement factors
	Stem cells - source of cells for organic replacement	
Storage	Leukocytes	
	Thrombocytes	
	All metals	
Clearance	Parasites	
	Infection agents	
	Antigenic substances	
	Altered cells	
	Foreign bodies	
Synthesis	Precursor of hepatic functions	
Metabolism	Lipids	
	Cholesterol	
	Bilirubins	
	Amino acids	
Control	Bone marrow	
	Mononuclear phagocytic function	
	Endocrine system	
	Somatic development	
	Sexual activity	

Manifestations of splenic disturbances include the splenomegaly and a decrease in the number of blood elements. Other clinical findings include infections, physical weakness and a delay in haemostasis, which tend to occur in more advanced splenic diseases. The early mortality of an elective splenectomy in elderly patients is around 8%. However, in an emergency situation, such as trauma, spleen removal results in a 37% mortality rate among the elderly due to complications related to the absence of preoperative preventions[1,2,4,6,7,8]. Before 80 years of age, patients are able to support a splenectomy much in the same way as younger patients, but with more complications. After 80, patients do not have a sufficient organic reserve to support a complication and the mortality rate rises by more than four times. In elderly patients, all complications must be considered severe[1,2,4,6,7,8].

The greater part of splenic diseases may be treated conservatively. Operative procedures should be considered in special conditions, when all conservative options have been unsuccessfully depleted. Even in the presence of a severe trauma to the spleen or advanced haematological diseases, the best approach is a nonoperative procedure. When the operation is unavoidable, partial (preserving the splenic vascular pedicle) or subtotal (preserving the upper or lower splenic poles, which are supplied by splenogastric vessels or by lower polar vessels) splenectomies should be preferred[7,8,9,10,11].

When a conservative procedure on the spleen is unfeasible, the best option is a total splenectomy combined with autogenous implants of normal splenic tissues onto the greater omentum. Splenic autotransplantation has been described as mainly following splenectomies due to trauma[12]. This procedure is based on splenosis, i.e. spontaneous implantation of spleen fragments in any part of the body, mainly into abdomen, after severe splenic

injury[1,2]. Experimental studies have indicated that the best place to implant splenic fragments is the greater omentum. This choice is not only due to the rich blood supply of the omentum, but also to the fact that the blood drainage of the greater omentum is to the liver by the portal system, which is also the natural drainage of the spleen. This particularity may be useful in terms of splenic function and production of immunoglobulins, complements and metabolic substances. The amount of splenic tissue to be implanted is at least 60 grams (about 25% of a normal spleen). Smaller amounts of the spleen work, but these are not enough to support systemic necessities. Less than 25% of normal spleen results in splenic insufficiency[12,13,14,15,16].

With advances in technology and surgeon's experience, the techniques of laparoscopic surgery are being refined and their application expanded to include many diseases and organs with much less pain and better cosmetic results. The most important is the lower organic response to the surgical trauma, leading to a faster recovery and less adversities, mainly in elderly patients. A relevant type of care is that of the pneumoperitoneum, which may be not tolerated by patients with severe cardiopulmonary diseases[17,18,19].

Laparoscopic splenectomy was first performed in 1991. Since then, many publications have followed, describing its indications, technique and results. As new steps in laparoscopic splenic surgery, partial and subtotal splenectomies have been performed to preserve important functions of the spleen and to prevent severe sepsis. New devices lead to advances in laparoscopic approaches by natural orifice transluminal endoscopic surgery (NOTES) and natural orifice transumbilical surgery (NOTUS) by performing surgical procedures by a single port[1,2,17,18,19,20].

More recently, laparoscopic procedures, including splenectomies, have been performed with robotic assistance. The efficacy of this technology is greater than the classic laparoscopy and the results have been better, especially when using a single port with less inflammatory organic response to the surgical trauma. In a few years, the robotic approaches will be the standard option for most surgeries of all specialities, even in elderly patients[1,2,21].

SPLENIC DISEASES IN THE ELDERLY

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The spleen is one of the most frequently damaged organs in blunt abdominal trauma. The spleen size decreases with age and in elderly people the dimensions of this organ may reach 20% of a normal spleen found in young patients[6]. Due to its reduced dimensions, the spleen is much less damaged in elderly people. Even in its smaller dimensions, the spleen preserves normal functions and there is no reason to remove it completely, which would put the patient at risk of all complications related to asplenism[1,2,6,7,22]. To prevent such events, nonoperative management and conservative surgical procedures are recommended in more than 95% of all splenic traumas treated by most of the advanced emergency services. However, elderly patients with severe medical conditions must undergo an earlier operative intervention, even when haemodynamically stable.

All patients submitted to conservative treatment should be advised to avoid sports or heavy physical tasks for three months, and are recommended to return to the hospital whenever they experience any abdominal pain, weakness or any other abnormality. This reference should also be provided to the family and guardian of the patient.

Haematological diseases, such as spherocytosis, elyptocytosis, hemoglobinosis, sickle cell disease, thalassemia, hypersplenism and myeloid splenomegaly, are rarely found in the elderly. If a patient reaches an advanced age, these haematological conditions will have been adequately controlled without the need for a surgical procedure. Consequently, conservative approaches should continue to be performed[23,24,25].

By contrast, leukaemia and lymphomas are more frequently found in the elderly. Chemotherapy is the most common treatment for leukaemia and lymphomas, and most of these patients survive many years under clinical control. However, a massive growth of the spleen, which may occur in some patients, provokes intense symptomatic discomfort and unresponsive clinical treatment. In such cases, a subtotal splenectomy is recommended to alleviate the symptoms and to improve the results of chemotherapy, without reducing the patient's immune defences, followed by severe sepsis and precocious death due to an asplenic condition if a total splenectomy needs to be performed. The advances of imaging methods and imaging guided biopsies have been enough to define the stage of oncological diseases, including Hodgkin's and non-Hodgkin's lymphomas; therefore, surgical procedures must be avoided[21,26,27,28,29].

Metabolic disturbances, such as dyslipidaemias (Gaucher's disease, Niemann-Pick's disease, Faber's disease, etc.) are extremely rare in elderly patients and treatment should consider partial splenectomy only for incapacitated discomfort provoked by an oversized spleen[30,31,32,33,34,35].

Benign tumours including haemangiomas should be treated by laparoscopic partial splenectomy. Non parasitic cysts are almost always benign in advanced-aged patients and can be adequately treated by opening their capsule

to drain the content into peritoneum, which will absorb the fluid[36].

Malignant tumours (leiomyosarcoma, metastasis, etc.) are extremely rare in the spleen and are almost never found in elderly patients. Nevertheless, a radical total splenectomy is recommended for these cases[1,2].

The spleen stores some parasites, including malaria, Manson's schistosomiasis, visceral leishmaniosis, echinococcosis, etc., as well as viruses like AIDS, which may destroy the spleen. All of these agents should be treated by specific drugs. Splenectomy is only recommended when clinical treatment fails. Conservative surgical procedures on the spleen should not be considered in these cases, to avoid virus or parasite storage[25,32].

Splenic abscesses generally occur in patients with neoplasms, immunodeficiency, bacterial endocarditis, haemoglobinopathies, trauma, mesenteric infections, splenic infarctions and diabetes mellitus. Though more common in young patients, the mortality rate due to splenic abscesses is much higher in elderly patients, ranging from 12% in young patients to 47% in elderly patients. Escherichia coli, staphylococci, streptococci, and salmonella are the most common bacteria found in abscesses, whereas a rate as high as 36% of the cases are polymicrobial. The diagnosis is based on fever (90% of the cases), leukocytosis, pain in the left upper abdominal quadrant and splenomegaly. A CT scan is the best exam to identify the abscess. Other imaging exams, such as ultrasound and nuclear magnetic resonance, are also useful. Despite the efficacy of ultrasound guided percutaneous drainage, the removal of the splenic abscess, and even of the spleen, under antibiotic therapy should be considered in severe cases[37].

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Elective surgical procedures on the spleen in elderly patients should be performed only after a profound and careful propaedeutics. All systems must be studied including related complementary exams. Other disorders must be treated or at least well controlled before the splenectomy[1,2].

If a total splenectomy is recommended, previous multiple vaccination is useful, with special attention concerning pneumococcal, meningococcal and Haemophilus influenza. There is some controversy over the value of vaccines, but in view of the risk of sepsis and of the fact that vaccination is safe with respect to any complication arising from its application, it is preferable to believe that this procedure will effectively stimulate patient immunity. The appropriate period for obtaining the best effect from vaccines is more than 30 days prior to surgery. Vaccination after total removal of the spleen has little effect, since vaccines need the spleen to activate the immune system. Another important aspect to be considered is the vaccine failure in immunocompromised individuals[38].

Immediately before the surgical procedure the superficial venous system of the lower limbs should be wrapped by bandages or other devices to reduce the possibility of thrombosis. Large spectrum antibiotic prophylaxis is always recommended. A naso- or orogastric tube introduced by the anaesthesiologist drains out the stomach, prevents regurgitation and facilitates the surgical splenic approach. A urinary tube is only recommended in extensive procedures or in patients with severe comobidity.

POSTOPERATIVE PERIOD

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Elderly patients present less inflammatory response due to the immune depression. These patients also present less surgical incision pain and their probability for infection is much higher[6,22]. Therefore, gram-positive and gram-negative antibiotic prophylaxis begun immediately before the surgical procedure must continue for at least five days.

Another severe postoperative complication is thromboembolism, which occurs in nearly 30% of all patients submitted to a total splenectomy, which is partially responsible for their high postoperative mortality[4]. Heparin-derivate prophylaxis is recommended for long periods to prevent thromboembolism, but their efficacy is controversial and these drugs have no effect in the prevention and treatment of portal thrombosis, which may occur after splenic vein ligature.

Patients submitted to splenic surgical procedures commonly present fluid collections in the left hypochondrium. In almost all cases, these consist of aseptic serum and blood and should not to be confused with subphrenic abscesses. There is a very high risk of puncturing a sterile fluid collection, which would certainly be completely reabsorbed even when it contains air remaining after the surgical act. Less experienced physicians may occasionally puncture or drain these collections, causing subphrenic abscesses, which are often difficult to be treated.

Leukocytosis and thrombocytosis with no clinical manifestations are very common in patients who undergo splenic surgeries. This transitory phenomenon is due to a disturbance in the splenic control of the blood element level. In the absence of the spleen, the rest of the mononuclear phagocytic system assumes this function. By contrast, in the presence of hyporexia, leukocytosis and fever, a septic disturbance should be considered. Wound, urinary infection and pneumonia are the most probable diagnoses[6,7,23,25].

The term OPSI (overwhelming postsplenectomy sepsis) defines fulminating sepsis triggered mainly by Streptococcus peumoniae, Neisseria meningitidis and Haemophilus influenzae type B in splenectomised subjects. Asplenia is the major risk factor for OPSI with a general incidence of 3.2%, but in elderly patients, this adverse event may occur in more than 10% of all cases with a high mortality rate. The risk of OPSI in patients who undergo conservative spleen procedures is absent or much lower[4,6,23,38].

FINAL CONSIDERATIONS

According to all medical literature based on rigorous scientific criteria, the conservative splenic approach, whether clinical or surgical, is the best way to prevent postsplenectomy infection, by preserving the spleen's immunity role. The surgeon should choose the best surgical procedure and the size of the splenic remnant, remembering that at least 25% of a normal spleen should be left inside the portal system. It is still important to emphasize the wise words of Sir Thomas Spencer Wells, in his editorial from 1866, " If a large spleen were wounded or ruptured, spleen might be excised as the only means of saving life. Nothing less than death should indicate splenectomy. Spleen may be excised for pathologic conditions in which the function of the spleen is implicated."

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Refbacks

There are currently no refbacks.