ORIGINAL RESEARCH

IATROGENIC INJURIES RESULTING IN INCIDENTAL SPLENECTOMY, WHAT LIES BENEATH?

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ABSTRACT

Objectives: Surgical reports on incidental splenectomy usually lack necessary details particularly during any other abdominal operative procedures. This retrospective study was conducted in order to analyze our institutional clinical experience in iatrogenic splenectomy and to evaluate the predisposing factors.

Patients and Methods: The patients who underwent splenectomy were retrospectively evaluated over a ten-year period. Among these patients, iatrogenically splenectomized cases were reviewed for demographic features, incision types, primary operation procedures, locations, and the mechanism of the injury.

Results: The evaluation involved 19/322 patients (5.9%) with a mean age of 63.9 years. Upper gastrointestinal procedures (63%) and midline incision (72%) were found to be the most common factors leading to splenic trauma in patients with iatrogenic splenic injury. In our series, the main contributive factor for splenic injury was splenic traction (52%) during surgery. The most frequent location of the injury was the splenic hilus (8 patients).

Conclusion: Splenectomy procedures may result in serious complications in both the postoperative period and long term follow-up due to immunologic defects. To avoid such complications, the appropriate incision type depending on the type of surgery and effective retractor should be determined. If complications occur, organ-preserving procedure is recommended, using high technical advances.

Keywords: Upper gastrointestinal procedures, Splenic injury, Iatrogenic splenectomy

İNSİDENTAL SPLENEKTOMİYLE SONUÇLANAN İATROJENİK YARALANMALARDA ALTTA YATAN NEDENLER NELERDİR?

ÖZET

Amaç: Cerrahi raporlar özellikle farklı nedenlerle yapılan operasyonlar esnasında gerçekleşen insidental splenektomiler hakkında detaylı bilgi içermezler. Bu çalışma kliniğimizde uygulanan iatrojenik splenektomileri analiz etmek ve predispozan faktörleri değerlendirmek amacıyla düzenlendi.

Hastalar ve Yöntem: 10 yılı aşkın bir sürelik bu çalışmada splenektomi operasyonu geçiren tüm hastalar analiz edildi. Bu hastalar arasında iatrojenik splenektomi uygulanan hastaların demografik özellikleri, insizyon tipleri, primer operasyon prosedürleri, yaralanma lokalizasyonları ve mekanizması kaydedildi.

Bulgular: Yaş ortalaması 63.9 olan 19/322 (%5.9) hasta saptandı. İatrojenik splenik yaralanma nedeniyle splenik travma saptanan hastalarda en sık gözlenen primer operasyon üst gastrointestinal prosedürler (%63) ve en sık insizyon tipi ise göbek üstü ve/veya göbek altı orta hat insizyonu (%72) idi. Splenik yaralanmadaki en çok katkısı olan faktör operasyon esnasındaki traksiyon (%52) olarak tespit edildi. En sık yaralanma lokalizasyonu ise 8 hastada olmak üzere splenik hilus idi.

Sonuç: Splenektomi sadece postoperatif dönemde değil aynı zamanda uzun sürelik takip döneminde de immonolojik defektler nedeniyle ciddi komplikasyonlara neden olabilir. Bu sorunla karşılaşmamak için planlanan cerrahiye en uygun insizyon yapılmalı ve uygun retraktor seçimi ile ameliyatta etkin görüş sahası sağlanabilmelidir. Eğer iatrojenik yaralanma olursa günümüzdeki teknik gelişmeler kullanılarak organ koruyucu prosedür uygulanmaya çalışılmalıdır.

Anahtar Kelimeler: Üst gastrointestinal cerrahi, Splenik yaralanma, İatrojenik splenektomi

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INTRODUCTION

The spleen is the largest of the ductless glands, and has a very friable and vascular structure. It is in contact with the posterior wall of the stomach, pancreas, colon, left kidney, and the left suprarenal gland. Therefore, in the course of any surgery to the surrounding organs, spleen is often in danger, due to these many connections. Fortunately, the spleen has a considerable amount of elasticity, which allows a great variation in size.

The potential sequel of a splenectomy is often underestimated and generally no systematic planned efforts are undertaken to avoid a splenic injury[1]. Thus, the incidence of iatrogenic splenic injuries has remained uncertain. However, this may be due to failure to report splenic injury on the operation note or inaccurate recording of the indication for splenectomy[2]. Polo et al reported that an iatrogenic reason was the second most common indication for splenectomy, after traumatic cases[3]. It is concluded that splenectomy due to trauma has decreased, whereas iatrogenic splenectomy associated with malignancy cases has increased. Morbidity and mortality rates significantly increase due to incidental splenectomy during exploratory laparotomy[3]. Nevertheless, splenectomy as a prompt solution is undoubtly preferential to splenic preservation in order to avoid both a long operative time and excessive hemorrhage. The purpose of this study was to review our institutional experience in incidental splenectomy procedure in all the splenectomy cases to date and to evaluate the predisposing factors.

MATERIAL AND METHOD

Between January 1995 and July 2005, over a ten-year period, 322 splenectomies were performed at the Ege University School of Medicine, Department of General Surgery. All splenectomy patients were retrospectively reviewed and iatrogenic cases were analyzed. Data collection included demographic variables such as gender, age, primary operations associated with iatrogenic splenectomy, incision type, mechanism of injury and the location of injuries. In addition, insertion of a drainage catheter, postoperative complications, and mortality rates were recorded.

RESULTS

During the 126-month period, 322 patients underwent splenectomy. The indications for primary splenectomy were: 106 patients (32.9%) for hepatic and splenic disorders, 105 patients (32.6 %) for cancer treatment, 65 patients (20.1%) due to diagnosis or /and treatment of a hematological disease, and 27 patients (8.3%) due to traumatic injury (Figure I). However, 19 (5.9%) spleens were removed incidentally. The study involved 11 female and 8 male patients with a mean age of 63.9 years (42-88 yrs.). Of these, 9 patients (47%) underwent emergency surgery. Iatrogenic splenectomy was performed on the remaining patients during elective procedures. Twelve patients underwent upper gastrointestinal surgery, whereas the others underwent other types of abdominal surgery (Table I). The most frequently used incision type was the midline incision, either upper or long, in 14 (72%) patients. The others were Mercedes-type incisions, left paramedian and bilateral subcostal incisions (Table II). The most frequent location of the injury was the splenic hilus in 8 (42%) patients. The other locations were seven upper and 4 lower pole injuries. Inappropriate traction in 10 patients (52%) was determined as the main cause for avulsion of the splenic ligaments or laceration. The other injuries were recorded as lacerations during splenic dissection or surrounding organ removal. A drainage catheter was inserted in the splenic cavity in all the patients except in one. No accessory spleen was discovered. Pneumococcal conjugate vaccine in management of postsplenectomy infection was administrated to all the patients on the postoperative day 0.

Table I. Primary procedures where iatrogenic splenectomy was performed

Operation procedure	Number of patients	%
Gastrectomy for malignancy	4	21
Primary suture for ulcer perforation and vagotomy	4	21
Left hemicolectomy	4	21
Hepatic surgery	2	10,5
Other gastric surgeries	2	10,5
Left adrenalectomy	1	5,2
Total esophagectomy	1	5,2

Table II. Incision types

Incision	Number of patients
Midline (upper or long)	14 (72%)
Mercedes-like	2
Left paramedian	2
Bilateral subcostal	1

Nosocomial pneumonia was detected in two patients (10.5%), in the early postoperative period. Only one patient (5.2%) died of respiratory disorder due to pneumonia. Klebsiealla pneumonia was found as the cause of nosocomial pneumonia. The other complications included left pleural effusion (n=2) and fluid collection in the upper left quadrant (n=1).

DISCUSSION

The spleen is the most fragile organ of all the peritoneal or/and retroperitoneal organs. However, its fragility or close anatomical relation to most of the abdominal organs makes it prone to injury during surgery, particularly in upper gastrointestinal procedures. On the other hand, homeostasis in the spleen is considered more difficult compared to that in the other organs because its vascular dominance is arterial, whereas the liver has majority of venous supply. Although the incidence of iatrogenic splenectomy usually remains controversial in all patients undergoing splenectomy, Polo et al reported a decrease in the number of cases associated with trauma versus an increase in the number of splenectomies on account of abdominal oncologic resections[3]. A rate of 8% to 32% due to cancer treatment procedure, the result obtained in our study, is compatible with their results. Additionally, Coon WW noted the decrease in the incidence of iatrogenic splenic injury with a comparable study from the same institution[4]. In our series, a rate of 5.9% was determined. This rate is lower than the incidence reported in the literature, which is between 9% and 40%[2,4].

The contributive factors for iatrogenic splenic injury related to surgery are inadequate exposure due to incision type or inefficient retractor, and inappropriate anesthetic administration, especially in athletic and obese patients. The incision type should be selected according to operation procedure and extension of the incision should be performed avoiding unnecessary injury. Carmignani et al reported a higher incidence (13.2%) of iatrogenic splenectomy in the first group of patients where the incision performed was anterolateral xipho-umbilical-subcostal type, and an acceptable rate of 2.6% in the second group where the incision was Mercedes-type[1]. Choosing the most appropriate incision for the surgical procedure is one of the determinants of a good exposure. In our study, there were only 3 cases (15%) where the Mercedes type of incision was applied, whereas on patients (72%) with iatrogenic

splenic injury, the incision most used was the midline incision (72%).

The type of primary operation procedure is also considered a contributive factor for splenic injury. Cassar K and Munro reviewed in a Medline literature research that the risk of splenic injury was highest during left hemicolectomy (1-8%), open anti-reflux procedures (3-20%), left nephrectomy (4-13%), and during exposure and reconstruction of the proximal abdominal aorta and its branches (21-60%)[2]. In our study, splenic injury was most common during upper gastrointestinal procedures. Additionally, the materials used during surgery, either for dissection or for retraction, have also considerable importance. Ten (52%) of the splenic injury incidences were thought to have occurred while maintaining exposure. Thus, direct trauma including excessive traction, manually, or/and retractor pressure on the spleen, which may cause serious capsular tear due to inappropriate location, is one of the significant factors of iatrogenic injury. Furthermore, the patient's body condition, which is necessary for effective exposure, is also considered as important as other underlying reasons. If not due to exposure, incidental splenectomies probably resulted from excessive manipulation of the spleens, even with no abnormal structural condition to make them more friable and susceptible to laceration. Nevertheless, in the previous studies, no morphological change of the spleen predisposing to rupture was observed[5,6]. On the other hand, blunt palpation is dangerous for particularly enlarged spleens.

In the remaining patients, the reason for splenic injury was associated with dissection. Particularly, adhesion bands in the upper left quadrant, which resulted from previous operations may have caused iatrogenic splenic injury during dissection. Likewise, Rogers et al reported patients who suffered splenic injury in a study of 97 patients who had undergone Nissen fundoplication. In these cases, iatrogenic splenectomies were performed due to failure of division of the vasa brevia and significant hemorrhage was related to injuries during the operative procedure[7]. However, Downdall et al reported that linear stapling of the short gastric vessels, particularly during upper gastrointestinal surgery, reduced the incidence of iatrogenic injury[8].Currently, besides surgical experiment, availability of multifunctional surgical equipment through advanced technology, including new haemostatic agents such as the fibrinogen patch and thrombin in fixed combination, maintains lower complication rates. However, Coon et al concluded that constant awareness of the continued prevalence of this surgical complication and the mechanisms by which it is caused should enable surgeons to reduce its incidence and potential sequel[4].

Certain indications for iatrogenic splenectomy and the answer to the question of the necessity of splenectomy due to injuries are still controversial. Although no criteria have been established for an appropriate approach to iatrogenic splenic injury, many surgeons prefer to perform a splenectomy to preserve the spleen and to reduce the morbidity rate secondary to primary operation. However, under unexpected circumstances, none of the approaches may be justified. Thus, although several complications including fluid collection and septic complications resulting from immune deficiency may emerge in the late period; early postoperative complications such as hemorrhage, increased operation time, and unexpected blood loss are disregarded. Morbidity may include blood collection in the operation site secondary to leakage from failed splenic homeostasis and subsequent systemic infection. The age and underlying reason for surgery are clearly important factors influencing infection and mortality after splenectomy. Our study population consisted of elderly patients with a mean age of 63.9 years and median age of 69.2 years. A higher rate of infection and a shorter rate of survival in older age groups than in younger age groups were noted at the time of splenectomy[9].

Organ preserving procedures have recently become more popular because of the reports of poor prognosis after iatrogenic

splenectomy. A preserving approach to splenic injury should be practiced when possible. However, it should be kept in mind that when the patient's condition is unstable, which requires promptness, a splenectomy must be performed. Nevertheless, concomitant pathologic processes such as cardiac, respiratory, metabolic problems or vascular surgery, which require anticoagulant therapy in the postoperative period, make the preservation of the spleen preferable to performing a splenectomy. Splenectomy operations are usually considered serious because they may result in unexpected complications in both the postoperative period and the late period because of immunologic failure[9]. Although there are no satisfying literature data about postsplenectomy hemorrhage, when intraoperative hemorrhage and postoperative hemorrhage are compared, postoperative hemorrhage clearly presents a higher risk for mortality, even after an elective splenectomy procedure. In addition, sepsis due to pneumonia associated with particularly capsulated bacteria such as klebsiella pneumonia, may cause lethal infection in the long term. In the present study, one patient died of sepsis due to pneumonia, in the early postoperative period. The patient must be vaccinated as soon as possible after surgery. In 1982, Standage et al reported that a majority of the deaths were from septic causes, and infectious complications accounted for most of the morbidity as well[10].

Hospital stay was longer in patients with iatrogenic splenectomy compared to the patients who underwent only a primary operation procedure without any complications. In case of minor capsular tears, management of homeostasis includes using an electrocauter or cohesive agents such as surgicel (oxidized cellulose) and sponges (lyophilized cellulose). In a study of bariatric surgical procedures including 200 patients, Peters et al concluded that splenic injuries should be repaired by simple haemostatic methods[11]. Above all, it should be determined whether the injury is repairable or not. Inadequate or wrong efforts to control hemorrhage may result in increased operation time or even iatrogenic splenectomy in case of uncontrolled hemorrhage. In another study including 17 patients with iatrogenic splenectomy, splenorrhaphy procedure was attempted in seven patients, but continuing hemorrhage mandated spleen removal in all the patients[12]. In conclusion, the incision type and the surgical approach are the most important determinants in avoiding incidental splenectomy. Nevertheless, when incidental splenectomy occurs, splenic preservation methods should be used to protect the spleen in order to avoid any challenges presented by unexpected complications including death. Despite the challenges, the surgeon should consider the importance of preserving the spleen in case of iatrogenic injury during any surgical procedure without overlooking the stability of the patient's condition.

Conflict of Interest Statement

There is no commercial association that might pose a conflict of interest in connection with this submitted communication entitled **"Iatrogenic Injuries Resulting In Incidental Splenectomy, What Lies Beneath?"**. No funding was used in conducting the work.

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