Iatrogenic splenic injuries

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Iatrogenic splenic injuries

Inadvertent intraoperative injuries to the spleen by the surgical team represent an underestimated complication of many abdominal procedures. Surgical reports often lack the necessary details and frequently a clear justification as why a splenectomy was indicated is not provided. The wide variability of the incidence reported in literature makes it is difficult to evaluate the morbidity and mortality associated to these injuries and to assess the early and late consequences of this complication, although it is still possible to infer some of the reasons for these inconsistencies and to roughly estimate both clinical and socio-economical effects of this injury.
Given the degree of uncertainty on the incidence of iatrogenic and traumatic splenic injuries and on the immediate and long-term sequelae suffered by asplenic patients, we thought that a multicentric prospective study was warranted. We are therefore announcing the start of a study involving several Institutions within the Regione Campania, aimed at obtaining an unbiased estimate of the incidence of these injuries, together with the extent and severity of their long term complications. We also aim to help promoting a more effective prevention.

KEY WORDS: Iatrogenic Splenic Injury, Incidental Splenectomy, OPSI.

Introduction

Iatrogenic splenic injuries can be defined as inadvertent damages of the spleen caused by the operating team during a surgical procedure.
Despite being a common complication of abdominal surgery, its incidence is likely to be underestimated. This can be attributed mainly to poor documentation, which often leads to incorrect rate reporting: the operation notes are often inaccurate or incomplete and frequently the indication for the splenectomy is not specified.
In 1949, Quan e Castleman [1] first reported that 13 out of 70 splenectomies (18.5%) had been unplanned and were secondary to incautious surgical manoeuvres. Since then the issue has been debated numerous times generating controversies over the inconsistency of the reported results [2]. We conducted a literature search aimed at establishing the real incidence, as well as morbidity and mortality and the immediate and late consequences of this complication. We searched Medline using the following keywords: spleen, splenic injury, iatrogenic splenic injury, splenic trauma. We also looked at articles describing results on abdominal surgical procedures (bariatric surgery, colorectal surgery, gastrointestinal surgery, left nephrectomy, anti-reflux procedures, aortic surgery, omentopexy), trying to establish whether splenic injuries were mentioned among the possible complications. This helped us to gain some understanding of the reasons of the wide variability in literature of the incidence reported and to estimate the clinical and socio-economical effects of this injury, but failed to provide an answer to the problem of its real incidence and preventability.

Discussion

Incidence of iatrogenic splenic injuries

In a review published in 2002, Cassar. and Munro of the Department of Surgery of Raigmore Hospital, Inverness (Scotland) reported that up to 40% of all sple-

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nectomies are performed following a iatrogenic splenic injury [3]. In other studies, unplanned splenectomies range from 9% to 44% [4-7]. Incidental splenectomies are reported with a rate of 0.9% to 3.4% in gastric surgery [4], 1.2% to 8% in operations involving the left colon [3,4], 1.4% to 24% in left nephrectomies [8], 0.1% to 4% in abdominal vascular surgery, with an increase to 21.3% when manoeuvres of visceral rotation are performed and 60% in case of emergency surgery on the abdominal aorta [3]. Among all abdominal operations, those performed in the upper left quadrant yield a higher rate of iatrogenic lesions (0.9% to 49%), whereas appendicectomies and cholecystectomies are the procedures with the lowest incidence of splenic injuries [2,4,9-11].

The splenic capsule is more frequently injured, whereas the rate of injury to the hylum and the short gastric branches of the splenic artery is lower.

The wide variability in the reported incidence of this complication can be attributed primarily to a lack of discrimination between the cases in which the splenectomy is part of a planned procedure, as in radical excisions for cancer, or if it becomes necessary following an accidental injury during the treatment of benign as well as malignant, yet non invasive, diseases. Furthermore, little information is available regarding the ratio of splenectomy to the total of abdominal surgical procedures, and a detailed description of the operation often is missing making it difficult to establish whether the splenectomy was really indicated. There are also cases whereby unplanned splenectomies become almost a necessary burden due to specific pathological conditions, as it happens in reoperations and in morbidly obese patients. Often, concerns over the risk to incur in litigation or medico-legal problems induce some surgeons to offer "technical explanations" for what would be otherwise a splenectomy not justified by the primitive disease. A typical example is the case of patients undergoing cancer surgery where the splenectomy is performed following an intraoperative injury and not for reasons of surgical radicality. Finally, even poorer information is provided on partial splenic injuries that are treated conservatively, which are not always reported.

The lack of prospective studies makes the reported incidence of accidental splenectomy even less reliable, as subjected to inherent bias. It is apparent that a high degree of statistical ambiguity, and the lack of reliable data make it difficult to draw any reliable conclusion on the real incidence of iatrogenic splenic injuries [3].Because of the inconsistencies mentioned above on the type and modality of these intraoperative injuries and due to the underestimation and sometimes lack of awareness of their importance, it becomes less likely for surgeons to refine their operative techniques with an aim to reduce the incidence of unplanned splenectomies.

Mechanism of splenic injuries and preventative measures

Excessive traction or the incorrect use of retractors [12] during mobilization of the splenic angle of the colon, the lysis of peritoneal and omental adhesions [1] during the mobilization of the stomach and during the dissection of the abdominal aorta, pancreas, adrenals glands and left kidney are the main causes of splenic injuries.

In order to minimize the risk of inadvertent injuries to the spleen it is important to:

1. have a sound knowledge of the anatomy of the organ and its relations [13];
2. obtain a good visualization using the most appropriate access;
3. choose the most appropriate position for both patient and surgeon and change them if necessary [14];
4. avoid excessive tractions of meso- and ligaments;
5. position the retractors carefully and remove them as soon as they are not necessary;
6. consider using the laparoscopic technique if possible [15].

In bariatric surgery, the use of the laparoscopic approach has been reported to carry a lower rate of splenic injuries, but a higher incidence of delayed small bowel occlusions or gastrointestinal haemorrhages [15].

Complications

A prompt recognition of an injury occurred to the spleen at the time of surgery allows the surgeon to attempt to repair and limit the damage, whereas when the patient has to be brought back to the operating theatre due to a severe postoperative haemorrhage the lesion becomes almost invariably irreparable.

Among the early complications of splenectomy the followings are particularly noteworthy:

1. acute gastric dilatation, collapse of the left lung base and thromboembolic events [16];
2. blood loss requiring transfusions, with a higher rate compared to the patients who did not have a splenectomy;
3. post-operative infections.

In anti reflux surgery the incidence of early infections is reportedly higher (up to 36%) when a splenic injury occurs [16-18]. Similarly, a four-fold increase in the rate of postoperative infections has been observed in gastrectomised patients in whom also a splenectomy had become necessary [19,20]. In vascular surgery, incidental splenectomies carry an increased risk of infections and a longer hospital stay [20]. The same seems to be true also for colonic surgery [10]. A possible explanation is that further surgical manoeuvres, the serous or haematic collections that evolve into abscesses, and a reduction of the patient immune defences all contribute to expose the patient to a higher risk of infection. However, in a study by Fujita et al. the loss of more than 600 ml of blood does, not

seem to be associated to a significant increase in the risk of infections [21,22].

An increase in the incidence of post-operative complications in splenectomy patients entails a longer hospital stay, compared to those patients in whom a splenectomy was not required. A longer period of absence from work, the need for antibiotics and other medications and a longer follow-up, all contribute to increase the cost to the society of this complication.

Late complications and mortality

Often underestimated, late infections represent a significant complication in splenectomy patients and have been reported at 5 years in 42% of patients by Cullingford et al. [23], and reportedly can occur even after 10-20 years from the splenectomy [24,25]. Pneumonia is the most frequent of these complications with a mortality in these subjects of up to 60% [26,27]. The agents that are most frequently responsible are Streptococcus pneumoniae (pneumococcus), Haemophilus influenzae type b, and Neisseria meningitidis (meningococcus) [28]. Asplenic patients, due to a reduction in their immune defences, are also exposed to malaria, babesiosis, and infections by Escherichia coli and Capnocytophaga canimorsus (bacillus DF-2) [29]. However the highest risk to asplenic patients is posed by the Overwhelming Post-Splenectomy Infections (OPSI), a fulminating sepsis that in the most severe cases can cause the death of the patients within 48 hours, with an overall mortality of 50% [30]. It has also been suggested that the overall mortality is increased in these patients. The mortality following surgery for diverticular disease of the colon it has been reported to be significantly higher in those subject who had their spleen removed (37.5% compared to 5.6% in the subjects who did not have a splenectomy) [43].Fabri et al., have found an increase in mortality following an intervention on the digestive tract if a splenectomy was also carried out [44].

Infection Prophylaxis

In order to minimize the risk of infections, prophylaxis and follow-up protocols are recommended by most authorities. These protocols prescribe that asplenic patients should receive a pneumococcal vaccination before discharge. In patients under treatment with immunosuppressant chemotherapy or radiotherapy, the vaccination will not be performed unless at least 6 months have elapsed since the treatment has been stopped. During this period the patient will only receive antibiotic prophylaxis.

The vaccination should be repeated at regular intervals of 5-10 years [31], and the anti-pneumococcus vaccine, an anti-Haemophilus a and b vaccine, and in selected cases an anti-meningococcal vaccine should be also administered [32].

It must be also emphasized that even if a correct prophylaxis is carried out, the protection is not guaranteed in all cases [33]. Therefore, some authors advocate that a dosage of anti-pneumococcal antibody titers should be checked in all asplenic patients, and an aggressive antibiotic prophylaxis should be started in those subjects with low titers [34].

To achieve an effective prophylaxis it is necessary a focused approach; however this task is often delegated to busy and at times unaware general practitioners, with variable and non-standardised results. A study aimed at evaluating the implementation of prophylaxis in 708 asplenic subjects shows that an anti-pneumococcus vaccination had been administered in as low as 72% to 88% of cases, an even fewer patients had received a vaccination anti-haemophilus (70%), anti-meningococcus (51%) and prophylactic antibiotics (61%) [35]. In addition to the implementation of a correct prophylaxis, with vaccinations and long term antibiotics, it is of paramount importance to inform correctly and comprehensively these patients on the risks they may incur and the precautions they should take. In order to minimize delays in starting an aggressive antibiotic therapy, these patients should be provided with special cards or bracelets that should be worn at all times. This would increase the doctors' awareness (particularly in emergencies) of the increased risk of fulminating overwhelming sepsis in these patients [36].

Many authors have stressed the need for a register of asplenic patients, to improve the coverage of vaccines and antibiotic prophylaxis in these high-risk patients [37-39]. In some areas of the United Kingdom, the use of a splenectomy register has been shown to be useful to raise awareness among health care professionals of the presence and severity of OPSI in asplenic patients and of the need for a prolonged antibiotic prophylaxis and of a prompt and aggressive antibiotic therapy in presence of signs of infection. The existence of a register helps also to educate the patients on their risks and needs and to provide them with cards or bracelets [40]. It has also been shown that such a register can help to identify subjects unresponsive to the vaccine and subjects whose titers decrease with time, allowing to give further doses or to prescribe a life long antibiotic prophylaxis [41].

Presently, in Italy there are no comprehensive registers of asplenic patients, neither there are specific national guidelines for these patients. In view of the experiences of other countries reported in literature, we believe that a more active surveillance of these patients should be adopted. In particular, special care should be put into following up the patients who undergo emergency splenectomy, who often are not receiving a prophylaxis as effectively as other groups of asplenic patients [42].

It is clear that when talking about the consequences carried by iatrogenic splenic injuries we should not only think of the immediate complications, but also take into account the long term risk of life-threatening infections. The need for a correct prophylaxis with vaccines and

antibiotics, the possible creation of a register, together with the immediate costs of a prolonged hospital stay and absence from work, all contribute towards the social burden of these lesions. In a study by Cooper et al. it has been suggested that all the patients above 65 years of age who are undergoing a transperitoneal left nephrectomy should receive an anti-pneumococcus vaccination, due to the potential risk of splenic injuries [45].

The future: a prospective multicentric study

In view of all the problems associated to accidental splenectomy, we have designed and started a prospective, multicentric, regional study, which involves several Hospitals of the Regione Campania, to establish the incidence of splenic injuries, with an aim to evaluate the possibility to prevent them and to establish the entity of long term complications and program an effective prevention (Tab. I).

We believe that the creation of a regional protocol, subsequently implemented to a national scale would, as the literature suggests, represent an important step towards the prevention of life-threatening infections. Thereafter, in order to make possible the correct implementation of such protocols, the creation of local registries, coordinated centrally, would represent an essential step for the correct implementation of guidelines, as well as to adequately follow-up and inform the asplenic patients.

The primary objectives of our multicentric study are:

1. To know the real incidence of accidental splenectomies in our region (range 4-45% in literature) during abdominal surgery and the rate of post traumatic splenectomies. We aim to be able to calculate also the splenic injuries treated conservatively. In order for the data to be collected objectively, and in the full respect of confidentiality, all the details regarding patients, surgeons and hospitals will be anonymized.
2. To establish the extent of immediate and late complications and the socio-economical cost of these injuries. In this respect, the significance and the combined effect of numerous variables will need to be investigated, like an increase in postoperative infections, a higher risk of thromboembolic events, a greater need to use drugs, a more prolonged hospital stay, a slower return to normal activities or to work, and the need for any other therapy. The Department of Medical Statistics of our University (Servizio di Statistica Sanitaria) will have the task to estimate the increased expenditure per patient as a consequence of immediate and late complications of splenectomy. We also aim to establish the onset of immunodeficiency, as a late complication, with the help of protocols designed by the Department of Immunology of our University.

TABLE I – *Center included in the study*

Div. Chir. Gen. I Dipart dell'emergenza, AORN "S.G. Moscati", Avellino
U.O. Div. Chir. d'Urg. - A.O. "San Sebastiano", Caserta
Chir. D'Urg. e P.S. - P.O. "S. Leonardo", Castellammare di Stabia (Na)
II Chir. Generale, Università degli Studi di Napoli "Federico II"
Chir. Vascolare, Università degli Studi di Napoli "Federico II"
Ginecopatologia contr della Fertilità i.v.g. ed Emerg. Ostetr., Università degli Studi di Napoli "Federico II"
Accettaz II Liv., AORN "A.Cardarelli", Napoli
Chir. D'Urg., AORN "A. Cardarelli", Napoli
Chir. Mininvasiva e Laparosc., AORN "A. Cardarelli", Napoli
Chir. Vascolare, AORN "A. Cardarelli", Napoli
Dip. materno-infantile, AORN "A. Cardarelli", Napoli
Osserv. Chirurgica - AORN "A. Cardarelli", Napoli
Trauma Center, AORN "A. Cardarelli", Napoli
Dip. di Nefrourologia, AORN "A. Cardarelli", Napoli
Chir. D'Urg., P.O. "Loreto Mare", Napoli
Ospedale "Fatebenefratelli", Napoli
Div. di Chir Gen e Laparosc -AORN "Monaldi", Napoli
U.O.C. di Chir. Generale, P.O. "S. Gennaro", Napoli
U.O.C. di Chir. gen. d'Urgenza, P.O. "S. Giovanni Bosco", Napoli
U.O.C. Chir. Endoscopica, P.O. "S. Giovanni Bosco", Napoli
Div. di Chirurgia, P.O. "S.Paolo", Napoli
U.O.C. di Chir d'Urg. e P.S., P.O. "Umberto I", Nocera Inferiore (SA)
Dip. di Chir. Gen. ed Emergenza Chir., Seconda Università degli Studi di Napoli
Clinica Urologica, Seconda Università degli Studi di Napoli
Dip. di Ginecologia Ostetricia e della Riproduzione, Seconda Università degli Studi di Napoli
Dip. Scienze Mediche Chirurgiche
Dip. di Chir. Gen. e Specialistica, Seconda Università degli Studi di Napoli
Divisione di Chir. Generale, Casa di Cura "Pinetagrande" Castelvolturno (CE)
Servizio di Statistica Sanitaria, Seconda Università degli Studi di Napoli

The data are collected by a named person in each Institution, who is responsible for the communication with our Department. This colleague has been be assigned the task of recording all the abdominal surgical procedures carried out between 15th November 2003 and 15th November 2005, and, obviously, all the splenic injuries: traumatic and accidental. Every three months all the named persons in each Institutions will have to complete a questionnaire and return it to us (Tab. II).

Conclusions

In this article we have tried to remind to our colleagues of the risks and consequences of splenectomies both following trauma and due to iatrogenic injuries. We believe that there is the need for greater awareness of complications both in the immediate postoperative period and in the long term. Particular attention deserves the risk of OPSI (Overwhelming Post-Splenectomy Infections). In an attempt to achieve an unbiased estimate of

TABLE II – *Questionnaire*

MULTICENTRIC STUDY "ACCIDENTAL AND IATROGENIC SPLENIC INJURIES"

QUESTIONNAIRE

SPLENIC INJURY: **ACCIDENTAL** ☐ **TRAUMATIC** ☐

PATIENTS' DETAILS

Age < 18 ☐ 18-30 ☐ 30-40 ☐ 40-50 ☐ 50-60 ☐ 60-70 ☐ >70 ☐

Sex M ☐ F ☐

Primary disease: _____

Coexisting diseases: cardiovascular ☐ immune ☐ metabolic ☐ neoplastic ☐ obesity ☐

SURGERY DETAILS

Organ treated:

Abdominal wall ☐ Oesophagus ☐ Stomach ☐ Duodenum ☐ Small bowel ☐ Appendix ☐
Rt. colon ☐ Transverse colon ☐ Lt. colon ☐ Rectum ☐ Liver ☐ Pancreas ☐
Rt. Kidney ☐ Lt. kidney ☐ Rt. Adrenal ☐ Lt. Adrenal ☐ Uterus-adnexa ☐
Major arteries/veins ☐ Other (specify): _____

Procedure:

Laparoscopic ☐ Open ☐ Elective ☐ Urgent ☐ Reoperation ☐

Duration:

30'-60' ☐ 60'-120' ☐ 120'-180' ☐ > 180' ☐

Cause (confirmed or presumed) of the ACCIDENTAL splenic injury:

Retractors ☐ Traction ☐ Dissection ☐

Other (specify):_____

THERAPY: **conservative** ☐ **splenectomy** ☐ **(autoimplant: yes** ☐ **no** ☐ **)**

If conservative: which one? simple splenorraphy ☐ biological glue ☐ mesh ☐

Other (specify): _____

Early postoperative complications:

Wound infection ☐ Major infections ☐ Pleural effusion ☐ Haemorrhage ☐
Collections ☐ Abscess ☐

Hospital stay: _____ days

Was the hospital stay more prolonged as a consequence of the splenectomy/splenic injury? YES ☐ NO ☐

Outcome: Full recovery ☐ Transfer ☐ Death ☐

incidence and severity of these lesions and in the hope to unravel some inconsistencies currently present in literature we have started a prospective multicentric study. Our ultimate goal is to alert the surgeon so that any effort is put into refining techniques aimed at minimizing the risk of iatrogenic splenic injuries.

Riassunto

Le lesioni iatrogene della milza possono essere definite come un danno non intenzionale causato da un operatore o da un assistente durante l'atto chirurgico. Il problema esiste, ma è certamente sottostimato perché poco documentato,mancando spesso un'accurata relazione operatoria ed una chiara descrizione dell'esistenza dell'indicazione alla splenectomia.
Gli Autori hanno tentato, con un'attenta ricerca bibliografica,di risalire alla reale incidenza di questa lesione iatrogena,di verificare la morbilità e mortalità ad essa associata e di valutare le sequele immediate e tardive che essa determina.
Il risultato di questa indagine non ha chiarito tutti gli aspetti del problema,anche se sono emersi alcuni dati che ci possono aiutare sia a capire le ragioni dell'abnorme oscillazione di percentuali sia a quantizzare i danni clinici e socio-economici ad essa legati. In considerazione di tutta la problematica esistente sulle conseguenze delle splenectomie accidentali e traumatiche abbiamo pensato di iniziare uno studio prospettico multicentrico coinvolgendo moltissime strutture della Regione Campania per prendere in esame la reali incidenza delle lesioni spleniche, al fine di valutare la possibilità di prevenirle, di stabilire l'entità delle complicanze a lungo termine e di programmare una possibile efficace prevenzione

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