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Spleen Injuries in Spain: At What Point Are We?☆☆☆☆

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ABSTRACT

Introduction: Management of spleen trauma has changed over last few decades, although there are no data on its treatment in Spain. The aim of this study is to determine the characteristics of spleen injuries in adults with severe abdominal injuries and how we manage them.

Methods: A prospective study using the databases of six Spanish hospitals: Gregorio Marañón Hospital, Virgen de la Vega Hospital, Torrevieja Hospital, Getafe Hospital, Doce de Octubre Hospital and Corporació Sanitària Parc Taulí.

Results: A total of 566 patients who had sustained spleen injuries were analyzed (448 males and 118 females), most of them were due to blunt trauma (94%), and the most frequent mechanism of injury was motor vehicle accident. The mean Injury Severity Score (ISS) was 25.2. The initial treatment was surgical in 56.6% of the patients (85.3% total splenectomy and 14.7% other conservative surgical procedures, of which 4.6% finally failed and required total splenectomy). The remaining 43.4% were initially managed conservatively, but 6.5% of them finally required surgical splenectomy, and in 8.8% angioembolization was performed.

Conclusion: In Spain, management of spleen trauma is mainly surgical (particularly splenectomy). Angioembolization and conservative surgical procedures are now hardly used.

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Traumatismo esplénico en España: ¿en qué punto estamos?

RESUMEN

Palabras clave:

Traumatismo esplénico
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Embolización

Introducción: Aunque el tratamiento del traumatismo esplénico ha cambiado en las últimas décadas, no existen datos de la actitud que los cirujanos españoles adoptamos frente a este tipo de lesión tan frecuente. El propósito de este estudio es determinar el perfil del traumatismo esplénico en los adultos con traumatismo abdominal severo y el tratamiento que se realiza en nuestro medio.

Método: Estudio de datos de registros de trauma de 6 hospitales españoles: Hospital Gregorio Marañón, Hospital de Getafe, Hospital Doce de Octubre, Hospital Virgen de la Vega, Hospital de Torrevieja y Corporació Sanitària Parc Taulí.

Resultados: Se analizó a 566 pacientes con lesiones esplénicas (448 hombres y 118 mujeres). El tipo de traumatismo fue fundamentalmente cerrado (94%) y el mecanismo lesional más frecuente fue el accidente de tráfico. El ISS medio de la serie fue de 25,2. El tratamiento fue inicialmente quirúrgico en el 56,6%, siendo en el 43,4% restante, conservador. De estos, el 6,5% de los pacientes requirió finalmente cirugía y en el 8,8% se realizó angioembolización esplénica. De los pacientes intervenidos al inicio, en el 85,3% de los casos se realizó esplenectomía, y cirugía conservadora de bazo en el 14,7%, de los que el 4,6% fracasaron y requirieron nueva intervención quirúrgica con esplenectomía.

Conclusión: El tratamiento en España para el traumatismo esplénico continúa siendo en su mayoría quirúrgico (fundamentalmente esplenectomía). La angioembolización y el tratamiento conservador continúan teniendo escasa presencia.

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Introduction

The spleen is the most commonly injured solid organ in blunt trauma and treatment of these injuries has changed in recent decades. Starting in the 19th century, surgical treatment with splenectomy was performed to prevent patients from bleeding to death. The risk of death associated with non-intervention was estimated at 90%, versus 30%–40% after splenectomy without incident.¹ In the mid-1970s, the recognition of the immunological importance of the spleen and the life-long risk of post-splenectomy sepsis provided the basis to try to conserve the traumatized spleen. Surgeons then began to focus on spleen-saving techniques.^{2–4}

In addition, pediatric surgeons contributed their experience, where the best way to save the spleen was not to operate.⁵ After these data were published, surgeons began to very slowly apply non-surgical treatment because the initial data documented failure rates of 30%–70% after conservative treatment. In addition, there was a concern about concomitant abdominal injuries that could go unnoticed. However, with the increasing experience in non-surgical treatment, the recognition that exploratory laparotomies caused significant morbidity, and the availability of higher-quality CT scans, non-surgical treatment became standard in the U.S. for adults in the mid-1990s. Angioembolization also began to be used as a tool for conservative treatment, and failure rates decreased from 13% to 2%.^{6–8}

While these trends in treatment have been published by international trauma centers, there are currently no adult studies in Spain that allow us to know the common practice of our hospitals. The purpose of this study is to determine the

splenic injury profile in the adult population of our country, its current treatment and results.

Materials and Methods

Study Design

Data were collected from the trauma records of 6 hospitals: Hospital Gregorio Marañón (Madrid) with its register since 1993, Hospital de Getafe (Madrid) since 2001, Hospital Doce de Octubre (Madrid) since 2003, Hospital Virgen de la Vega (Salamanca) since 2000, Corporació Sanitària Parc Taulí (Barcelona) since 2004 and Hospital de Torrevieja (Alicante) since 2007. From these databases, patients with splenic injury were analyzed.

Patients

We analyzed adult patients with severe abdominal trauma (Injury Severity Score, ISS>15) and splenic injuries found in the mentioned records. The cases were classified in accordance with the Abbreviated Injury Scale (AIS) for abdominal injuries (although one hospital did not provide these data as it was not recorded in its database).

We analyzed demographic data, mechanism of injury, AIS for the abdominal region, diagnostic methods, treatments and the results obtained. ISS was used to provide a general measurement of injury severity. Treatments were divided into 2 groups for analysis: surgical (splenectomy, splenic mesh repair, partial splenectomy) or conservative (angioembolization of the splenic artery and observation). Failure of

Table 1 – Epidemiology of Patients With Splenic Trauma.

Sex	
Males	448
Females	118
Type	
Blunt	94%
Penetrating	6%
Mechanism	
Car	267 (47%)
Motorcycle	89 (16%)
Vehicle vs pedestrian	44 (8%)
Precipitation	63 (11%)
Stab wound	25 (4%)
Firearm	5 (0.9%)
Other	73 (13.1%)
Associated lesions	
Extremities and soft tissue	409 (72.3%)
Thorax	351 (62%)
TBI	300 (53%)
Abdomen	231 (41%)
Facial trauma facial	102 (18%)
Spine	66 (11.7%)
Pelvis	63 (11%)

conservative treatment was defined as splenic bleeding requiring surgical intervention (regardless of when) after having initially indicated a non-surgical treatment.

Analysis

Categorical data are presented as absolute values and percentages. Continuous variables are presented as means and compared with the Mann-Whitney test. Comparisons between groups were done with the chi-squared test.

Results

In total, 566 patients with splenic trauma were registered in the available databases (Table 1): 448 were men and 118 women. Mean age was 36.6 years (range 15–90). 120 patients had prior medical co-morbidities (in order of frequency: hypertension, diabetes mellitus, heart disease and COPD), 187 had no notable medical history and in the remaining 259 this information was not available.

Most injuries were caused by blunt trauma (94%), and the most common mechanism of injury was traffic accidents (car 47%, bicycle 16%, vehicle vs pedestrian 8%) and the remainder were falls (11%), stab wounds (4%), gunshot wounds (0.9%) and a miscellaneous group (13.1%).

In order of frequency, the associated injuries were of the extremities and soft tissue (72.3% of patients), chest (62%), TBI (53%) (one of the hospitals did not treat patients with TBI due to lack of a neurosurgery department) and abdomen (41%), followed by less frequent facial (18%), spinal (11.7%) and pelvic (11%) trauma. Mean ISS of the series was 25.2.

Diagnostic tests included: CT in 432 patients (76%), eco-FAST in 146 (26%), peritoneal lavage aspiration in 14 (2.5%) and exploratory laparotomy in 3 (0.5%), which were performed depending on the patients' hemodynamic status, while in 6.9% of cases 2 tests (eco-FAST and CT) were performed.

Initially, the treatment was surgical in 56.6%, and in the remaining 43.4% treatment was conservative (Fig. 1). In the latter group, 6.5% of the patients finally required surgery and in 8.8% splenic angioembolization was done.

Of the patients who were initially treated surgically, in 85.3% splenectomy was performed, and spleen-conserving surgery (splenorrhaphy and mesh) was used in 14.7%, 4.6% of which failed and required reoperation with splenectomy.

As mentioned before, in one of the databases the abdominal AIS score was unavailable (45 patients). The remaining databases (521 patients, except for 4 patients for whom these data were not available) analyzed the treatment performed with the AIS (Table 2).

In 100% of patients with AIS 1, initial treatment was conservative, which failed in one patient (9.9%). For patients with AIS 2, conservative treatment was used in 75% of cases, with a failure rate of 7.7% and 4.6% died. In patients with AIS 3, conservative treatment was used in 35.7% of cases, 8.1% of which failed and 7% died. For the group of patients with AIS 4, we opted for conservative treatment in 21%, 7.7% of which failed, resulting in 15.4% deaths. None of the patients with AIS 5 was initially treated conservatively (one was not operated on before death).

Out of the patients who initially underwent surgery, conservative surgery was performed in 14.8%. In patients with AIS 2, splenectomy was initially performed in 77.3% of operated cases. In patients with AIS 3 who were initially

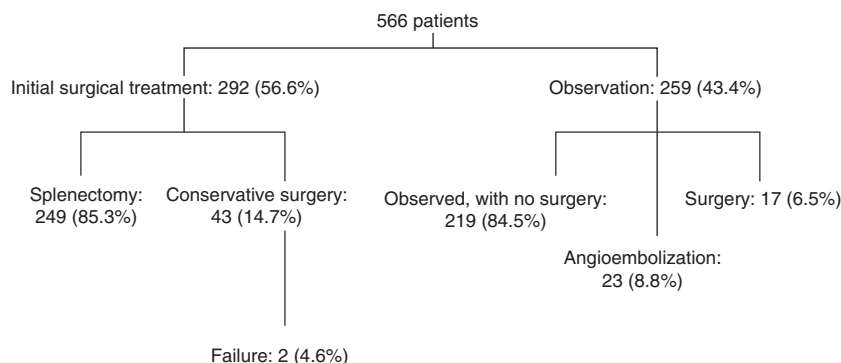
**Fig. 1 – Treatment of splenic lesions.**

Table 2 – Treatment Applied According to AIS Score.

Treatment	AIS 1 (patients)	AIS 2 (patients)	AIS 3 (patients)	AIS 4 (patients)	AIS 5 (patients)	AIS 6 (patients)
No surgery	11 (1 death, 1 failure)	130 (6 deaths, 10 failures)	86 (6 deaths, 7 failures)	13 (1 failure, 2 deaths)	1 (1 death)	
Surgery	0	44	155	49	25	3
Splenectomy		34	128 (15 deaths)	45 (10 deaths)	25 (8 deaths)	3 (3 deaths)
Conservative		10 (1 death)	27 (4 deaths, 1 failure)	4	0	

treated surgically, splenectomy was performed in 82.6%. In patients with AIS 4, splenectomy was done in 92%, and 100% of AIS 5 patients underwent splenectomy.

42.5% of patients had complications, the most frequent of which were pulmonary. 12.5% of patients (71 patients) died, with early death (<24 h) in 18 and late death in the remainder; these data were not available in 9 of the deceased patients. The main causes of death (in order of frequency) were exsanguination, CNS injury due to associated TBI and multiple organ failure.

Comparison Between Cases Treated Conservatively and With Splenectomy

The 2 main treatment groups (splenectomy and conservative treatment) were compared. Both presented differences in the ISS, but were not statistically significant ($P > .05$). Similarly, no statistically significant differences between centers were found.

Discussion

This is the first multicenter study of splenic injury treatment in Spain. Even though in the last decade there have been publications of a growing number of patients with splenic trauma treated conservatively, in our setting the application of this therapeutic modality is still timid compared with other series.⁹⁻¹⁴

In the year 2000, the Delphi Study on abdominal trauma in Valencia was published,¹⁵ which was written with the intention of reaching a consensus. In splenic trauma, the following conclusions were drawn:

- In hemodynamically stable patients, non-surgical treatment could be used.
- The control and follow-up of these patients should be clinical, analytical and supported by imaging tests (ultrasound and CT), but their frequency was not defined, nor was the reasoning behind this recommendation.
- Patients should be monitored in an intensive care unit or similar.
- There was a limit of blood units to be transfused to indicate laparotomy, regardless of other criteria.

After laparotomy was indicated:

- There was consensus on using spleen-conserving surgical methods.
- If this failed, there was agreement on attempting a partial splenectomy.

- There was consensus that splenic injury by firearm was an indication for surgery.

If we compare the opinions of surgeons surveyed 10 years ago with the results obtained in the present analysis of patients, it is noteworthy that the number of conservative treatments performed is low, and, likewise, that spleen-conserving surgery is almost anecdotal in the series and splenectomy was primarily used. In 2005, Louredo et al.¹⁶ published a study on the use of absorbable mesh in 6 patients (20% of a series where 76.6% of the patients underwent splenectomy). Three of them, however, had grade III and IV injuries, were hemodynamically stable, had no associated injuries, were younger than 65 and had required less than 3 units of packed red blood cells, so the indication for surgery in these 3 patients is questionable, as they may have been candidates for conservative management.

Similarly, after analysis, the limited use of angioembolization is striking when compared with the international literature. One of the probable reasons for this is that in Spanish hospitals there is a limited possibility of this procedure being performed in the emergency room. This makes angioembolization impracticable as a tool in the actual management of our patients, as only reference hospitals have it available. Barrio et al.¹⁷ published a series of patients with blunt splenic trauma in whom conservative treatment was used with angioembolization. This is a retrospective study that included 136 splenic injuries. Splenectomy was performed in 80% of patients, and the rest (presenting low-grade lesions) received conservative treatment. In stable patients, angioembolization was used in 8.5% due to active bleeding or splenic vascular injury seen on CT.

Conservative treatment is used to minimize the complications of surgery and possible sepsis that can threaten the lives of patients. However, contrary to international tendencies, this study seems to show that Spanish surgeons do not use conservative treatment in most patients; instead, they are treated surgically, and the predominant procedure is splenectomy, regardless of the degree of splenic injury. This could suggest that splenectomy is overused. Likewise, no correlation was found between AIS, ISS and type of treatment, although the trend in our country is for patients with AIS 1 and 2 to receive mainly conservative treatment, while patients with AIS 3, 4 and 5 are mostly treated surgically. Several recent studies suggest that patients with higher ISS more frequently undergo splenectomy.¹⁴ However, in our series, patients with low ISS were splenectomized, meaning that radical surgery was performed regardless of ISS. Furthermore, the decision not to operate may be influenced by poor prognosis or imminent death due to associated injuries, regardless of the AIS.

A study has been recently published¹⁸ in which 70 experts from 10 countries give their opinion on controversial issues in the management of splenic trauma. In this study, several scenarios are proposed:

1. *Stable patient with grade 2 injury and conservative treatment*–Most surgeons do not order any imaging tests before or after discharge, although it is noteworthy that European surgeons tend to repeat imaging tests before discharge.
2. *Grade 3 injury and failure of conservative treatment*–Only half would order a CT scan if the patient had clinical worsening (74% justify this by therefore being able to identify lesions that could be treatable with angioembolization). In this situation of conservative treatment failure, 69% would perform splenorrhaphy and 41% would do splenectomy.
3. *Grade 4 injury with arterial contrast extravasation and hemodynamically unstable patient*–35% would attempt angioembolization despite unstable hemodynamics (mainly Latin American surgeons), but most would not repeat the angioembolization if it failed.
4. *Low-grade injury in a senior patient*–97% think that age is not a contraindication for conservative treatment.
5. *Low-grade injury in a patient with severe TBI*–Two-thirds would try non-surgical treatment.
6. A considerable percentage of surgeons (38%), mostly Latin American, considered that *penetrating abdominal trauma* (either stab wound or firearm) is not a contraindication for conservative treatment if the patient is stable.

The major limitation of this study is that the data were obtained from hospitals that have a special interest in multiple-trauma patients. Therefore, the treatments may not reflect the global reality in Spain. In addition, the databases are different, so comparisons are not easy. Furthermore, the data from the literature are not comparable to ours because in Spain there is no trauma surgery specialty and training in this area is quite poor, although the introduction of courses such as ATLS and DSTC are contributing to improve proper management of polytrauma patients. Furthermore, in our country, resources differ between hospitals, so the therapeutic armamentarium is different depending on the hospital.

Conclusion

According to the databases analyzed, most patients with splenic trauma in Spain are young men involved in traffic accidents. This study suggests that conservative treatment is not frequently used in our country and that Spanish surgeons usually treat these patients surgically, the preferred approach being splenectomy. The use of conservative surgery and angioembolization as an alternative to splenectomy is practically anecdotal.

However, the current practice in Spain is not definable because there are no sufficient recorded data to know what is actually happening. In this context, it is necessary to create a national trauma registry that would enable us

to determine our true situation in polytrauma patient management and develop clinical approaches accordingly that are adapted to our hospitals. This would enable us to provide the best possible treatment in all cases, regardless of individual opinions or surgical decisions based on bad experiences in the past. Surgical treatment is a therapeutic modality that should be used under evidence-based criteria.

Conflict of Interests

The authors have no conflict of interests to declare.

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