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Review Article

Advances in Assessment and Management of Spleen Blunt Trauma in Emergency Room

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Abstract

Introduction: The spleen is considered one of the most common organs susceptible to damage in cases of abdominal blunt trauma. It is injured in up to 50% of all abdominal solid organ injuries. The late diagnosis of the spleen cases of abdominal blunt trauma (BSI) could cause many serious poor outcome and is associated with high mortality rates up to 18%.

Aim of Study: We conduct Narrative review to evaluate the current evidence on modern assessment, management and outcomes of BSI, mainly in adult population.

Methods: A comprehensive and systematic search was conducted regarding spleen blunt trauma, the updated methods of management, diagnosis, and treatment. PubMed search engine and Google Scholar search engine were the mainly used database. All relevant available and accessible articles were reviewed and included.

Conclusion: Worldwide, splenic injury represent about one-fourth of all blunt abdominal trauma cases. A very careful clinical sense, and a high level of suspicion beside many modalities of radiological imaging Aare needed in order to establish a diagnose and characterize splenic injuries. The usage of the radiological imaging modalities is very useful to choose between OM and NOM approach of management. There is an increasing shift from OM to NOM of splenic injuries; especially for the high grade splenic injuries with use of angioembolization.

Keywords: *Emergency Department; Spleen Trauma; Blunt Trauma; Focused Assessment with Sonography for Trauma*

Introduction

The spleen is considered one of the most common organs susceptible to damage in cases of abdominal blunt trauma. It is injured in up to 50% of all abdominal solid organ injuries [1]. The late diagnosis of the spleen cases of abdominal blunt trauma (BSI) could cause many serious poor outcome and is associated with high mortality rates up to 18% [2].

In order to establish a diagnosis of BSI, the physician need to have high suspicions regarding the mechanism of injury, clinical presentation and hemodynamic status of the patient at the time of presentation. Those mentioned aspects play a very important role in the decision of the management of the case. In abdominal trauma cases where the patient is hemodynamically stable, abdominal CT scan with IV contrast is considered the best test to detect BSI, associated injuries and evidence of contrast leakage into the abdominal cavity which indicates an active bleeding [3].

Findings of CT scans can also be used in grading the splenic injury and anticipating any possible complications. On the other hand, patients which are presented hemodynamically unstable, can be managed using Focused Assessment with Sonography for Trauma (FAST) and Diagnostic Peritoneal Aspiration and Lavage (DPA/DPL) in order to determine if the patient needs immediate urgent laparotomy [3].

Herein, we conduct Narrative review to evaluate the current evidence on modern assessment, management and outcomes of BSI, mainly in adult population. However, we will briefly comment on the management and success rate in comparison to pediatric population as well.

Methodology

A comprehensive and systematic search was conducted regarding spleen blunt trauma, the updated methods of management, diagnosis, and treatment. PubMed search engine (http://www.ncbi.nlm.nih.gov/) and Google Scholar search engine (https://scholar.google.com) were the mainly used database. All relevant available and accessible articles were reviewed and included. The terms used in search were: emergency department, spleen trauma, blunt trauma, Focused Assessment with Sonography for Trauma.

Discussion

Currently, there are many available modern radiological modalities playing a huge part in diagnosing and identifying different injuries of the spleen with high accuracy. And furthermore, deciding between the surgical or conservative ways in managing the different cases of splenic trauma [4].

Evaluation of splenic injuries

The role of different radiological modalities in the diagnosis of BSIs have been deeply studied and investigated. The type of radiological modality used in cases of abdominal trauma depends on the patients' hemodynamic status. Generally, FAST and CT scans are the most used radiological modalities in stable patients. In cases with unstable patients, non-invasive bedside FAST is considered to be the radiological modality of choice. It can detect intra-peritoneal hemorrhage and fluid collections, which require urgent exploratory laparotomy [5]. FAST scan is considered to be a highly sensitive test, with 98% sensitivity for abdominal fluid collections. However, it is considered operator dependent, and can be susceptible to human errors. Sometimes FAST scans are difficult to perform in cases with highly obese patients. A previous review found that ultrasound tests have a high probability of error, as it can miss up to 25% of intra-abdominal, hepatic and splenic injuries, when it is used alone [6]. Making a negative ultrasound test not enough to rule-out the possibility of intra-abdominal injuries. Therefore, leaving the underlying cause of the hemodynamic instability unknown. DPA/DPL is used in such cases [6].

In most cases, CT scan is considered as the diagnostic test of choice in hemodynamically stable patients [7]. CT scan is the main test to differentiate cases of BSI which can be managed non-operatively. The use of CT scan has raised the percentage of blunt scenic injuries managed non-operatively from 11% to 71%. The dual phase CT imaging technique was found to be more sensitive in detecting vascular anomalies and injuries [8]. However, CT scan has some limitations. It cannot be used to predict the complications and outcomes of blunt injuries, like delayed splenic bleeding or sub-phrenic abscess. And can underestimate the severity of the injury.

Many scoring systems have divided splenic injuries into many grades, in order to manage each grade of injuries properly. The American Association for the Surgery of Trauma (AAST) grade splenic injuries based on its appearance during surgery. Another grading system is

based on CT findings, which assess the injury based on the anatomical findings on the CT scan. However, the two previous grading systems cannot be used as a predictor for the success of the management plan and must be associated with many clinical parameters. The final decision of the management plan must be based on the grading system accompanied with a full clinical examination. In cases of BSI in hemodynamically stable patients, non-operative management is considered to be the most commonly used approach with increasing success rate, which can be due to the introduction of splenic artery angiography and embolization in cases with high failure risk [9]. In cases of grade III splenic injury, non-operative approaches were associated with success rate of 50%, with higher rates of failure associated with cases of higher grades of splenic injuries (IV, V), which must be managed surgically [10].

In a systematic review that studied 16,940 BSI patients, NOM was found to be the best way to manage minor splenic trauma of grade I and II. Moreover, more advanced BSI cases managed non-operatively were associated with decreased mortality rates [11]. While another multicenter study found the success rates of NOM of BSI patients to be decreased with injuries of higher grades [10]. Many studies found the BSI cases who were managed non-operatively without the use of angioembolization to have higher failure rates up to 83.1% according to the grades of BSI [12]. In cases of high grade BSI (more than level III) with positive CT findings splenic angioembolization must be done. Angioembolization must be considered as an important tool for splenic salvage in cases of NOM for grade IV/V BSI [13].

The absolute indications to perform angiography and embolization in cases of BSI included grades IV and V injuries in addition to the existence of perisplenic extravasation of contrast. While relative indications are considered to be lower injury grades (I-III), the presence of intrasplenic injuries on CT scan, and the development of hemoperitoneum and decreased hemoglobin levels [14].

Many factors were found to affect the success of NOM in BSI patients, With the failure rate ranging between 6 and 20% based on different factors, such as age of the patient, ISS, the grade of the injury, embolization frequency, and the patients selection criteria. In a retrospective study of 3085 BSI patients; the failure of non-operative approach was associated with advanced age, low admission blood pressure, higher ISS, and prolonged hospital stay [15].

Due to the recent advanced imaging techniques and quality, about 80% of injuries in solid organs are managed non-operatively especially liver and spleen with successful rates up to 80%. Nevertheless, there is increasing concerns that the missed associated injuries are associated with increased mortality rates in cases managed by NOM [16]. Of note, in pediatric population, Morse., et al. studied 120 cases of BIS who underwent successful NOM, with no risk on associated other injuries [17].

Operative management (OM)

Historically, more than half of BSI cases were managed surgically and required OM [3]. Recently, the indications for operation are failed NOM and hemodynamic instable patients [18]. Even in cases of surgical operation, the spleen is usually preserved in cases of hemodynamically stable patients and a formal splenectomy is rarely performed. Spleen preserve techniques include the usage of topical hemostatic agent like fibrin glue, which was found to be associated with successful splenic salvage. in cases of splenic laceration, Partial splenectomy is performed. While in cases of high Grade injuries of the spleen, and cases of multiple lacerations, absorbable mesh is used to save the spleen [19]. While a total splenectomy is performed in cases of associated organ injuries and hemodynamic instable patients [18].

Many studies investigated the use of NOM in children with BSI. Conservative non-operative management of BSI were found to be the best approach in this population [20].

Complications of NOM and OM

In cases of NOM, the major concerns include; the existence of an associated abdominal injuries, delayed hemorrhage, blood born infections, pseudo-aneurysm, pseudo-cysts and abscesses [21]. Louredo., et al. found that the incidence of post-operative complications was associated with missed associated injuries, age, indication for surgery and the time interval [22]. In cases of splenic trauma,

recommendations to prevent post-operative infections including early vaccination, antibiotic prophylaxis, early intervention and patients education [23]. Some recent guidelines suggest lifelong prophylaxis [23].

Mortality

Worldwide, mortality rates secondary to BSI ranges from 7 to 18% of all cases [2]. However, it is considered challenging to estimate the precise incidence of BSI related mortality; as some patients died instantly at the site of the trauma, while, others died due to severe associated injuries [24]. Some studies reported the mortality rates to be lower in OM group comparing to NOM in high grade BSIs. In a recent systematic review a significantly lower mortality rate was reported with NOM (4.78%) as compared to OM (13.5%) in BSI patients. Making the selection of the management technique a very important decision with significant effect on the mortality rates.

Summary and Conclusion

Worldwide, splenic injury represent about one-fourth of all blunt abdominal trauma cases. A very careful clinical sense, and a high level of suspicion beside many modalities of radiological imaging Aare needed in order to establish a diagnose and characterize splenic injuries. The usage of the radiological imaging modalities is very useful to choose between OM and NOM approach of management. There is an increasing shift from OM to NOM of splenic injuries; especially for the high grade splenic injuries with use of angioembolization.

Therefore, further studies are needed to establish a guideline to help physicians to choose between NOM and OM in the different cases of splenic trauma. As the careful selection of NOM is associated with a lower rate of morbidity and mortality regardless of the grade.

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