NONOPERATIVE MANAGEMENT FOR SPLENIC LESIONS IN POLYTRAUMATIZED PATIENTS – CASE REPORT AND LITERATURE REVIEW

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ABSTRACT

Introduction. Nonoperative management (NOM) of blunt splenic injuries was first used in the 1970’s for pediatric patients. The high rate of overwhelming post-splenectomy infection (OPSI) in children determined the shift of medical attitude to NOM. In the 1990’s it was seen the beginning of NOM for adults. Nowadays, NOM of blunt injury of the spleen (BST) in adults has become the standard of care in hemodynamically stable patients, and is well established by the 2012 EAST guidelines, along with AAST splenic lesion classification. It is highly successful, with an overall failure rates ranging from 2% to 31% (average 10.8%), the majority of failures occurring in the first 24 hours. Currently, NOM for splenic trauma includes splenic artery embolization (SAE).

Case report. We present a case of a 50 year-old woman, brought to the emergency room by ambulance after being involved in a traffic accident as a pedestrian. Initial diagnosis on admission was bilateral hemopneumotorax and pulmonary contusions, with diagnosis of a subcapsular hematoma after admission, during a routine ultrasound checking. A less severe pathology (without pulmonary lesions, for example), associated with initial failure of FAST and CT to discover the

RéSUMÉ

Introduction. Gestion non opératoire des lésions spléniques chez les patients polytraumatisés – rapport de cas et revue de la littérature

Introduction. La gestion non opératoire (NOM) de la lésion contondante de la rate a été utilisée pour la première fois dans les années 1970 pour les patients pédiatriques. Cela s’explique parce que le taux élevé d’infection accablante post-splénectomie (OPSI) chez les enfants a déterminé le changement de l’attitude médicale à NOM. De nos jours, la NOM de la lésion contondante de la rate (BST) chez l’adulte est devenue la méthode standard de soin chez les patients hémodynamiques stables et elle est bien établie par les lignes directrices de l’EAST en 2012, ainsi que par la classification des lésions spléniques de l’AAST. Le taux de défaillance globale est très élevé, passant de 2% à 31% (10,8% en moyenne), avec la majorité des échecs ayant eu lieu au cours des premières 24 heures. Actuellement, la NOM pour le trauma splénique comprend l’embolisation de l’artère splénique (SAE).

Rapport de cas. Nous présentons le cas d’une femme de 50 ans qui a été amenée à la salle d’urgence par
presumable but not yet formed splenic lesion, could have been leading to non-admission or very early discharging of the patient, with consecutive life-threatening evolution. Ultrasound monitoring was the key factor in blunt splenic trauma diagnosis, and finally led to successful nonoperative management (NOM) of the lesion.

**Discussion.** The association with extra-abdominal lesions initially appeared to complicate the NOM decision, but proved actually to be more like a factor in favor of surgical nonintervention. Consecutive ultrasound evaluations offered important data about integrity of the splenic capsule, by revealing the absence of free fluid in the peritoneal cavity. In our case, the rather slow progressive evolution of hematoma during 72h could have prevented the rupture of splenic capsule and consecutive surgery, leading to a successful NOM at the end.

**Conclusion.** Nonoperative management of BST, by preserving the spleen, is the treatment of choice in hospitals with trained trauma surgical team, ICU and potential of monitoring by imaging investigation. In patients with NOM for BST, association of extra-abdominal injuries does not have different outcome than in case of unique organ involvement. Angiography with splenic artery embolization (SAE) is an important method for increasing the success rate of NOM, especially in splenic injuries grades IV and V.

**Keywords:** spleen, blunt trauma, conservative approach.

**Introduction**

Trauma is a major cause of death in people aged under 45 years, and second only to cancer and cardiac disease in all age groups. The spleen is one of the most commonly injured intra-abdominal organs, and along with extensive hepatic trauma, is the most common and yet life-threatening cause of hemoperitoneum. Nowadays, the importance of spleen as a component of the immune system cannot be ignored. For performing CT scans in patients with blunt abdominal trauma, these patients should be hemodynamically stable. Many patients can be treated with conservative measures, if they are monitored in a trauma center where immediate operative intervention is available.

Focused assessment with sonography in trauma (FAST), along with diagnostic peritoneal lavage...
(DPL), cannot entirely rule out an intra-abdominal bleeding. In case of a hypotensive patient, a positive result for either of the above is an indication for immediate laparotomy, as well as patients who require more than four units of blood during 48 hours.

CT scan helps the trauma surgeon to successfully select patients for nonoperative management (NOM) of splenic blunt lesions (BST). Whole-body CT scan has become the gold standard diagnostic approach in blunt polytrauma, CT grading system proving to be better than AAST system in predicting which patients with blunt splenic trauma need NOM, splenic artery embolization (SAE) or surgery.

Senn, in 1903, was the first to describe NOM for spleen lesions, later followed by Kocher, who advocated for surgery due to high mortality of NOM. NOM was first used in the 1970’s for pediatric patients with BST. The high rate of overwhelming post-splenectomy infection (OPSI) in children determined the shift of medical attitude to NOM.

In the 1990’s it was seen the beginning of NOM for adults. Nowadays, nonoperative management of blunt injury of the spleen in adults has become the standard of care in hemodynamically stable patients, established in 2012 by EAST guidelines. It is highly successful with overall failure rates ranging from 2% to 31% (average 10.8%), with the majority of failures occurring in the first 24 hours. Currently, NOM for splenic trauma includes splenic artery embolization (SAE).

**CASE PRESENTATION**

We present the case of a 50 year-old woman, brought to the emergency room by ambulance after being involved in a traffic accident as a pedestrian.

The clinical signs and symptoms at presentation were: blood pressure 90/60 mmHg, oxygen saturation in breathing air 82%, with complaints relating to dizziness, lack of air, bilateral thoracic pain augmented by air intake. Immediate chest X-ray in the ER revealed bilateral hemopneumothorax due to multiple bilateral costal fractures (Fig. 1). FAST examination did not show free fluid in peritoneum or any post-traumatic pathological aspects of the intraperitoneal organs.

The hemodynamically stable patient was rushed to contrast CT, with the following results: bilateral pulmonary contusions, costal fractures from C3 to C11 left and C8 right, and more important, a bilateral hemopneumothorax (Fig. 2). Abdominal computed tomography examination still did not show any post-traumatic lesions at this level, or free intraperitoneal fluid (Fig. 3).

Laboratory tests were within normal range, with initial values of hemoglobin 11.8 g/dL and 230,000/mm³ platelets.

The patient was rushed to operating room and underwent bilateral minimal pleurotomy with pleurostomy, that evacuated 300 ml of blood from left pleura and 200 ml from the right one. Immediate postoperative hemoglobin value was 10.2 g/dL.

Next day, a routine abdominal ultrasound examination revealed a small splenic subcapsular hematoma (Fig. 4), soon after being confirmed by contrast CT scan.

Taking into consideration the hemodynamical stability of the patient and the level of hemoglobin, the medical team decided for NOM, after informed consent of the patient and explanation of the risks and benefits of non-surgical intervention.

In the next days, consecutive abdominal ultrasoundography showed a progressive growth of splenic hematoma, up to a maximum of 8/3 cm in the 5th day, without free intraabdominal fluid (Fig. 5,6). Therefore, splenic lesion was categorized in grade II splenic injury, according to the American Association for the Surgery of Trauma (AAST) scale. Hemoglobin levels monitoring ranged between 9 and 10 g/dL.

From the 3rd day, the levels of platelets started to...
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Figure 3. Spleen integrity. CT scan on admission

Figure 4. Ultrasonography – day 2.

Figure 5. Ultrasonography – day 3.

Figure 6. Ultrasonography – day 5.

Figure 7. Follow-up ultrasonography.

Figure 8. Follow-up ultrasonography.
increase, up to 700,000/mm$^3$ maximal value in the 10th day, most probable due to parenchymal compression and consecutive inhibition of splenic functions.

In the 8th and 9th day, both left and right pleural drainages were suppressed.

The patient was discharged in the 14th day, with the following recommendations: avoidance of lifting weights, no physical effort for 6-8 weeks, and only light activities for 4 weeks after discharge, along with regular medical and ultrasound examinations for a period of 8 weeks.

During the follow-up period, ultrasound examinations have showed that the dimensions of the splenic hematoma slowly decreased, with fibrous changes over the weeks. (Fig. 7,8,9).

Two months after hospital discharge, the dimension of splenic hematoma was only 2/1 cm (Fig. 10) and the thoracic X-ray examination was normal (Fig. 11).

**Discussion**

First medical interventions in patients with blunt splenic trauma (BST) are focused on airway, breathing and circulation (ABC), as the primary survey of trauma evaluation.

Abdominal CT scan evaluates potential trauma of internal abdominal organs, in the presence of hemodynamic stability. At this point, if the patient has a splenic lesion, it is graded accordingly by AAST splenic injury scale (Table 1).

The patient should be admitted and monitored 24 hrs/7 days, if recurrent bleeding develops after a period of stability, and trauma surgeon should be available for immediate surgery.

NOM represents the gold standard treatment for minor and mild splenic trauma. NOM of BST, by preserving the spleen, is the treatment of choice for the American Association for the Surgery of Trauma’s grades I and II and are detailed by EAST Guidelines for Nonoperative management of blunt splenic injury (2012)$^9$.

The standard criteria for NOM are the following (with the only absolute contraindication represented by hemodynamic instability): blood transfusions ≤ 4 units; age <55 years; CT splenic lesion, hemodynamic stability$^2$. 

![Figure 9. Follow-up ultrasonography.](image)

![Figure 10. Ultrasonography follow-up two months after discharge.](image)

![Figure 11. X-ray follow-up two months after discharge.](image)
Sartorelli et al proved that associated extra-abdominal injuries are considered with no different outcome for NOM than in case of unique organ involvement. In our case, a less severe pathology (without pulmonary lesions, for example), associated with initial failure of FAST and CT to discover the presumable but not yet formed splenic lesion, could have been leading to non-admission or very early discharging of the patient, with consecutive life-threatening evolution. Ultrasound monitoring was the key factor in discovering the splenic lesion, and led to successful NOM. This case confirms once again the Garber’s observation that chest injuries are the most frequent associated lesions (77%), followed by head injuries (59%). Nonetheless, failure to recognize an associated injury can be catastrophic for the evolution of the patient. Successful NOM in adults ranges between 61.5% and 97%, according to different studies. In our case, the rather slow progression of hematoma (around 5 days until maximum dimension), may have prevented the rupture of splenic capsule and consecutive surgery, leading to successful NOM. The association with extra-abdominal lesions seemed to complicate the NOM decision, but proved in fact to be more like a factor in favor of surgical nonintervention. Anyway, the medical management was decided after informed consent of the patient, with thorough explanations of the risks and benefits of NOM. Thrombocytosis in our case was the result of splenic hypofunction due to hematoma compression of splenic parenchyma, and returned to normal limits within 10 days.

Repeated ultrasound evaluations add important information about integrity of the splenic capsule, by constant revealing the absence of free fluid in the peritoneal cavity. Currently, NOM for splenic trauma includes splenic artery embolization (SAE). It is proven that successful SAE can eliminate the need for surgical intervention even for high grade splenic injuries. A meta-analysis of 10,157 patients that underwent NOM for blunt splenic injury showed that failure rate for grade IV was 43.7% without SAE and 17.3% with SAE, and failure rate for grade V was 83.1% without SAE and 25.0% with SAE.

There is also a debate about the splenic immune function suppression after SAE, that seems to depend on technique, blood vessel size and long-term development of collateral circulation. Current studies do not consider vaccination necessary after SAE for splenic trauma, although a large splenic infarction after proximal embolization may appear, simulating a surgical splenectomy. The high rate of overwhelming post-splenectomy infection (OPS I) with bacteria such as Streptococcus pneumoniae, Neisseria meningitis, and Hemophilus influenza in children determined the shift to NOM. Many studies have established the increased risk of infection in splenectomized patients. Although the incidence of OPSI is low in the adult population, its mortality exceeds 50%. This explains why 99.2% of US and Canadian trauma surgeons vaccinate their splenectomized patients, though only 56% of them routinely gave all three type of vaccinations.

**CONCLUSIONS**

NOM of BST, by preserving the spleen, is the treatment of choice in hospitals with trained trauma surgical team, ICU and potential of monitoring by imaging investigation. Associated extra-abdominal injuries are considered to have the same outcome as for patients with
NOM for BST than in case of unique organ involvement.

Angiography with splenic artery embolization (SAE) is an important method for increasing the success rate of NOM, especially in case of grade IV and V of splenic injuries.

In order to minimize morbidity or mortality associated with blunt splenic injury in adults, guidelines should be strictly followed and careful classification and monitoring of the lesion should be made correctly.

Systematic control must be scheduled before a patient’s discharge, and repeated until healing is complete. This follow-up is essential as it allows monitoring of the evolution of splenic hematoma or detection of the onset of a common late complication such as pseudo-aneurysm. Ultrasound remains a reliable, affordable and noninvasive method of monitoring these patients. In case of failure of NOM, splenectomy remains a life-saving measure for many patients with ongoing hemorrhage, and exploratory laparoscopy is the method of diagnosis that should be used whenever a suspicion of other associated lesions is raised.

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**Conflict of interest:** nothing to declare

**REFERENCES**


