

## IV. PEDIATRIC SURGERY

### DIAGNOSIS AND TREATMENT OF BLUNT SPLEEN TRAUMA

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#### Abstract

The consequence of a serious accident in children is represented by a triad associated with closed cranial injuries, abdominal or thoracic lesions and long bone fractures (9). Spleen is the most involved intraperitoneal organ in closed abdominal traumas (1,8). Splenic lesions can be isolated or may be associated with other abdominal organ lesions. Sonography and CT are the most useful diagnostic methods which reveal the presence and extension of the splenic lesions.

**Key words:** spleen trauma, sonography, nonoperative therapy

#### Introduction

The therapeutic concept in abdominal injuries, especially those of the parenchymatous organs, has dramatically changed in the last 25 years (2,3,9). The new therapeutic tactics are strictly conservative and has been possible due to the spectacular progress in the imagistic, particularly speaking of sonography and CT.

#### Material and method

This is a retrospective study of patients with splenic injury treated in our service from May 1990 until May 2000. During this period, 27 patients were admitted with splenic lesions, with 10 of them having one or more associated major lesion: pulmonary lesions – 6 patients, fractures – 5 patients, hepatic lesions – 4 patients, cranial injury – 2 patients, pancreatic rupture – 1 patient and renal rupture – 1 patient. The patient age group was confined to 5-15 years, with 16 male patients and 11 female patients. Based on etiology, most of the injuries took place during sport practice – 10 cases, followed by road accidents – 8 cases (pedestrians - 5 cases), fall from a height – 7 cases, other causes- 2. Majority of the patients (n =23) benefited of medical assistance while on their way to our hospital, 2 of whom were brought

intubated, while the other 4 patients were 4 patients were transported by there guardians. During admission in our clinic, 15 patients were hemodynamically stable, 11 were in critical state in hypovolemic shock, while one patient was brought in moribund state. Clinical examination and simultaneous re-equilibration measures were done in 11 patients who required it. The severely critical patient (with splenic and hepatic injury) was immediately transferred to the operating room.

Emergency Sonographic Examination (ESE) was done in 22 patients (all the 15 hemo-dynamically stable patients initially had only sonographic examination), while emergency CT in 15 patients (all 11 hemodynamically instable patients had emergency CT, 7 of these also had ESE). At the ESE, lesions were identified in 18 patients (81%) while at CT in 14 patients (93%). Grade IV lesions (CT classification grade I-IV) was present in 3 patients, while other 7 patients had grade III splenic lesions.

All patients with grade III and IV lesions, all hemodynamically instable patients and those with multiple lesions were at first admitted in the intensive care unit. 8 patients required blood transfusion, in volume ranging until 30ml/kg body weight. Only 2 of the 27 patients were surgically treated: the patient brought in moribund state was discovered intra-operative having both the hepatic lobes destroyed with lesions of the large veins of the liver as well as splenic rupture, while another patient had splenic fragmentation. In the latter patient, correction consisted in “approximation” of the fragmented spleen and wrapping it in a vicryl bag.

All patients, except the one who died, were followed up in evolution: clinically, the blood parameters and imagistic. Sonographic follow up was performed in all patients while CT follow up was performed only.

## Results

Only a single death was noted: the patient brought in moribund state who died on the operating table. Evolution of all other patients was favorable, without any evidence of complications related to splenic lesions. Three of the patients with pulmonary lesions necessitated pleural drainage. One patient with epidural hematoma was bored, the hematoma evacuated and the hemostasis applied, with progressive evolution without any complications. Bed rest was sustained over a variable period: 2 days in operated patients, 10-14 days in majority of patients, 14-21 days in patients with grade III and IV lesions. Discharge of patients was done after having a hemotocrite balance approximately around 7 days. Sports were restricted for a period of 2-3 months from the accident. After the discharge, the patients were followed up clinically and imagistic in our service or other clinical units until the disappearance of lesions.

## Discussions

The high incidence of infections after splenectomy has been described in numerous publications (7). The risk of sepsis after splenectomy lies between 0.5 and 20%. The risk is higher in patients under 4 years and in most of the cases in the first 2 years after splenectomy (6). On the other hand, the current diagnosis possibilities (sonography and CT) and monitoring of patients with lesions of the parenchymatous organs have made it possible in the last many years to avoid a surgical treatment in majority of patients. More than 90% of our patients were subjected to conservative treatment.

Evaluation of patients with abdominal injury can be a difficult task for the physician (5). Splenic lesions should be suspected in patients with generalized abdominal pain or pain in the left hypochondria associated with rigidity in the superior abdominal quadrant (left) and sometimes with the pain radiated to the left shoulder. Shock can be present in proportion of over 40%. In our series, 11 patients presented with shock, while another patient was brought in moribund state. Sonography is the elective imagistic tool for the paraclinical diagnosis in stable patients. Even if the lesions are not discovered in all patients at ESE, the percentage of positive results (sonographic diagnosis of the lesion) nears 100% at repeated examinations at day's 1-2 post admission. In hemodynamically unstable patients, CT with contrast substance is the obligatory examination. This examination reveals lesions in more than 90% of the cases and generally provides information more exact than sonography in

the diagnosis of associated lesions. After ascertaining the examination mode, sonography is also indicated in these patients (easily accessible, cost effective, absence of radiations could be repeated at short intervals). Our entire grade III-IV patients – grade classification I-IV (7) – were identified at the first imagistic examination. It must be mentioned that in some patients ESE determined lesser severity of lesions than the actual grade. The final extension of the lesions was correctly identified either by CT performed immediately after sonography (unstable patients) or by repeating the sonography (in stable patients) at days 2 or 3 post admission.

Effusion with peritoneal lavage (EPL) can be avoided in children when sonography and CT examination s are at hand. Rothenberg (5) published a study which showed that laparotomies done for abdominal traumas based on the results of EPL were futile in proportion of 67.5%. EPL retains its indication in multiple trauma cases when the associated lesions require urgent therapy due to shortage of time for CT.

Indications for surgical treatment are recommended in the following cases: requirement of blood transfusion exceeding amounts of more than 50% of patient's total blood volume, persistent hypotension or evidence of significant continuous hemorrhages, associated lesions that require surgery. In our series, 10 patients had grade III and IV lesions: of these only 2 were operated, while 9 required blood transfusion reaching amounts of 30ml/kg body weight. Others were stabilized by intravenous infusion of hydro-electrolyte solutions and macromolecule solutions. Bed rest was maintained over a variable period, the criteria being stabilizing hematocrite and hemoglobin and improvement in the sonographic image and from this moment another 7 days of bed rest. After this period, the patients were mobilized and were discharged the same day or the day after. American authors have suggested that hospitalization can be reduced without any negative influence on the results: patients can be discharged in 5 days after stabilizing the hematocrite (9).

In conclusion, the standard treatment of isolated splenic lesions should be the conservatory treatment in 90% of the cases. The approach should be different in cases of the presence of associated lesions which require surgery. The paraclinical examination of choice in stable patients remains sonography in cases of emergency as well as for follow up in evolution while CT examination has an absolute indication in unstable patients.

## References

1. Almond PS, Arensman RM. Abdominal trauma in children in „Pediatric Trauma: Initial care of the Injured Child“, Raven Press, Ltd., New York, 1995, pg. 77-97
2. Iuchtman M, Alfici R, Sternberg E, Trost L, Litmanovitch M. Multimodality management in severe pediatric spleen trauma. *Isr Med Assoc J* 2000, 2: 523-5
3. Lakhoo K, Bass DH, Cywes S. Blunt splenic trauma in children. *S Afr J Surg* 1991, 29: 108-9
4. Rothrock SG, Green SM, Morgan R. Abdominal trauma in infants and children: prompt identification and early management of serious and life-threatening injuries. Part II: Specific injuries and ED management. *Pediatr Emerg Care* 2000, 16: 189-95
5. Rothenberg S, Moore EE, Marx JA, Moore FA, McCroskey BL. Selective management of blunt abdominal trauma in children--the triage role of peritoneal lavage. *J Trauma* 1987, 27: 1101-6
6. Rowe MI, Fonkalsrud EW, O'Neill JA, Jr, Coran AG, Grosfeld JL. Abdominal and genitourinary trauma in „Essentials of Pediatric Surgery“, Mosby, St. Louis, 1995, pg. 197 – 213
7. Scorpio RJ, Wesson DE. Splenic Trauma in „Pediatric Trauma“, Mosby, St. Louis, 1993, pg. 456-463
8. Shoham N, Sweed Y. Abdominal trauma in childhood—the conservative approach in 95 cases. *Harefuah* 1999, 2: 672-7
9. Stylianos S. Controversies in abdominal trauma. *Seminars in Pediatric Surgery* 1995, 4: 116-9

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