"OVIDIUS" UNIVERSITY FROM CONSTANTA
DOCTORAL SCHOOL OF MEDICINE
THE FIELD OF MEDICINE
UNIVERSITY YEAR 2024

NEWS IN THE DIAGNOSIS AND TREATMENT OF TRAUMATIC RETROPERITONEAL HEMATOMA

ABSTRACT DOCTORAL THESIS

PhD supervisor :
PROF. UNIV. Dr. SÂRBU VASILE

PhD student: **FILIP DANIEL CIPRIAN**

CONSTANTA

CONTENT

The doctoral thesis is composed of two parts: the general part (53 pages) made up of 5 chapters in which the current state of knowledge that presents data on the anatomy of the retroperitoneal space, the diagnostic and therapeutic management of traumatic retroperitoneal hematoma (TRH) and a special part (220 pages), divided into three distinct studies that analyze the group of patients with TRH in a general perspective (study 1), then the associated abdominal visceral lesions (study 2) and lastly, the associated lumbo-pelvic bone lesions (study 3) to which 240 bibliographic references and annexes are added. This summary selectively reproduces the iconography and bibliography from the thesis, respecting the numbering and content of the thesis in extenso.

Key words: traumatic retroperitoneal hematoma, associated visceral injuries, associated bone injuries, surgical treatment, conservative treatment.

INTRODUCTION

Traumatic retroperitoneal hematoma is a clinical entity of an acute and urgent nature. Thus, all patients brought to the Emergency Department with traumatic injuries secondary to road accidents or falls from another level, benefited from a quick and efficient assessment. Due to the urgent nature of this pathology and the associated comorbidities, often the clinical evaluation is rather brief, giving way to the paraclinical evaluation, especially the imaging one, or in the most severe cases, directly to the surgical evaluation through exploratory laparotomy.

The main objective of the current study is to develop a modern diagnostic and prognostic algorithm for retroperitoneal hematoma, based on patient characteristics, associated symptoms, biological parameters and imaging investigations, available in Romanian hospitals. We hope that through this study, we will update the data currently available at the national level, regarding traumatic retroperitoneal hematoma, in such a way as to allow the optimization of the management protocols of polytraumatized patients with suspicion of posttraumatic retroperitoneal hematoma, brought to the Unit of Emergency Department.

The secondary objectives pursued:

- evaluation of the pathophysiological aspects of posttraumatic retroperitoneal hematoma, as well as associated complications;
- development of a stratification algorithm for patients with traumatic retroperitoneal hematoma;

- identifying patients at high risk of complications or death;
- identification of predictors for medium-term survival;
- optimization of interactions within the entire team, which cares for the patient with retroperitoneal hematoma, sometimes, multiple clinical and surgical disciplines being involved.

MATERIALS AND METHOD

The current doctoral thesis presents a unicentric, observational, retrospective study that evaluated patients with traumatic retroperitoneal hematoma, hospitalized consecutively in the "St. Andrei" County Emergency Clinical Hospital (SCJU) in Constanta, between January 1, 2017 and December 31, 2020 The registration and data collection was carried out with the help of the inpatient management programs: Charisma (between January 1, 2017 and April 30, 2017) and, subsequently, Hippocrates (from May 1, 2017 until the end of the study).

Inclusion and exclusion criteria

Patients of any age, hospitalized were included in this study, in consecutive order:

- diagnosed retroperitoneal hematoma (hospitalizations for re-evaluation were not taken into account);
- traumatic etiology of retroperitoneal hematoma;
- imaging (computed tomography - CT) or intraoperative (exploratory laparotomy) confirmation of the retroperitoneal hematoma.

The exclusion criteria consisted in the presence of at least one of the following:

- death at the scene of the accident, during transport or in the Emergency Reception Unit;
- uncertain etiology of the retroperitoneal hematoma, or its spontaneous character;
- re-evaluation of a patient with previously diagnosed traumatic retroperitoneal hematoma; absence of data in the hospital's database.

Given that the patients included in the study were only those discharged from SCJU, the ICD-10 code "S36.83" (Retroperitoneum lesion) was used to identify patients with lesions described at the level of the retroperitoneum, from the management program of hospitalized patients , subsequently refining the search using the code "K66.1" (Hemoperitoneum), to identify

patients with hemoperitoneum. Among them, the patients who met the additional inclusion criteria (traumatic cause and imaging confirmation) were selected.

RESULT

Between January 1, 2017 and December 31, 2020, 295 patients with the diagnosis of retroperitoneal hematoma, confirmed by imaging (CT) or intraoperatively, were admitted to the Emergency County Clinical Hospital "Sfântul Apostol Andrei" in Constanta. Among them, there were 256 unique patients with post-traumatic retroperitoneal hematoma etiology.

Blunt traumas were most frequently due to road accidents (51.4%), of which, in 76.6% of cases, the person was on board a vehicle, and in 23.4% pedestrians involved in the crash. Other causes of blunt trauma, in order of frequency, were falls (35.7%), followed by crushing in 13 cases (5.1%) and assaults with blunt objects in only 11 cases (4.4%) . Other causes of blunt trauma were found in 8 cases (3.2%) and included ship or railway accidents - **Fig. 1.**

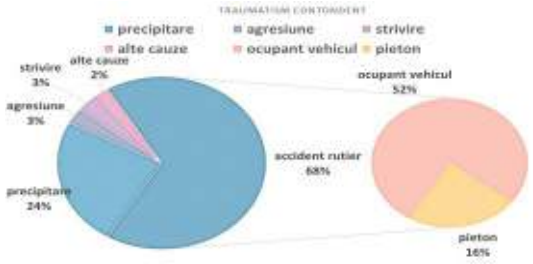

Figure 1. Distribution of types of blunt trauma, according to the frequency of the causative mechanism of TRH. Patients involved in road accidents were further divided into vehicle occupants and pedestrians.

In the current cohort of TRH patients, abdominal visceral lesions were most frequently described (62.5%), followed by pulmonary (42.0%), cerebral (20.7%) and, in a number less, other injuries (muscular, mesenteric, main bile duct injuries, spongy body laceration, urethral rupture, etc. – 4.3%) – **Fig. 2.**

Figure 2. Segmental distribution of TRH-related visceral lesions in the study group.

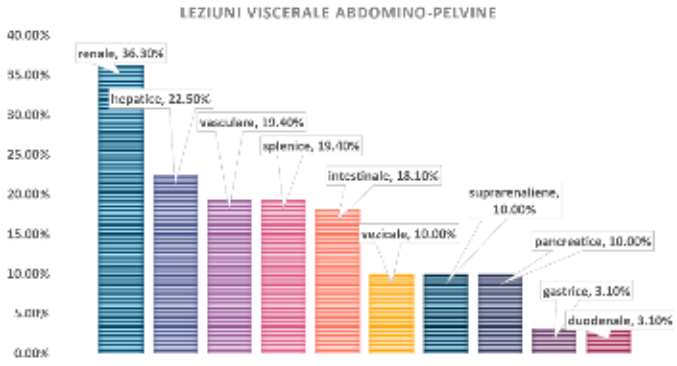

Figure 3. Frequency of organ damage in patients with visceral injuries in TRH.

Regarding the severity of the injuries of each organ, we mention the following distribution:

• grade I liver damage – 11.1%, grade II – 33.3%, grade III – 36.1%, grade IV – 13.9% and grade V – 5.6%;

• splenic lesions grade I – 35.5%, grade II – 22.6%, grade III – 16.1%, grade IV – 12.9% and grade V – 12.9%;

• pancreatic injuries grade I – 62.5%, grade II – 25.0%, grade III – 6.3% and grade IV – 6.3%;

• grade I kidney damage – 19.0%, grade II – 31.0%, grade III – 25.9%, grade IV – 15.5% and grade V – 8.6%;

• grade I adrenal gland injuries – 68.8% and grade II – 31.3%;

• bladder injuries grade I – 50.0%, grade II – 37.5% and grade III – 12.5%

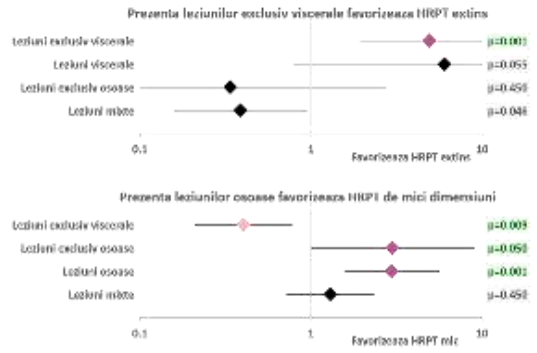

Figure 4. The presence of exclusively visceral lesions favors the formation of extensive TRH, while the presence of exclusively bone lesions favors small (small or medium) TRH.

We note statistically significant differences in mean ISS score (expressed by median) in terms of TRH dimensions: small – 19 points, medium – 26.5 points, large – 22 points and massive – 34 points, p=0.007 – **Fig . 4.** Thus, extensive TRH (medium, large or massive) had a median ISS value of 27 points compared to 19 points for small TRH (p=0.010).

The patients hospitalized with TRH were evaluated in different sections of the hospital: 28.1% in the Orthopedics-traumatology section, 21.9% in General Surgery, 14.5% in Thoracic Surgery, 12.1% in Urology, 10.9% in Neurosurgery, 4.3% Pediatric surgery, 2.3% in clinical departments (Cardiology, Gastroenterology, etc.) and 0.8% in the Plastic surgery department.

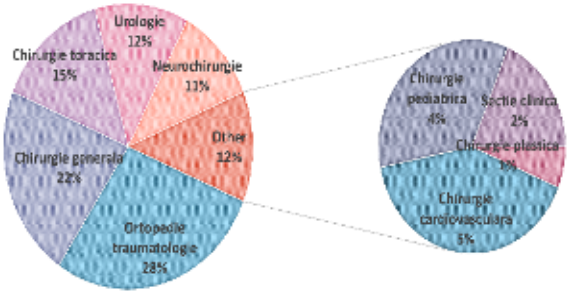

Figure 5. Distribution of patients with TRH according to the department from which they were discharged.

Regarding the management of patients with TRH, 51.6% were treated conservatively, 48.0% surgically and 0.4% interventionally . Of the entire cohort, only 14 patients (5.5%) required transfer to another care center. The median duration of hospitalization was 7 days, longer for patients with surgical management (9 vs 5 days, p<0.001) – **Fig. 6.**

The conservative treatment involved the administration of pain relievers, anti-inflammatory, anticoagulant, antibiotic and possibly orthopedic treatment.

Surgical treatment included the following interventions: surgical stabilization of a fracture (21.1%), enterectomy (16.9%), enterorrhaphy (15.3%), nephrectomy (12.1%), splenectomy (11.3%) , stabilization of fractures on external fixator (10.2% - of which 68.4% pelvis and 64.3% limbs), aortoplasty (9.7%), hepatorrhaphy (6.5%), cystectomy (6.5%) , gastrectomy and cavoplasty (2 patients each – 1.6%), respectively phrenoraphia in the case of a single patient (0.4%) – **Fig. 7.**

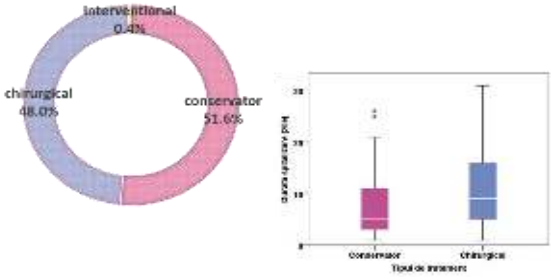

Figure 6. Distribution of patients according to the type of treatment applied (left), average duration of hospitalization according to the type of treatment (right).

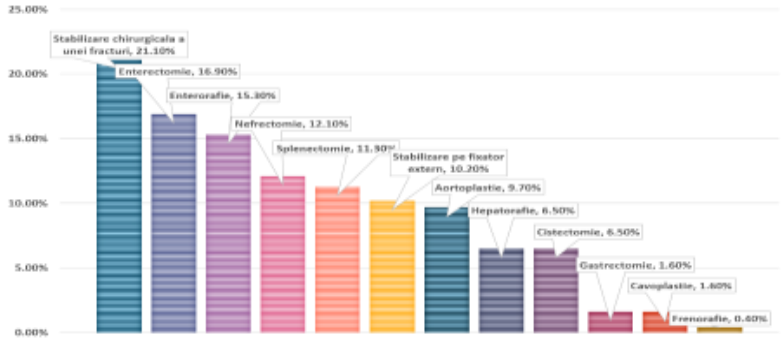

Figure 7. Frequency of necessary procedures in surgically treated patients.

Among surgical patients, 55.3% required laparotomy: exploratory - immediate (66.2%) or emergency (33.8%). Of the number of patients who benefited from laparotomy, 57.4% required damage control interventions; in this regard, we note that exploratory laparotomies were more frequent (71.1% vs 30.4% emergency laparotomies, p=0.002 – RR: 2.34, CI95%: 1.23 – 4.46). Regarding the number of iterative interventions, we note that 12 (10%) of the patients who received surgical treatment required 1 or 2 reinterventions for: hemostasis, fixator ablation, practice of osteosynthesis and reconstruction maneuvers.

There were no significant differences in age or sex, regarding conservative treatment compared to surgical treatment (age: p=0.46; sex: p=0.52). All patients with penetrating trauma required surgical treatment (100, 0% vs. 46.7%, p=0.024). The lesion mechanism had a major influence on the choice of the type of treatment: the victims of the falls benefited more from conservative treatment (64.0% vs 45.7% surgical, p=0.006) - **Fig. 8**. Although there were no differences in the type of treatment for patients involved in road accidents (p=0.08), we note, however, that pedestrians required more frequent conservative treatment than vehicle occupants (66.7% vs 40.2%, p=0.013).

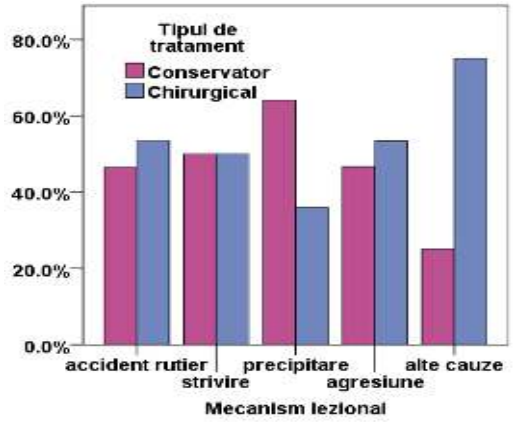

Figure 8. The type of treatment required depending on the lesional mechanism of TRH.

Mortality was proportional to the size of the retroperitoneal hematoma: small TRH – mortality of 10.2%, medium – 34.4%, large – 58.3% and massive – 72.7%, p<0.001. Thus, small TRH was associated with a mortality of only 10.2%, constituting a protective factor (RR: 2.48, CI95%: 1.42 – 4.36), while extensive TRH (at least medium) associated 47.3% deaths, being a significant risk factor (RR: 4.63, CI95%: 2.81 – 7.64, p<0.001) – **Fig. 9.**

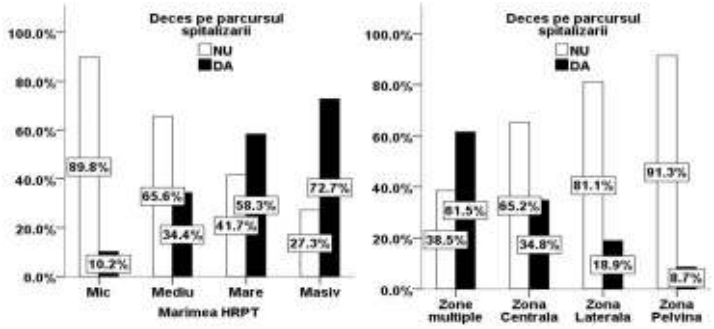

Figure 9. The frequency of death during hospitalization depending on the dimensions of the TRH, respectively the area occupied by it.

In-hospital mortality varied with the type of lesions associated with TRH: exclusively visceral lesions associated the highest mortality - 32.8%, and exclusively bone lesions, the lowest - 2.0%, mixed lesions having an intermediate mortality of 17.9 %, p<0.001 – **Fig. 10.** Thus, visceral lesions were associated with an 11 times higher risk of death (RR: 11.19, CI95%: 1.58 – 79.25, p<0.001), while exclusively bone lesions were a factor of protection (RR: 1.19, CI95%: 1.09 – 1.30, p=0.003).

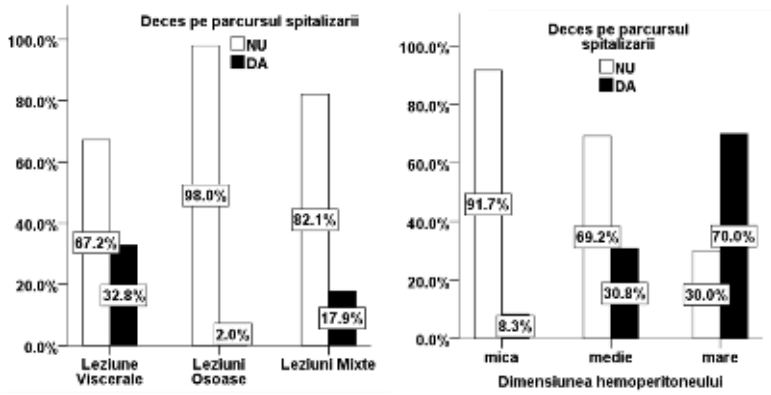

Figure 10. Frequency of death during hospitalization according to the type of injuries associated with TRH, respectively the size of the hemoperitoneum.

DISCUSSIONS

The current cohort included 256 patients with traumatic retroperitoneal hematoma, with an average age of 47.9 ± 18.8 years and male predominance - data similar to those in the literature, probably secondary to the greater exposure of this demographic to situations that can generate polytrauma[1]. The major cause was blunt trauma (97.3%), and as a mechanism of injury we mention road accidents (50.0%), falls from another level (35.2%), aggression (6.6%) and crushes (5 ,1%). We note that a higher percentage of men develop TRH secondary to assault.

Retroperitoneal hematomas were most frequently associated with mixed lesions (both bone and visceral, 55.9%), exclusively visceral ones being identified in 1 out of 4 patients, and exclusively bone ones in 1 out of 5. We note that penetrating trauma causes the more frequently visceral lesions (85.7%), much less often mixed lesions (in one case, 14.3%) and never exclusively bone lesions.

Regarding the management of patients with TRH, 51.6% were treated conservatively, 48.0% surgically and 1 patient was managed interventionally, the average duration of hospitalization being 7 days, longer in surgical patients.

Through the comparative evaluation of patients with traumatic retroperitoneal hematoma depending on the associated lesions, either those of the abdominal viscera or those of the lumbo-pelvic bones, two phenotypes of patients with TRH are outlined:

1. Patients with TRH and visceral abdominal injuries. They are characterized by the increased frequency of the association between retroperitoneal hematomas and hemoperitoneum

with moderate-large sizes, with preferential localization at the level of zone II (lateral) and the involvement of organs with a high risk of bleeding such as the kidneys, liver, spleen and vessels, but also superinfection as in the case of intestinal lesions. These patients manifest more frequently, from the pre-hospital phase, pallor, signs of acute surgical abdomen, elements of the local triad, altered mental status with the need for airway prosthesis, and during hospitalization they benefit more often from surgical treatment, in particular from exploratory laparotomy (immediate), evacuation of the hematoma, peritoneal drainage, antibiotic therapy and substitution treatment of anemia. Their mortality is up to 25% during hospitalization.

2. Patients with TRH and lumbo-pelvic bone injuries mainly occur following road accidents and falls from a height and cause retroperitoneal hematomas of small or medium size, preferentially located at the level of zone III (pelvis). The early clinical signs that lead to this diagnosis are the presence of the traumatic mark and functional impotence. In these patients, anemia at admission is rare, but liver cytolysis syndrome occurs more frequently. Treatment is primarily conservative, and in the case of surgery, fracture reduction with the help of an external fixator and anticoagulant therapy was most often practiced. The mortality of these patients during hospitalization was slightly over 10%.

CONCLUSIONS

Traumatic retroperitoneal hematoma, due to the associated unfavorable prognosis, requires an evaluation as quickly as possible to direct the medical staff to the cases with the highest risk of hemodynamic degradation and death. Retroperitoneal hematomas occur as a result of the accumulation of blood secondary to damage to the viscera, muscle tissue or vascular structures in this anatomical region, but the negative prognostic factor of these patients, who are largely polytraumatized, it is represented more by the number and severity of associated injuries than by retroperitoneal hemorrhage.

The management of this pathology is particularly complex, in continuous development, and requires individualization for each patient to obtain the best results, but mortality remains high.

SELECTIVE BIBLIOGRAPHIC REFERENCES

1. MOHAMMED M D, HAYTHAM H, MUSTAFA E E-H, et al. Diagnostic Accuracy of Multidetector Computed Tomography în Evaluation of Retroperitoneal Traumatic Injuries and Retroperitoneal Hemorrhage. The Medical Journal of Cairo University 2019;87(June): 1829-1839