

# DIAGNOSIS AND TREATMENT OF PATIENTS WITH TRAUMATIC RETROPERITONEAL HEMATOMA COMPLICATED WITH BONE FRACTURES

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## ABSTRACT

**Objective:** Traumatic retroperitoneal hematoma (RPH) is an underdiagnosed entity, turned to have a high mortality rate, when is not earlier diagnosed. Our aim was to analyze our experiences in patients with traumatic RPH complicated with bone fractures, and highlight the problems in diagnosis and treatment to facilitate the surgeon's decision.

**Methods:** In this retrospective study, all cases who presented to the emergency room (ER) and/or admitted to our center with bone fractures complicated with RPH from January 2016 to December 2019 were included (4-years data). Data collected included age, hematoma zones, fracture production mechanisms, mortality, surgical intervention, bones lesions frequency, frequency of pelvic bone injuries, complications and biochemical and hematological analysis (e.g. hemoglobin (Hb), hematocrit (Ht), platelets (PLT), leukocytes (Leu), aspartate aminotransferase level (AST), alanine aminotransferase level (ALT) and creatinine (Cr). All RPHs were diagnosed using computed tomography scan.

**Results:** A total number of 173 RPH cases with bone fractures were included with a mean age of  $48.80 \pm 1.40$ . Zone II and III (lateral and pelvic hematoma) bleed were the most common type of RPH. The main fracture production mechanism was road accident ( $n=110$ ). The bone lesions frequency besides pelvis, was seen in lumbar vertebral fractures (e.g. 19 cases in 2016, 38 cases in 2017, 45 in 2018 and 40 in 2019), comparing with the other fractures, without any statistical significance. An important significance was seen for frequency of pelvic bone injuries, when comparing 2016 with 2018 year ( $p=0.040$ ). Furthermore, the complications seem to have a statistical significance when 2016 year was compared with all the other years ( $p=0.030$ ,  $p=0.035$ ,  $p=0.052$ ). Regarding the biochemical and hematological analysis, a statistical significance was seen at Hb (when 2016 was compared with 2017 year,  $p=0.007$  and 2018 year,  $p=0.001$ ), Ht (when 2016 was compared with 2017,  $p=0.054$  and 2018,  $p=0.002$ ), PLT (when 2016 was compared with 2018 year,  $p=0.0004$ , and 2019 year,  $p=0.002$ ) and ALT (when 2016 was compared with 2017 year,  $p=0.026$ , and 2018 year,  $p=0.026$ ). The highest mortality was registered in 2019 ( $n=11$ ), being statistically significant in comparison with 2016 year ( $p=0.030$ ). About 109 patients were treated conservatively, and 64 by surgical interventions.

**Conclusion:** There is a lack of evidence for the best management in RPH, conservative approaching being reserved only for patients who are stable. Therefore, traumatic RPH complicated with bone fractures, especially lumbar vertebral fractures, represent a life-threatening condition, early diagnosis and correct treatment is of utmost importance.

**Keywords:** retroperitoneum, hematoma, bone fracture, diagnosis, treatment.

## Introduction

Traumatic retroperitoneal hematoma (RPH) represents a common condition, especially on pelvic injuries. Retroperitoneal space is filled with different structures, like gastrointestinal,

genitourinary, musculoskeletal or nervous systems (1). This space could be responsible for many hematoma, making the diagnosis and treatments difficult to achieve, becoming the main cause of mortality in any age group (2).

Knowing its vast anatomy from the human body, the management of retroperitoneal injuries

can vary (3). Furthermore, blunt trauma pelvic fractures are mainly associated with genitourinary and intestinal injuries (4).

The aim of the present study is to highlight the issues met in diagnosis and treatment of RPH complicated with bone fractures, facilitating further the surgeons' decision.

## Material and Methods

From 215 patients with traumatic RPH, 173 patients with bone fractures treated in "Sf. Apostol Andrei" Emergency County Clinical Hospital from Constanta, Romania from January 2016 to December 2019 were reviewed retrospectively. The data including patient's age, hematoma zones, fracture production mechanisms (precipitation, road accident, crushing and others like iatrogenic, shooting, hit by the animal, nautical accident, stabbed and aggression), mortality, surgical interventions (nephrectomy, enterectomy, splenectomy and pelvic stabilization including drain hematoma and exploratory laparotomy), bones lesions frequency (e.g. cranio-cerebral fractures, cervical, toracal, and lumbar vertebral fractures, ribs, breastbone, pelvis, limbs), frequency of pelvic bone injuries (e.g. sacred fractures, pubic disjunction, iliac bone fractures, ischio-pubic ram, and acetabular cavity fractures), complications (e.g. haemoperitoneum, adrenal hematoma, hematuria, pneumothorax, hemothorax and vascular lesions) and biochemical and hematological analysis (e.g. hemoglobin (Hb, normal range (n.r.) M= 13.1-17.2 g/dl and F=11.7-16.0 g/dl), hematocrit (Ht, n.r. M= 39-50% and F=35-47%), platelets (PLT, n.r. 150-450 x103/ul), leukocytes (Leu, nr 4.0-10.0x103/ul), aspartate aminotransferase level (AST, n.r. M<50 and F<35 U/L), alanine aminotransferase level (ALT, n.r. M<41 and F<33 U/L) and creatinine (Cr, n.r. M<1.2 and F<1 mg/dl) (5). All RPHs were diagnosed using computed tomography (CT) scan.

Our study population consisted of patients in whom the traumatic RPH was confirmed with a final diagnosis, and the cases of RPH resulting from other reasons were excluded from the study. According to the classification from Selivanov and contributors, the RPHs were classified under three zones, i.e., centro-medial (zone I), lateral

(zone II) and pelvic hematoma (zone III) (6).

Agreement of Ethic Committee from "Sf. Apostol Andrei" Emergency County Clinical Hospital and informed consent of patients were obtained.

### Statistical analysis

Characteristics of the study subjects were expressed in means  $\pm$  SD and percentage. Student's t test for two-tailed distribution was used to examine the significance. P values less than 0.05 were considered as significant.

## Results

One hundred and seventy- three patients included in the current study consisted of 108 men and 65 women with a mean age of  $48.80 \pm 1.40$ . Zone II and III (lateral and pelvic hematoma) bleed were the most common type of RPH (12 patients in 2016, 16 in 2017, 18 in 2018 and 24 in 2019 for zone II and 4 patients in 2016, 18 in 2017, 32 in 2018 and 17 in 2019 for zone III), without any statistical significance.

The main fracture production mechanism was road accident (9 cases in 2016, 27 in 2017, 41 in 2018 and 33 in 2019), followed by precipitation (n=75), others (n=7) and crushing (n=4), without any statistical significance.

The bone lesions frequency was measured in cranio-cerebral fractures, cervical, toracal and lumbar vertebral fractures, ribs, breast bone, pelvis and limbs. Interesting, the higher prevalence besides pelvis, was seen in lumbar vertebral fracture (e.g. 19 cases in 2016, 38 cases in 2017, 45 in 2018 and 40 in 2019), comparing with the other fractures, without any statistical significance.

Moreover, we measure also the frequency of pelvic bone injuries which included sacred fractures, pubic disjunction, iliac bone fractures, ischio-pubic ram, and acetabular cavity fractures. The higher prevalence was seen for ischio-pubic ram (e.g. 6 patients in 2016, 22 in 2017, 23 in 2018 and 25 in 2019). Here, an important significance was seen when comparing 2016 year with 2018 year ( $p=0.040$ ) (Table 1). Furthermore, the complications which include hemoperitoneum, adrenal hematoma, hematuria, pneumothorax, hemothorax and vascular lesions seems to have a statistical significance when

Table 1. The characteristics of pelvic bone injuries and complications.

Characteristics	2016	2017	2018	2019	p*	p**	p***
Pelvic bone injuries (sacred fractures, pubic disjunction, iliac bone fracture, ischio-pubic ram, acetabular cavity fracture)	5±2.54	12.4±6.98	17±9.13	14.6±8.44	0.076	0.040	0.062
Complications (haemoperitoneum, adrenal hematoma, hematuria, pneumothorax, hemothorax, vascular lesions)	1.83±2.13	8.33±5.39	8.66±5.88	7.5±5.46	0.030	0.035	0.052

Data are all presented as means and standard deviations.

\*Comparing parameters from 2016 with 2017

\*\*Comparing parameters from 2016 with 2018

\*\*\* Comparing parameters from 2016 with 2019

2016 year was compared with all the other years (p=0.030, p=0.035, p=0.052) (Table 1).

Regarding the biochemical and hematological analysis, a statistical significance decreased was seen for Hb (when 2016 was compared with 2017, p=0.007 and 2018, p=0.001) and Ht (when 2016 was compared with 2017, p=0.054 and 2018, p=0.002) (Table 2). Although PLT had normal values, it was seen a statistical significance of the values when 2016 was compared with 2018, (p=0.0004), and 2016 with 2019 (p=0.002). Moreover, leukocytes alongside AST and ALT showed increased values from normal range, with a statistically significance for ALT when 2016 was compared with 2017 (p=0.026), and 2018 (p=0.026). Important to note, creatinine seems to show normal parameters (Table 2).

The highest mortality was registered in 2019 (n=11), being statistical significant in comparison with 2016 year (p=0.030). From the total of 173 patients, only 64 patients were treated by surgical interventions, the rest of the

patients (n=109) being treated conservatively.

## Discussion

Traumatic RPH showed to have a higher impact on abdominal and pelvic injuries, early diagnosis and surgical management being of most importance. In the current study, we performed a review of 173 cases treated in our institution to help surgeons determine the strategy of diagnosis and treatment for the RPH with fatal lesion.

The main objectives in the management of bone injuries in RPH are to maintain hemostasis, restoring the stability of the pelvic ring. If there are minor pelvic lesions, the hemostasis is maintained, and the management should be non-surgical. In the same context, in moderate lesions with mechanical instability, the embolization should be considered (7, 8).

Interestingly, CT scan show to have an important role in the diagnosis of retroperitoneal organs (9, 10). In the current study, from a total of 215 patients who underwent CT examination,

Table 2. Biochemical and hematological parameters of HRP patients with bone fractures.

Parameters	2016	2017	2018	2019	p*	p**	p***
Hb (g/dl)	10.84±1.88	12.26±1.97	12.51±2.29	11.67±3.01	0.007	0.001	0.170
Ht (%)	32.15±5.49	35.04±5.49	36.98±6.44	34.98±7.92	0.054	0.002	0.093
PLT (x 103)	149.71±74.00	234.06±70.20	233.15±120.95	216.45±86.88	0.169	0.0004	0.002
Leu (x103/μl)	14.45±6.14	16.06±6.31	30.18±115.32	15.88±10.64	0.338	0.300	0.489
AST (U/L)	218.9±188.97	160.56±186.70	175.55±282.77	192.89±337.49	0.256	0.438	0.689
ALT (U/L)	284.75±246.91	137.59±209.25	133.79±269.67	156.96±302.45	0.026	0.026	0.076
Cr (mg/dl)	1.54±1.58	0.89±0.40	0.93±0.49	0.87±0.28	0.082	0.105	0.075

Hb= hemoglobin; Ht= hematocrit; PLT= platelets; Leu= leukocytes; AST= aspartate aminotransferase; ALT= alanine aminotransferase; Cr= creatinine.

Data are all presented as means and standard deviations

\*Comparing parameters from 2016 with 2017;

\*\*Comparing parameters from 2016 with 2018;

\*\*\* Comparing parameters from 2016 with 2019.

only 173 patients were diagnosed with RPH complicated with bone fractures. Moreover, RPH from different anatomical position has different clinical and treatment approaches. The RPH from zone I (centro-medial) represent the consequence of the organs injury. In our case, the common type of RPH was lateral and pelvic hematoma (zone II and zone III), more suggestive for bone fractures, sustained also by the decreased values of Hb and Ht, and increased in ALT, based on liver injury response. Besides pelvic area lesions, the most affected fracture was at lumbar spine, in which attention must be directed.

On the other hand, we suggest that the stable hematoma without injury of organs like in the present study should be managed using conservative approach.

Interestingly, when hematoma rapidly expands or breaks, usually open surgery is used. About 109 of retroperitoneal hematoma in the current study were treated non-surgically and 64 cases were treated surgically. Some authors suggest that hematoma in the retroperitoneal space can be kept under control by applying pressure on the bleeding region (11). In contrary, exploratory laparotomy in such cases could result in uncontrollable bleeding of the patients (12).

However, there are not so many studies in literature which emphasizing RPH from bone fractures, especially from lumbar vertebral fracture (13), than certain notaries about pelvic fracture, referring at the most affected zone III (14, 15).

## Conclusions

Our study suggests that a rapid diagnosis by using CT alongside clinical and paraclinical tests should be of great importance in facilitating the surgeon's decision on the RPH treatment, complicated with bone fracture, especially with lumbar vertebral fracture.

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