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NON-OPERATIVE MANAGEMENT FOR RENAL AND SPLENIC TRAUMA – A CASE REPORT

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Abstract: *Management of abdominal trauma has evolved over the past decades and most of trauma patients can be managed conservatively. This article demonstrates the effectiveness of non-operative management (NOM) in a patient with grade IV renal trauma and grade II splenic trauma that was treated in the urology department of Emergency Clinical County Hospital of Brasov after a car crash. Clinical examination showed bruises on the right shoulder and macroscopic haematuria that suggest renal trauma. The abdomen was spontaneously painles, no signs of acute abdomen but severe pain in the left lumbar area, with no additional relevant medical history.*
The CT scan revealed laceration of the valvular area of the left kidney, spleen contusion and retroperitoneal haematoma with contrast spreading in the iliopsoas muscle region, classifying renal trauma as stage IV and splenic trauma as stage II on American Association for the Surgery of Trauma injury scale. The trauma is classified as serious with an Injury Severity Score of 18, and Resciniti CT score of 2, therefore NOM is recommended. Despite high grade trauma, the patient was haemodynamically stable, with a heart rate of 90 bpm, blood pressure of 105/65 mmHg and haemoglobin of 10.4g/dl. Under constant observation and with the help of a multidisciplinary team, the therapeutic focus was directed on local protocol consisting of pharmacological treatment with fluid resuscitation, antibiotic therapy, analgesics, haemostatics, anticoagulant therapy and multiple blood transfusions consisting of fresh frozen plasma and packed red blood cells. Starting with day 6, the haemoglobin levels normalized, no further blood transfusion beeing necessary. The patient was discharged and didn't developed complications in the following 6 months. The NOM in the case of grade IV renal trauma and a grade II splenic trauma is effective, provided the patients are haemodynamically stable and constant reevaluations are performed.

Key words: *non-operative management, renal trauma, splenic trauma, retroperitoneal haematoma*

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1. Introduction

Abdominal trauma is very common in car accidents, internal organs like kidney and spleen are often affected. Even though the seat belt is life saving in most cases, it can still cause internal injury. In such cases the problem of non-operative management (NOM) or operative management (OM) is considered.

Indications for laparotomy are represented by signs of peritonitis, haemodynamic instability or significant intra-abdominal injury associated with hemoperitoneum [17].

NOM of major abdominal injuries is an important challenge in trauma patient management and has become the standard of care in blunt abdominal injuries. In patients with multiple severe injuries, NOM may be considered as long as the patient is haemodynamically stable and the hospital can provide blood and blood products, emergency imagistic evaluation and emergency access to an operating room at any time [2], [12], [25].

Diagnostics in NOM patients with blunt traumatic injuries requires access to CT scan, angiography and endoscopy to asess the haemodynamic status and the needs of the patient [14].

Due to the high diagnostic accuracy of CT scan, it can accurately identify the grade of the injury, increaseing the success rate of NOM in trauma patients [3], [8].

The decision regarding the management of the patient should be taken considering the trauma level of each organ and the haemodynamic status. Treating high level renal trauma (grade IV according to American Association for the Surgery of Trauma [AAST] scale) and low grade splenic injury (AAST II) non-operatively yielded good results: 86.8% respectively 68% [2], [9], [16].

The overall outcome may be determined not only by the blunt abdominal trauma but also by significant extra-abdominal injuries which can be associated with [7].

A case of car accident caused politrauma (including renal and splenic injury) in a 27-year-old patient is described.

2. Case Report

A 27-year-old woman, victim of a car crash was transported to Emergency Clinical County Hospital of Braşov few hours after the incident, accusing excruciating pain in the left lumbar quadrant. General status was altered, but she was conscious and cooperant (Glasgow coma scale of 15). On admission, the clinical examination revealed bruises on the right shoulder and macroscopic haematuria that could suggest renal trauma. The abdomen was spontaneously painless but the palpation of the left lumbar area caused severe pain. The patient was haemodynamically stable, with a heart rate (HR) of 90 bpm and blood pressure (BP) of 105/65 mmHg. No signs of acute surgical abdomen were present and no additional relevant medical history was reported. On admission, the presumptive diagnosis was left renal dilaceration, retroperitoneal haematoma and splenic contusion. The patient was moved to the urology critical care unit for closer observation.

Abdominal ultrasound revealed a 3 cm retroperitoneal haematoma, in the proximity of the iliac muscle, next to the iliac crest. The left kidney had a bipolar diameter of 12 cm with a heterogen mediorenal transsonic structure with anfractuous contour that interests the

renal capsule. Extravasation of the fluid was present. The following biochemical parameters were modified: Sodium - 132,9 mmol/L, Calcium - 3,72 mmol/L, Haemoglobin - 10.4g/dl.

The urinalysis revealed the presence of urinary leukocytes, erythrocytes, urinary nitrite, proteinuria, ketonuria and an urobilinogen of 2 E.U/dl.

Urine sediment examination showed macroscopic and microscopic haematuria, the presence of rare epithelium cells, relatively frequent leukocytes, microbial flora and frequent amorphous urates crystals.

An urology exam is performed observing a left renal rupture with peritoneal haematoma and the leak of contrast substance towards the inferior pole. A diuresis of 900 ml with haematuria is observed after an urinary catheterization.

The left renal pelvis and the ureter are intact. Structure modifications of the inferior part of the spleen consistent with a contusion. Due to the fact that the patient is haemodynamically stable the decision to move her into the urology intensive care unit for closer observation is made.

The head CT showed no intracerebral heterogeneities, low capacity ventricles, intact median line, no post traumatic cranial modifications. No pleural pulmonary modifications appeared on the thorax CT.

CT scan (8 slice-1G) taken on admission revealed laceration of the valvular area of the left kidney (Figure 1), spleen contusion and a retroperitoneal haematoma with contrast spreading in the iliopsoas muscle region, classifying renal trauma as stage IV and splenic trauma as stage II on AAST injury scale and considering the patient is haemodynamically stable, conservative management is possible.

Fig. 1. *Renal Axial CT*

Patients that are not haemodynamically stable usually develop other complications making them unsuited for NOM. The same can be said about patients that have an ISS of severe or worse status. A CT with intravenous contrast (CE-CT) is needed in order to calculate the ISS grade.

The Injury Severity Score (ISS) is calculated based on the AIS scores of the three most damaged body regions by squaring each score and then summing them up (Table 1).

ISS calculation [5] Table 1

Region	Injury Description	AIS	Square top three
Head and neck	Cerebral contusion	3	9
Face	No injury	0	
Chest	Flail chest	4	16
Abdomen	Minor contusion of liver		25
	Complex rupture spleen		
Extremity	Fractured femor	3	
External	No injury	0	
Injury Severity Score			50

The result will be between 3 and 75. If any of the AIS scores is 6 ("unsurvivable"), the ISS score is considered to be 75 therefore, in a case of multiple victims triage, this could mean the cessation of further care (Table 2).

Table 2

ISS interpretation [5]

1-8	Minor
9-15	Moderate
16-24	Serious
25-49	Severe
50-74	Critical
75	Maximum

Consistent with the CT findings, the trauma is classified as serious and not severe, having an ISS of 18, therefore the treatment being oriented towards NOM.

The SPLENIC Resciniti CT score is 2 (laceration with thin, linear defect and perisplenic fluid present in the splenic capsule), therefore NOM is recommended (Figure 2).

Fig. 2. *Splenic axial CT*

Despite the severity of the lesions, the patient was haemodynamically stable and the therapeutic approach guided by local protocol consisting of patient monitoring and pharmacological treatment was instituted in the urology department.

Because operative treatment can become imperative, only in hospitals that can provide access to an operating room at any time and constant monitoring for the patients NOM should be attempted [13].

The medical staff was instructed to monitor the HR and BP, to conduct a haemodynamic re-evaluation every hour and to inform the urologist and surgeon if the patient is haemodynamically unstable for immediate operative management.

The patient remained haemodynamically stable durring her enteire hospitalization period, without any significant variations of BP and HR (Figures 3 and 4).

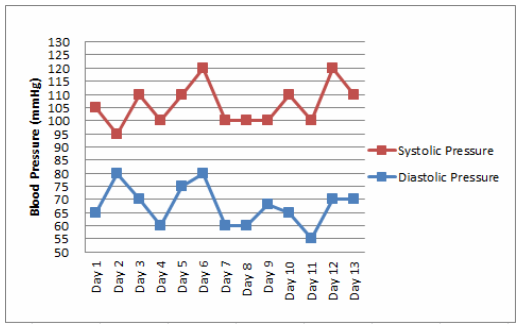

Fig. 3. *Blood pressure variation*

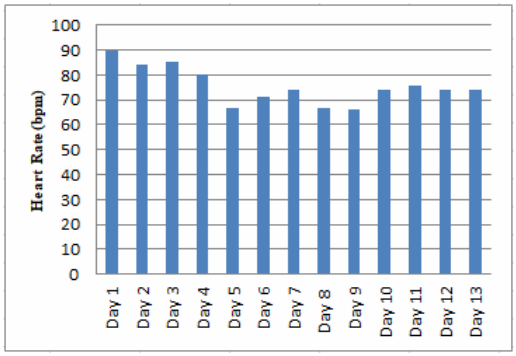

Fig. 4. *Heart rate variation*

First re-evaluation abdominal CT scan, 4 day after admission, showed the left kidney with stable, perirenal haematoma, and small splenic laceration.

The second re-evaluation abdominal CT, 12 days after admission, showed the left kidney with stable, secluded haematoma, with signs of haematoma resorption and no splenic laceration.

Because of anemia, the patient received in the first 5 days from admission multiple transfusions as follows: on day 1 - 2 units of fresh frozen plasma (FFP), on day 2 - 2 units of FFP and one of packed red blood cells (RBC) and on day 4 & day 5 - one unit of FFP and one unit of RBC. Starting with day 6, the haemoglobin levels started to normalize, no further blood transfusion beeing necessary (Figure 5).

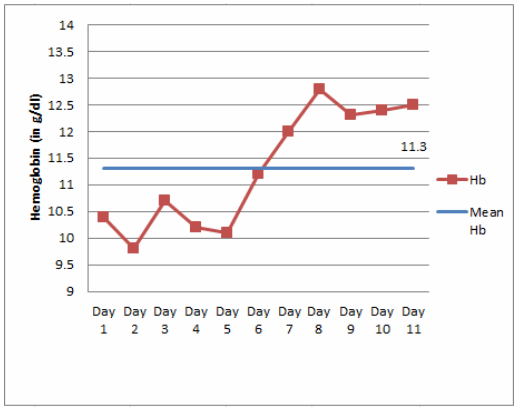

Fig. 5. *Haemoglobin fluctuations*

During her hospitalization, the patient received the following medication. Fluid resuscitation – glucose 5% 1000mL, Ringer's solution 1500mL; Antibiotic therapy - Cefuroxime 1g IV Q8h; Haemostatics - Carbazochrome 10mg PO Q8h, Calcium gluconate 1g/10mL IV Q6h; Anticoagulant therapy – Sodium Enoxaprin 40mg SC Q24h on 29.03 and Nadroparin calcium 0.4mL SC Q24h; Analgesic – Tramadol hydrochloride 50mg IV Q6h.

3. Discussion

The treatment of renal (RT) and splenic trauma (ST) underwent significant change in the last 30 years, non-operative treatment becoming the standard procedure in cases of low grade injuries. The most frequently injured organs in abdominal blunt trauma are the spleen and the liver, closely followed by the kidney. For the mid to high (III-IV) grade RT, the criteria for deciding between OM and NOM are not yet clear, but American Urology Association (AUA) recommends NOM in all cases that are stable from the haemodynamic point of view, but the need for delayed intervention has to be reconsidered regularly [11], [21].

The high-level evidence and guidelines are scarce regarding what NOM of renal trauma should involve. A review of the medical literature was conducted and showing consensus in the need for a multi-disciplinary team. The treatment of a multi-traumatised patient should be performed by experienced radiologists, urologists and infectious disease clinicians [19].

This case report on a 27-years old patient implicated in a car crash highlights the safety and effectiveness of NOM as treatment option in politrauma. If low grade renal trauma rarely requires operative management and grade V trauma more often than not requires surgical intervention, grade IV trauma can be particularly challenging.

A study showed that in cases of grade IV renal injury NOM is not sufficient sometimes, with 11% of patients requiring renal exploratory surgery; 25% needed embolisation and 27% needed ureteral stenting [15]. The consensus is that absolute contraindications of non-operative management regarding renal vascular pedicle avulsion, life-threatening bleeding and the persistence of a haematoma that is pulsatile and increasing.

All haemodynamically unstable patients require operative intervention to control the bleeding, but OM should be also considered early if the patient is at risk of ongoing blood loss. Factors predicting the need for renal exploration include penetrating injuries and extravasation of intravascular contrast, central laceration and perirenal haematoma larger than 3.5 cm in diameter observed on a CT scan [22], [24].

Because the patient was haemodynamically stable, in spite of alterations in the haemoglobin level, non-surgical treatment was preferred.

In the last decade, renal and splenic trauma have been highly accurately assessed (98% accurate) using conventional CT and intravenous contrast material in order to observe if extravasations are present and decide between OM and NOM. Non-surgical management is generally preferred, but it is important to identify and characterize all abdominal trauma including the liver, the mesentery, the bowel or the retroperitoneum that might require surgery [21], [25].

In many cases ureteral trauma is not discovered due to haemodynamic instability and secondary injuries. It's mandatory that trauma specialists observe and treat additional injuries after major trauma to prevent complications [10].

The eligibility of non-operative treatment must be based both on the haemodynamic stability of the patient and on the severity of renal and splenic trauma but also considering the overall ISS score. NOM can be a feasible and safe treatment plan for severe polytraumatized patients, but this decision must be constantly reevaluated to decide if the patient is still suited for it [5], [20].

3.1. Anticoagulant Therapy

Venous thromboembolism (VTE) is a common complication for trauma patients and managing this risk with pharmacological thromboprophylaxis in NOM should be a priority. Choosing the right thromboprophylaxis method is difficult, however, the guidelines indicate that low-molecular-weight (LMWH) heparin can be better than both mechanical prophylaxis and unfractionated heparin in minimizing the risk of VTE after trauma. In a case of polytrauma with renal and splenic injuries, the need for thromboprophylaxis must be put into balance with the increased bleeding risk, therefore many specialists are not comfortable prescribing unfractionated heparin or LMWH [26]. This decision has to be made considering multiple factors like haematuria, medication and other injuries. VTE risk

factors including specific injuries, the need for major surgery, age and other indicators showing that the patient is in a therapeutic decline must also be reviewed [10].

3.2. Antibiotic Therapy

In grade IV renal injuries 5% of the patients not receiving prophylactic antibiotics, later needed nephrectomy because of sepsis [15]. Segments that lost vascularisation, soft tissue injury, simultaneous pancreatic or bowel trauma have a higher risk of infection therefore antibiotics should be prescribed; individual specific factors such as comorbidities, age and immunosuppressive treatment should also be taken into consideration.

In patients that have no other risk factors, grade I-III trauma does not need antibiotic therapy, but higher-level injury should receive prophylactic antibiotherapy. If risk factors are present, on any injury grades, antibiotic therapy has to be considered. Unless contraindicated, the indicated antibiotic should be a first-generation cephalosporin, providing reasonable gram-negative cover and also good anti-staphylococcal cover. If concomitant bowel injury is present, an additional anaerobic antibiotic like metronidazole or clindamycin has to be prescribed.

All patients with renal or splenic injury should be admitted, except for the ones with grade I trauma, without visible haematuria. An urine specimen should be obtained as soon as possible either by a clean catch of urine or by catheterisation of the bladder [24]. Haematuria is one of the most relevant signs in the case of urinary tract trauma, however it is not entirely sensitive nor specific. Most renal injuries also present with haematuria, but its severity is not directly correlated with the renal trauma level as about 7% of grade IV RT can present without it [1].

NOM failure can be caused by peritonitis, therefore clinicians should meticulously search for bowel trauma as it is sometimes missed while performing the initial imaging [6].

Vital signs (BP, HR, respiratory rate, temperature measurements and oxygen saturation), blood work and clinical examinations are required with a frequency dependent on the patient status. In patients presenting RT, initial assessment must include haemoglobin (Hb) and creatinine levels. For a patient with grade IV RT and grade 2 ST, serial examinations up to every 6 h are appropriate. It is recommended that the patient remains in bed until haematuria is insignificant and not requiring manual bladder washouts or bladder irrigation [4, 18]. The patient should be discharged when afebrile, can tolerate a generic diet, has a good pain management, and the blood tests are constant [19].

The patient was followed for 6 months, revealing an excellent progress, with preservation of the kidney and no secondary complications. Providing the patients are haemodynamically stable, RT including damage to the excretory system can be treated successfully using NOM.

Conservative management of splenic injury is preferred if possible, bringing big

advantages including the preservation of the immune function (preventing post-splenectomy sepsis) and avoiding the complications associated with laparotomy [23].

4. Conclusion

After an exhaustive search of medical literature, an consensus that unites most specialists was not observed, due to the lack of specific high level evidence detailing what non operative management should involve. However, it was observed that most studies recommend using complex interdisciplinary teams for the appropriate treatment of poly-trauma patients.

The decision to treat a patient non-operatively should not be taken considering only the haemostatic status of the patient, but also taking into account each organ AIS score and the overall ISS grade. The decision to treat patients non-operatively should be taken if possible, but the they need to be under constant re-evaluation of NOM efficiency and if failing, OM has to be considered as early as possible.

Polytrauma patients managed non-operatively, can become haemodynamic unstable at any time, therefore a surgical team has to be ready to operate on short notice. Because of this, only hospitals that are well equipped should attempt NOM.

The patient had a great progress with no ulterior complications in the 6 months following discharge. The NOM in the case of grade IV renal trauma and a grade II splenic trauma is effective, provided the patients are haemodynamically stable and constant reevaluations are performed.

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