

# KIDNEY ECHO IN POLYTRAUMA – PEDIATRIC LESIONS VERSUS ADULT ONES

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## Abstract

Traumatic kidney injuries are an important life threatening situation following blunt or penetrating abdominal lesions. At every age, the goal of renal trauma management is preservation of renal function with minimal morbidity. It is imperative that these patients are treated urgently and efficiently to prevent renal damage.

We present a series of patients (adults and children), treated in our department for kidney traumatic lesions on a period of 10 years. It will be discussed the main aspects of management of these patients and the similarities or differences between the two categories of age.

**Key words:** children, adults, trauma, kidney, management

## Introduction

Within polytrauma, the urinary system occupies a considerable percent (between 10-12%) [1,2], which follows the same upward curve frequency as polytrauma itself.

In children, trauma is responsible for 90% of the genitourinary lesions, with approximately 90% having coexisting injuries of other organs [3,4]. Traumatic injury to the kidney accounts for greater than 60% of the pediatric genitourinary injuries [5-8].

In great polytrauma, urinary involvement is often ignored because the attention of the doctor who performed the first examination is captured by the obvious injuries, to which it is given more importance.

Today, thanks to the precision offered by modern investigations of the urinary system, the modern means of resuscitation, the surgical opportunities, it has come to change tactics in therapeutics, at least in some forms of urinary tract trauma. Thanks to them, it appreciably shortens the early recovery of the urinary tract, the patient's suffering and enables good quality of healing. [9,10].

## Purpose

The aim of this study is to compare therapeutic results obtained in renal trauma, either closed or open, conditioning these results of exploration opportunities in the emergency room and to reconsider the attitudes to treat kidney lesions that are not necessarily life-threatening (in case of polytrauma), dealed as secondary affections. We have observed that these injuries must be recognized, acknowledged and treated by an urologist, even from the beginning.

Finally we would like to show the contribution of medical observation, assessment, diagnosis and treatment of kidney trauma for the main groups of patients – children and adults, the similarities or differences between the two categories of age.

## Material and method

My study is conducted over a period of 10 years, from 2006 to 2015, and comprises a group of 218 patients, adults and children who were hospitalized for evaluations, investigations, monitoring and treatment, including kidney lesions. The study was conducted retrospectively for the period 2006-2010 and prospectively for the period 2011-2015. For the retrospective study we took into account the observation charts, controls carried out regularly to the part of patients who respected timing controls or answered calls for individual checks. The prospective study took into account the diagnostic protocol, clinical evaluation and treatment. To this group we were able to apply and track primary and secondary evaluation phases of the diagnostic protocol and imaging investigations following a specific algorithm.

## Results

Of the 1117 polytrauma who were hospitalized, only 74 cases had only a renal lesion, confirmed by imaging or during surgery, the remaining 1043 had associated injuries to other organs or systems.

The most common associations found in our study were spleen ruptures with head trauma and musculoskeletal injuries in general, or the association of these lesions among themselves, but also with other injuries listed in Table 1.

Head trauma, when it had a severity above average, greatly influenced the evolution of the case, and in some cases even the vital prognosis, as shown by the literature [11].

In our study there were more patients from urban areas and also more females than males. This is due to specific activities or car accidents, more frequent in urban areas than in rural ones.

Kidney injuries occur most frequently between the ages of 16-40, representing the maximum of physical activity, basically belonging to social groups at risk through activities they are involved. In this group an important role play car accidents or sport injuries.

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Table 1 - The association of renal trauma with lesions of other organs or systems.

Frequent associations	Cases
Kidney trauma + spleen rupture	22
Kidney trauma + head trauma	28
Kydney + head + spleen	26
Kidney + osteoarticular	28
Kydney + head + osteoarticular	22
Kydney + head + spleen + osteoarticular	16
Others	2
Isolated kidney trauma	74

It seems that the majority of renal trauma arose from car accidents, following a high percentage of fall from heights, and

sports accidents, aggressions occurring in a small number of cases in our study (Table 2).

Table 2 – Distribution by age and ethiology.

Age group	Cases	Ethiology			
		Car accidents	Fall from heights	Sport injuries	Aggressions
0-3 years	2	2	0	0	0
4-9 years	8	6	2	0	0
10-15 years	38	20	12	6	0
16-40 years	102	28	40	22	12
41-60 years	60	26	30	0	4
> 60 years	8	2	6	0	0

In our study we observed a higher frequency of trauma on the right, and an explanation is that the right kidney is located lower than the left. Some put this higher frequency on the right and on behalf of the defense reflex, which automatically displays the individual right in front of an aggression, protecting it on the left.

18 patients suffered trauma on an ectopic, polycystic, tumoral, hydronephrotic or lithiasic kidney. These injuries are more serious because pathological kidney is more fragile and exposed to vulnerable agents even of lower intensity.

We had 212 kidney contusions and 6 ruptures.

Closed kidney trauma was more often observed. Child's kidneys are more likely to suffer closed trauma because they did not support the defense of perirenal fat and there is no well developed rib ossification. Concussion is the most common renal damage seen in children [12-14].

Section of the ureteropelvic junction and parenchymal lesions on preexisting abnormalities are next in frequency. These are caused by direct hit. The concept of conservative treatment (nonoperative), was greatly expanded and included also renal lesions [15].

The distribution of kidney lesions is illustrated in table 3.

Table 3 – Distribution of kidney lesions.

Cases		Minor kidney trauma		Major kidney trauma		
Closed	Open	Grd.1	Grd. 2	Grd. 3	Grd. 4	Grd. 5
212	6	88	64	52	12	2
218		152		66		

Minor kidney traumas were treated conservatively in all age groups (grd. 1 and 2). Treatment of renal lesions is highly controversial for grds. 3, 4 and 5. Absolute indication for surgical exploration is the presence of pulsatile or expansive hematoma. Other indications are urinary extravasation, vascular lesions, devitalized tissues.

The presence or absence of hematuria and its degree of intensity, does not correlate with the degree of the lesions. Some grd. 4 lesions can be treated conservatively [16]. In contrast to adults, in children, hematuria is a very unreliable sign in determining the need to screen for renal injuries. In some studies there is no evidence of gross or microscopic hematuria in up to 70% children sustaining grade 2 or higher renal injury [17].

Therapy consists of bed rest, drainage by catheter, extravasation of urine, evaluated by CT and sonography. Ureteral stent and catheter drainage can be used for urinary extravasation. Allgrd. 5 kidney lesions require surgery and in 30% of cases the kidney can be saved [18,19].

Nephrectomy was the main procedure for surgical cases, with complications in only 9% and 2% deaths. The most common immediate complications were urinary fistulas, which resolved conservatively, with only 2 reinterventions. Late complications were hydronephrosis, lithiasis, hypertension. The date are similar with those in literature [19,20].

In the group of patients less than 18 years of age, 92% of them were treated conservatively, only two patients with

grd. 4 lesions were treated surgically but only with suture of the kidney. There were no complications for this group of patients, with both treatment types.

### Conclusions

Management of polytrauma in emergency should be done after a written protocol which follows well defined steps. Attention should be directed towards potential injuries, quickly evolving, likely to lead to vital complications: pneumothorax, intra and retroperitoneal hemorrhage. Multidisciplinary team may highlight secondary lesions. Kidney lesions often are in the background unnoticed and are detected in the stage of complications or sequelae. Kidney response is largely masked by clinical violent associated lesions. A severe polytrauma, almost always present a kidney lesion, so we have to think about it. Recovery of blood pressure by perfusion, will allow making the required investigations. Lack of response to tensional treatment, done properly, requires emergency surgery to stop bleeding. Conservative treatment is applied in grade I-II and in most cases in grade III lesion. A small percentage of grade III injuries may require intervention.

The pediatric kidney is believed to be more susceptible to trauma because it is protected by an immature, more pliable thoracic cage and weaker abdominal musculature. The child has less perirenal fat and is positioned in a lower area in the abdomen than in adult.

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