

CT EVALUATION OF RENAL TRAUMAS

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Abstract: Kidneys are interested in lumbar, thoracic and abdominal trauma, standing in third place (after the spleen and liver) as in their frequency. Their complex structure causes damage to the parenchyma and upper urinary tract often with repercussions on the bladder and ureters. The purpose of present paper is to evaluate CT renal injuries. Material and methods. We studied a total of 132 patients aged between 12 and 76 years with renal trauma in which CT examination performed abdomen and pelvis with intravenous contrast, evaluating the parenchyma, collecting system and vascular pedicle. Conclusions. CT is the imaging method of choice in the diagnosis of patients with abdominal trauma thoracoabdominal. 98% of injuries identified were closed due to trauma, nepenetrante, in 88% of them they were due to accidents or road work. 92% of patients had parenchymal contusions and minor lacerations. In 14% of patients were identified and other injuries spleen, liver, bones

Cuvinte cheie: traumatism renal, evaluare computer tomografică

Rezumat: Rinichii sunt interesați în traumatismele lombare și toracoabdominale, situându-se pe locul al treilea (după splină și ficat) ca frecvență în cadrul acestora. Structura lor complexă determină apariția de leziuni ale parenchimului dar și la nivelul căilor urinare superioare uneori cu repercusiuni asupra vezicii urinare și ureterelor. Scopul lucrării prezente este evaluarea CT a leziunilor traumatice renale. Material și metodă. Am luat în studiu un număr de 132 de pacienți cu vârste între 12 și 76 de ani cu interesare renală în cadrul unui traumatism, ce au efectuat examinare CT abdomen și pelvis cu contrast intravenos, evaluându-se parenchimul, sistemul colector și pediculul vascular. Concluzii. Examinarea CT este metoda de elecție în diagnosticul imagistic al pacienților cu traumatisme abdominale sau toracoabdominale. 98% din leziunile identificate au fost datorate unor traumatisme închise, nepenetrante, în 88% dintre acestea ele s-au datorat accidentelor rutiere sau de muncă. 92% dintre pacienți au avut contuzii parenchimotoase și laceratii minore. La 14% dintre pacienți s-au identificat și alte leziuni: splenice, hepatice, osoase.

INTRODUCTION

From the point of view of frequency and interest, kidneys occupy the third position (after the spleen and the liver) in abdominal traumas (1,2), representing 10% of the total visceral traumas (2,3). Kidneys present interest in lumbar traumas as well as in thoracoabdominal traumas. Their complex structure determines the presence of parenchymal injuries and of injuries at the level of the upper urinary tracts, sometimes with repercussions on the urinary bladder and on the urethras.

Trauma on kidneys may be diagnosed with an echography as well as with a computed tomography.

AIM OF STUDY

The aim of the present paper is to make a CT evaluation of the lesions suffered at the level of kidneys during traumas.

MATERIAL AND METHOD

The study was applied upon 132 patients, aged 12-76, whose kidneys suffered a trauma and who performed an abdominal and pelvic CT with i.v. contrast material, evaluating the parenchyma, the collecting system and the vascular pedicle.

Medical examinations were carried out at the County Clinical Hospital and at Pelican Hospital beginning with January 1st, 2008 till June 1st, 2010. 129 (98%) of the 132 patients suffered from closed blunt traumas, and 3 patients presented open traumas caused by cutting weapons or firing guns.

RESULTS AND DISCUSSIONS

The aetiology consisted of: traffic accident in 101 cases, work accident in 10 cases, sports accident in 11 cases, domestic accident in 7 cases and accident caused by cutting weapons or firing guns in 3 cases.

From a clinical point of view, microscopic hematuria (haematuria) suggests injuries of the kidney or of the urinary tract without showing the level of injury. An emergency echographic or CT examination is necessary in order to show the hemoperitoneum.

Clinical symptomatology in our lot included: lumbar pains in 121 cases, hematuria in 91 cases, changes at the level of teguments and sensibility to palpation in 68 cases, and hypertension in 37 cases.

Of the 132 patients, only 24 had the blood pressure <60 mm Hg.

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Figure no. 1. The aetiology of renal trauma

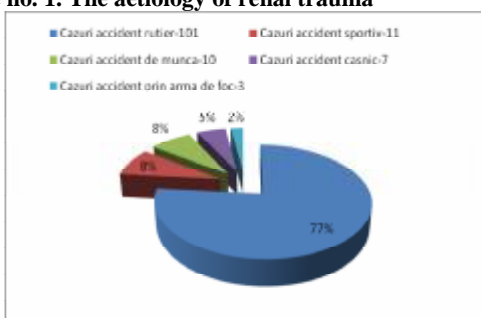


Figure no. 2. Clasificarea în funcție de stabilitatea hemodinamica

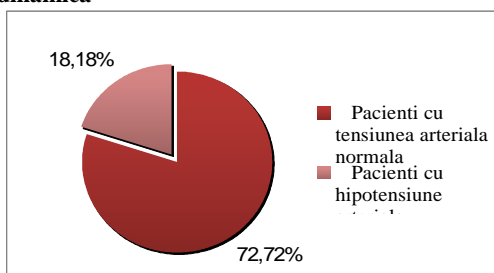
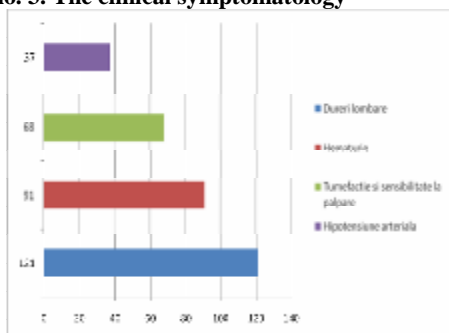


Figure no. 3. The clinical symptomatology



Renal injuries can be classified into 5 grades

- grade I: contusion, subcapsular hematoma; no laceration of the parenchyma.
- grade II: laceration extending less than 1 cm into the renal cortex; no urinary extravasation.
- grade III: laceration extending more than 1 cm into the renal cortex; no urinary extravasation.
- grade IV: laceration extending through the renal cortex, to the medulla and into the collecting system; minor renal artery or vein injury with contained hematoma.
- grade V: shattered kidney; devascularization of the kidney, hilar avulsion.

Figure no. 4. Classification of renal trauma (AAST)

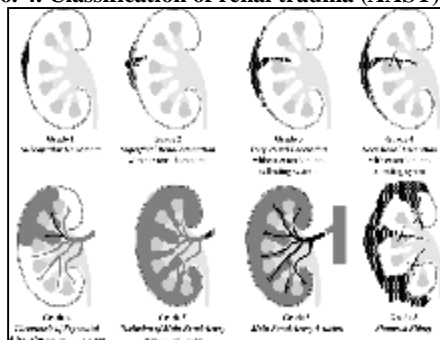
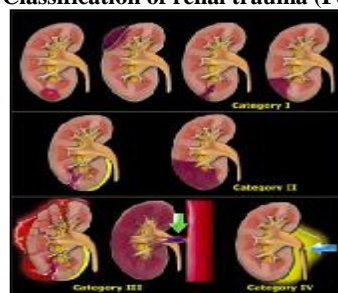


Figure no. 5. Classification of renal trauma (Federle)



Michael Federle placed renal injuries into four categories:

- minor injury: renal contusion, intrarenal and subcapsular hematoma, minor laceration with limited perinephric hematoma without extension to the collecting system or medulla; small segmental infarct
- major injury: major laceration into medulla or collecting system; segmental infarct
- catastrophic injury: maceration of the kidney, total devascularization due tot arterial occlusion
- rupture collecting system

Renal contusion appears under the form of an intraparenchymal serohematic extravasation; CT examination shows an area of diffuse hypodensity, non-homogenous, ill-defined, intrarenal, with juxtaleSIONAL flattening of the renal contour (4,5). 67 patients from our study presented renal contusion.

Figure no. 6. The focal area of renal contusion – right kidney



Hematoma may be subcapsular, intraparenchymal or perirenal.

Acute hematoma is hyperdense compared to normal parenchyma, it becomes hypodense in chronic phases after the isodense phase; i.v. postcontrast material, the density of the hematoma is always lower than that of a normal parenchyma(4,6,7).

Subcapsular hematoma occurs due to the cleft of the cortex, preserving the integrity of the fibrous capsule. It has lenticular shape (biconvex or semilunar), it compresses and deforms the renal parenchyma and the capsule is pushed laterally(3,6). CT examination showed the presence of a subcapsular hematoma in 39 patients.

Figure no. 7 Left subcapsular hematoma



Perirenal hematoma occurs due to the cleft of the cortex and lesion of the capsule, without affecting the cavities; it includes a part or the entire kidney inside the perirenal space(3,6,8). 15 patients were identified with perirenal

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hematoma and in 9 cases it was associated with subcapsular hematoma.

Figure no. 8. Left perinephric hematoma

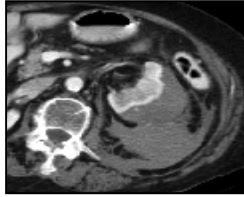
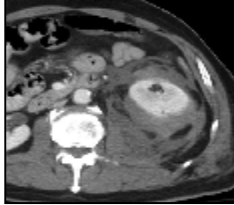


Figure no. 9. Left subcapsular and perinephric hematoma



Intrarenal (intraparenchymal) hematoma occurs due to the transection of the cortex and of the urinary tract; CT examination shows a focal area of reduced nephrogram and decreased excretion at the level of the corresponding calyx. A fluid-fluid level is rarely identified inside the hematoma(2,7,8).

Figure no. 10. Laceration renal gr III

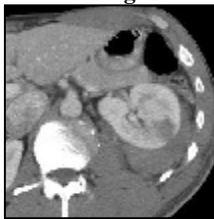
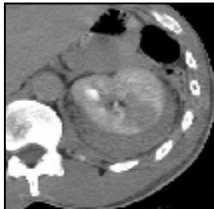


Figure no. 11. Delayed CT scan



In case of severe traumas may occur:

- *dilacerations of the renal parenchyma* when the lesion extends in the renal parenchyma and in the collecting system with blood and urine extravasation in the sinus and in the perirenal space; CT examination shows lacerations as irregular linear areas of reduced densities at the level of the parenchyma(3,4,8).

Figure no. 12. Laceration renal grIV

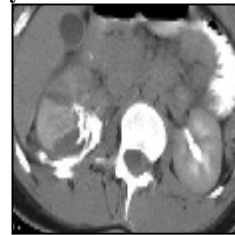


- *rupture of the kidney* accompanied by the transfixiant transection of the parenchyma and by haemorrhages in the retroperitoneal space(9,10). The transection may be complete when it intersects the capsule, the cortex and the

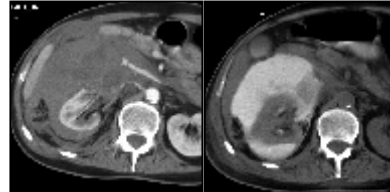
pyelocaliceal system being in fact a laceration that extends from the hilum to the outer surface of the kidney(4,6,8); CT examination shows a kidney with an ill-defined contour, fragmented parenchyma, non-homogenous after the administration of sciv due to renal perfusion defects and its extravasation(3,10,11). The rupture may be polar, with complete detachment of a part of the renal pole; renal bipartite may also occur when the rupture intersects all renal structures, dividing the kidney into 2 approximately equal segments(3,7). Triangular hypodense images show a vascularisation with spasm or a vascular rupture.

- *shattered kidney* with complete destruction of the parenchyma with ruptures and fragment detachment(1,6,7,11).

Figure no. 13. Delayed CT scan



Figurile nr. 14, 15. Shattered right kidney- precece and delayed CT scan



Lesions of the vascular pedicle occur rarely. Lesion of the renal artery leads to global or segmental perfusion defects, with consecutive arterial thrombosis. Severe injuries of the parenchyma may be associated with the development of a pseudoaneurysm(12,13). Avulsion of the renal artery leads to infarct(14,15). Lesion of the renal vein produces perirenal or retroperitoneal hematomas masking the renal sinus(9,15).

Figurile nr. 16, 17. Avulsion of right ureteropelvic jonction

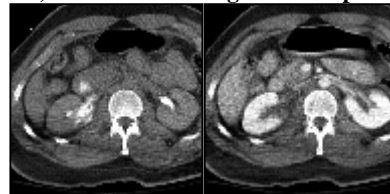


Figure no.18. Lesion of left renal artery



121 (92%) patients of the 132 presented parenchymal contusions and minor lacerations, the other 11 presented severe traumas.

12 patients presented renal lesions associated with intraparenchymal hepatic hematoma or hepatic dilaceration. 18

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patients presented lesions associated with splenic subcapsular hematoma or splenic dilaceration.

In 5 cases, the CT examination also identified bone lesions (1 case of fracture of the vertebral body, 1 case of pelvic fracture, 3 cases of rib fracture).

CONCLUSIONS

1. CT examination represents the method of choice in imaging diagnosis for patients with abdominal and thoracoabdominal traumas.
2. 98% of the identified lesions occurred due to closed, blunt traumas of which 88% were the result of traffic or work accidents.
3. 92% of the patients presented parenchymal contusions and minor lacerations.
4. 14% of the patients were diagnosed with other lesions: splenic, hepatic, bone.

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