CT EVALUATION OF RENAL TRAUMAS

ALINA VENTER1, ADRIANA PIRTE

UNIVERSITATEA DIN ORADEA

INTRODUCTION

From the point of view of frequency and interest, kidneys occupy the third position (after the spleen and liver) in abdominal traumas (1,2), representing 10% of the total visceral traumas (2,3). Kidneys present interest 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.

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.

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 pains in 121 cases. 89% of injuries identified were closed due to trauma, nepenetrante, in 88% of them they were due to accidents or road work. 2% of patients had parenchymal contusions and minor lacerations. In 14% of patients were identified and other injuries spleen, liver, bones.

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.
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.

**Classification of renal trauma (AAST)**

**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 subsegmental infarct
- major injury: major laceration into medulla or collecting system; segmental infarct
- catastrophic injury: maceration of the kidney, total devascularization due to renal 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.

**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.

**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...
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 pyelolical 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. Shaterred right kidney- precoce 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
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.

REFERENCES