

UDC 616.61-001-031.25-08

## **Management of the patients with blunt renal trauma: 20 years of clinical experience**

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### **Abstract**

**The aim of the study.** Analysis of effectiveness of conservative and expectant treatment tactics under ultrasound and CT monitoring in patients with blunt renal trauma (BRT).

**Materials and methods.** The results of treatment of 81 patients with BRT during 20 years (1998-2017) were analyzed. Amount of men was 58 (71.6%), women - 23 (28.4%). Grade I trauma was seen in 37.0% of cases, grade II – in 25.9%, grade III – in 11.1%, grade IV – in 16.1% and grade V – in 9.9% of observations.

### **Results.**

Conservative tactics was effective in 67.9% of observations. In 11.1% of cases treatment was accompanied with percutaneous drainage of liquid perirenal hematoma and urohematomas (in 2 cases with formation of perirenal abscess). Indications for surgical treatment (in 21.0% of observations) were progressing perirenal hematoma, unstable hemodynamics, inefficiency of hemorrhage stop with conservative treatment. In 9 cases, the kidney was sutured. Eight patients with multiple ruptures of the kidney, damage of the kidney vessels, massive bleeding underwent nephrectomy.

**Conclusions.** Achievements in visualization and therapeutic technologies can avoid and, at severe trauma, reduce the surgical treatment rates in BRT. In the presence of urohematomas with the formation of perinephral abscess and development of sepsis, the method of choice is percutaneous drainage. Indications for surgical treatment are multiple parenchymal

lacerations with damage of the segmental vessels and vessels of the renal hilum when the hemorrhage stop is ineffective by conservative or noninvasive methods.

**Key words:** renal trauma, conservative, expectant tactics.

**Introduction.** Usually blunt renal trauma (BRT) is associated with car accidents, falling from a height, contact kinds of sports. It is often combined with damage of other organs and systems [1,2]. Patients with polytrauma are more often admitted to surgical and traumatological departments, and patients with isolated kidney damage - to urological centers. In peacetime in the structure of urological patients, the fraction of patients with BRT does not exceed 0.2-0.3%. The ratio of men and women is 3:1.

BRT of mild grade (I, II according to the classification of AAST, 1989) is seen in 85% of cases, severe (IV-V) – in 4-6%. However, the multiple kidney ruptures with injuries of the vessels of the renal hilum that endanger the life of patient become indication for urgent surgery [3].

Introduction of extracorporeal shock-wave lithotripsy (ESWL) into the clinical practice has created a special type of renal trauma: the use of optimal parameters corresponds to the contusion of the kidney, and the use of high energies may cause a violation of the parenchyma integrity with the formation of subcapsular or perinephral hematoma.

The early complications of BRT include bleeding, suppuration of urohematoma, sepsis, distant ones – sclerosing paranephritis, hydronephrosis, chronic pyelonephritis, kidney shrinking, arterial hypertension, rarely – arteriovenous fistula and pseudoaneurysm [4].

Achievements in visualization methods expanded the limits of conservative treatment of BRT [5]. Urine extravasation without obstruction of the urinary tract and infectious complications, as a rule, resolves conservatively [6, 7]. When a perinephral abscess forms, the method of choice is percutaneous drainage. An open kidney revision is the best choice to stop bleeding. However, due to the danger of development of early and distant complications, the

problem of active surgical tactics in patients with massive kidney trauma remains open. Often the choice of therapeutic tactics is empirical [8, 9].

**The aim of the study.** Analysis of the effectiveness of conservative and expectant tactics and minimally invasive technologies in BRT patients.

**Materials and methods.**

The results of treatment of 81 patients with BRT in the urological department of the Poltava Regional Clinical Hospital n.a. M.V.Sklifosovsky for 20 years (1998-2017) were analyzed. Amount of men was 58 (71.6%), women - 23 (28.4%). Age of patients was 15-78 years (mean age  $41,9 \pm 4,6$  years). Damage of the right kidney was seen in 45 patients (55.6%), of the left kidney – in 36 patients (44.4%).

The cause of injury in 54 observations (66.7%) was non-occupational (of which 32 cases were associated with a falling from height and in 2 cases of a sports origin), in 20 observations (24.7%) – car accidents and in 7 observations (8.6%) - extracorporeal shock-wave lithotripsy (ESWL).

Grade I trauma (contusion, hematoma, non-increasing subcapsular hematoma) occurred in 30 observations (37.0%), grade II (superficial cortical laceration up to 1 cm without extravasation of the urine, non-increasing perirenal hematoma) - in 21 observations (25.9%), grade III (laceration >1 cm without extension into the renal pelvis or collecting system, non-increasing perirenal hematoma) - in 9 observations (11.1%), grade IV (corticomedullar laceration with urine extravasation, segmental vessel damage, expanding subcapsular haematomas compressing the kidney) - in 13 observations (16.1%) and grade V (multiple lacerations with urine extravasation, damage to the vessels of the renal hilum, increasing perirenal hematoma) - in 8 observations (9.9%).

In 22 patients (27.2%) there was a polytrauma: BRT and closed craniocerebral trauma – 4 cases, contusion of the chest organs – 2 cases, damage of the abdominal organs – 4 cases

(intraperitoneal bladder rupture – 1, liver rupture – 1, spleen rupture – 1, damage of colon – 1), fractures of the ribs – 7 cases, fractures of the spine processes – 3 cases, fracture of the pelvic bones and femur – 1 case, fracture of the pelvic bones with extraperitoneal rupture of the bladder – 1 case.

All patients underwent general clinical studies.

The ultrasonography was performed in "gray scale" mode, energy doppler (ED) and color doppler mapping (KDM) modes.

Computed tomography was performed in "native" mode and, if indicated, with bolus contrast enhancement.

### **Results and discussion.**

The most constant symptom of BRT was hematuria - 100% (macro hematuria - 88.9%, microhematuria - 11.1%), the nature of which did not always corresponded to the grade of the injury.

The pain syndrome occurred in 95.1% of the observations and was more marked when accompanied with a fracture of the ribs, pelvic bones and spine.

Hyperthermia was observed in 71.6% of patients (subfebrile body temperature – in 65.4%, fever  $>38.5^{\circ}\text{C}$  – in 6.2%). If the subfebrile body temperature was a manifestation of perirenal hematoma or urohematoma, its hectic grade indicated about the accompanied infection.

The initial investigation started with a "gray scale" ultrasography, power doppler (PD), and color doppler mapping (KDM). According to ultrasound data, subcapsular hematoma (fig.1,2) was detected in 16 cases (100.0%), perirenal hematoma - in 50 cases (98.0%), cortical laceration - in 9 cases (17.7%), free fluid in the abdominal cavity - in 3 cases (100.0%), fluid in the retroperitoneal space - in 5 cases (29.4%).

According to data, obtained after CT with bolus enhancement (fig.3), subcapsular hematoma was detected in 16 cases (100.0%), perirenal hematoma - in 50 cases (98.0%), cortical laceration - in 24 cases (70.6%) and corticomedullar rupture with urinary extravasation - in 15 cases (88.2%), deformation of the bladder and flow of the contrast agent outside the bladder - in 2 cases (100.0%), segmental vessel damage - in 5 cases (71.4%) and damage of the vessels of renal hilum - in one patient (100.0%).

Thus, ultrasound has proven to be an effective screening method for diagnosis of BRT and monitoring of the pathological process.

CT with bolus enhancement is a more informative method of diagnosis and monitoring of CT, and it is highly sensitive to detect lacerations of parenchyma, extravasation of urine and damage of the renal vessels, thus, it is more reasonable in the choice of treatment tactics.

Conservative treatment was effective in 55 observations (67.9%).

Percutaneous drainage was performed in 9 patients (11.1%): in 4 – with the liquid perirenal hematoma, in 5 – with urohematoma (including 2 cases of the perirenal abscess formation).

The indications for surgical treatment in 15 patients (18.6%) were increasing perirenal hematoma, unstable hemodynamics, and the ineffectiveness of hemorrhage stop with conservative measures. Of these, in 9 observations the suturing of the kidneys was performed and in 6 observations (in multiple lacerations with damaged segmental vessels), nephrectomy was done. Of those, in 2 cases, a massive bleeding after opening Gerota's fascia made it impossible to suture the parenchymal defect.

In 2 observations (2.4%), suppuration of urohematomas and repeated massive bleeding became indications for secondary nephrectomy.

The use of high energies of ESWL in 4 patients led to the formation of subcapsular hematoma and in 3 patients – of non-increasing perirenal hematoma. More often, kidney

damage was observed during repeated sessions of the ESWL for the stone of the proximal ureter with a density of more than 1500 HU. During dynamic observation of this group of patients with ultrasound and CT, hematomas gradually disappeared for up to 3 months. At the control examination after 6 months consequences of kidney injury were not detected.

In the period from 6 to 12 months, 60 patients were examined. Arterial hypertension was detected in 3 patients, chronic pyelonephritis - in 2 patients, sclerosing paranephritis, pyeloectasy and arterial hypertension - in 1 patient. Total long-term complications of BRT had not exceed 10%.

### **Conclusions.**

1. Achievements in visualization methods and modern medical technologies can avoid, and at severe trauma to reduce the indications for surgical treatment of BRT, which itself carries the risk of nephrectomy.
2. In the presence of urohematomas with the formation of perinephral abscess and the development of sepsis, the method of choice is percutaneous draining.
3. Indications for surgical treatment are multiple parenchymal lacerations with damage of the segmental vessels and vessels of the renal hilum when the hemorrhage stop is ineffective by conservative or noninvasive methods.

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The article is performed within the scientific research field of the department “Optimization of treatment tactics of patients with urinary tract and male genitals injuries”.

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