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Traumatic renal injury versus the necessity of nephrectomy

The intensification of dangers of civilization, connected with scientific and technical progress, has contributed to a considerable increase in the number of serious accidents posing direct threat to human life. The consequence of the existing situation is a statistically significant rise in the number of victims with multi-organ injuries, including to a great extent renal injuries; they account for the most frequent urinary injuries – 37% (4) as well as coexist in 8–10% of abdominal injuries (9). Lumbosacral injuries can involve a wide range of symptoms with varied grades of intensification, therefore it is very important to treat each case individually, at the same time following generally established procedures. The patients admitted to hospital due to traumatic renal injuries are most frequently treated in the Department of Traumatic or General Surgery and part of them are sent to the Department of Urology for the specialistic treatment (3).

According to the range of renal injury (1, 4, 7, 11) currently there is a commonly applied five-grade organ injury scale by American Association for Surgery of Trauma (AAST): Grade I. Parenchymal contusion (haematuria or microscopic haematuria), minor subcapsular haematoma, Grade II. Parenchymal contusion with minor laceration (<1 cm depth), medium-sized perirenal haematoma, Grade III. Deep parenchymal laceration (> 1 cm depth), major perirenal haematoma, injuries non-expanding into the pyelocalyceal system, Grade IV. Parenchymal laceration expanding into the pyelocalyceal system of the injured kidney, large perirenal haematoma, minor injury of main renal vessels, Grade V. Avulsion of renal hilum, shattered kidney.

What is also taken into consideration in the evaluation of renal injuries is the question whether the injury is blunt or expanding. The subsequent procedures of treatment depend on the type of trauma. For blunt injuries conservative treatment is applied (approximately 98%), while for expanding injuries surgical treatment is applied in 53.3% cases (8).

The aim of the papers was a retrospective analysis of diagnostics and methods of treatment of patients with the suspicion of traumatic renal injuries as well as the symptoms that indicated qualification for either conservative or surgical treatment.

MATERIAL AND METHODS

Research material was constituted by case records of patients with renal injuries (Grades I–V) admitted to the Voivodship Specialist Hospital in Lublin from 1993 to 2003. In the period up to 1997 Traumatic Department had not existed; therefore all the data from the years 1993–1997 come from the Department of Urology or General Surgery (10 patients), while the following come from the Department of Multiorgan Injuries (28 patients); a total of 38 patients. Case records were analysed as regards personal data of the injured, circumstances of trauma development, diagnostic methods applied as well as the selected form of treatment during hospitalization.

RESULTS

The injured comprised 28 men (73.7%) and 10 women (26.3%). The age of men ranged from 15 to 70 years, with an average of 38.7, while the age of women ranged from 14 to 75, on average 32.4. In both groups the injury most frequently occurred in their forties. The average period of patients' hospitalization was 14.3 days – one mortal case was recorded in the group under examination (extensive internal injuries). The most frequent causes of renal injuries include: traffic accidents – 19 (50%), followed by falls – 10 people (26.3%), assault – 5 people (13.1%) and single cases of gunshot wound, stab wound, hit during P.E. classes and horse kick. Research material included 20 cases of accidents in the spring-summer and 18 in the autumn-winter season. As regards the incidence of left and right kidney injuries, 20 and 18 cases were recorded respectively.

Table 1 presents the methods of renal injury treatment with regard to the expected organ injury grade by AAST. Grade I was recognized in 18 injured, grade II – in 5, grade III – in 5, grades IV and V were diagnosed in 6 and 4 patients respectively. The patients with the diagnosed grades I and II of renal injury underwent exclusively conservative treatment. Among the grade III patients, two had their kidney removed, while three patients were applied conservative treatment. Regarding renal injuries grade IV and V, the patients received exclusively surgical treatment; a total of 3 operations of renorrhaphy and 9 of nephrectomy were carried out.

Table 1. Methods of treatment of renal injuries with regard to expected organ injury grade

Organ Injury Scale for Renal Trauma (AAST)	Methods of treatment of renal injuries (%)		
	conservative treatment	renorrhaphy	nephrectomy
Grade I (18 patients)	18 (100)	0 (0)	0 (0)
Grade II (5 patients)	5 (100)	0 (0)	0 (0)
Grade III (5 patients)	3 (60)	0 (0)	2 (40)
Grade IV (6 patients)	0 (0)	2 (33.3)	4 (66.7)
Grade V (4 patients)	0 (0)	1 (25)	3 (75)
Total	26 (68.4)	3 (7.9)	9 (23.7)

In 23 traumatic patients (60.5%) different organ injuries were recognized. The most frequent of them included: cranial and thoracic injuries, respectively in 13 (34.2%) and 11 (28.9%) patients, pelvic injuries (4 patients accounting for 10.5%), injuries of lower limbs (2 patients- 5.2%) and upper limbs (1 patient – 2.6%). Besides, in 4 patients (10.5%) splenic injuries were diagnosed, in 2 patients (5.2%) – injuries of the large intestine and single cases of aortic injury, liver and diaphragm ruptures as well as brain concussion. The symptoms of brain concussion occurred in 4 patients.

In the Voivodship Specialist Hospital in Lublin three forms of radiological examination were applied in the diagnostics of renal injuries, namely: urography, abdominal ultrasonography and computerised tomography (equipment purchased in 1996.) In 35 patients (92.1%) abdominal ultrasonography examination was carried out, 14 patients (36.8%) underwent urography, while 5 patients (13.1%) – computerised tomography. On the basis of the general state of the injured as well as the diagnostic examinations mentioned above, the patients were classified into two groups. One of them was constituted by the patients who required surgical treatment, while the other – by those for whom conservative treatment was sufficient; one injured person from this group had ultrasonography-guided kidney puncture done (haematoma evacuation).

Table 2 illustrates the data concerning etiology of renal trauma among the patients requiring hospitalization and surgical treatment due to renal injuries. Out of 36 patients with blunt injuries, 10 (27.8%) were qualified for surgical treatment; as regards open injuries both patients received surgical intervention.

Table 2. Methods of treatment of renal injuries with regard to expected organ injury grade

Etiology of trauma	Number of hospitalizations	Number of performed operations (%)
Blunt trauma	36	10 (27.8)
• Traffic accidents	19	6 (31.6)
• Fall	10	4 (21)
• Assault	5	0 (0)
• Other	2	0 (0)
Expanding trauma	2	2 (100)
• Stab wounds	1	1 (100)
• Gunshot wounds	1	1 (100)
Total	38	12 (31.6)

Of the total of 12 patients undergoing surgical treatment due to renal injuries, nine (75%) had nephrectomy and three had renorrhaphy. Two operations of nephrectomy involved simultaneous spleen removal (splenectomy), in one patient surgical suture of hepatic and diaphragmatic lacerations, cholecystectomy and pleural drainage where necessary, while another case involved skull trephination and aortorrhaphy. Furthermore, two patients had to undergo exploratory laparotomy and splenectomy; a total of 14 people were applied surgical treatment. Nine patients underwent erythrocytes transfusion in the course of hospitalization.

Table 3. Types of renal injuries versus applied surgical treatment

Type of renal trauma	Number of performed operations (%)		
	number of hospitalizations	renorrhaphy	nephrectomy
Blunt trauma	36	2 (5.5)	8 (22.2)
Expanding trauma	2	1 (50)	1 (50)
• Stab wounds	1	1 (100)	0 (0)
• Gunshot wounds	1	0 (0)	1 (100)
Total	38	3 (7.9)	9 (23.7)

Table 3 presents the data concerning types of renal injury versus the applied surgical treatment. In 36 patients (closed renal injuries) two repair operations (renorrhaphy) and 8 operations of nephrectomy were performed, while in two patients (open renal trauma) they included one operation of nephrectomy and one repair operation.

DISCUSSION

Urogenital injuries, especially renal trauma, remain a challenge for traumatologists-surgeons and urologists, primarily due to the variety of symptoms and difficulties in the estimation of organ injury grade. Therefore, it is particularly important to get acquainted with diagnostic procedures aimed at the selection of a proper type of treatment. Diagnostics involves not only the measurement of patient parameters (arterial blood pressure, pulse, respiratory rate – breaths/minute, blood cell count, biochemical blood examination, urine analysis etc.) but also physical examination and injured organ estimation (lumbar balance, presence of superficial injuries, kidney shock susceptibility – Goldflam syndrome). Further proceedings (stable respiratory and circulatory state of patients) involve immediate initiation of x-ray examinations following intravenous contrast injection. Current gold standard is computerised tomography which enables the most precise estimation of

organ injury scale (particularly grades III–V) and making decisions concerning further therapy (2,3,4,5,6,8,10,11). In the situations of unstable state of patients, intrasurgical urography is recommended in the course of exploratory laparotomy (3,10) followed by either continuation or cessation of the surgery depending on the examination result. The third type of radiological examination for patients in a stable state with the suspicion of heavy renal injury (no emission of contrast in urography or CT examination) is renal arteriography. It enables to estimate renal vessels directly and, if needed, also to embolize an injured vessel (3,4). However, the above mentioned world standards of diagnostic proceedings are impossible to realize in the majority of Polish hospitals, especially within the emergency unit (1). The major reason for this is the lack of access to specialistic diagnostic equipment (1), therefore the results obtained in the present material as well as in the study by Dobrowolski et al. (3,4) prove that abdominal ultrasonography and urography play a dominant part in renal trauma diagnostics. In the material by Dobrowolski ultrasonography was performed in nearly all the patients (diagnostic function as well as estimation of dynamic organic changes in kidneys), urography was administered in approx. 80% of patients, tomography – in 20% (3,4); in the material under research from the Voivodship Specialist Hospital in Lublin ultrasonography was performed in 92.1% of patients, urography – in 36.8%, while tomography in 13.1%.

The data concerning ways of treatment applied in patients with renal injuries in hitherto published studies depend primarily on the approach to the above issue in particular research centres. What results from the data obtained by Santucci et al. (11) is that renal injury grade I in AAST scale was an indication for conservative treatment. 85% of patients with grade II of renal injury were also administered conservative treatment, while the remaining 15% required surgical intervention (repair operations). The patients with the diagnosed grade III and IV of renal injury required surgical treatment in more than 70% of cases: grade III – 76% (3% – nephrectomy), grade IV – 78% (9% – nephrectomy), while in 86% of patients with renal injury grade V nephrectomy was performed (repair operations – 7%). Comparing treatment trends applied in Poland for renal injuries a tendency to administer surgical treatment can be observed and the most frequently performed surgical intervention is traumatic nephrectomy (3,4). Figure 1 presents the percentage of traumatic nephrectomies performed in patients accounting for the material in four different research studies. The most positive result – approx 1% of nephrectomies in population under research was obtained by the Americans McAninch (7) and Nash (8), followed by the material by Dobrowolski with the result of 19.1% (3,4) and the present study – 23.7%.

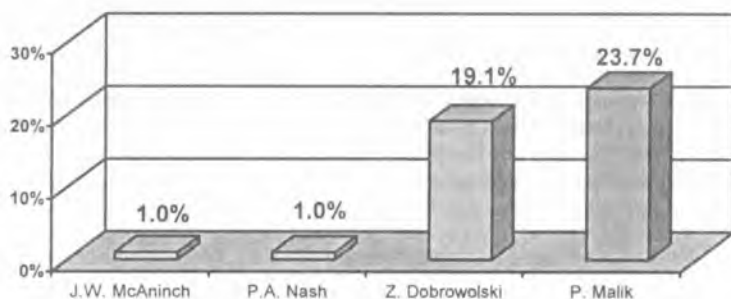


Fig. 1. Percentage of traumatic nephrectomies performed

Figure 2 presents the percentage of patients qualified for surgical treatment due to renal injuries in four groups mentioned above. The comparison is again in favour of the Americans McAninch (7) – 9.3% and Nash (8) – 7.8%. The result obtained in this study is 31.6% of hospitalized patients under surgical treatment, while in the material by Dobrowolski (3,4) – the percentage is 26.4%.

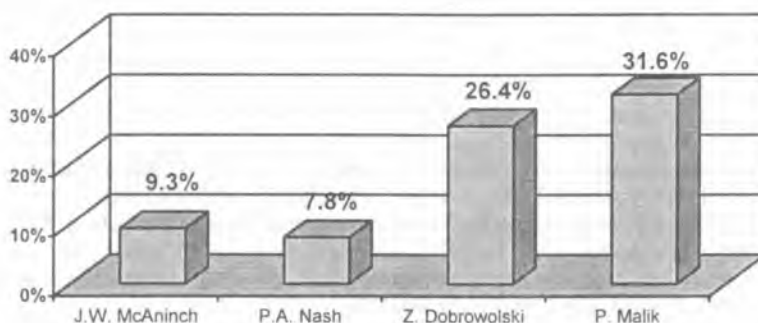


Fig. 2. Percentage of patients qualified for surgical treatment due to renal injuries

On the basis of the data collected from 61% of Departments of Urology in Poland from 1995 to 1999, Dobrowolski claimed that 97% of renal injuries were closed injuries, while expanding injuries accounted for 3%, surgical treatment was applied in 26.4% of patients, including 73% who had the injured organ removed and 27% whose operations aimed at maintaining the injured kidney (3, 4). Similar results, despite considerably small research group, were also obtained in this material. In 94.7% of the injured close renal injuries were recorded, while in 5.3% – open injuries. In 31.6% of patients (Grades III–V of renal injury) invasive treatment was applied; 75% had nephrectomy performed, while repair operations accounted for 25% of cases. For comparison, the following results were obtained in the study by McAninch (7). The percentage of open renal injuries turned out to be larger than in our study and reached 12.5%. In spite of that, 9.3% of the injured were qualified for surgical treatment. 11.3% of them had an operation of nephrectomy performed and 88.7% – repair operations. In the study by Nash (8) in 1995 the percentage of patients who underwent operation due to renal injuries was 7.8%. Blunt renal injuries were recognized in 89.1% of the hospitalized patients – 98% of them received conservative treatment and 2% – surgical treatment. Expanding injuries were diagnosed in 10.9%, and their treatment was surgical in 53.5% of cases. Nephrectomy was performed in 13.3% of patients under surgical treatment, while 74.3% of them underwent repair operations and the remaining part was constituted by exploratory laparotomies.

CONCLUSIONS

1. In case of suspicion of upper urinary tract trauma abdominal ultrasonography and urography play a fundamental part. What should become a standard element of diagnostics in these cases is computerised tomography following contrast injection.

2. In diagnostics and treatment of renal injuries greater attention should be paid to the possibility of renal arteriography with a simultaneous use of the therapeutic method of embolization.

3. Patients with a diagnosed renal injury should in principle be qualified for further observation and conservative therapy. Only patients who are in an unstable respiratory and circulatory state, with suspected multi-organ trauma, including grade III–V injuries of the kidney or both kidneys should receive surgical treatment due to a life threat.

4. On comparing the proportional rate of patients undergoing surgery due to renal injuries and the number of operations of kidney removal in Poland and worldwide, the conclusion can be drawn that there is an intensified tendency to apply radical surgical treatment in our country. The situation should gradually evolve towards the reduction of

surgical interventions performed due to renal injuries and increase in the number of kidney-efficient surgeries.

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SUMMARY

The aim of the paper was a retrospective analysis of diagnostics and methods of treatment of patients with the suspicion of traumatic renal injuries as well as the symptoms that indicated qualification for either conservative or surgical treatment. The research material included case records of patients with renal injuries (grade I–V) admitted to the Voivodship Specialist Hospital in Lublin from 1993 to 2003; a total of 38 patients. The most frequently applied diagnostic radiological examination in renal injuries in the Voivodship Specialist Hospital in Lublin was abdominal ultrasonography and urography; since 1996 also computer assisted tomography. On the basis of these examinations patients were qualified into two groups: for conservative and surgical treatment. Patients with a suspected grade I or II renal injury were exclusively qualified for further observation and conservative therapy. Patients with an unstable respiratory and circulatory state, with multi-organ injuries or suspected grade III–V renal injuries: shattered kidney (avulsion of the renal pole, ureter or laceration of the renal pelvis), avulsion of the renal hilum, expanding retroperitoneal haematoma or persistent bleeding from the kidney, received surgical treatment due to direct life threat (14 cases): nine operations of nephrectomy and three repair operations (renorrhaphy) as well as two exploratory laparotomies with splenectomy were performed.

Pourazowe uszkodzenia nerek a konieczność przeprowadzenia zabiegu nefrektomii

Celem pracy była analiza retrospektywna diagnostyki i metod leczenia chorych z podejrzeniem pourazowych uszkodzeń nerek oraz wskazań, na których podstawie pacjenci zostali zakwalifikowani do leczenia zachowawczego bądź też zabiegowego. Materiałem badawczym były historie chorób 38 pacjentów z urazami nerek (I–V stopień) hospitalizowanych w Wojewódzkim Szpitalu Specjalistycznym w Lublinie w latach 1993–2003. Najczęściej stosowanym radiologicznym badaniem diagnostycznym w przypadku urazów nerek w W. Sz. S. w Lublinie było usg jamy brzusznej oraz urografia, od r.1996 zaczęto również stosować tomografię komputerową. W oparciu o nie chorzy zostali zakwalifikowani do dwóch grup: leczonych zachowawczo lub operacyjnie. Pacjenci z podejrzeniem I lub II stopnia uszkodzenia nerki bez wyjątku kwalifikowani byli do dalszej obserwacji i terapii zachowawczej. Chorzy niestabilni krążeniowo i oddechowo, u których występowały obrażenia wielonarządowe bądź podejrzenie urazu nerki III–V stopnia: rozkawałkowanie narządu (oderwanie bieguna nerki, moczowodu, rozerwanie miedniczki nerkowej), uszkodzenie szypuły naczyniowej, narastający krwiak zaotrzewnowy czy utrzymujące się krwawienie z nerki – operowani byli z powodu bezpośredniego zagrożenia życia (14 przypadków). Wykonano dziewięć nefrektomii, trzy operacje naprawcze (szycie nerki) oraz dwie laparotomie zwiadowcze ze splenektomią.