

Pre-existing renal lesions revealed after renal trauma, Difficulties in diagnosis and accountability: About 14 cases

Les lésions préexistantes du rein révélées par un traumatisme rénal, difficultés diagnostiques et d'imputabilité: A propos de 14 cas

Sataa Sallami¹, Mohamed Mongi Mighri¹, Mahmoud Benatta², Hassen Khouni³, Sana Abou El Makarim¹, Mohamed Allouch⁴, Hassen Touinsi¹.

1-Service Chirurgie - Hôpital Maamouri - Nabeul / 2-Oran - Algérie / Oran

3-Service d'urologie Hôpital FSI - La Marsa / 4- Service Medecine légale - CHU Charles Nicolle

R É S U M É

Objectif: Les lésions préexistantes du rein (LPER) peuvent interférer avec la physiopathologie du traumatisme, modifier les données de l'imagerie médicale et influencer l'approche thérapeutique. Les objectifs de cette étude étaient de colliger les cas de LPER diagnostiqués fortuitement lors d'un traumatisme fermé du rein, de préciser la place du traitement conservateur et d'estimer l'incapacité partielle permanente estimée (IPP).

Méthodes: Les dossiers médicaux de 14 patients avec des LPER associées à un traumatisme fermé du ont été examinés. Pour chaque patient, les anomalies rénales, les symptômes cliniques, les résultats de l'imagerie médicale, les lésions associées, l'approche thérapeutique, les critères d'imputabilité ainsi que le taux estimé d'IPP ont été notés.

Résultats: Notre série compte 11 hommes et 3 femmes avec une médiane d'âge de 35,6 ans (19-66 ans). Le traumatisme rénal était dû à un accident de la circulation chez 8 patients. Les lésions rénales semblent être disproportionnées par rapport à la gravité du traumatisme (traumatisme mineur) avec un faible taux de lésions associées (quatre patients seulement). Les calculs urinaires étaient présents chez 5 patients, l'anomalie de la jonction pyélo-urétérale chez 3, un rein en fer à cheval chez 3, un rein ectopique chez 2 et un carcinome urothélial du haut appareil urinaire dans un cas.

La néphrectomie précoce en urgence a été nécessaire chez trois cas pour instabilité hémodynamique. Le drainage par sonde urétérale a été indiqué chez 3 cas. Six patients étaient opérés plus tard en raison de leur pathologie rénale sous-jacente. Un traitement conservateur était possible chez 7 cas seulement. L'IPP liée à un traumatisme rénal variait de 0 à 13%.

Conclusion: Les LPER peuvent compliquer un traumatisme rénal mineur et mettre en jeu le pronostic vital du patient. L'imagerie médicale est indispensable, mais peut être source de confusion. L'approche thérapeutique est, dans une large mesure, conservatrice chez le patient hémodynamiquement stable. L'imputabilité peut être difficile à établir et l'IPP dépend des LPER et de la gravité des blessures rénales.

Mots-clés

Rein, traumatisme rénal, anomalie congénitale, Adulte, tomodensitométrie, Imputabilité, Incapacité partielle permanente.

S U M M A R Y

Objective: Pre-existing renal lesions (PERL) may interfere with the patho-physiology of trauma, alter the radiographic imaging and influence the therapeutic approach.

The aims of this study were to record the PERL found incidentally during blunt renal trauma, to specify the place for effective conservative management and to determine the estimated partial permanent disability (PPD).

Methods: The medical records of 14 patients with PERL and blunt renal trauma were reviewed. In each patient, pre-existing renal abnormalities, clinical symptoms, CT scan study findings, associated injuries, therapeutic approach, the accountability criteria and the estimated PPD were recorded.

Results: There were 11 men and 3 women with a mean age of 35,6 years (range 19-66 years).

Renal trauma was due to a traffic accident in 8 patients.

Renal damage appeared to be disproportionate to the severity of the trauma (minor trauma). They had a lower rate of associated trauma to other abdominal organs (four patients only).

Urinary stones were present in 5 patients, pelvi-ureteric junction obstruction in 3, horseshoe kidney in 3, ectopic kidney in 2 and upper urinary tract carcinoma in one case.

Early nephrectomy was required in three cases for hemodynamic instability. Ureteral stenting was indicated in 3 cases. Six patients were operated later because of their underlying renal pathology. A conservative treatment was possible only in 7 of cases.

The PPD related to renal trauma varied from 0 to 13% in all cases.

Conclusion: PERL may complicate a negligible renal trauma while in some cases they may be of vital importance for the patient's final outcome. The imaging findings are crucial but may be confusing. The therapeutic approach is, to a large extent, dependent on the type of PERL and the severity of damage, and is often conservative in the hemodynamically stable patient. Accountability link may be difficult to establish and the PPD depends on the PERL and the renal injuries severity.

Key- words

Kidney, Renal trauma, Congenital anomaly, Adult, Computed tomography, Accountability, Permanent partial disability.

Pre-existing renal lesions (PERL) associated with blunt renal trauma (BRT) may increase the risk of renal injury. These abnormal kidneys are particularly fragile and easily injured even with relatively minor trauma (1). Moreover, blunt trauma on pathological or abnormal kidney is a particular entity because of the difficulty of distinguishing between damage caused by trauma and by PERL spontaneous evolution.

It is also of particular medico-legal problems of accountability. Indeed renal trauma can reveal a previous state, can aggravate or precipitate its aggravation. The assessment of disability depends on the importance of lesions and the evolution of the underlying uropathy.

The aim of this study was to evaluate the PERL found incidentally during evaluation for BRT, to analyse their impact on trauma management, and suggest baselines for objective medico-legal evaluation of damage.

We point on the difficulties faced by the medical expert in the research of the accountability relationship between renal damage and the BRT, presumed to be the cause.

METHODS

We reviewed the medical records of 14 patients hospitalized at three different institutions for BRT on abnormal kidneys between 2000 and 2014. We have included only victims of traffic accidents or aggression / fight. No pediatric cases were encountered.

Inclusion and non inclusion criteria : All patients underwent an abdominal computerized tomography (CT) scan with intravenous contrast in order to detect other associated lesions, to identify the renal damage and its severity.

The grade of renal injury was classified by two independent senior radiologists according to the kidney injury scale of the American Association for the Surgery of Trauma (AAST)(2).

Patients with hemodynamic instability (refractory to transfusion) or those with persistent bleeding (major hematuria and/or increasing hematoma size) underwent surgical exploration. Otherwise, initial treatment included intravenous fluids, broad-spectrum antibiotics, antalgic drugs, bed rest, and close clinical observation with monitoring of vital signs. Patients were transfused for hemodynamic instability or a hematocrit < 24%. Those with gross hematuria were kept on bed rest until the urine was grossly clear. Daily clinical examination and hematocrit were performed to detect any clinical instability or bleeding. Abdominal ultrasound was used to monitor the size of the hematoma/urinoma upon request.

When conservative approach was indicated, CT scan was repeated at days 7, 15, and 30 following the trauma. These findings on repeated CT scans were compared with the initial exams to plan the therapeutic management. Patients with progressively increasing

urinomas were treated by ureteral stenting. Later, patients were evaluated by clinical examination including blood pressure measurement, urinalysis, serum creatinine levels, and CT scan. Dimercaptosuccinic acid (DMSA) scanning was reserved for patients with poorfunctioning kidneys that means split function on DMSA less than 20% on the affected side.

We collected epidemiologic data, symptoms at presentation, the type of PERL, grade of renal injury according to the AAST grading system, initial radiologic exam and the following evaluations, initial management, complications and their treatment.

Permanent partial disability was calculated in each patient after consolidation (at least 12 months after trauma) and according to the Tunisian official scales. Evaluation of permanent partial disability was made by two surgeon experts individually. When the difference was significant (> 5%), the two experts were asked to meet to make one final decision.

RESULTS

Our series accounts 14 patients, they were collected from three different departments thus the exact frequency of PERL among patients with BRT can't be calculated.

There were 11 men and only 3 women who sustained BRT. Mean patient age was 35,6 years (19-66). Only 2 patients knew that they had such renal abnormalities before trauma (renal stone and ureteropelvic junction obstruction (UPJO)).

An estimated major blunt trauma was reported in 4 cases. Five patients sustained injuries from seemingly minor sources (bicycle or falls). The causes of blunt renal injuries were motor vehicle accidents and abuse or assault in respectively 8 and 6 cases.

Renal injuries were on the right and left sides respectively in 8 and 6 patients.

Abdominal or flank pain was reported by all patients, macroscopic hematuria was present in 11 patients, and flank mass in 6 patients. Three patients had hemodynamic instability. Initial CTScan showed variable degrees of renal perfusion and multiple lacerations. The grades of renal injuries included grade IV in 4 and grade V in 10. (Table I). There were 3 patients with renal pelvic stone, 3 patients with horseshoe kidney, 3 patients with UPJO, 2 patients with renal ectopia / pelvic kidneys, 2 patients with lumbar ureteral stone and one with upper urinary tract carcinoma (multifocal tumors in the lumbar ureter and up to the uretero-pelvic junction) According to the to the classification of CENDRON et VALAYER, UPJO were stage 2 in two cases and stage 3 in one case. Associated abdominal injuries were encountered in 4 patients, including lumbar supine trauma (2 cases), multiple rib fractures (2 cases), head trauma (one case) and hepatic contusion (one case). Ten patients had no other injuries.

Table I: The type of PERL according to the severity of renal trauma

PERL \ AAST grading	Grade IV	Grade V
UPJO		3
Renal pelvic stone		3
Horseshoe kidney		3
Ectopic kidney	1	1
Lumbar ureteral stone	2	
Upper urinary tract carcinoma	1	

Nonoperative treatment with rest and antalgic drugs was indicated in two cases of ectopic kidney and a case of renal stone.

Surgery had been performed as an immediate emergency procedure in 3 cases because of the hemodynamic instability of the patients (renal stone in one case and pyelo-ureteral junction rupture with minimal functioning parenchyma in two cases). There were no deaths in these patients. Surgical management by renorrhaphy was performed in 2 patients who had horseshoe kidneys. Ureteral stenting was performed in 3 patients who didn't require surgery. In 6 patients, open surgery was indicated especially because of the underlying renal pathology and not trauma damage (2 cases of Horseshoe kidney, 2 cases of UPJO, one case of renal stone and one case of upper urinary tract carcinoma). The delayed procedures were nephrectomy in four patients (3 months later) and secondary renal parenchyma excision and renorrhaphy in two others (within the first week after trauma).

The traumatized kidney was preserved in 7 patients (half of cases). All the patients (operated or not) were discharged with stable vital signs and laboratory profiles as well as grossly clear urine. CT scan follow-up in the 7 patients in whom the kidneys were salvaged demonstrated cicatrization of the parenchyma; there were no vascular abnormalities or hydronephrosis. With a mean follow-up of 4,6 years (range 1-11 years), 12 patients were normotensive with a normal urinalysis and serum creatinine levels. Ten patients continue to complain of low to moderate back pain and renal colics, two patients developed hypertension, one developed minimal renal insufficiency, two had developed incisional hernia and one patient developed retroperitoneal fibrosis.

Two patients with nonoperative treatment recovered uneventfully and without disability, however the third patient developed renal atrophy. Final permanent partial incapacity rates (made after at least 23 months of follow-up) vary from 0 to 13% (Table I). It was minor than 5% in all cases but two.

DISCUSSION

In our study, pre-existing congenital or acquired kidney abnormalities found at the time of evaluation and treatment of renal trauma, were found in 14 patients. The

incidence of PERL with BRT is reported to range between 4.4 and 19% in adults (3-5) and as high as 12.6-35% in children (3,6,7). All our patients but two were unaware of the underlying disorder at the time of the accident.

These PERL may modify the clinical signs, radiological images, diagnosis and therapeutic approaches (5).

PERL increase the vulnerability of kidneys in BRT (4,6-8). It seems that abnormal renal size, position, consistency, or location diminishes the effectiveness of the natural protective mechanisms and predisposes more the kidney to injury (8). Rapid deceleration forces encountered with BRT predispose to ureteropelvic junction rupture, especially when the kidney is abnormally enlarged (8-10). Direct compressive forces can compress the kidney if it is displaced from its relatively protected position in the retroperitoneum by processes where the kidney is abnormally enlarged (hydronephrosis, renal cyst or mass) or from failure of normal ascension of the metanephros (crossed-fused renal ectopia, horseshoe kidneys)(11). It has been pointed out in a computer-simulated kidney trauma model that a liquid-filled incompressible compartment (cyst or a hydronephrotic renal pelvis) amplifies the force of the trauma impact, which results in a higher risk of tissue fracture (12). This suggests that fluid-filled lesions contribute to the higher vulnerability of abnormal kidneys. Even trivial trauma can result in serious renal injury (13).

Motor vehicle collisions have been the cause of most (47%-82%) BRT in the present and previous series (1).

Trauma in PERL produces more symptoms than expected for the extent of the injury in normal kidney (13). Thus, an underlying renal disorder should be suspected when the severity of the patient's symptoms is disproportionate to the degree of injury suffered (relatively minor or even trivial trauma) (9). Urine extravasation may be clinically occult or lead to acute abdomen symptoms.

Contrast material-enhanced CT is the imaging technique of choice for the evaluation of renal trauma (11). It is particularly useful in evaluating traumatic injuries to kidneys with pre-existing abnormalities since it accurately demonstrates not only injuries involving the kidney and PERL, but also associated damage to other abdominal or retroperitoneal organs (9, 14-19). Repeat imaging 2-4 days after trauma minimizes the risk of missed complications, especially in grades 3-5 blunt renal injuries (20). Follow-up imaging may be accomplished with US or potentially MR-Urography to further reduce exposure to ionizing radiation (11).

Application of trauma guidelines for imaging injured PERL kidneys has proven difficult.

The management of PERL, at the time of trauma, may pose significant challenge (4).

Although, the management of high-grade renal injury in hemodynamically unstable patients is clearly defined, the management of renal injuries with PERL after blunt trauma in clinically stable patients remains controversial (11). The presence of pre-existing renal pathology may

alter the treatment plan or even prohibit non-operative management (6, 21,22). In a stable patient, the actual trend tend to be towards conservative treatment initially, even though surgery may be needed electively at a later stage (13).

Many parameters guide the therapeutic decision:

The type of PERL and eventual complication often more than the severity of renal trauma (4,13).

Accurate imaging diagnosis is of paramount importance to determine the severity of renal injury and guide the clinician as to whether surgery or conservative management is needed (4,23). Technological advances in interventional radiology, endourological drainage and resuscitation currently possible to maintain conservative treatment even in the most severe injuries. Patients with persistent extravasation of urine from an obstructed kidney can benefit from endoscopic or minimally invasive techniques (percutaneous tube drains alone and / or internal stenting) in controlling persistent extravasation and flank pain (13,24-26). They were reported to be efficient and may avoid the need for surgical exploration in patients with high Grade renal trauma. This approach was performed in 3 patients in our series, followed by delayed etiological repair. We believe that this approach optimizes the conditions for satisfactory lesions repair and renal salvage. The indication for surgery is often based on the presence of an underlying significant pathology and not on hemodynamics (4,5). If surgery is contemplated, the best time is during the first week and a repair of the defect can be performed at the same time.

In our study, all seven patients who underwent delayed exploration or conservative management recovered completely with no major complication.

The establishment of an accountability link between the damage and the event was done on a set of criteria called «accountability criteria» and it may sometimes, as in such condition, pose many questions. In the context of a trauma of kidney with PERL, the reality of some of these criteria raises a great discussion:

The intensity: trauma should be intense enough to generate disorders. In our context, this criterion without being serious and intense, can lead to more or less complex damage of the kidney with PERL which is known more vulnerable to the same minimal and minor traumas.

The corresponding seat: This criterion is however subject to exceptions insofar indirect trauma of the abdomen such as chest trauma with compression may cause hypertension at a hydronephrotic kidney, the contusion of the thoracic spine can cause the rupture of a horseshoe kidney and a pelvic contusion may cause lesions on ectopic kidney.

The absence of previous state: The existence of the latter would enter the process in a worsening mechanism rather than initial genesis.

Indeed, the expert was confronted, beyond the calculations of PPD resulting of worsening of the prior

state, to questions dealing with accountability and shares of responsibility of total pluralities. Three questions were put to the expert in this context:

What would have been the result of trauma if the kidney was not pathological or abnormal?

What would have been the evolution of kidney disease or malformation without superimposed trauma?

What was the result of trauma in the presence of disease or renal malformation?

Only the answer to the third question would be possible, it was provided by the medical examination of the victim. The first two issues didn't have an objective and scientifically valid answers since they remain hypothetical assumptions.

Thus in the genesis of prejudice related to blunt trauma, pre-existing disease or anatomical variant may have played a more or less important role. Different types of influence have been described:

The trauma can reveal a previous state: as in almost all cases in our series.

The trauma can aggravate a previous state: which was the case in some patients in our series especially UJPO and stones.

The trauma may precipitate worsening of a previous state: A superimposed trauma comes accelerate the speed of this aggravation.

Other factors of influence can also be discussed:

In case of nephrectomy for nonfunctioning kidney, what would be the part of responsibility of renal trauma in the genesis of this condition, in other words in the indication of nephrectomy.

Before any surgical indication, what would be the responsibility of the prior kidney state in this indication?

Considering the previous state of the kidney, what would be the part of responsibility of blunt trauma in the evolution of the underlying anomalies?

When blunt trauma occurs, what are the injuries caused by trauma and those by pre-existing kidney lesions?

The question that should be asked in such circumstances is to determine the respective part of responsibility by the previous state and superimposed trauma, knowing that only the part resulting from the trauma is compensable. The answer to this question is not always easy, given that the previous state is often overlooked in its reality and in its original gravity, besides the fact that the victim often tries to «hide» this prior condition, otherwise minimize, sometimes sincerely believing that the damage that this is wholly a result of trauma.

The evaluation of sequels for patient victims of traffic accident or violence was investigated 12 months or more after the trauma.

The most important element in the assessment of the disability was renal function. Difficult to fix permanently,

the disability rate should depend primarily the impact on the subject's life (post-traumatic hypertension) and the constraints of treatment.

The sequels found were minimal renal failure without impact on daily life in 2 cases, incisional pain in all surgical patients and renal colic in 3 cases. Two patients were reoperated for incisional hernia.

CONCLUSION

The presence of pre-existing abnormalities may increase

the risk of renal injury after blunt trauma, often manifesting as more severe damage than would normally be dictated by the mechanism of injury (relatively minor or even trivial trauma). Trauma to a kidney with a pre-existing lesion often presents with complex and confusing imaging features.

We have to correctly diagnosing both the injury grade and the pre-existing abnormality, which ultimately has significant impact on trauma management.

The partial permanent disability depends on the pre-existing lesion and the renal injuries severity.

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