DOI: 10.1590/0100-69912015006006 Original Article

Epidemiological analysis of polytrauma patients with kidney injuries in a university hospital

Análise epidemiológica de politraumatizados com lesões renais em um hospital universitário

Bianca Luiza Valduga Guareschi[1]; Carla Martinez Menini Stahlschmidt, ACBC-PR[1]; Karin Becker[2]; Marianna Fergutz S. Batista[2]; Patricia Longhi Buso, ACBC-PR[3]; Luiz Carlos Von Bahten, TCBC-PR[4]

A B S T R A C T

Objective: To analyze the characteristics of trauma patients with renal lesions treated at a university hospital in Curitiba. **Methods:** We conducted a retrospective, cross-sectional study guided by review of medical records of trauma victims who underwent surgical treatment. The variables analyzed were age, gender, mechanism of injury, degree of kidney damage, conduct individualized according to the degree of renal injury, associated injuries, complications and deaths. We classified lesions according to the American Association of Trauma Surgery (TSAA). **Results:** We analyzed 794 records and found renal lesions in 33 patients, with mean age 29.8 years, most (87.8%) being male. Penetrating trauma accounted for 84.8% of cases. The most common renal injuries were grade II (33.3%), followed by grade I (18.1%), III, IV and V. Nephrectomy treated 45.4% of injuries, 73.3% being total nephrectomy, and 45.4% by nephrorraphy. In 9% treatment was non-surgical. Only 12.1% of patients had isolated renal lesions. Complications ensued in 15.1% and mortality was 6.06%. **Conclusion:** The surgical approach was preferred due to penetrating trauma mechanism. We achieved low rates of complications and deaths, and neither case could be directly related to kidney damage, and there were patients with multiple lesions. In this sample, we could not observe a direct relationship between kidney damage and complications, deaths or the type of conduct employed.

Key words: Kidney. Wounds and injuries. Epidemiology. Traumatology. Wounds, Penetrating.

INTRODUCTION

Trauma is the leading cause of death in the population under 40 years and is largely responsible for deaths in young adults in Brazil. Renal trauma, although unusual[1], is of great importance due to the high morbidity and mortality resulting from renovascular injuries[2], and the definition of conducts and protocols.

The kidneys are retroperitoneal organs, protected by a layer of perirenal fat and contained by the Gerota's fascia[2]. With these characteristics, they remain the third most affected organ in abdominal trauma, being present in 10% of such occurrences[3].

The initial assessment of the trauma patient must follow the protocols of trauma care (ATLS). Renal injury should be suspected from the mechanism of trauma, bruising or presence of holes in the abdominal wall and back[2]. Moreover, clinical signs contribute to the diagnosis, such as hematuria, which present in up to 90% of patients, although its intensity does not correlate directly with the degree of renal injury[2].

The hemodynamic findings in patients with abdominal solid organs trauma becomes the reference for the diagnosis and treatment algorithm, determining or excluding the selective non-operative treatment[4].

The conduct in renal trauma has adopted a more conservative management[1], seeking to decrease nephrectomy rates and increase the number of kidney reconstructions and nonsurgical treatment.

To assist in choosing the best treatment, we use evidence-based guidelines, an important method to standardize the approach to be adopted. However, these guidelines are not always followed in daily practice, especially in trauma[5].

This study aimed to analyze the profile of patients with renal trauma treated at a university hospital in Curitiba.

METHODS

We conducted a study with transversal and descriptive design, with retrospective analysis of medical

1. Escola de Medicina - Pontifícia Universidade Católica do Paraná. Curitiba. PR. Brasil; 2. Serviço de Cirurgia Geral e Trauma do Hospital Universitário Cajuru. Curitiba. PR. Brasil; 3. Serviço de Ortopedia e Traumatologia do Hospital Universitário Cajuru. Curitiba. PR. Brasil; 4. Serviço de Cirurgia Geral do Hospital Universitário Cajuru. Curitiba. PR. Brasil.

records of trauma patients from January 2010 to September 2011.

The variables analyzed were age, gender, mechanism of injury, degree of kidney damage, conduct individualized according to the degree of renal injury, overall conduct, associated injuries, complications and deaths. Lesions were classified according to the updated AAST scale[4].

Data were stored and analyzed using spreadsheet software.

RESULTS

Of the 794 records analyzed, 33 reported renal lesions, a 4.15% prevalence and an average of 1.5 cases per month. The average age was 29.8 years and male gender was the most affected (87.8%).

The most prevalent trauma mechanism was penetrating, accounting for 84.8% of the injuries, while 15.2% occurred due to blunt trauma. Injuries by firearms prevailed among penetrating wounds.

The grade I renal injury accounted for 18.1% of cases, second only to grade II injury, the most common (33.3%). Lesions of Grade III, IV and V corresponded to 16.1% each.

We opted for non-operative management in 9% of cases and surgical one in 90.8%: in 45.4% we held suture of the injury and in 45.4%, nephrectomy. The total nephrectomy was used to treat 73.3% of kidney lesions, and partial nephrectomy, in 26.7%, (Table 1).

Fifty percent of grade I lesions were managed with conservative treatment and 50% with surgical treatment, all by nephrorraphy. We performed nephrectomy in 18.8% of grade II lesions and nephrorraphy in 81.8%, including the use of omentum patch in 22.2% of such operations. For grade III injuries, the nephrectomy rate increased to 60%, but the nephrorraphy was possible in 40% of cases. Grade IV injuries were treated with total nephrectomy in 60%, in 20%, partial nephrectomy, and nephrorraphy in the remaining. Total nephrectomy was the choice for all grade V lesions.

Most patients (87.9%) had associated visceral lesions and 12.1% of patients, isolated renal injury. Among the prevalent associations, liver injuries occurred in 25.13% and splenic ones in 18.45%.

The occurrence of complications was 15.1%. However, we observed that none of the them were directly related to kidney damage or choice of treatment, but to the associated lesions. There have been no deaths directly related to primary renal trauma, but 6.06% of the patients died, the associated lesions being mainly responsible.

DISCUSSION

Renal injury is responsible for 1% to 5% of hospitalizations due to trauma[2,6,7]. Our data show a similar rate, that is, 4.15% of the lesions over a period of approximately two years were renal lesions. Among the urological traumas resulting from car accidents, renal trauma is the most common, ranging from 43%[8] to 51%, and the parenchymal injuries are the most frequent[9].

Renal injuries occur most commonly after blunt abdominal trauma, in 80% to 90%, but may also be due to penetrating injuries or deceleration trauma[2]. These data differ from ours, as 84.8% of renal trauma resulted from penetrating injuries, while only 15.2% occurred in patients with blunt trauma.

While renal injuries by firearms are unusual, they favor the occurrence of complex lesions of the urinary system. Thus, only a minority of these lesions is submitted to nonoperative treatment[10,11]. In addition, there are few services that have a sufficient number of patients with penetrating renal injuries, especially those produced by firearms, which enables studying their experience[10]. This, despite not being the most common, is the majority in our study, since the our sample shows wounds by firearms as the most prevalent mechanism of trauma, which further supports our results and may contribute to the medical literature. We employed the surgical approach to 90.8 of patients.

About 90% of patients with blunt renal trauma are not surgically managed, while the majority of patients with penetrating trauma must be submitted to surgical

Table 1 - Results - Treatment according to the injury grade.

	Patients	Nonoperative	Nephrorraphy	Partial Nephrectomy	Total Nephrectomy
Grade I	18.1%	50% (n=3)	50% (n=3)	X	X
Grade II	33.3%	X	81.8% (n=9)	X	18.2% (n=2)
Grade III	16.1%	X	40% (n=2)	X	60% (n=3)
Grade IV	16.1%	X	20% (n=1)	20% (n=1)	60% (n=3)
Grade V	16.1%	X	X	X	100%
Total	33%	9%	45.4%	26.7%	73.3%

Source: Medical records of trauma victims at Hospital Universitário Cajuru (January / 2010 to September / 2011).

treatment, a fact associated with higher injury severity. Nephrectomy is the choice in blunt traumas in only 4% of patients, while it is held in 21% of penetrating ones[2], a much lower rate than ours, and this fact probably is due to the high frequency of associated intra-abdominal injuries[12], found in 87.9% of our patients.

Anatomically, the only kidneys supporting structures are its vascular pedicle and the ureters[6], making them exposed to avulsions by violent displacements and decelerations, yielding pedicle injuries in 4% to 10% of renal trauma[8]. The high renal blood flow makes bleeding a major difficulty in the approach of the injured kidney, suggesting that the kidney bleedings sometimes require some invasive procedure to stop hemorrhage[13]. However, in most cases, they cease spontaneously, contained in the retroperitoneum[10].

Helical CT with intravenous contrast is standardized and carried out within two hours of hospital admission. Radiological findings, such as perirenal hematoma, contrast extravasation and complex lacerations, are risk factors that can guide hemostatic interventions as angioembolization, and greatly increase the risk of intervention in these patients[4,14], being the best method to assess renal lesions and guide treatment[15].

In a study[10] covering non-operative treatment of right thoracoabdominal injuries by firearms, most patients, 91.9% were male, the mean age was 24 years, slightly lower than the average age of our patients (29.8 years), 87.8% of which were men and the most common lesion was grade II (46%), as found in our analysis (33.3%), followed by grade III lesions (35.1%).

The intimate anatomical relationship of the right kidney with the visceral surface of the liver explains the higher frequency of this organ in lesions associated with the kidney[2], . Similarly, the proximity of the left kidney to the spleen justifies the lesions associated with this organ, the second most incident. Our results corroborate this information: liver injuries occurred in 25.13% of our patients, followed by splenic ones in 18.45%.

For Grade I lesion, in which there is only renal contusion, the treatment of choice is conservative, even for penetrating trauma, provided there are no other associated organ injury, nor entrance orifice dorsal to the the posterior axillary line. Grade I lesions were conservatively managed in 50% of our patients. Conservative treatment can be employed in grade II, III and IV injuries as well, but it should be remembered that hemodynamic stability is required[2] .

Conservative treatment for renal injuries by firearms should only be adopted after careful patient selection. We believe that patients initially considered without immediate surgical indication should be monitored by means of computed tomography with intravenous contrast. This approach is used in 10% to 40% of renal injuries by firearms, with a success rate ranging from 91% to 100%[11,16].

A study in a single hospital using diagnostic angiography and angioembolization in 9,000 cases of renal trauma has identified a high success rate, reducing nephrectomies in grade IV and V by 78% and 83%, respectively. But penetrating trauma were more prone to embolization failure[17].

There is a tendency to seek predictors for nephrectomy, since it is the most commonly performed surgery in renal trauma, although less invasive methods have been increasingly used for its complications[1].

Complications most commonly found in renal trauma are urinoma and perinephric abscess, secondary hemorrhage, hypertension and kidney failure.

The management of renal trauma can be conservative or surgical, and the conduct should be defined according to the classification of lesions. There is also the decision between nephrorraphy and nephrectomy, for which we noted no preference in this study, since both had rates of 45.4%, despite published data[1,2,6] evidencing a remarkable rate of unwanted nephrectomies, mainly after penetrating trauma. The overall incidence of complications in traumatic kidney injury ranges from 3% to 33%[2], enclosing the data resulting from our work, in which complications occurred in 15.1%.

We conclude that the surgical approach was preferred due to penetrating trauma mechanism, which leads to more complex lesions, and also due to the high frequency of associated visceral lesions. We achieved low rates of complications and deaths, and neither outcome could be directly related to kidney damage, occurring in patients with multiple lesions. In this sample, we could not prove a direct relationship between kidney damage and complications, deaths or the type of conduct employed.

R E S U M O

Objetivo: *analisar as características de pacientes vítimas de trauma, com lesões renais atendidos em um hospital universitário de Curitiba.* ***Métodos****: estudo transversal retrospectivo guiado por revisão de prontuários de vítimas de trauma submetidos ao tratamento cirúrgico. As variáveis analisadas foram idade, sexo, mecanismo de trauma, grau das lesões renais, conduta individualizada de acordo com o grau da lesão renal, lesões associadas, complicações e óbitos. As lesões foram classificadas de acordo com a Associação Americana de Cirurgia do Trauma (AAST).* ***Resultados****: foram analisados 794 prontuários, a lesão renal foi encontrada em 33 pacientes, a média de idade foi 29,8 anos, a maioria dos pacientes era (87,8%) do sexo masculino. O trauma penetrante foi responsável por 84,8% dos casos. As lesões mais frequentes foram as de grau II (33,3%), seguidas pelas lesões de grau I (18,1%) e pelas lesões de grau III, IV e V. Foram tratadas com nefrectomia, 45,4% das lesões, 73,3% por nefrectomia total e 45,4%, por nefrorrafia. Em 9% o tratamento não foi cirúrgico. Apenas 12,1% dos pacientes apresentaram lesões renais isoladas. Complicações foram observadas em 15,1% e a taxa de óbito foi 6,06%.* ***Conclusão****: a abordagem cirúrgica foi a preferencial devido ao mecanismo de trauma penetrante. Obtivemos baixos índices de óbitos e complicações, sendo que nenhum dos casos pôde ser relacionado diretamente à lesão renal, e ocorreram em pacientes com múltiplas lesões. Nesta amostra, não foi possível provar relação direta entre lesão renal e complicações, óbitos ou com o tipo de conduta empregada.*

Descritores*: Rim. Ferimentos e Lesões. Epidemiologia. Traumatologia. Ferimentos Penetrantes.*

REFERENCES

1. Wright JL, Nathens AB, Rivara FP, Wessells H. Renal and extrarenal predictors of nephrectomy from the national trauma data bank. J Urol. 2006;175(3 Pt 1):970-5; discussion 975.
2. Silva LF, Teixeira LC, Rezende Neto JB. Abordagem do trauma renal – artigo de revisão. Rev Col Bras Cir. 2009;36(6):519-24.
3. Lima TFN, Andrade PR, Carvalho JAR, Pereira RN, Livrini VA, Hachul M. Trauma Renal: algoritmo de investigação e conduta. Emerg Clín. 2011;6(28):11-6.
4. Reis LO, Kim FJ, Moore EE, Hirano ES, Fraga GP, Nascimento B, et al. Atualização da classificação e tratamento das lesões renais complexas. Rev Col Bras Cir. 2013;40(4):347-50.
5. van der Vlies CH, Olthof DC, van Delden OM, Ponsen KJ, de la Rosette JJ, de Reijke TM, et al. Management of blunt renal injury in a level 1 trauma centre in view of the European guidelines. Injury. 2012;43(11):1816-20.
6. Shoobridge JJ, Corcoran NM, Martin KA, Koukounaras J, Royce PL, Bultitude MF. Contemporary management of renal trauma. Rev Urol. 2011;13(2):65-72.
7. Yeung LL, Brandes SB. Contemporary management of renal trauma: differences between urologysts and trauma surgeons. J Trauma Acute Care Surg. 2012;72(1):68-75; discussion 75-7.
8. Paparel P, N'Diaye A, Laumon B, Caillot JL, Perrin P, Ruffion A. The epidemiology of trauma of genitourinary system after traffic accidents: analysis of a register of over 43,000 victims. BJU Int. 2006;97(2):338-41.
9. Starling SV, Azevedo Filho TV, Drumond DAF, Leal IV PAON. Ruptura isolada da pelve renal secundária ao trauma abdominal contuso. Rev Col Bras Cir. 2007;34(3):208-9.
10. Cesar BP, Starling SV, Drumond DAF. Tratamento não operatório das lesões renais por arma de fogo. Rev Col Bras Cir. 2013;40(4):330-34.
11. Voelzke BB, McAninch JW. Renal gunshot wounds: clinical management and outcome. J Trauma. 2009;66(3):593-600; discussion 600-1.
12. Kansas BT, Eddy MJ, Mydlo JH, Uzzo RG. Incidence and management of penetrating renal trauma in patients with multiorgan injury: extended experience at an inner city trauma center. J Urol. 2004;172(4 Pt 1):1355-60.
13. Peterson NE. The significance of delayed post-traumatic renal hemorrhage. J Urol. 1978;119(4):563-5.
14. Dugi DD 3rd, Morey AF, Gupta A, Nuss GR, Sheu GL, Pruitt JH. American Association for the Surgery of Trauma grade 4 renal injury substratification into grades 4a (low risk) and 4b (high risk). J Urol. 2010;183(2):592-7.
15. Muir MT, Inaba K, Ong A, Barmparas G, Branco BC, Zubowicz EA, et al. The need for early angiography in patients with penetrating renal injuries. Eur J Trauma Emerg Surg. 2012;38(3):275-80.
16. Navsaria PH, Nicol AJ. Selective nonoperative management of kidney gunshot injuries. World J Surg. 2009;33(3):553-7.
17. Hotaling JM, Sorensen MD, Smith TG 3rd, Rivara FP, Wessells H, Voelzke BB. Analysis of diagnostic angiography and angioembolization in the acute management of renal trauma using a national data set . J Urol. 2011;185(4):1316-20.

Received at: 10/03/2015
Accepted for publication: 02/06/2015
Conflict of interest: none.
Source of funding: none.

Mailing address:
Bianca Luiza Valduga Guareschi
E-mail: bia_guareschi_07@hotmail.com