

Urogenital disorders after pelvic ring injuries

Atom A. Ter–Grigorian¹, George R. Kasyan², Dmitry Y. Pushkar²

¹Department of Orthopedic Surgery Moscow City Hospital, Moscow, Russian Federation

²Department of Urology Moscow State University of Medicine and Dentistry, Moscow, Russian Federation

Article history

Submitted: May 12, 2013

Accepted: June 2, 2013

Correspondence

George Kasyan
Urology Department
of Moscow State University
of Medicine and Dentistry
Mosfilmovskaya d.15 kv.69
119330 Moscow,
Russian Federation
phone: +91 546 433 18
g.kasyan@gmail.com

Introduction. The close anatomical relationship between the skeletal and connective systems of the pelvis, neurological, and vascular structures and pelvic organs are predisposing factors for structural and functional damages of the urogenital system.

Materials and methods. We performed PUBMED and MEDLINE search using terms “pelvic ring trauma/disruption, bladder injury, urethral injury, sexual dysfunction”.

Results. The probability of damage of the pelvic organs increases along with the degree of disturbance of integrity of the pelvic ring. The most important risk factor of urogenital injuries is the rupture of the symphyseal joint. Patients with lesions of the urogenital system have a higher risk of mortality compared with patients without lesions of the urogenital system. Sexual dysfunctions along with urinary incontinence are a common consequence of the pelvic fracture in men and women.

Conclusions. Injuries of the urogenital organs during pelvic ring fractures have an important negative prognostic value in terms of morbidity and quality of life. A prerequisite for a successful therapeutic outcome in case of pelvic fractures with disturbance of pelvic ring integrity is cooperation of orthopedists and urologists, with possible early diagnosis and treatment of injuries of the urogenital organs.

Key Words: pelvic trauma ◊ bladder injury ◊ urethral injury ◊ pelvic ring rupture

INTRODUCTION

Combined injuries of pelvis and pelvic organs often develop during traumatization in military conflicts, civil disasters and domestic traumatic situations, and often affect younger patients. Moreover, the injuries of the urinary tract are the most typical complications of pelvic fractures with disturbance of integrity of the pelvic ring. The close anatomical relationship between the skeletal and connective systems, neurological and vascular structures, and pelvic organs are the predisposing factors for structural and functional damages of the urogenital system.

MATERIALS AND METHODS

This is a review of current literature that is gathering a data from orthopedic, urological, and trauma literature. To address the goals, the review was based on PUBMED and MEDLINE search using terms “pelvic ring trauma/disruption, bladder injury, urethral injury, sexual dysfunction”.

RESULTS

Epidemiology

The damages of the pelvic organs are often complicated by urinary leaks, phlegmonas, peritonitis, and urosepsis [1]. The probability of damage increases along with the degree of disturbance of integrity of the pelvic ring [2]. In the most severe cases of pelvic damages, intra–abdominal lesions occur in approximately 30% of cases, and the most frequently affected organs are the bladder and the urethra, making up to 16% [3, 4].

According to the literature, almost 25% of patients with pelvic ring trauma have any type of urinary tract lesions that were either documented radiologically, or were found during surgery. Moreover, among 30% of the men who have urinary tract lesions, the isolated damage of the urinary bladder was observed in 7% of cases, 17% had partial damage of the urethra, and complete urethral rupture was diagnosed

in 5% of cases. Some patients with a fracture of the acetabulum had a complete rupture of the urethra (2%), others (7%) had partial urethral damage [3]. According to the data of other authors, the probability of urogenital injuries in complex vertical pelvic injuries reaches to 29% [5].

It should be noted that male patients are more susceptible to have urogenital lesions than females: 66% versus 34% [6].

Urethral injuries in children are similar to lesions in adults, however, the prostate and bladder neck injuries occur most often [4, 7].

Risk factors

The most important risk factor of urogenital injuries is the rupture of the symphysis [5]. Among patients with the rupture of the symphysis almost 42% have had urological injuries [1]. There is another current opinion, according to which the urogenital and gastrointestinal dysfunctions occur to a greater extent because of the neurological damage and do not correlate with the severity of primary pelvic lesions or injuries of the urinary or digestive organs [8].

It is important to notice that the pelvic fracture by itself does not lead to the increase of mortality rate, while the presence of associated lesions of the other organs is an important predisposing factor for increased mortality [9]. Thus, patients with lesions of the urogenital system have a higher risk of mortality compared with patients without lesions of the urogenital system (14% and 8%, respectively) [6].

A retrospective study of 721 blunt trauma pelvic fractures published by Avay and co-authors was looking for potential associations between pelvic fracture pattern, degree of hematuria, and bladder injury. Pelvic injuries that were independently associated with bladder injury included diastasis of the pubic symphysis >1 cm, and fracture of the obturator ring with displacement >1 cm. No patient with isolated acetabular fractures sustained bladder injury [10]. At the same time Hayes published a rare a case report of blunt trauma with pelvic ring disruption and an extraperitoneal bladder rupture that communicated with the hip joint through an acetabular fracture [11].

Taking into consideration the above mentioned, omission or late reveal of bladder and urethral damages, the most common comorbidities of pelvic fractures with disturbance of integrity of the pelvic ring, may cause long-term problems and increased mortality that raises the need for more thorough examination of the pelvic organs in case of pelvic fractures with disturbance of integrity of the pelvic ring [2].

Bladder injuries due to pelvic factures

Bladder injuries are divided into two main groups according to the type of injuries: bladder non-penetrating and penetrating traumas.

The more frequently used classification of the bladder trauma is simplified to intraperitoneal, extraperitoneal, and combined injuries [12]. Gross hematuria detected after emptying of the bladder or after introducing of the urinary catheter is the most common symptom suggestive to bladder damage [1, 5]. Other signs of bladder lesions are limited mainly to painful bladder at palpation, bloating, suprapubic discomfort, and voiding difficulties [5].

Due to possible spinal injuries and subsequent neurological deficit, the physical examination in these patients might be uninformative, thus, a high level of vigilance in these cases is needed [5]. In women, the history of bladder rupture or anteroposterior compression injury was associated with poor musculoskeletal functional assessment scores [13].

The occurrence, relation to a particular type of fracture of the pelvis, and the possible mechanism of early urinary complications were studied in 186 consecutive patients with fracture of the pelvis [14]. Many patients showed different urinary complications. These complications were minor in 32.9% of patients and major in 8.1% of all pelvic fractures. There was retention of urine in 15.6% of cases, hematuria in 15.6%, and oliguria in 1.6%. The latter comprised rupture of the posterior urethra and was found in 4.8%, rupture of the bladder – 5.7%, and combined injury to the bladder and posterior urethra in 1.1% of cases.

CT scan or cystography

Bladder injuries always require an intervention for management, and because of that fact the early diagnosis and treatment is very important in order to reduce the complication rates [15]. For early diagnosis the retrograde cystography should be performed after urethral or suprapubic catheterization in all patients who have symptoms suspected to the bladder damage [5]. Moreover, since the urethra and bladder damages are often combined, the cystography is indicated to all patients with a lesion of the urethra as well [7]. A CT cystography provides accurate information comparable to that of X-ray cystography, especially when simultaneous pelvic bones and other organ traumas are present. According to the most modern data, the computed tomography and retrograde cystography are equivalent in terms of detection of bladder rupture [13]. In this

regard, it might be recommended to carry out CT cystography in all patients with suspected damage, particularly those with bladder damage due to pelvic trauma, which is statistically possible in these patients 16–27% [2, 16].

Urethral injuries due to pelvic fractures

In regard to the pelvic fracture localizations, the results of some studies of the urethral injuries after pelvic trauma in men have shown that fractures of the acetabulum are not associated with urethral damages. Pelvic fractures that are statistically significantly associated with urethral damages include the fractures with displacement of inner–medial pubic bone and pubic diastasis of symphysis [17].

The localization and the extent of displacement in pelvic bones in men are considered as determining risk factors of urethral damage and, therefore, the presence of these factors increases the chance for urethral damage. Moreover, every one millimeter of the diastasis of pubic symphysis or dislocation of inner–medial part of the pubic bone increases the risk of urethral damage to 10% [13, 17].

Taking into consideration the female pelvic anatomy the female urethra is rarely damaged in pelvic fractures. The female urethra might be damaged only in case of very severe pelvic injuries, especially major traumas of the symphysis [3, 7, 18, 19]. These cases often are causing severe stress urinary incontinence due to urethral sphincter damage.

Treatment of urethral injuries with concomitant pelvic trauma

Primary reconstruction of the posterior urethral rupture is a simple procedure that provides a low morbidity rate. It might be a treatment option for the patients with no other intra–abdominal injuries or damages of the other pelvic organs [20].

But mostly, the surgical intervention for the ruptured urethra in men should occur within several weeks after the injury [12].

Partial rupture of the anterior urethra in men is treated with suprapubic catheter or urethral catheterization. Suprapubic cystostomy has an advantage since in that case there is no need for urethral catheterization, which may further exacerbate the condition of the urethra. Damage of the urethra in women often occurs with rupture of the bladder and, therefore, it is treated at the same time. Rarely, in cases of the proximal urethral injuries, the transvesical approach might be used. In majority of cases transvaginal reconstruction is successful [7].

Sexual dysfunctions after pelvic fracture

Erectile dysfunction along with urinary incontinence is a common consequence of the pelvic fracture, especially combined with the damage of posterior urethra. Erectile dysfunction develops in 20–60% of these cases [21].

The results of one study show higher percentage of sexual dysfunction in patients with pelvic fractures compared with patients without pelvic fracture (21% and 14%, respectively) at one year after the injury. Moreover, in case of sacroiliac fractures there is higher risk of sexual and ejaculatory dysfunctions [22]. The quality of life is significantly decreased in patients with sexual dysfunction after pelvic trauma [21].

According to Metze, 61% of men who had a pelvic fracture reported any kind of sexual dysfunction. The author showed that persistent erectile dysfunction was presented in 19% of patients. The rupture of symphysis or distraction had higher risk of erectile dysfunction compared with compression. The damage of the posterior part of the pelvic ring increases the probability of persistent problems, possibly due to the pelvis plexus damage [23].

It is necessary to remember that erectile dysfunction may occur even in the absence of primary urological injuries. According to Hessman, sexual dysfunctions are the result of the primary lesion of the pudendal nerve or supplying blood vessels, which often remain undiagnosed during the initial stages of treatment [1].

The results of the prospective study have shown that patients with urethral distraction — pelvic fracture–urethral distraction defect (PFUDD) – had a significantly higher risk of erectile dysfunction when compared to patients without urethral distraction [24].

There are morphological and psychogenic causes of sexual dysfunctions and only a fundamental diagnostic workup might help in differential process. Vascular or neurogenic causes are included in the category of biogenic causes. The most important factor leading to impotence is the degree of severity of the initial injury [7].

In order to evaluate the various aspects of sexual function in men after pelvic fracture, the retrospective study including patients with pelvic fractures admitted to the relevant department from 1995 to 2001 was conducted [23]. The evaluation was done using the IIEF scale. About 61% of patients reported limitations in their sexual functions. Persistent erectile dysfunction was found in 19% of cases. It was found that the damages to the symphysis increase the risk of temporary erectile dysfunctions. Comparison of compres-

sion and distraction of the urethra showed that patients with distraction suffer from more severe sexual dysfunction. Damages of the posterior part of the pelvic ring increase the risk of persistent problems, which probably associated with nerve damage. According to the authors, the IIEF questionnaire should be applied to all patients during period of the rehabilitation in order to identify patients who need further medical care.

From the other hand, there are some data that at two years after the injury the spontaneous return of the potency is possible [22].

Sexual dysfunctions among women after pelvic ring injuries are not well investigated. Indeed women with pelvic ring injury are more likely to report dyspareunia than other female patients with musculoskeletal trauma. According to Vallier and co-authors dyspareunia was related to anteroposterior compression and B-type injuries. Symphyseal plate fixation is also associated with dyspareunia. Pain with intercourse was also noted in all patients with a history of bladder rupture [25].

DISCUSSION

With an increase in survival after severe pelvic trauma the number of long-term consequences of these injuries increases [26]. Although published data on the follow-up of patients is limited, however, in general it should be noted that patients with a history of pelvic fracture and combined lesion of the urogenital organs, remain hospitalized longer, spend more time

in the intensive care unit, and have a higher mortality rate compared to patients without urogenital complications.

Although urogenital damages are not the cause of mortality by themselves, they used to be an important risk factor for further complications [6]. An age older than 65 years, high systolic blood pressure, high degree of severity of pelvic injuries (Injury Severity Score (ISS) > or = 25), coma (Glasgow coma score < or = 8), and female gender are independent predictors of higher mortality [6]. Late urogenital complications are rare, at the same time the membranous urethral injuries may lead with high probability to the development of strictures and sexual dysfunctions, as well as to the urinary incontinence [12]. Other potential causes of urinary disturbances are post-traumatic urinary fistulas. If the injuries of the genitourinary system remain unfixed within 1 year after the injury, there is higher probability of irreversible changes [1]. Generally the isolated bladder trauma has a good prognosis, but in some cases can cause development of chronic pelvic pain [27]. Functional disorders, such as neurogenic overactive bladder, are usually well controlled by anticholinergic drugs.

Thus, the injuries of the urogenital system in pelvic fractures have important prognostic value in terms of morbidity and quality of life. A prerequisite for a successful therapeutic outcome in case of pelvic fractures with disturbance of pelvic ring integrity is cooperation of orthopedists and urologists, with possible early diagnosis and treatment of injuries of the urogenital system [20, 25].

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