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Original article

Incidence of erectile dysfunction in pelvic ring injuries: Study of 48 patients at the Antananarivo hospital, Madagascar

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ABSTRACT

Introduction: Pelvic fractures are responsible for genito-urinary injuries in 25% of cases. The objective of this study was to assess the severity and psychological impact of erectile dysfunction in patients with pelvic ring fractures.
Hypothesis: Unstable pelvic fractures are associated with erectile dysfunction and depression.
Patients and method: We retrospectively reviewed consecutive patients older than 18 years who were admitted to the orthopaedic and trauma surgery department of the Antananarivo university hospital, Madagascar, over a 3-year period (2014–2016) for pelvic ring fractures. Erectile function was assessed using the 5-item International Index of Erectile Function questionnaire (IIEF-5) and mood using the Major Depression Inventory (MDI). All patients were invited to attend a visit to complete both questionnaires.
Results: The study included 48 patients with a mean age of 39 years (range, 18–82 years) and a mean follow-up of 12 months. The fracture was due to a traffic accident in 81.2% of patients and occurred as one of multiple injuries in 22.9% of patients. The fracture was stable in 34 (70.8%) patients (type A1, 16 patients; type A2, 18 patients) and unstable in 14 (29.5%) patients (type B, 9 patients; type C, 5 patients). Erectile dysfunction was found in 16 (33.3%) patients and was severe in 6, moderate in 4, and mild in 6. Erectile dysfunction was more common in the patients who had type C fractures. Depression was associated with severe erectile dysfunction.
Conclusion: Erectile function should be assessed in the medium and long term in patients with pelvic ring fractures. If left untreated, erectile dysfunction may lead to depression in these often young patients.
Level of evidence: IV, retrospective observational study.
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1. Introduction

Pelvic ring fractures account for 3% to 8% of all fractures and are usually caused by high-energy trauma in young individuals. Among multiply injured patients, 20% have pelvic ring fractures [1,2]. Erectile dysfunction is not uncommon after pelvic ring fractures and causes considerable distress, particularly in younger patients. However, erectile dysfunction is often overlooked due to the frequent presence of concomitant and potentially life-threatening injuries [3,4]. Among the many studies of the causes of erectile dysfunction, few have addressed the role for trauma.

The objective of this study was to assess the severity and psychological impact of erectile dysfunction in patients with pelvic ring fractures. The working hypothesis was that unstable pelvic fractures were associated with erectile dysfunction and depression.

2. Patients and methods

A cross-sectional evaluation was performed in retrospectively identified males admitted to the orthopaedic and trauma surgery department of the Antananarivo university hospital, Madagascar, over a 3-year period (1 January 2014 to 31 December 2016) for pelvic ring fractures. Inclusion criteria were male sex, age older than 18 years, admission during the study period, pelvic ring fracture confirmed by an antero-posterior radiograph of the pelvis, and regular sexual activity before the injury. Exclusion criteria were a history of erectile dysfunction, spinal and spinal cord injury with

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Table 1
Erectile dysfunction according to age.

Age group	Normal	Mild ED	Moderate ED	Severe ED	Not interpretable	Total
18–25 years	2	4	1	3	2	12
26–35 years	8	–	2	–	2	12
36–45 years	7	1	–	3	–	11
46–55 years	3	–	–	–	–	3
56–65 years	5	1	–	–	–	5
≥ 66 years	1	–	1	–	2	4

ED: erectile dysfunction. Fisher's exact test, $p = 0.02$.

Table 2
Erectile function according to comorbidities.

Erectile function	None	Hyper-tension	Diabetes	Smoking	Arterial disease	Total
Normal	15	5	1	4	1	26
Mild ED	4	1	–	1	–	6
Moderate ED	–	–	1	2	1	4
Severe ED	4	1	–	1	–	6
Not interpretable	3	2	–	1	–	6

ED: erectile dysfunction. Fisher's exact test, $p = 0.49$.

a confusional state, and patient refusal to participate in the study. Exhaustive case ascertainment was performed to identify all eligible patients seen during the study period.

For each patient, the following data were collected: age, comorbidities including history of vascular disease, type of trauma (traffic, domestic, or work-related accident), fracture instability type according to Tile [5], concomitant injuries, type of treatment, and hospital stay length in days.

Each patient was contacted by telephone, informed of the study modalities, and invited to attend a visit at the hospital for a physical examination and completion of the 5-item international index of erectile function (IIEF-5) [6] and of the major depression inventory (MDI) [7] Time from the injury to questionnaire completion was recorded. Patients with erectile dysfunction and/or depression were directed to the relevant departments within the hospital, where they received appropriate care.

Statistical comparisons were with Fisher's exact test and were performed using Epi Info™ version 3.2.2 (Centers for Disease Control, Atlanta, GA, USA).

3. Results

3.1. Population

During the 3-year study period, 1100 males were admitted to our department. Of the 87 patients with pelvic ring fractures admitted during the study period, 52 were male, including 4 who were lost to follow-up. Thus, 48 patients were included. Among them, 50% were aged 26 to 35 years. Median age was 39.6 years (range, 18–82 years).

The fracture occurred during a traffic accident in 39 (81.2%) patients, including 24 who were on two-wheeled vehicles. The fracture was due to a domestic accident in 3 (6.3%) patients and to a work-related accident in 6 (12.5%) patients.

Of the 48 patients, 34 (70.8%) had stable type A fractures (A1, $n = 16$; A2, $n = 18$), 9 (18.8%) had type B1 fractures, and 5 (10.5%) had type C fractures (C1, $n = 3$; C2, $n = 1$; and C3, $n = 1$).

Other injuries were present in 11 (22.9%) patients, including 10 with injuries to abdominal organs, 4 (8.3%) with blunt chest injuries, 5 (10.4%) with other osteo-articular injuries, and 3 (6.3%) with severe head injuries. Urethral injuries were present in 7 (14.6%) patients. The pelvic ring fracture was the only injury in 8 (16.7%) patients.

Table 3
Erectile function according to type of fracture.

	Type of Fracture (Tile)			
	A	B	C	Total
Normal	22	3	1	26
Mild ED	6	–	–	6
Moderate ED	1	2	1	4
Severe ED	–	3	3	6
Not interpretable	5	1	–	6

ED: erectile dysfunction. Fisher's exact test, $p = 0.0003$.

Non-operative treatment was used for the pelvic ring fracture in 46 patients, including 3 who were managed with a pelvic sling and 43 who were positioned supine on a hard surface. In 2 multiply injured patients, emergent external fixation was used. Mean hospital stay length was 11.8 days (range, 1–53 days).

3.2. Erectile dysfunction

Mean follow-up at the time of the evaluation was 12.5 months. Of the 48 patients, 29 (60%) were evaluated after more than 12 months, 16 (29.2%) after 6 to 12 months, and 8 after 3 to 6 months. The evaluation showed erectile dysfunction in 16 (33.3%) patients and normal erectile function in 26 (54.2%) patients; in the remaining 6 patients, the IIEF-5 was not interpretable. The erectile dysfunction was severe in 6 (12.5%) patients and moderate in 4 (8.3%) patients.

Erectile dysfunction was more common in the patients aged 18 to 25 years (Fisher's exact test, $p = 0.02$). Of the 14 patients aged 35 to 55 years, only 4 had erectile dysfunction (Table 1) and of the 4 patients older than 66 years, only 1 had erectile dysfunction. None of the comorbidities considered was associated with erectile dysfunction (Fisher's exact test, $p = 0.49$) (Table 2). Thus, among the 6 patients with severe erectile dysfunction, 1 (16.7%) had hypertension and 1 (16.7%) was a smoker. Of the 4 patients with moderate erectile dysfunction, 1 had occlusive arterial disease, 2 were smokers, and 1 had diabetes. Finally, of the 6 patients with mild erectile dysfunction, 1 (16.7%) had hypertension and 1 (16.7%) was a smoker.

Of the 34 patients with type A fractures, 81.3% had normal erectile function and none had severe erectile dysfunction. In contrast, of the 5 patients with type C fractures, 66.7% had severe erectile dysfunction (Table 3). Type C fracture was significantly associated with severe erectile dysfunction (Fisher's exact test, $p = 0.0003$).

Table 4
Depression according to erectile function.

	Depression	
	Yes	No
Normal	–	26
Mild ED	–	6
Moderate ED	2	2
Severe ED	4	2
Not interpretable	2	4

ED: erectile dysfunction. Fisher's exact test, $p = 0.0001$.

The MDI results indicated depression in 8 patients. Among them, 4 had severe erectile dysfunction (Table 4). Depression was significantly associated with erectile dysfunction (Fisher's exact test, $p = 0.0001$).

4. Discussion

The report of the second international consultation on sexual dysfunction defines erectile dysfunction as a persistent or recurrent inability for at least 3 months to obtain or maintain sufficient penile erection to allow sexual penetration [8]. Erectile dysfunction has been reported in 20% to 60% of patients with traumatic pelvic ring injuries [9]. In a cross-sectional study done in France by Malavaud B et al. using the IIEF-5, 29.7% of males experienced erectile dysfunction after sustaining a pelvic ring fracture [4]. Of 87 patients with traumatic pelvic ring fractures studied in Turkey by Ceylan et al., 26 (29%) had moderate-to-severe erectile dysfunction [10]. In our population, the IIEF-5 results showed erectile dysfunction in 33.3% of patients. Differences in the frequency of erectile dysfunction across studies may be ascribable to differences in the distribution of fracture types and in the time from injury to erectile function evaluation. An accurate evaluation of the incidence and outcomes of erectile dysfunction after pelvic ring fractures would require a multicentre cohort study with long-term follow-up.

Follow-up varied across patients in our study. The evaluation of erectile dysfunction was done more than 12 months after the fracture in 60.4% of patients. Erectile dysfunction can resolve over time. In a study by Metze et al. [11], sexual dysfunction of any type developed in 61% of males with traumatic pelvic fractures but persistent erectile dysfunction was noted in only 19%. Ceylan et al. [10] evaluated their patients 3, 6, and 12 months after the injury and found improvements in erectile dysfunction over time. Of 25 patients with posterior urethral injuries due to pelvic fractures studied by Shenfeld et al. [12], 18 (72%) had erectile dysfunction. This high proportion may be ascribable to the short time of only 3 months between the injury and the evaluation. The time to evaluation is important to consider, as erectile dysfunction may change over the first 18 months after the injury [13]. After a pelvic ring fracture, sexual function should be evaluated repeatedly for a period extending far beyond fracture healing and recovery of ambulation.

The genito-urinary tract is in close proximity to the bones of the pelvic ring, and each type of pelvic ring fracture carries specific risks of genito-urinary tract injury. We used the Tile classification, which distinguishes three main patterns based on fracture stability. Type A comprises innominate bone avulsion and transverse sacral fractures, which do not usually require interval fixation, as they do not compromise the stability of the pelvic ring. Types B and C, in contrast, require anterior internal fixation alone or combined with posterior internal fixation. Among our patients, 70.8% had stable fractures and 29.2% unstable fractures. Unstable fractures were associated with erectile dysfunction (Table 3). Johnsen et al. [14] evaluated the anatomical factors involved in erectile function. They noted erectile dysfunction in 22.04% of patients with fractures involving the sacro-iliac joint and in 33.17% of those with pubic symphysis disjunction. Posterior segment fractures with vertical instability may cause traction injury to the pre-sacral pudendal plexus. Branches of the pudendal nerve may be injured during pubic symphysis disjunction [15]. Fractures involving the anterior segment can cause injury to the pudendal artery with the formation of a compressive haematoma [16]. Traction injury to the pre-sacral pudendal plexus is often unilateral, resulting in disturbed sensation in the penile region with mild erectile dysfunction. Andersen et al. [17] stated that disorders of ejaculation were caused by injuries to the ischio-cavernosus and bulbo-spongiosus muscles.

Age is a major consideration when making management decisions in patients with erectile dysfunction after a pelvic ring fracture. According to the report of the second international consultation on sexual dysfunction, the prevalence of erectile dysfunction is less than 10% overall in patients younger than 40 years, 10% to 30% between 40 and 59 years, 20% to 40% between 60 and 69 years, and 50% to 75% after 70 years [18]. In younger patients, erectile dysfunction causes greater coping challenges and psychological distress. In our study, 66.6% of patients aged 18 to 25 years had erectile dysfunction after the injury. Only 5 patients were older than 66 years and among them only 1 had erectile dysfunction, which was moderate.

Severe erectile dysfunction makes sexual penetration difficult or impossible. The resulting distress may be difficult to accept by younger patients, explaining the higher prevalence of depression among patients with severe erectile dysfunction. A vicious circle ensues [19], as greater fracture complexity is associated with more severe erectile dysfunction and with a higher risk of depression. In the general population, erectile dysfunction is related to psychological factors in 50% of cases [20]. These psychological factors must receive attention as part of the management of erectile dysfunction and may, in some cases, require hospital admission.

The treatment of erectile dysfunction depends on the suspected or confirmed causes. Psychological support is always required, as a psychological component is involved in over 60% of cases. Selective phosphodiesterase type 5 (PDE5) inhibitors seem to be an option for medical treatment aside from contraindications [21]. Psychotherapy has produced good outcomes in published studies and must accompany the medical treatment on chemical substances, thereby decreasing treatment costs. Pharmacological treatment is a useful adjunct that can enhance sexual performance and is chiefly indicated in mild-to-moderate erectile dysfunction without major nerve or blood vessel injuries. Suggested surgical options for patients with severe erectile dysfunction unresponsive to medications include revascularisation and implant insertion. However, these procedures are costly.

In a study of 26 men, erectile dysfunction was not associated with non-operative versus surgical treatment [22]. This finding deserves further evaluation in a study with greater statistical power.

5. Conclusion

Pelvic ring fractures in Madagascar are usually caused by high-energy traffic accidents. The development of erectile dysfunction is related to vertical and horizontal instability of the disrupted pelvic ring. Severe erectile dysfunction is associated with depression in younger patients.

Disclosure of interest

The authors declare that they have no competing interest.

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Contribution of each author

Ralahy Malinirina Fanjalalaina wrote and submitted the article.

Randriantsoa Marina Parfaite recruited and followed the patients.

Rakototiana Auberlin Felantsoa performed the literature review and revised the article.

Razafimahandry Henri Jean Claude revised the article.

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