

Penile Fracture: Diagnosis, Treatment and Outcomes of 150 Patients

Leandro Koifman, Rodrigo Barros, Ricardo A.S. Júnior, André G. Cavalcanti, and Luciano A. Favorito

OBJECTIVE	To report the diagnosis, treatment options, and outcomes of 150 patients with suspicion of penile fracture.
MATERIALS AND METHODS	We analyzed 150 patients with clinically suspected penile fracture (PF). The patients were divided into two groups: group 1 (G1) with low suspicion of penile fracture (n = 25), and group 2 (G2) with high suspicion of penile fracture (n = 125). Complementary image methods were conducted on 59 patients (39.3%), with ultrasonography (USG) performed on 37 (24.6%) patients and magnetic resonance imaging on only one (0.6%). Retrograde urethrocytogram was performed when urethral injury was suspected (21 patients, 14%). In G1, all patients underwent USG to complement diagnosis. In G2, 12 patients underwent USG owing to a doubtful diagnosis. Mean follow-up was 34.6 months.
RESULTS	All patients in G1 were able to achieve erection after the initial traumatic event and immediate penile detumescence did not occur in any of the cases. Of the 125 patients evaluated in G2, 110 (92%) presented with disruption of the tunica albuginea and 15 (8%) showed injury of the dorsal vein of the penis. Urethral injury was found in 20 (16%) patients and was always associated with corpus cavernosum injury. Among 110 cases of PF, 95 (86.3%) presented with unilateral and 15 (13.7%) presented with bilateral lesions.
CONCLUSIONS	Patients with high suspicion of PF should be treated surgically. However, in cases of low suspicion of corpora cavernosum injury, based on clinical criteria and imaging methods, conservative treatment is a feasible and safe option. UROLOGY 76: 1488–1492, 2010. © 2010 Elsevier Inc.

Penile fracture (PF) is a rare urological emergency situation, accounting for about one in every 175,000 hospital care emergencies.¹ It is defined as a rupture of the corpus cavernosum caused by blunt trauma to an erect penis. Injuries to a flaccid penis or in the suspensor ligament of the penis are not included in this definition.^{2,3}

The main cause of penile fracture is vaginal intercourse. Masturbation is a less frequent cause.^{1,2,4-8} Although rare, another injury mechanism is rolling over on one's own penis during night erection.

Penile fracture has a typical clinical presentation. Patients report hearing a snapping sound during the sexual act, followed by immediate pain and penile detumescence, in addition to the emergence of large edema, hematoma, and penile deformity.^{6,9-11} In the presence of associated urethral injury, which happens in 10% to 20% of cases, findings, such as urethral bleeding, hematuria, and difficulty voiding can be observed.^{6,10-12} Despite the classic clinical presentation, penile fracture can show

variations in presentation, making a precise diagnosis, and therefore the appropriate treatment choice, difficult, because conditions indicating a different diagnosis, such as injury to the superficial dorsal vein of the penis or vessels of smaller size and soft tissue damage, can be managed conservatively.

This article reports the diagnosis and therapeutic options of 150 patients admitted to our unit with clinical suspicion of penile fracture, based on clinical history, physical examination, and complementary image methods; we evaluate the clinical outcomes based on the treatment option.

MATERIAL AND METHODS

In the period between January 1997 and November 2009, 150 patients with penile blunt trauma on an erect penis were admitted to our unit and retrospectively assessed.

The patients' ages ranged from 18 to 69 years (mean, 32). Primary diagnostic assessment was clinical history and physical examination.

The patients were divided into two groups: low suspicion (G1) and high suspicion (G2) of corpus cavernosum lesions (Fig. 1). The cases of absence of penile detumescence immediately after the traumatic event, presence of small to moderate edema and/or bruising, normal corpus cavernosum physical

From the Division of Urology, Souza, Aguiar Municipal Hospital, Rio de Janeiro, RJ, Brazil

Reprint requests: Luciano Alves Favorito, M.D., Ph.D., Urogenital Research Unit, State University of Rio de Janeiro, Av. 28 de Setembro, 87. fundos, FCM, térreo., CEP 20551-030, Rio de Janeiro, RJ, Brazil. E-mail: lufavorito@yahoo.com.br



A



B

Figure 1. (A) Patient with low suspicion of penile fracture (G1). The presence of small edema and ecchymoses involving the penis can be observed; (B) patient with high suspicion of penile fracture (G2). The presence of the characteristic penile deformity can be seen: “eggplant deformity.”

examination, absence of pain, and/or images showing no signs of tunica albuginea rupture were included in G1. Those with classic clinical PF presentation were included in G2.

Complementary imaging methods were performed on 59 patients (39.3%), with ultrasonography (USG) being performed on 37 (24.6%) patients and magnetic resonance imaging (MRI) alone on one (0.6%). Retrograde urethrocytogram (RUG) was performed when urethral injury was suspected, which was the case for 21 (14%) patients. In G1 ($n = 25$), all patients underwent USG to complement diagnosis. In G2 ($n = 125$), only 12 patients underwent USG owing to a doubtful diagnosis.

The patients in G1 ($n = 25$) were treated conservatively through the use of painkillers and antiinflammatory drugs without the need for hospitalization. Those in G2 ($n = 125$) were admitted for immediate surgical exploration.

The surgical technique for correction of penile fracture and associated urethral injuries consists of penile degloving through subcoronal incision, with debridement and synthesis of the albuginea of the corpora cavernosa with interrupted polyglactin 3-0 sutures. Urethral lesions were primarily corrected with interrupted polyglactin 5-0 suture thread under a Foley catheter.

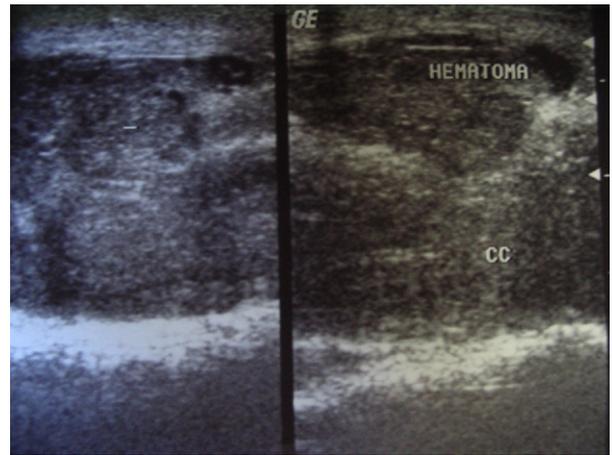


Figure 2. Penile ultrasound of a patient from G2 (high suspicion of penile fracture). The ultrasound image shows rupture of the tunica albuginea with a large hematoma. CC, corpus cavernosum.

ter. In the cases where only superficial dorsal vein injury was observed during surgical exploration, ligation of the vessel and clot evacuation were performed. Circumcision was routinely performed on all uncircumcised patients who underwent surgical exploration to facilitate hygiene and dressings and to provide better immediate esthetic results.

The patients were followed up during outpatient clinic visits for 6 months after the traumatic event and yearly thereafter (mean follow-up, 34.6 months). The patients were clinically evaluated for the presence of erectile dysfunction based on the international sexual dysfunction index and penile tortuosity.

RESULTS

Sexual trauma was the main etiologic factor, occurring in 140 (93.3%) patients, followed by masturbation, corresponding to 10 (6.7%) cases. Time elapsed from injury to hospital admission ranged from 2 hours to 3 weeks (mean, 14 hours).

Of the 37 patients sent for USG, 25 belonged to G1 and 12 to G2. The results of the USG in patients with low suspicion of penile fracture were small edema of the soft tissue in 15 (60%), large edema of the soft tissue in 5 (20%), and normal examination in 5 (20%). In patients belonging to G2, ultrasound examination revealed rupture of the tunica albuginea in 9 cases (Fig. 2). One patient was diagnosed with a large hematoma without albuginea lesion, and in 2 cases the examination was inconclusive. These 12 patients underwent surgical exploration, with confirmation of penile fracture in 11 cases and injury of dorsal vein in the other. In the 2 cases with inconclusive examination results, albuginea disruption was found during surgical exploration. MRI was used in only 1 case, locating the exact site of injury, which was confirmed during surgical exploration. In 21 cases with suspected urethral injury, RUG revealed contrast medium leakage in 20 patients and a full urethra in 1 case. After the surgical exploration, urethral injury was confirmed in all cases in which there was contrast medium leakage.

Table 1. Lesions found during surgical exploration in patients of G2 (125 patients with high suspicion of penile fracture)

Type of Lesion	Cases (%)
Unilateral corpus cavernosum	90 (72%)
Unilateral corpus cavernosum and urethra	5 (4%)
Bilateral corpus cavernosum and urethra	15 (12%)
Dorsal vein lesion	15 (12%)
Total	125 (100%)

With respect to the clinical presentation of the patients in G1 (n = 25), only 3 (12%) patients reported mild pain during hospital admission; and a cracking sound during trauma was noticed by 3 (12%) patients. Immediate penile detumescence did not occur in any case. Small-to-large penile edema was observed in 20 (80%) and 5 (20%) cases, respectively. All patients were able to achieve erection after the initial traumatic event and, upon physical examination, no injury of the corpus cavernosum was observed. Sexual activity was the main etiologic factor, affecting 23 (92%) patients in G1, followed by penile manipulation, which occurred in only 2 (8%) cases.

In the group of patients who underwent conservative treatment (G1), all patients were followed up by outpatient clinic visits, 6 months after the traumatic event and yearly thereafter (mean follow-up, 30.4 months). No patient has presented clinical complications relative to erectile dysfunction, based on the international sexual dysfunction index and/or penile curvature.

Of the 125 patients who were submitted to surgical exploration (G2), 117 (93.6%) had penile trauma caused by sexual intercourse, and only 8 patients (5.4%) had penile trauma caused by manipulation. Of the 125 patients evaluated, 110 (92%) presented with disruption of the tunica albuginea and only 15 (8%) showed injury of the dorsal vein of the penis. The size of the tunica albuginea lesions ranged from 0.3 to 4.0 cm (mean, 1.5 cm). Urethral injury was found in 20 (16%) patients, all of whom had associated corpus cavernosum injury. Of the 110 cases of PF, 95 patients (86.3%) presented with unilateral lesions and 15 (13.7%) with bilateral lesions (Table 1). Associated urethral disruption was found in only 5 patients with unilateral corpus cavernosum injury. All patients with bilateral corpus cavernosum lesion (15 patients) presented with associated urethral injury, and in 3 cases the rupture was complete (Fig. 3).

Of the patients who underwent surgical treatment (G2), 15 (12%) did not return for follow-up evaluation and 110 (88%) were monitored through clinic visits, 6 months after the traumatic event and yearly thereafter (mean follow-up, 38.8 months). In this group, there were no complaints related to erectile dysfunction after the traumatic event, based on the international sexual dysfunction index, and only 7 (5.6%) patients developed slight penile curvature, which was investigated with pharmacologic-induced erection through alprostadil in-



Figure 3. Patient with classical clinical findings of penile fracture (G2) with bilateral albuginea disruption and complete urethral section.

jections. Among these patients, none showed penile curvature above 10° or sexual function impairment.

COMMENT

Penile fracture is a condition whose diagnosis is usually clinical, based on the patient's medical history and physical examination findings. However, questions can arise regarding diagnosis, calling for the use of some complementary methods. There are few studies regarding the appropriate approach for patients with suspected PF, their various differential diagnoses, and diagnostic image methods. Zargooshi¹³ reports a study of 172 cases of PF and recommends only clinical diagnosis, suggesting that additional tests not be performed routinely.

USG is an examiner-dependent method whose interpretation depends on the examiner's experience. Because of the rarity of this lesion, very few radiologists are trained to make a precise diagnosis of PF. The examination is hindered by the presence of blood clots and edema at the site of the fracture, so that small lesions of albuginea can easily go unperceived by inexperienced radiologists.^{1,14,15} Nevertheless, some authors advocate USG as an ideal technique for evaluating patients with penile trauma.^{16,17} In G1, 25 patients were evaluated by USG and corpus cavernosum injuries were observed in none. Swelling of soft tissue was observed in 20 patients and, of these, 15 showed slight edema and 5 large edema of the soft tissue. In the other 5 cases, the examination was normal. Of the 12 cases evaluated in G2 by USG, the procedure proved effective in 10 (83.3%) cases and the method inconclusive in only 2 cases. USG with color Doppler has been incorporated into the diagnosis of penile trauma, providing better diagnostic accuracy, because it allows evaluating the relationships between the hematoma and penile vascular structures. Because it is a noninvasive, low-cost, and widely available method, USG can be considered useful in the diagnostic investigation of penile trauma.¹⁶

Although USG was the first type of sectional image of the penis, MRI provides better soft-tissue contrast, in addition to achieving high spatial resolution, allowing better definition of images of the male sexual organ, and it can be used to reveal lesions of the corpora cavernosa.^{1,6,13,18-20} The high precision of the method allows differentiating vascular sinusoids of the cavernous body from the tunica albuginea, achieving high diagnostic accuracy.^{1,6,18-20} However, it is expensive and is not available at most institutions. In this study, only 1 patient with doubtful clinical findings was submitted for this examination, which was performed outside our institution. The result confirmed the lesion, in agreement with the surgical finding.

When there is clinical suspicion of urethral injury, RUG should be performed routinely because it is inexpensive, easy to perform, and highly accurate.⁶ In this study, all patients with clinical suspicion of urethral injury were submitted for this examination. Of the 21 cases evaluated, 20 had contrast medium leakage and urethral injury was confirmed in all cases during the surgical exploration. In the only case where RUG was negative, the surgical exploration showed urethral integrity. However, urethrocytography is not always as effective as it was in our series. Mydlo et al¹⁰ describe 2 cases of false-negative tests for urethral injury in a total of 7 patients with PF. Despite the small sample, the author recommends thorough assessment of the urethra through penile degloving so that injuries do not go unnoticed.

The type of treatment in PF has been the subject of various studies, with conflicting recommendations. There is an increasing tendency for immediate surgery to avoid later complications related to sexual dysfunction.^{1,5,6,8,9,13,20-24} Nicoliasen et al⁵ report complication rates with conservative treatment of around 29% and an average hospitalization stay of 14 days, and they urge early surgical treatment. In this study, only 5 (6.2%) patients treated surgically developed slight penile curvature, without loss of sexual function, corroborating other findings in the literature in favor of immediate surgical treatment for patients with classical clinical signs of PF.

Lesions of the superficial dorsal vein of the penis, smaller vessels, and soft tissue may occur during sexual activity, leading to a clinical picture that is very similar to PF.²⁵ Often, the differential diagnosis of these conditions can be established only through specific complementary tests or surgical exploration. In our study, 15 patients had dorsal vein injury, diagnosed after surgical exploration. In all cases, the patients had an exuberant clinical picture of PF, with formal indication of immediate surgery. Nevertheless, these lesions can be present in a less pronounced form, leading to doubtful diagnosis and the need for new approaches to avoid unnecessary surgery.

There are several reports in the literature that mention rupture of the dorsal vein treated conservatively, resulting in complete recovery without sequelae to the pa-

tients.^{26,27} The precise differentiation between PF and dorsal vein rupture may be achieved by additional imaging tests, which are not available in most cases in hospital emergency wards. The low incidence of dorsal vein rupture of the penis does not justify the routine use of additional tests in all cases of suspected PF, especially in pronounced ones. Patients with an exuberant clinical condition of PF, where the surgical exploration reveals dorsal vein lesion, show exceptional recovery with early hospital discharge.⁶

In this study, 25 patients were treated conservatively based on low suspicion of corpora cavernosa injury and USG findings. All of these patients reported during hospital admission a clinical history of trauma during sexual intercourse or penile manipulation without immediate penile detumescence, with little or no pain. On physical examination, no changes in the corpora cavernosa were noted. The edema, if present, was small and limited, with areas of bruising of varied length. All of these patients were able to achieve normal erections immediately after the traumatic event, confirming the integrity of the corpora cavernosa. USG findings did not demonstrate albuginea disruption, in agreement with clinical history and physical examination. Of this group, no patient had later complications related to erectile dysfunction or penile curvature upon follow-up. Thus, the conservative approach in our sample proved to be very safe and feasible in selected cases.

CONCLUSIONS

Penile fracture is a predominantly clinical diagnostic condition. In doubtful cases, additional examinations such as USG and MRI can be used for diagnostic confirmation.

Patients with high suspicion of PF should be surgically treated based on the excellent results of this approach. However, in cases of low suspicion of corpora cavernosa injury, based on clinical criteria and imaging methods, the conservative conduct has proved to be a feasible and safe option.

References

1. Miller S, McAninch JW. Penile fracture and soft tissue injury. In: McAninch JW, ed *Traumatic and Reconstructive Urology*. Philadelphia: W. B. Saunders; 1996; chapter 59, pp. 693-8.
2. Elke N. Fracture of the penis. *Br J Surg*. 2002;89:555-565.
3. El-Sherif AE, Dauleh M, Allowneh n, Vijayan P. Management of fracture of the penis in qatar. *Br J Urol*. 1991;68:622-625.
4. Schonberger B. Verletzungen der mannlichen genitalorgane. *Z Urol Nephrol*. 1982;5:879-883.
5. Nicoliasen S, Melamud A, McAninch JW. Rupture of the corpus cavernosum: surgical management. *J Urol*. 1983;130:917-920.
6. Koifman L, Cavalcanti AG, Manes CH, Filho DR, Favorito LA. Penile fracture—experience in 56 cases. *Int Braz J Urol*. 2003;29:35-39.
7. Klein FA, Smith V, Miller N. Penile fracture: diagnosis and management. *J Trauma*. 1985;25:1090-1092.
8. Taha SA, Sharayah A, Kamal BA, Salem AA, Khwaja S. Fracture of the penis: surgical management. *Int Surg*. 1988;73:63-64.
9. Meares EM. Traumatic rupture of the corpus cavernosum. *J Urol*. 1971;105:407-409.

10. Mydlo JH, Hayyeri M, Macchia RJ. Uretrography and cavernosography imaging in a small series of penile fracture: A comparison with surgical findings. *Urology*. 1998;51:616-619.
11. Ruckle CH, Handley HR, Lui PD. Fracture of the penis: diagnosis and management. *Urology*. 1992;40:33-35.
12. Tsang T, Demby AM. Penile fracture with urethral injury. *J Urol*. 1992;147:466-468.
13. Zargooshi J. Penile fracture in Kermanshah, Iran: report of 172 cases. *J Urol*. 2000;164:364-366.
14. Dierks PR, Hawkins H. Sonography and penile trauma. *J Ultrasound Med*. 1983;2:417-419.
15. Martinez Perez E, Arnaiz EF. Fracture of penis: two new cases. Review of the literature: usefulness of ecography. *Arch Esp Urol*. 1997;50:1099-1102.
16. Bhatt S, Kocakoc E, Rubens DJ, Seftel AD, Dogra VS. Sonographic evaluation of penile trauma. *J Ultrasound Med*. 2005;24:993-1000.
17. Kervancioglu S, Ozkur A, Bayram MM. Color Doppler sonographic findings in penile fracture. *J Clin Ultrasound*. 2005;33:38-42.
18. Fedel M, Venz S, Andressen R, Sudhoff F, Loening S. The value of magnetic resonance imaging in the diagnosis of suspected penile fracture with atypical clinical findings. *J Urol*. 1996;155:1924-1927.
19. Susuki K, Shimizu N, Kurokawa K, Susuki T, Yamanaka H. Fracture of the penis: magnetic resonance imaging of the rupture of the corpus cavernosum. *Br J Urol*. 1995;76:803-804.
20. Choi MH, Kim B, Ryu JA, Lee SW, Lee KS. MR imaging of acute penile fracture. *RadioGraphics*. 2000;20:1397-1405.
21. Gianini PTR, Piovesan AC, Mesquita JLB, Romao RLP, Arap S. Long-term outcome of penile fracture treatment. *Int Braz J Urol*. 2001;27:46-49.
22. Pryor JP, Hill JT, Packham DA, Yates-Bell AJ. Penile injuries with particular reference to injury to erectile tissue. *Br J Urol*. 1981;53:42-46.
23. Orvis BR, McAninch JW. Penile rupture. *Urol Clin North Am*. 1989;16:369-375.
24. Muentener M, Suter S, Hauri D, Sulser T. Long-term experience with surgical and conservative treatment of penile fracture. *J Urol*. 2004;172(2):576-579.
25. Babu N. Rupture of the dorsal vein mimicking fracture of the penis. *BJU Int*. 1999;84:179-180.
26. Bujons Tur A, Rodríguez-Ledesma JM, Cetina Errando A, Puigvert Martínez A, Iglesias Guzmán JC, Villavicencio Mavrich H. Penile hematoma secondary to rupture of the superficial dorsal vein of the penis. *Arch Esp Urol*. 2004;57(7):748-751.
27. Sharma GR. Rupture of the superficial dorsal vein of the penis. *Int J Urol*. 2005;12(12):1071-1073.