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Primary urethral reconstruction results in penile fracture

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ABSTRACT

OBJECTIVE This study assessed primary urethral reconstruction results in patients with a penile fracture.

MATERIALS AND METHODS Between January 2005 and April 2016, patients who underwent primary urethral reconstruction due to penile fracture were called for a follow-up. Epidemiological and clinical presentation data and operative findings were reviewed retrospectively. Partial urethral lesions were primarily treated with interrupted absorbable sutures over urethral catheter. In cases of complete urethral lesion, tension-free end-to-end anastomosis was performed. From the third month after surgery, all patients were interviewed using the International Prostate Symptom Score questionnaire and uroflowmetry. Retrograde urethrocystography was used in patients with urinary symptoms or altered uroflowmetry to rule out or confirm urethral stenosis.

RESULTS Of 175 patients with penile fractures, 27 (15.4%) had associated urethral injury. All patients were diagnosed with penile fracture by means of clinical history and physical examination. No subsequent examinations were conducted. Ages varied from 30 years to 58 years old (mean 39.2 years). All fractures resulted from sexual activity. Reported sexual positions were 'doggy style' position in eight cases (61.5%) and with the 'man on top' in five cases (38.4%). Ten patients (76.9%) experienced haematuria, ten (76.9%) had urethral bleeding and four (30.7%) suffered urinary retention. Unilateral and bilateral injury of the corpus cavernosum was observed in four (30.7%) and nine (69.2%) patients, respectively; partial injury was found in nine cases (69.3%) and complete urethral injury was noticed in four cases (30.7%). All cases of complete urethral injury were associated with bilateral lesion of the corpus cavernosum. Six patients who had uroflowmetry with maximum urinary flow rate below 15 ml/s and/or had IPSS above 7 underwent retrograde urethrocystogram, and this was normal in all cases, excluding the possibility of urethral stenosis. Two patients (15.3%) experienced surgical postoperative complications represented by an urethrocutaneous fistula and a subcutaneous abscess adjacent to the end-to-end anastomosis area.

CONCLUSIONS Penile fracture is a rare urological emergency, especially when it is associated with a urethral lesion. This must be suspected when the clinical picture is suggestive or in cases of high-energy trauma, especially in bilateral lesions of the corpus cavernosum. Complementary imaging methods are not needed in these cases and immediate exploration should not be delayed. Primary urethroplasty produces satisfactory results with low complication levels. Nonetheless, prospective studies with larger samples should be conducted.

KEYWORDS

Penile fracture – Urethral injury – Urethral reconstruction

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Introduction

Penile fracture is an injury of the penis in erection, resulting in tunica albuginea rupture of one or both corpus cavernosum.[1] The fracture may be accompanied by a partial or complete urethral lesion, depending on the aetiology and kinetic energy of the trauma. Its incidence is variable, reaching up to 38% of cases in the United States and Western countries, where sexual causes are predominant.[2] In typical cases, patients report hearing a snap followed by pain, penile oedema and subsequent immediate detumescence. Urethral lesion may be suspected when blood is seen in the urethral meatus or haematuria or urinary retention is observed.[3] Immediate surgical treatment is mandatory in penile fracture, especially in cases associated with urethral rupture. Complex lesions of the corpus cavernosum involving the urethra may transform surgical repair into a significant challenge, thus compromising results.[4]

Treatment for urethral lesions associated with penile fracture are well established but reports on this subject are few, notably regarding urethral reconstruction results and the impact on urinary function of patients undergoing surgical correction. Previous studies in patients with penile blunt trauma show the incidence of urethral injury but did not report the urinary symptoms or appropriate follow-up.[5] Our study aimed to assess the outcomes of primary urethral reconstruction in patients with penile fracture.

Materials and Methods

Between January 2005 and July 2016, patients who underwent primary urethral reconstruction following penile fracture at the Souza Aguiar Hospital were called for a follow-up. Epidemiological and clinical data and operative findings were reviewed retrospectively by means of analysis of the medical records. The experimental protocol was approved by the ethics and human research committee of the institution.

All patients were operated on using the usual surgical technique employed in our department. Prophylactic antibiotics were given before surgery. Under spinal anaesthesia, all patients underwent an immediate surgical exploration through a circular subcoronal incision followed by further penile degloving and exposure of the corpus cavernosum and urethra. Corpus cavernosum lesions were identified, the hematoma was evacuated, surgical debridement was performed and the tunica albuginea was sutured using interrupted 3-0 polyglactin sutures. Partial urethral lesions were primarily treated with simple 5-0 polyglactin sutures over an 18 French catheter. In cases of complete urethral lesion, the urethral edges were dissected at both sides, trimmed, spatulated and closed with interrupted absorbable sutures using 5-0 polyglactin after ensuring tension-free end-to-end anastomosis. The urethral catheter was left in place for 10–14 days in cases of partial injury and for 14–21 days in cases of complete rupture.[3] Neither a Penrose drain nor a suprapubic cystostomy was inserted (Fig 1).

Patients were followed-up at least twice; first at 30 days after surgery and then 60 days after surgery. From the third month after surgery, all patients were interviewed and asked about urinary symptoms using the International Prostate Symptom Score (IPSS) questionnaire, followed by physical examination and Uroflowmetry.[6,7] Uroflowmetry was used to assess urinary flow and possible urethral stenosis. Maximum urinary flow rate (Q_{max}) was considered above 15 ml/s. Patients with a Q_{max} that was in the dubious range (between 10–15 ml/s) or reduced (less than 10 ml/s) had a retrograde urethrocystogram. Those with moderate lower urinary tract symptoms (LUTS; IPSS between 8 and 19) or severe symptoms (IPSS between 20 and 35) were also examined to exclude or confirm urethral stenosis.

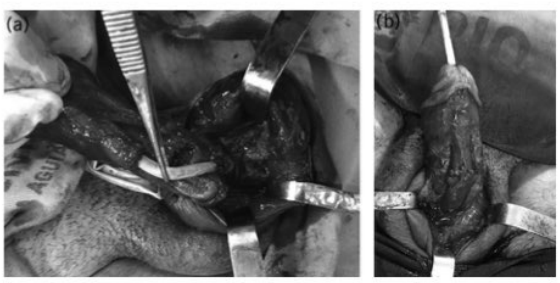

Figure 1 Penile fracture in a 44-year-old man. A) Complete urethral disruption with rupture of both corpus cavernosum. B) Final aspect after the end-to-end anastomosis.

Results

Of 175 penile fractures treated in our emergency department between January 2005 and July 2016, 27 patients (15.4%) had associated urethral injury. In these cases, the most common type of lesion was bilateral corpus cavernosum and urethral partial lesion (51.8%) and the principal aetiology was the 'doggy style' position (44.4%); 13 of the 27 patients with associated urethral injury responded to telephone calls or letters for follow-up appointments. Follow-up time varied from 3 months to 132 months (mean 29.7 months).

All 13 patients were diagnosed with penile fracture by means of clinical history and physical examination. No subsequent examinations were conducted. Ages ranged from 30 years to 58 years old (mean 39.2 years). Time between trauma and surgery varied from 2 hours to 36 hours (mean 13 hours). However, in most cases, was 12–24 hours. All cases resulted from sexual activity. Reported sexual positions were 'doggy style' position (one of these cases happened during homosexual intercourse) in eight cases (61.5%) and with the 'man on top' position in five cases (38.4%).

All patients experienced immediate penile detumescence. Hearing a snap when the trauma occurred was reported by nine patients (69.2%) and ten (76.9%) complained of genital pain. Analysing specific signs and symptoms related to urethral injury, ten patients (76.9%) experienced urethral bleeding and four (30.7%) experienced urinary retention. All patients had a haematoma. With regard to operative findings, unilateral and bilateral injury of the corpus cavernosum was observed in four (30.7%) and nine (69.2%) cases, respectively and complete urethral injury was noted in four cases (30.7%), always being associated with bilateral injury of the corpus cavernosum (Table 1).

During follow-up, five patients (38.4%) complained of pain in their surgical incision when they had an erection and they had a palpable nodule in the operative area, whereas the other eight patients (61.5%) displayed no alteration at physical examination. Regarding uroflowmetry findings, Q_{max} varied between 4 ml/s and 18 ml/s with an average of 13.5 ml/s. According to the IPSS analysis, ten patients (76.9%) experienced mild LUTS (IPSS scores 0–7). Two patients (15.3%) experienced moderate LUTS (IPSS scores 8–19) and another patient experienced severe LUTS (IPSS scores 20–35). Three of the six patients who had a Q_{max} below 15 ml/s also had IPSS above 7, meeting the criteria for postoperative assessment with retrograde urethrocystography. This was normal in all cases, excluding the possibility of urethral stenosis (Table 1).

Two patients (15.3%) experienced surgical postoperative complications. One patient with a complete urethral section developed a subcutaneous abscess adjacent to the end-to-end anastomosis area. Consequently, this patient needed percutaneous drainage (Fig 2). The other complication was a urethrocutaneous fistula that developed soon after removal of the urethral catheter on the 14th postoperative

Table 1 Age, type of penile fracture and follow-up data for 13 patients

Patient		Lesion type	IPSS	Uroflowmetry Qmax (ml/s)	RGU	Urethral stenosis
No.	Age (years)					
1	43	Unilat + partial	3	16	No	No
2	32	Unilat + partial	14	14	Yes	No
3	42	Unilat + partial	4	11	Yes	No
4	41	Bilat + partial	4	17	No	No
5	35	Unilat + partial	5	18	No	No
6	44	Bilat + total	6	14	Yes	No
7	31	Bilat + partial	7	16	No	No
8	40	Bilat + partial	4	16	No	No
9	38	Bilat + partial	26	6	Yes	No
10	58	Bilat + partial	4	4	Yes	No
11	45	Bilat + total	6	15	No	No
12	36	Bilat + total	6	16	No	No
13	30	Bilat + total	12	13	Yes	No

Bilat, bilateral lesion of corpora cavernosa; IPSS, International Prostate Symptom Score; partial, partial urethral lesion; total, total urethral lesion; Unilat, unilateral lesion of corpora cavernosa.

Figure 2 Complication after penile fracture in a 36-year-old man. This patient with a complete urethral section developed a subcutaneous abscess adjacent to the end-to-end anastomosis.

day (Fig 3). Primary presentation was a bilateral lesion of the corpus cavernosum accompanied by partial urethral lesion. This was resolved by maintaining the catheter for a further 4 weeks. The patient subsequently experienced

Figure 3 Urethrocutaneous fistula after penile fracture in a 40-year-old man. The patient had a bilateral lesion of the corpus cavernosum accompanied by partial urethral lesion. Retrograde urethrocystography reveals the urethrocutaneous fistula.

altered uroflowmetry and moderate LUTS. For this reason, he underwent control retrograde urethrocystography, the results of which were normal, excluding fistula or urethral stenosis.

Discussion

Penile fracture followed by a urethral lesion is considered to be an extremely rare condition. Its frequency is related to the region and aetiology of the trauma. Studies conducted in the United States, Europe and Brazil, where sexual aetiology is more common, showed that the incidence of penile fracture varies from 10% to 38%. In Eastern European countries, Asia, and Africa, however, where most cases involve penile manipulation, incidence is 1–3.2%.8 In this study, penile fracture-related urethral lesions were observed in 15.4% of patients. All cases were linked to sexual intercourse.

Urethral bleeding, haematuria and urinary difficulty may be experienced with urethral injury.[9] In our series, urethral bleeding and haematuria were observed in 76.9% of the cases, while urinary retention was found in 30.7%. Because of the high suspicion of urethral lesions in such cases, some authors recommend preoperative investigation through retrograde urethrocystography or flexible cystoscopy.[2,10,11] Nonetheless, retrograde urethrocystography may show false negative results in up to 28.5% of the cases, as described by Mydlo *et al*.[12] In this small series of seven patients, results may have been linked to haematoma under the lesion, blocking extravasation of the contrast.[12] In addition, a 2016 meta-analysis has revealed that there is no consensus as for

the role of retrograde urethrocystography in penile fracture.[15] Similarly, not every emergency department offers flexible cystoscopy. Conducting these examinations is not necessary because the diagnosis of penile fracture is eminently clinical, especially in cases of suspected urethral lesion in which surgical intervention provides less morbidity and faster recovery.[14] The penile degloving technique provides excellent exposure of the urethra and corpus cavernosum at their full extension. Urethral lesions are easily detected in the intraoperative period, since these are partial lesions and they are close to the tunica albuginea lesion.[2,15] However, complete urethral injuries, which need end-to-end urethroplasty, may become a significant challenge to some surgeons. According to Bullock,[16] almost 58% of the urologists in the United States do not conduct urethroplasties. Perhaps the lack of experience in reconstructive surgery is a strict indication of the need for preoperative assessment of a likely urethral lesion in order to transfer more complex cases to specialised centres. In this series, all patients underwent surgery soon after diagnosis and all suspected cases of urethral lesion were identified in the intraoperative period. Nine (69.2%) of 13 cases in our study had partial urethral lesion localised at the level of the corpus cavernosum lesion and four cases (30.7%) had complete urethral section. These cases were associated with bilateral rupture of corpus cavernosum, corroborating the association between urethral lesion and elevated kinetic energy trauma.

Because penile fracture is rarely linked to urethral lesions, there are few published studies. Most have a small number of patients and do not provide details of urinary function after primary urethral reconstruction. In this study, a subjective assessment was conducted applying the IPSS questionnaire and an objective assessment was conducted using uroflowmetry. Hatzichristodoulou *et al.*[1] assessed patients admitted for surgical treatment of a penile fracturand observed urinary deterioration using IPSS in 4 of 13 (30.8%) cases. In a study by El-Assmy *et al.*,[15] uroflowmetry was carried out in all urethral injury patients. Only one case showed abnormal urinary flow due to penile urethral stenosis. This case necessitated periodic dilatation for 1 month before normal urination was restored. Similar results were found in the series described by Raheem *et al.*[2] Ten (89.9%) of eleven patients had normal flow and one (9.1%) experienced urinary difficulty. This patient then underwent retrograde urethrocystography, which revealed urethral stenosis. The stenosis was treated with sequential dilatations. In our study, six patients had normal flow. Retrograde urethrocystography was advised in these cases. Three patients (23%) experienced moderate LUTS and one of them (7.6%), severe LUTS. Retrograde urethrocystography was also advised because of urinary complaints. However, no case of urethral stenosis was observed at the end of the study.

The most common complications found in penile fracture associated with urethral injury are urethral stenosis, urethrocutaneous fistula and penile deformity.[17] Hatzichristodoulou *et al.*[1] described seven cases of penile fracture associated with urethral lesion followed by postoperative complications in two cases. One patient had a urethrocutaneous fistula and another experienced urethral stenosis. Both experienced deterioration in urinary function according to the IPSS questionnaire analysis. The authors consider that urethral fistula formation may be linked to the proximity of the corpus cavernosum injury to the urethral injury and suggested using graft to interpose the suture to avoid fistulous trajectory formation. Di Pierro *et al.*[18] reported a case of penile fracture associated with urethral lesion that evolved with a pseudodiverticulum, which was highlighted by urethrocystography. The case was treated conservatively with cystostomy for 2 months after surgery. In our series, 2 (15.3%) of 13 cases had postoperative complications – a subcutaneous abscess and a urethrocutaneous fistula. The abscess occurred in a patient with a full urethral lesion who underwent to end-to-end urethroplasty. It is believed that, despite the use of the urethral catheter, there might have been a small extravasation of urine between the points causing collection of urine and formation of an abscess. This case was treated with percutaneous drainage and oral antibiotic therapy with a satisfactory outcome. The fistula was manoeuvred conservatively with a urethral catheter for 30 days. The patient evolved with mild LUTS (IPSS score 6) and uroflowmetry revealed a discreetly reduced flow (Q_{max} 14 ml/s). However, control retrograde urethrocystography did not reveal signs of urethral stenosis.

This study has limitations owing to the small number of cases included. Moreover, several data were assessed retrospectively. The method of this study was restricted to evaluating urethral complications. It was not possible to verify urinary dysfunctions and prostatic hyperplasia in patients with altered IPSS or uroflowmetry despite normal retrograde urethrocystography.

Conclusions

Primary urethroplasty after urethral trauma associated with penile fracture produces satisfactory results with low levels of complications. Nonetheless, prospective studies with larger samples should be conducted.

References

1. Hatzichristodoulou G, Dorstewitz A, Gschwend JE *et al.* Surgical management of penile fracture and long-term outcome on erectile function and voiding. *J Sex Med* 2013; **10(5)**: 1,424–1,430.
2. Raheem AA, El-Tatawy H, Eissa A *et al.* Urinary and sexual functions after surgical treatment of penile fracture concomitante with complete urethral disruption. *Arch Ital Urol Androl* 2014; **86(1)**: 15–19.
3. Koifman L, Barros R, Júnior RA *et al.* Penile fracture: diagnosis, treatment and outcomes of 150 patients. *Urology* 2010; **76(6)**: 1,488–1,492.
4. De Stefani, R. Stubinski, F. Ferneti *et al.* Penile Fracture and Associated Urethral Injury. *Sci World J* 2004; **4(Suppl 1)**: 92–99.
5. Cavalcanti AG, Krambeck R, Araújo A *et al.* Management of urethral lesions in penile blunt trauma. *Int J Urol* 2006; **13(9)**: 1,218–1,220.
6. Barry MJ. Evaluation of symptoms and quality of life in men with benign prostatic hyperplasia. *Urology* 2001; **58(6 Suppl 1)**: 25–32.
7. el Din KE, Koch WF, de Wildt MJ *et al.* Reliability of the International Prostate Symptom Score in the assessment of patients with lower urinary tract symptoms and/or benign prostatic hyperplasia. *J Urol* 1996; **155(6)**: 1,959–1,964.

8. Derouiche A, Belhaj K, Hentati H *et al.* Management of penile fractures complicated by urethral rupture. *Int J Impot Res* 2008; **20(1)**: 111–114.
9. Koifman L, Cavalcanti AG, Manes CH *et al.* Penile fracture – experience in 56 cases. *Int Braz J Urol* 2003; **29(1)**: 35–39.
10. Jack GS, Garraway I, Reznichek R *et al.* Current treatment options for penile fractures. *Rev Urol* 2004; **6(3)**: 114–120.
11. Kamdar C, Mooppan UM, Kim H *et al.* Penile fracture: preoperative evaluation and surgical technique for optimal patient outcome. *BJU Int* 2008; **102(11)**: 1,640–1,644.
12. Mydlo JH, Hayyeri M, Macchia RJ. Urethrography and cavernosography imaging in a small series of penile fractures: a comparison with surgical findings. *Urology* 1998; **51(4)**: 616–619.
13. Amer T, Wilson R, Chlosta P *et al.* Penile fracture: a meta-analysis. *Urol Int* 2016; **96(3)**: 315–329.
14. Moslemi MK. Evaluation of epidemiology, concomitant urethral disruption and seasonal variation of penile fracture: a report of 86 cases. *Can Urol Assoc J* 2013; **7(9–10)**:E572–E575.
15. El-Assmy A, El-Tholoth HS, Mohsen T *et al.* Long-term outcome of surgical treatment of penile fracture complicated by urethral rupture. *J Sex Med* 2010; **7(11)**: 3,784–3,788.
16. Bullock TL, Brandes SB. Adult anterior urethral strictures: a national practice patterns survey of board certified urologists in the United States. *J Urol* 2007; **177(2)**: 685–690.
17. McAninch JW, Santucci RA. Genitourinary trauma. In: Walsh PC, Retik AB, Vaughan ED *et al.*, eds. *Campbell's Urology*. 8th ed. Philadelphia, PA: WB Saunders; 2002. Volume 4, pp. 3,707–3,744.
18. Di Pierro GB, Lannotta L, Innocenzi M *et al.* Urethral pseudodiverticulum secondary to penile fracture and complete urethra dissection. *Can Urol Assoc J* 2013; **7(5-6)**: E347–E350.