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RESEARCH ARTICLE

Outcomes of Emergency Surgical Treatment for Penile Fractures: A Study on Suture Materials, Delayed Repair, and Postoperative Results

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Abstract

Objective: This study examines the impact of surgical timing and suture materials on postoperative outcomes in penile fracture patients, particularly focusing on the development of penile curvature (PC). Specifically, it focuses on the role of delayed surgical intervention in the development of PC.

Material and Methods: A retrospective analysis was conducted on 63 patients treated for penile fractures between 2015 and 2024. Data on the time to surgery, suture materials, and postoperative complications such as PC were collected.

Results: PC occurred in 27% of patients, with a significantly longer surgical delay in those with PC compared to those without. Suture material type (2-0 Prolene vs. 3-0 Vicryl) had no significant effect on PC or nodule formation.

Conclusion: Delayed surgical intervention is associated with an increased risk of PC. Early surgery is recommended to reduce complications, while suture material does not influence outcomes.

Keywords: penile fracture, surgical timing, penile curvature, suture materials, postoperative outcomes.

INTRODUCTION

Penile fracture (PF) is defined as the rupture of the tunica albuginea of the corpus cavernosum (1). This rupture occurs due to severe bending during an erect state, often resulting from vigorous vaginal penetration, anal intercourse, forceful manipulation, firearm injury, masturbation, or any other mechanical trauma (2, 3). In Europe and the United States, the most common cause of this injury is trauma during sexual intercourse (4).

Historically, in cases with a history of PF, conservative treatment methods such as penile splinting, compression, anti-inflammatory, antifibrinolytic, and analgesic medications were commonly preferred (5). However, these treatment methods often led to long-term complications, including painful erections, fibrotic penile lesions that interfere with erections, PC, arteriovenous fistula, infection, and erectile dysfunction (ED) (5). Due to the high rate of complications

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and prolonged hospital stays, emergency surgical repair is now the preferred treatment method over conservative approaches (6, 7). Surgical treatment involves hematoma evacuation, penile exploration, and repair of the local defects in the tunica albuginea and urethra. Common postoperative complications include penile nodules (PN), lower urinary tract symptoms, ED, and PC. However, some studies have reported no impact of PF repair on the development of PC and ED. These studies, which advocate for emergency surgical repair, report lower complication rates (8).

Our study aims to make a significant contribution to the literature by comprehensively exploring the connection between the timing of surgical intervention and the incidence of PC in patients with PF. Specifically, we analyze how delays in surgical treatment may increase both the risk and the severity of PC development. In addition to the timing aspect, our research also investigates the role of different suture materials, such as 2-0 Prolene and 3-0 Vicryl, in influencing postoperative outcomes. By examining the combined effects of surgical delay and suture type, we aim to provide a clearer understanding of how these factors interact and their overall impact on minimizing long-term complications like penile curvature and nodule formation.

MATERIAL AND METHODS

Study Population

This cross-sectional, retrospective study was conducted on 63 patients who underwent surgery for PF between 2015 and 2024 at Ankara City Hospital and Mardin Training and Research Hospital. Ethical approval was obtained from the Gazi Yaşargil Training and Research Hospital, Health Sciences University, on June 7, 2024, with reference number 88. All patients provided informed consent for the study.

PC who agreed to participate in the study, had no loss of sexual performance (International Index of Erectile Function [IIEF] score > 25), attended the 6-month follow-up, and were reachable by phone were included. Patients with pre-existing PC, ED, Peyronie's disease, chronic comorbid conditions, alcoholism, or psychological disorders were excluded.

Procedure

All PF patients underwent surgery using a classic circumcision incision, where the penile skin was degloved, hematomas (if present) were evacuated, and necessary repairs were performed. Postoperative care included wound checks on the 10th day and a follow-up evaluation at 6 months post-surgery. Data regarding age, defect size, marital status, fracture location, urethral injury, type of sutures used, and lower urinary tract symptoms were extracted from medical records and included in the survey. Additional data on the time from PF occurrence to surgical intervention and the presence of PC were also collected. PC was defined as penile curvature of 30° or more when erect. Measurements were evaluated using photographs of patients in the erect state, and the angle of curvature was determined for the patient using a goniometer.

Statistical Analysis

The statistical analysis was performed using IBM SPSS Statistics for Windows version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics such as median (IQR: Interquartile range), number, and percentage were provided. The Kolmogorov-Smirnov test was used to assess the normal distribution of numerical data. The Mann-Whitney U test was applied for comparisons of quantitative data, while the Pearson Chi-Square and Fisher's Exact tests were used for categorical data comparisons. A p-value of < 0.05 was considered statistically significant.

RESULTS

In accordance with the inclusion and exclusion criteria, the study was conducted on 63 patients. Among these, 17 patients presented with PC, while 46 did not. There was no statistically significant difference between the two groups in terms of average age, height, weight, or Body Mass Index (BMI) ($p>0.05$). The intervention time was nearly double in patients with PC [Median: 17(6) hours] compared to those without PC [Median: 10(5) hours], and this difference was statistically significant ($p<0.001$) (Table 1). There was no statistically significant relationship between BMI and the presence of PC ($p = 0.439$) (Table 2), indicating that PC can occur independently of BMI.

The rupture site appeared to play a significant role in the development of PC, although the effect of ruptures in the right and left cavernosal bodies on PC was borderline significant ($p = 0.103$) (Table 2). No significant relationship was found between the direction of the rupture and the presence of PC ($p = 0.133$), though ventral ruptures seemed to pose a higher risk for developing PC. There was no statistically significant relationship between the presence of urethral injury and PC ($p = 0.061$), suggesting that urethral injury is not a determining factor in the development of PC (Table 2).

Among patients with nodules, 21.1% had PC, while 29.5%

of those without nodules had PC, indicating no significant difference in the development of PC based on the presence of nodules (Table 2). There was no significant difference in the presence of PC between patients who had 2-0 Prolene sutures and those who had 3-0 Vicryl sutures (p=0.883) (Table 2), suggesting that the type of suture material used is not a determining factor for PC development. In patients where 2-0 Prolene sutures were used, 28.0% developed nodules, while 72.0% did not. Among those with 3-0 Vicryl sutures, 31.6% developed nodules, and 68.4% did not. There was no significant difference between the two groups regarding nodule formation (p=0.762) (Table 3).

Table 1. Evaluation of Penile Curvature Presence Based on Age and Anthropometric Measurements

	Curvature Present (n=17) Median (IQR)	**Curvature Absent (n=46) Median (IQR)**	**P-value***
Intervention Time (Hours)	17 (6)	10 (5)	**<0.001**
Age	42 (13.5)	40 (24.25)	0.309
Height	171 (15)	166 (6.25)	0.087
Weight	75 (16)	78.5 (10.25)	0.963
BMI	27.70 (15.08)	27.70 (4.63)	0.394

IQR: Interquartile range

*: Statistical analysis was performed using the Mann-Whitney U test.

Table 2. Presence of Penile Curvature According to Deformity Characteristics in Penile Fracture

	Curvature Present n (%)	**Curvature Absent** n (%)	**Total**	**P-value****
BMI				0.439
Normal	5 (41.7)	7 (58.3)	12	
Overweight	8 (22.9)	27 (77.1)	35	
Obese	4 (25.0)	12 (75.0)	16	
Rupture Site				0.103
Right Cavernous	6 (20.7)	25 (79.3)	31	
Left Cavernous	11 (39.3)	17 (60.7)	28	
Bilateral Cavernous	- (0.0)	4 (100.0)	4	
Rupture Direction				0.061
Ventral	14 (37.8)	23 (62.2)	37	
Ventrolateral	3 (13.0)	20 (87.0)	23	
Dorsolateral*	- (0.0)	2 (100.0)	2	
Dorsal*	- (0.0)	1 (100.0)	1	
Urethral Injury				1.000***
Present	1 (16.7)	5 (83.3)	6	
Absent	16 (28.1)	41 (71.9)	57	
Nodule Presence				0.486
Present	4 (21.1)	15 (78.9)	19	
Absent	13 (29.5)	31 (70.5)	44	
Suture Type				0.883
2-0 Prolen	7 (28.0)	18 (72.0)	25	
3-0 Vicril	10 (26.3)	28 (73.7)	38	

*Since the expected value in each cell was below 5, the data were combined and statistical analysis was performed.

**Pearson Chi-Square and ***Fisher's Exact tests were used for statistical analysis.

Table 3. Relationship Between Suture Type and Nodule Presence

Suture Type	Nodule Absent n (%)	Nodule Present n (%)	P-value*
2-0 Prolen	18 (72.0)	7 (28.0)	0.762
3-0 Vicryl	26 (68.4)	12 (31.6)	
Total	**44 (69.8)**	**19 (30.2)**	

*: Statistical analysis was performed using the Pearson Chi-Square test.

DISCUSSION

Our study was based upon the retrospective data of 63 patients who underwent emergency surgical treatment from the moment they presented to the hospital. All cases resulted from trauma during sexual intercourse. Emergency surgical intervention was performed after optimal conditions were ensured for all patients from the time of presentation. In the treatment of PF, which is one of the urgent urological conditions, the most effective approach is emergency surgical repair. However, postoperative complications such as ED, PN, PF, and painful erection are common in these patients (9). A study by Muentener et al. observed good results in 92% of patients who underwent surgery for PF. Emergency surgical intervention in patients with PF leads to excellent outcomes and is superior to non-surgical treatment (2). Other studies and guidelines also recommend emergency surgical intervention for PF treatment due to the early return to sexual activity and reduced morbidity (10).

Regan et al. observed that monofilament sutures are superior to Vicryl for penile nodules resulting from penile fractures (11). Niessen et al. compared poliglecaprone-25 and polyglactin-910, finding that poliglecaprone-25 resulted in less hypertrophic scar formation (12). Therefore, it is recommended to pay more attention to the type of suture used in the surgery of patients with penile fractures. We preferred to use Vicryl (NJ, USA) and Prolene (J&J, USA) for the repair of tunica albuginea tears. In our study, we did not find a statistically significant difference in terms of curvature and nodule formation between the types of sutures used ($p>0.05$) (Table 3). Both types of sutures appeared to have similar effects on nodule development. This suggests that the choice of suture type does not make a significant difference in terms of nodule formation for surgeons.

In the study by Altan et al., postoperative penile necrosis was observed in 7 out of 25 PF cases (28%) (13). Yılmaz et al. reported that 8 out of 53 PF patients (15%) had associated urethral rupture (14). The location of PF is generally transverse and unilateral (15). In our study, the most common type was right cavernous rupture (n=31, 49%), while bilateral cavernous rupture was the least common (n=4, 6%). The incidence of concomitant urethral rupture in the study by Fergany et al. was lower than 22% of their patients (16). In our cases, only six patients (9%) had complete urethral rupture, which was repaired simultaneously.

Several studies have reported that emergency surgical repair yields better long-term results compared to conservative treatments (17-19). In our study, the effect of delayed surgical repair on penile necrosis was statistically significant (Table 2). Wong et al. compared immediate and delayed surgical repair for PF and noted that the curvature in the immediate repair group was 1.8%, whereas it increased approximately threefold to 4.5% in the delayed group (20). Amer et al. reported an incidence of PC of about 2.7% after PF repair in their recent meta-analysis (21).

Dell et al. observed that 77.7% of patients had a post-operative curvature greater than 30° after tunica closure, and correction of cavernous body deviation was necessary (22). The reconstruction of the corporal bodies depends on the extent of the tunica tear. The optimal surgical treatment for PF is still debated, and the long-term quality of life outcomes of genital reconstructive surgery are still relevant in practice.

Various authors have reported different incisions for accessing the injury site, including circular degloving, inguinoscrotal, lateral, and midline incisions. In our patients, a degloving procedure was performed after a subcoronal incision, which we believe provided excellent exposure of the entire penis and urethra.

Limitations

The limitations of this study are evident. The retrospective nature may result in unrecognized biases. Firstly, all surgeries were performed at two high-volume centers, which may affect the results. Our data should be validated by future multicenter studies. Secondly, there was no control group with early intraoperative curvature correction to assess the effects on surgical and functional outcomes. Thirdly, recurrence of curvature, nodularity, postoperative erections, and penile length were reported by patients and not objectively verified with pharmacologically induced erections.

CONCLUSIONS

This study highlights the critical role of timely surgical intervention in reducing postoperative complications, particularly PC, following penile fractures. Our findings demonstrate that a significant delay in surgery markedly increases the risk of PC, emphasizing the importance of emergency surgical repair. Interestingly, the choice of suture material, whether 2-0 Prolene or 3-0 Vicryl, did not show a significant impact on the development of PC or postoperative nodule formation. This suggests that the timing of surgery, rather than the suture material, is the key determinant in postoperative outcomes.

Based on these results, the focus should shift toward minimizing delays in surgical intervention for penile fractures to improve patient prognosis. Early surgical repair not only reduces the risk of PC but also ensures better overall functional outcomes, including reduced rates of ED and other long-term complications. Our study contributes valuable insights into the management of penile fractures and supports existing recommendations favoring prompt surgical treatment. Further multicenter studies with larger patient cohorts could help validate these findings and solidify the surgical protocols for treating penile fractures.

Data Sharing Statement: It is not open to data sharing due to personal data**.**

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The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

Author Contributions: Conception and design of the study: S.S., F. C., Experimental protocols: S.S, M.E., Acquisition of data: S.S., M.E., F. C., C.Ö.,M.G., İ.T., Analysis, and interpretation of data: S.S., M.E., F. C., İ.T. Drafting the article: S.S., U.S., Critical review: S.S., M.E., F. C., C.Ö.,M.G., İ.T., All authors read and approved the final version of the manuscript.

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