

Scrotal Trauma Treatment and Outcomes

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ABSTRACT

Introduction: Genitourinary tract injuries have been reported to account for 3% to 10% of trauma patients, and scrotal injuries have been reported to comprise 71% of male genital trauma. Scrotal trauma is particularly prevalent in males 10 to 30 years of age, thus posing a potential threat to fertility. Scrotal trauma can be blunt or penetrating in nature, and the mechanism of trauma can have an impact on the management and outcomes of this type of injury.

Methods: A retrospective chart review of adult patients who presented with scrotal trauma to a single large level I trauma center from January 1, 2000, to June 1, 2022, was conducted to assess the relative occurrence and type of trauma (blunt vs penetrating), as well as differences in the management, duration of hospital stay, and need for orchiectomy between these 2 types of injury.

Results: There were 102 patients included in this study, with an average age of 39.5 years (18.7-77.2 years). Fifty-six patients had blunt scrotal trauma, and 46 had penetrating scrotal injury. There was not a statistically significant difference in the percentages of blunt versus penetrating trauma ($P=0.3729$). Patients with penetrating trauma were more likely to be inpatient than those with blunt trauma (69.6% vs 42.9%; $P=0.013$; 95% CI, 0.062-0.473). A total of 61 patients were treated conservatively (44 and 17 patients in the blunt and penetrating trauma groups, respectively). Overall, 41 patients required surgical intervention: 12 who had blunt trauma and 29 who suffered penetrating injury. Surgical treatment was more common for penetrating trauma than for blunt trauma (63.0% vs 21.4%; $P<0.0001$; 95% CI, 0.220-0.612). Eleven patients underwent orchiectomy – 4 from the blunt trauma group and 7 from the penetrating trauma group; the rate of orchiectomy was not significantly different between the 2 groups.

Conclusions: In this study, blunt scrotal trauma was slightly more common than penetrating injury, but the difference did not reach statistical significance. Blunt scrotal trauma was associated with a higher rate of conservative treatment. Further study is needed to better understand the impact of scrotal trauma on future fertility.

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INTRODUCTION

Genitourinary tract injuries were reported to be present in approximately 10% of cases of abdominal trauma, with up to 67% of genitourinary injuries involving the external genitalia.¹ The increased incidence of genital trauma in males has been attributed to both the more exposed location of the male genitalia and men's increased participation in contact sports and violent and combat activities.¹

The incidence of scrotal or testicular injury in the setting of trauma generally has been considered less than 1%, presumably due to the protective effects of testicular mobility within the scrotum, the cremasteric reflex, and the tunica albuginea.¹ However, the scrotum was reported to be the main site of injury in 71% of men who sustained genital trauma.² Furthermore, the potential fertility impairment and psychological effects associated with scrotal trauma may amplify the importance of these injuries, in terms of both subsequent patient morbidity and health care costs.^{1,3-4} Scrotal trauma can cause direct acute injury to the reproductive organs, and obstruction of the vas deferens and epididymis can develop later on secondary

to fibrotic changes involved in the posttraumatic healing process. Additionally, scrotal trauma can violate the blood-testis barrier, with subsequent formation of antisperm antibodies, potentially leading to immunologic infertility.

Scrotal trauma can be blunt or penetrating in nature. The type

Table. Characteristics of Patients with Scrotal Trauma

	No. of Patients	Age (Range)	Outpatients	Inpatients LOS (Days)	Avg Hospital Management	Conservative Intervention	Surgical	Orchiectomy
Overall	102	39.5 (18.7-77.2)	46	56	15.6	61	41	11
Blunt Trauma	56	37.7 (18.8-77.2)	32	24	11.1	44	12	4
Penetrating Trauma	46	41.4 (18.5-69.9)	14	32	19.6	17	29	7

Abbreviations: No., number; Avg, average; LOS, length of stay.

and mechanism of scrotal trauma may be of clinical significance, in terms of the extent of injury to the testicles, epididymis, and the scrotal portion of the vasa deferentia; the need for immediate surgical intervention; and long-term sequel of this type of injury. In a study of adult men with injuries of the genitals (including the scrotum as well as the penis and the urethra), blunt trauma was more common than penetrating injuries (61% vs 39%, respectively). In that study, surgical intervention was more common after penetrating injury than blunt trauma (89% vs 64%, $P < 0.01$).²

The current study focused on scrotal trauma cases and involved an extensive retrospective chart review of such cases at a large tertiary care center over 2 decades. The goal was to assess the relative occurrence of blunt and penetrating scrotal trauma, as well as differences in the management, duration of hospital stay, and need for orchiectomy between these 2 types of scrotal injury.

This study provides a particular view of scrotal trauma in the rural Midwest of the United States, which could be helpful to clinicians practicing in this area, and also adds to the general knowledge of the topic by delineating characteristics of scrotal trauma that are typical to this geographical area.

METHODS

After obtaining Institutional Review Board approval, a retrospective chart review was conducted involving charts of adult patients who presented to the University of Iowa Hospitals and Clinics for scrotal trauma from January 1, 2000, to June 1, 2022. Charts were identified by the biomedical informatics team at the University of Iowa's Institute for Clinical and Translational Science (based on *Current Procedural Terminology* [CPT] codes pertaining to scrotal trauma) and subsequently reviewed by research team members. Data extracted from each chart included the type of scrotal injury (blunt or penetrating, determined by review of clinical notes), duration of hospital stay, whether any surgical intervention regarding scrotal injury was performed in the operating room, and if an orchiectomy was required. Charts with missing data were excluded.

Descriptive statistics were provided for study variables, with median and interquartile range (IQR) reported for continuous variables and frequencies for categorical variables. Chi-square tests were used for 1 sample proportion and 2-sample tests with a continuity correction. Due to low expected counts, Fisher exact testing was used to assess differences in rates of orchiectomy. All

statistical analyses were performed in R, version 4.2.1 (R Core Team, 2022).

RESULTS

A total of 102 charts were reviewed. The average age of patients was 39.5 years (18.7-77.2 years). The majority (54.9%) were treated as inpatient, and average hospital length of stay (LOS) was 15.6 days (11.1 and 19.6 days for the blunt and penetrating trauma groups, respectively). More than half of the patients received conservative management (59.8%). Fifty-six patients (54.9%) had blunt trauma and 46 (45.1%) had a penetrating trauma (Table). There was insufficient evidence to suggest a difference in the percentage of blunt trauma versus penetrating trauma ($P = 0.3729$, 95% CI for patients with blunt trauma, 44.7%-64.7%).

Patients with penetrating trauma were more likely to be inpatient than those with blunt trauma (69.6% vs 42.9%; $P = 0.013$; 95% CI, 0.062-0.473). Surgical treatment was also more common for penetrating trauma than for blunt trauma (63.0% vs 21.4%, $P < 0.0001$; 95% CI, 0.220-0.612). There was not sufficient evidence to suggest a difference in rate of orchiectomy for penetrating trauma versus blunt trauma (15.2% vs 7.1%, $P = 0.2159$).

Among those patients who required surgical intervention, the rate of orchiectomy for those with penetrating trauma versus blunt trauma was not significantly different (24.1% vs 33.3%, $P = 0.7195$). There were no differences in orchiectomy complications (eg, wound healing issues, infections) between patients who had penetrating trauma and those who sustained blunt trauma.

DISCUSSION

Scrotal trauma has been reported to comprise 71% of male genital trauma.² While typically not life-threatening, scrotal trauma has the potential to impair future fertility as it is particularly prevalent in males who are 10 to 30 years old. The type of scrotal trauma—specifically whether it is blunt or penetrating in nature—can affect injury management and outcomes.

The management of scrotal trauma begins with obtaining detailed history to learn about the circumstances and timing of injury. This should be followed by physical examination to assess for other injuries, such as associated abdominal or pelvic injuries that require general or orthopedic surgery consultation and also may require immediate attention. Scrotal examination may reveal obvious findings of penetrating trauma, such as open laceration

tions with or without visualized exposed testicular tissue. In the absence of the such findings, however, imaging in the form of a scrotal ultrasound is helpful in assessing testicular integrity and blood flow and guiding decisions regarding the need for surgical intervention (see Figure).

Surgical intervention in the setting of scrotal trauma is indicated in cases of disruption of the tunica albuginea with extrusion of testicular tissue⁵⁻⁷ and when doppler study suggests testicular devascularization. While milder cases of tunica albuginea disruption may be repaired surgically with salvage of the testicle, more severe cases of such disruption and cases of testicular devascularization would require an orchiectomy.

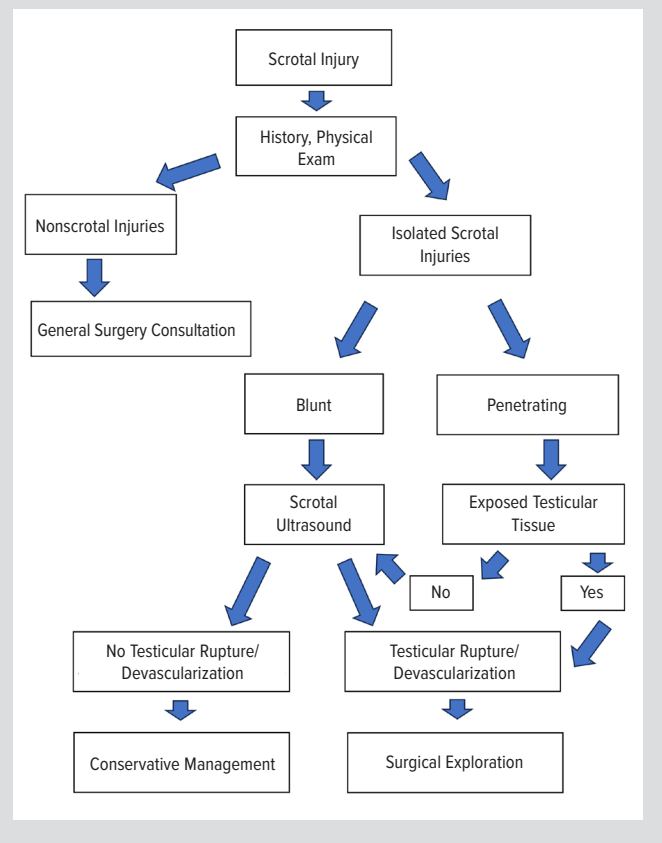
Antibiotic prophylaxis has been recommended for scrotal trauma due to animal bites.⁸ For other types of penetrating scrotal trauma, the decision about antibiotic prophylaxis depends on the circumstances of injury and assessment of the wound upon presentation. Early exploration and repair of a testicular injury has been associated with increased testicular salvage compared to delayed intervention. Orchiectomy was reported to be required in 9% of patients who underwent early scrotal exploration and repair versus 45% in cases of delayed exploration.⁹

Scrotal trauma can impair male fertility by different mechanisms involving the testicles, epididymis, and vas deferens or a combination of these organs.¹⁰⁻¹¹ Testicular injury can result in loss of seminiferous tubules at varying extent, even up to loss of an entire testicle. Additionally, scrotal trauma can violate the blood-testis barrier, which can lead to the development of anti-sperm antibodies and subsequent immunologic infertility. Scrotal injury also can disrupt the epididymis and/or the vas deferens, causing interference in sperm transport.

The effect of testicular trauma on hormonal parameters also has been studied. Theoretically, changes in serum levels of reproductive hormones in patients with scrotal trauma could suggest possible mechanisms by which scrotal trauma could impact future fertility. In a study of patients who sustained a gunshot wound to the external genitalia (scrotum and/or penis), rapid return of endocrine function was noted on short-term follow-up when testicular parenchyma was preserved.¹² However, Nolten et al reported that testicular trauma was associated with permanent hormonal changes. In this study, estradiol levels were found to be higher in infertile men who suffered testicular trauma compared to either infertile men without such trauma or to a control group of fertile men without testicular trauma. There were no differences in follicle-stimulating and luteinizing hormone levels between infertile men with and without testicular trauma or in prolactin and testosterone levels among infertile men with or without testicular trauma and the control group.¹³

In the current study, blunt scrotal trauma was slightly more common than penetrating injury (56 and 46 patients, respectively). As suggested by our findings, blunt scrotal trauma was associated with a higher rate of conservative management (44 and

Figure. Approach to Acute Scrotal Injury



17 patients in the blunt and penetrating trauma groups, respectively) and with a lower number of orchiectomies. Both findings may offer a better future fertility prognosis for blunt scrotal trauma, given the presumed testicular tissue-sparing nature of such injury, which also is less likely to cause transection or physical disruption of the epididymis and vas deferens. While these findings may offer some reassurance to patients with blunt scrotal trauma who are interested in future fertility, further study is needed to better understand the impact of scrotal trauma on postinjury fertility.

Interestingly, in a large study by Grigorian et al, a higher rate of penetrating scrotal injury (50.5% of cases) was reported, with gunshot injury (75.8%) being the most common cause.³ The latter might suggest varying injury patterns in different geographical areas, as our center typically serves more rural communities. Further, Grigorian et al reported that 48.3% of patients with scrotal or testicular trauma required scrotal or testicular operation³ but did not assess rates of surgical intervention separately for cases of blunt versus penetrating scrotal trauma, as performed in our study. Thus, our study offers a higher resolution assessment of scrotal trauma based on type of injury – specifically, if the injury was penetrating or blunt in nature.

The average hospital LOS in our study was 15.6 days (11.1 and 19.6 days in the blunt and penetrating trauma groups, respectively), which is longer than the median hospital stay of 3 days

reported by Grigorian et al.³ This discrepancy could be explained by the fact that most patients enrolled in the latter study (74.5%) sustained isolated scrotal injuries.

Limitations

This study has several limitations. It is based on cases from a single institution that has a large volume but serves mostly mid-size towns and rural communities, rather than large metropolitan areas. This may have an impact on the type and mechanisms of trauma sustained by patients. Additionally, this study categorized scrotal trauma as either blunt or penetrating injuries, without further subgrouping (eg, gunshot vs stab injuries). Subgroup analysis was not performed as the initial chart review suggested that some subgroups would include a very small number of patients that, in turn, could compromise statistical analysis. Finally, some patients sustained nonscrotal injuries that could impact the hospital LOS but were unlikely to affect the actual management of scrotal injuries.

CONCLUSIONS

This study provides focused insight on scrotal trauma based on information gathered over more than 2 decades at a level I trauma center whose location allows assessment of the type of scrotal trauma sustained in a more rural area of the United States. Blunt scrotal trauma was slightly more common than penetrating injury, but the difference did not reach statistical significance. Blunt scrotal trauma also was associated with a higher rate of conservative management. Further study is needed to better understand the impact of scrotal trauma on future fertility.

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