

CASE REPORT

Right Testicular Rupture Following a Firecracker Injury: A Case Report

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In the Philippines, data on testicular rupture due to a firecracker-related accident is sparse, and to the best of the authors' knowledge, there is only one published report in international literature on firework-related genitourinary injury. Most published data on testicular rupture are associated with blunt trauma, which are mostly sports-related. The objectives of this clinical case report were to describe a rare case of a firecracker-related injury to the groin, and to discuss the approach to its evaluation and management.

A 13-year-old male presenting with scrotal avulsion following a blast injury from a firecracker to his groin is described. After confirmation of right testicular rupture by ultrasonography, the patient underwent scrotal exploration and right testicular repair. The patient had an uneventful recovery and he was discharged on the second post-operative day. This case report highlights the importance of ultrasonography and early surgical exploration for a successful testicular salvage.

Key words: Firecracker-related genitourinary injury, testicular rupture, testicular repair

Introduction

Among the leading causes of mortalities worldwide, trauma ranks 6th, accounting for 10% of deaths.¹ In a systematic review by Mcgeady et al on the current epidemiology of genitourinary (GU) trauma, it was reported that the genitourinary system is a significant factor in trauma-induced mortality and morbidity, accounting for 10% of patients. Genitourinary trauma is more common in male patients because of their increased participation in high-risk activities, contact sports, and violent interactions.² The male preponderance of GU injury is also attributed to the extracorporeal location of their external genitalia. It can affect patients of any age, with a peak incidence of 10 to 30 years old. Injury may affect any part

of the genitourinary system, and incidence vary by institution. In the same systematic review by Mcgeady, et al. it was found that among GU trauma patients, specific occurrences were as follows: renal injury, seen in 1.2-3.3%; ureteral trauma in 2.5%; bladder injury in 1.6-3.6%; urethral injury accounted for 4%; and the external genitalia (penile, scrotal and testicular injury) in 27.8 to 68.1%.

Despite the extracorporeal nature of the male external genitalia, testicular injury is an uncommon occurrence as it is covered by a mobile scrotum. Prevalence in the Philippines is not known, while worldwide occurrence of testicular injury was estimated to be less than 1%.³ Blunt trauma accounts for up to 85% of scrotal and testicular injuries – this is mostly sustained during athletic activities, vehicular accidents, straddle injuries and assaults.⁴

Severe injury to the testicles is uncommon for the following reasons, as summarized by Harkanwal, et al. in their 2019 systematic review: 1. the inherent mobility of the testes within the scrotum; 2. the elasticity of the scrotal skin, allowing for internal structures to slip away from the point of contact of blunt trauma; 3. the cremasteric reflex as a protective mechanism; 4. the tunica albuginea providing tensile strength and fibrous physical defense.⁵ Reports in literature have pointed out that the right testis is more inclined to be trapped against the inner thigh or pubis than the left testis, hypothesized to be due to its bigger volume and cranial position.⁶ Although blunt sports-related injuries account for the majority of testicular rupture, blast injury due to firework has also been reported in literature. In this paper, the authors present an uncommon case of left testicular fracture following a firecracker injury.

The Case

A 13-year-old male was admitted to the Department of Urology following a blast injury from a firecracker to his groin. He complained of right sided testicular pain. Clinical examination of his genitalia revealed an avulsed wound on the right hemi-scrotum measuring 2cm x 2cm (Figure 1). There was tenderness and non-expanding hematoma, with irregular testicular border inferiorly noticed on the right testis. Scrotal ultrasonography was done, which revealed a loss of the normal configuration of the right testis—the outline was enlarged, having a heterogenous parenchymal echo-pattern (Figure 2 A1, A2) with intact doppler flow (Figure 2 B1, B2). The left testis, on the other hand, retained its normal configuration. The ultrasound findings suggested a right testicular rupture.

A decision for scrotal exploration was made. The procedure was performed 6 hours post-injury. A midline scrotal incision was done, and the right testicular hematocele was evacuated. The lower pole of the right testis was noted to be fractured in a bi-valve pattern (Figure 3A), which appeared to be viable, hence, the decision to spare the testis and to reconstruct (Figure 3B). Debridement of necrotic tissue was done, which was followed by closure of



Figure 1. 2cm x 2cm avulsion on the right hemiscrotum

the tunica albuginea using a 4-0 Vicryl suture. A Penrose drain was then left and anchored through the incision site.

The patient had an uneventful postoperative course, and was discharged on the second postoperative day. On follow up after 6 weeks, there were no signs of surgical complications, and repeat ultrasound was unremarkable.

Discussion

Clinical findings of scrotal trauma may range from local hematoma to testicular dislocation and rupture.⁷ Hematocele, torsion, dislocation and spermatic cord injuries are the other possible sequelae. Diagnostic evaluation and management are anchored on its broad categorization, on whether the injury is secondary to a blunt trauma, or a penetrating trauma. Majority of cases are due to blunt injury, which comprises 80% of cases. The American Association for the Surgery of Trauma (AAST) is the most widely accepted system in classifying traumatic injuries. It provides an injury scoring scale for the testis and scrotum from grades I to V based on severity (Table 1). This scoring system aims to aid a surgeon in his management consideration.

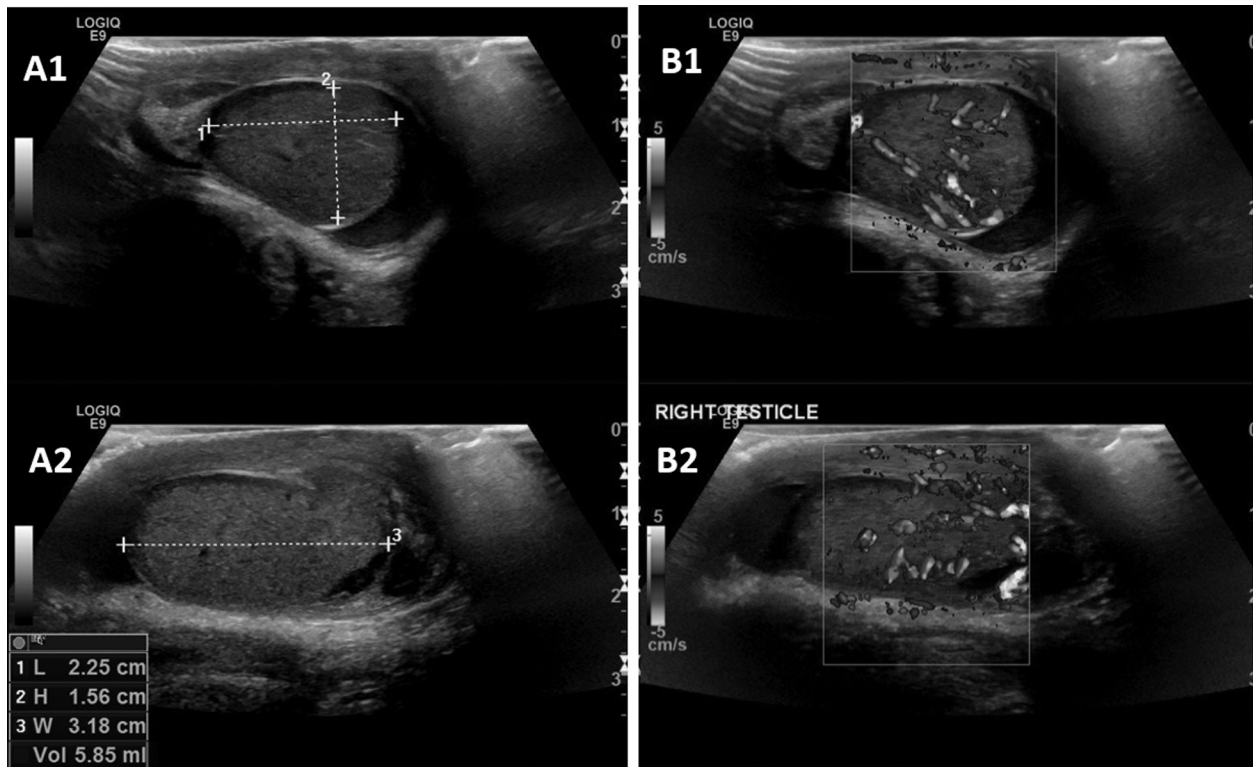


Figure 2. Scrotal ultrasound: Right testicular ultrasound (A1 & A2), Color doppler ultrasound (B1 & B2).



Figure 3. Fracture of tunica albuginea with extrusion of testicular contents (A). Tunica albuginea repair (B).

In addition to penetrating and blunt injuries, other mechanisms of scrotal injury include degloving, wherein skin loss occurs, typically involving the dartos fascia, due to avulsion from

rapid deceleration mechanisms, and thermal, typically secondary to industrial flames or chemical insult. Blast injury, particularly firework-related injuries to the groin causing testicular fracture has

Table 1. Scrotal and Testicular Injury Scale.⁸

Scrotum Injury Scale			
Grade	Description of injury	ICD-9	AIS-90
I	Contusion	922.4	1
II	Laceration <25% of scrotal diameter	878.2	1
III	Laceration ≥25% of scrotal diameter	878.3	2
IV	Avulsion <50%	878.3	2
V	Avulsion ≥50%	878.3	2

From Moore et al [1]; with permission

Testis Injury Scale			
Grade*	Description of injury	ICD-9	AIS-90
I	Contusion/hematoma	911.0/922.4	1
II	Subclinical laceration of tunica albuginea	922.4	1
III	Laceration of tunica albuginea with <50% parenchymal loss	878.2	2
IV	Major laceration of tunica albuginea with ≥50% parenchymal loss	878.3	2
V	Total testicular destruction or avulsion	878.3	2

*Advance one grade for bilateral lesions up to grade V
 From Moore et al [1]; with permission

also been published in literature. In a retrospective case series of 15 firework-related genitourinary injuries, it was observed that polytrauma with the scrotum and penis were the most common urologic sites, which also had high operative rates.⁹ In any case, regardless of the mechanism of injury, a comprehensive trauma evaluation, a detailed history of present illness and a complete physical examination are warranted, to explore both intrascrotal and extrascrotal pathology, including peritesticular and testicular masses.

Testicular rupture is a tear in the tunica albuginea with accompanying extrusion of scrotal contents.² The tunica albuginea is a dense fibrous layer that lies deep to the tunica vaginalis. Each testis is externally bound by the tunica albuginea, which maintains its shape and integrity. A 50-lb force is needed to rupture the protective outer tunica albuginea after direct force.¹⁰ Patients often have systemic signs of discomfort, including nausea and vomiting. There was one case report of a patient with a history of testicular trauma who developed Systemic Inflammatory Reaction Syndrome (SIRS), which was attributed to a cytokine storm following a direct trauma to the scrotum.¹¹

On inspection, there may not be a cremasteric reflex. Eliciting a reliable physical examination may be challenging in the acute setting due to significant soft tissue swelling and pain. Ultrasound evaluation of the scrotum and testicles has therefore become a standard evaluation procedure for traumatic injury of the male groin. Scrotal ultrasound can reliably assess scrotal injuries and diagnose testicular rupture with a high level of accuracy.¹² High frequency ultrasound with doppler flow is the imaging modality of choice for genital trauma in assessing the integrity of the affected tissue, along with the vascular perfusion of the testis, which is an important determinant in surgical management. Follow up management with re-imaging is also especially useful in hematomas that are conservatively managed but monitored for infection and necrosis.

On doppler assessment, a ruptured testis may continue to have adequate blood flow. Consistent findings of rupture include: focal areas of altered echogenicity, discrete fracture plane, loss of testis contour, and heterogeneous parenchyma.¹³ These findings were present in the patient. The sensitivity of ultrasound evaluation is estimated to be 100%, and the specificity is about 65% in

detecting testicular rupture.¹⁴ Operative exploration is generally indicated if imaging is equivocal or torsion or rupture is determined. Careful inspection of the scrotal contents is of paramount importance, irrespective of the imaging findings.⁴ For a successful testicular salvage, surgical exploration should be done within 24 to 72 hours of the initial trauma.⁶ Evacuation of the hematoma, tissue debridement, and closure of any defects should be performed if necessary. It has been suggested in literature that testicular salvage rate would decrease from 80-90% to 45-55% if surgery is delayed.¹⁵ The reported benefits of early surgical intervention include: 1. higher testicular salvage rate; 2. preservation of testicular function storage; 3. more rapid symptom control; 4. shorter hospital stay; and 5. An earlier resumption to sports.¹⁶ Typically performed are open scrotal and testicular exploration, debridement of non-viable tissue, and evacuation of hematoma, and primary repair of the disrupted tunica albuginea. Orchiectomy, on the other hand, is reserved for cases in which the testicle is clearly non-viable – this should only be considered if repair is not possible.

A transverse or vertical incision is usually made to fully expose the involved scrotal contents.¹⁷ Inspection of the ruptured tunica albuginea is done when the hematocele is drained and the testis is pulled out after opening the tunica vaginalis. The ruptured tunica albuginea is observed directly using a scrotoscope in a mini-invasive incision after washing the blood clots with normal saline solution.¹⁸

The long-term consequence of testicular trauma, particularly on reproductive function is not known. In a review of 15 patients who underwent immediate exploration after testicular trauma, evidence of subfertility based on an abnormal semen analyses and atrophic testes were noted on prospective follow up.¹⁹ Among those reported, only one patient had severely compromised fertility, leading to the authors' conclusion that early repair can help preserve hormonal function as well as fertility.

Conclusion

The surgeon should maintain a high index of suspicion and a low threshold for operative

exploration for a successful testicular salvage. Firecracker-related testicular rupture is ultimately a clinical diagnosis. Along with a good history, the constellation of symptoms, the physical examination findings, and the characteristic ultrasonographic picture should mandate an operative exploration. Testicular rupture, when promptly corrected, has a good prognosis, with subfertility as a possible long-term sequela. A delay in surgery portends a decrease in testicular salvage rate.

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