Original Research

ISOLATED SCROTAL TRAUMA DUE TO BICYCLE ACCIDENTS IN PEDIATRIC POPULATION IN A REMOTE HILLY REGION OF J&K: A RETROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Introduction: Bicycle-related trauma is a common cause of injury in pediatric population and involves varied presentation from simple bruise to life threatening visceral injuries. Although isolated scrotal injuries occurring after bicycle accidents is common but mostly under-reported due to various factors. Our study focuses on isolated scrotal injuries in a remote hilly region of J&K. The population is mostly catered to by our institution, GMC, Doda.

Aims & Objectives: To assess the pattern, management, and outcomes of isolated scrotal trauma in pediatric population caused by bicycle accidents in a remote hilly region of J&K, India.

Material & Methods: This study was performed over a period of 5 years from April 2020 to March 2025. Medical records were reviewed to extract demographic data, mechanism of injury, clinical findings, imaging, results, management and outcomes.

Results:-Out of 94 bicycle-related related trauma cases, 18 (19.15%) involved isolated scrotal injury. The mean age was 13.8 years (Range = 8-18). Most injuries were due to straddling impacts (11/18, 61.11%) followed by handlebar collisions (38.89%) while navigating hilly uneven terrain. Scrotal hematomas(12/18, 66.67%) were most common injury followed by testicular contusion (4/18, 22.22%) and testicular rupture (2/18,11.11%). Dopler Ultrasonography was used in all cases. Four patients required surgical exploration including two unilateral orchidectomies. Conservative management was done in 77.78% of patients. Mean follow-up was done for 6 months and showed complete recovery in 72.23% (13/18) of patientswith no complications. One patient of orchidectomy developed wound site infection and required re-admission and secondary suturing after debridement. Four patients of scrotal hematoma were lost to follow-up after 2 months.

Conclusion:-Isolated scrotal injury due to bicycle accidents is not rare and primarily affects young males especially teenagers. Prompt imaging and appropriate intervention are key to testicular preservation. Public health measures including safety education, adult supervision and use of protective gear are needed.

Keywords: Scrotal injury, Bicycle trauma, Testicular Rupture, Isolated scrotal injury.

INTRODUCTION

Cycling is gaining policy attention worldwide at city, national and supranational levels. The European Commission adopted the European Declaration on Cycling in 2024, thus recognizing cycling as a standalone mode of travel in the European Union (1).Cycling contributes to improving the health of its inhabitants by reducing the risk of mortality in populations (Zhao et al., 2021) and helping individuals attain physical activity in their daily lives (WHO, 2020). The National Institution for Transforming India (NITI), a think-tank of Indian government, actively works towards 'transforming India's mobility' as one of the key elements of the government's vision and acknowledges the need to promote bicycles to achieve this goal. Besides transportation, cycling is often a means of recreation and sports for pediatric population. In our part of world, with limited recreational facilities cycling by children is a favorite mode of fun and enjoyment. Given the hilly terrain and poor road conditions, cycling poses a significant risk factor for pediatric trauma cases.

Although uncommon, scrotal injuries bearsignificant clinical importance, accounting for less than 1%of all traumacases (4,5). However, conditions like testicularrupture may jeopardize future fertility and require prompt andappropriate intervention (5–7).The most common causes of penoscrotal trauma in children include

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bluntmechanisms such as falls, sports-related injuries,and bicycle accidents, although penetrating injuries alsoconstitute a significant portion (7–9). Intratesticular hematomas from blunt trauma can progress to testicular rupture, often requiring surgical intervention (10,11).Physical examination is vital in diagnosing scrotal trauma butcan be hindered by acute-phase pain, swelling and edema (4).Ultrasonography, however, remains an invaluable diagnostictool, identifying key indicators of testicular rupture such asheterogeneous echotexture and disrupted testicular contours (7,12,13). Doppler ultrasound additionally provides crucialinformation on testicular perfusion (14,15).

Our study presents afive-year retrospective analysis of isolated scrotal injuries in a remote hilly region of J&K. The population is mostly catered to by our institution, Government Medical College, Doda.

MATERIAL AND METHODS

Study Design: Retrospective Observational Study
Study Duration: April 2020 to March 2025
Study Location: Associated Hospital, Government Medical College, Doda, J&K, India.

Inclusion Criteria:

- Male patients aged 5-18 years
- Isolated Scrotal Injury following bicycle accident
- No associated pelvic, abdominal, or systemic trauma

Exclusion Criteria:

- Polytrauma cases
- Penetrating or assault injuries
- Chronic Scrotal Conditions

This study was performed over a period of 5 years from April 2020 to March 2025. Medical records were reviewed to extract demographic data, mechanism of injury, clinical findings, imaging, results, management and outcomes.Patient anonymity was maintained. Out of 94 bicycle-related related trauma cases, 18 (19.15%) involved isolated scrotal injury. The mean age was 13.8 years (Range = 8-18). Most injuries were due to straddling impacts (11/18, 61.11%) followed by handlebar collisions (38.89%) while navigating hilly uneven terrain. Scrotal hematomas (12/18, 66.67%) were most common injury followed by testicular contusion (4/18, 22.22%) and testicular rupture (2/18,11.11%). Dopler Ultrasonography was used in all cases. Four patients required surgical exploration including two unilateral orchidectomies. Conservative management was done in 77.78% of patients. Mean follow-up was done for 6 months and showed complete recovery in 72.23% (13/18) of patients with no complications. One patient of orchidectomy developed wound site infection and required re-admission and secondary suturing after debridement. Four patients with scrotal hematoma were lost to follow-up.

Table 1: Demographic Profile

Variable	Value
Total bicycle-related trauma cases	94
Cases with isolated scrotal injury	18 (19.15%)
Mean age (years)	13.8
Age range (years)	8–18

Table 2: Mechanism of Injury

Mechanism	Number (Percentage)
Straddling impact	11 (61.11%)
Handlebar collision	7 (38.89%)

Table 3: Type of Injury

Injury Type	Number (Percentage)
Scrotal hematoma	12 (66.67%)
Testicular contusion	4 (22.22%)
Testicular rupture	2 (11.11%)

Table 4: Management Details

Parameter	Number (Percentage)

Doppler USG performed	18 (100%)
Surgical exploration	4 (22.22%)
Including unilateral orchidectomy	2
Conservative management	14 (77.78%)

Table 5: Follow-up & Outcomes

Outcome	Number (Percentage)
Mean follow-up duration	6 months
Complete recovery	13 (72.23%)
Wound infection (post-orchidectomy)	1
Lost to follow-up	4

DISCUSSION

Bicycle related injuries have been reported for a long time in literature with studies showing 2% of genito-urinary injuries (16). It is further reported that about 10% of these injuries involve scrotum (16). Our study shows that scrotal injury was seen in 19.15% that is higher than what is reported in literature. Since we studied only pediatric population and most of the reports are from western population while ours is from rural Indian population. Although, the scrotum and testes are at a higher risk for trauma due to their extracorporeal location but they are still well protected by certain mechanisms which include: 1) inherent mobility of testes within the scrotum; 2) reasonable elasticity of the scrotal skin allowing for internal structures to slip away from the point of contact in blunt trauma; 3) protective cremasteric reflex mechanism; and 4) tough fibrous physical defense of Tunica Albuginea with its tensile strength (4).Straddling-type injuries accounted for 61.11% in our study that signifies risk associated with sudden deceleration or loss of balance while negotiating uneven hilly terrain. Our pattern that differs from reports in developed nations where collisions with stationary objects or vehicular impact are more common (16). The geographical and infrastructural factors in our region likely amplify the risk of direct perineal impact when children traverse steep slopes or poorly maintained roads. This emphasizes the need for contextual understanding of injury mechanism in resource-limited or mountainous settings.

Most patients in our study sustained scrotal hematomas (66.67%), which is consistent with established literature reporting hematoma as the most common sequela of blunt scrotal trauma (10,11). Early ultrasonography played a key role in differentiating between conservatively manageable hematomas and more severe injuries such as testicular rupture. Consistent with the evidence from Guichard et al. and Buckley et al., Doppler ultrasonography remained accurate in identifying testicular integrity, perfusion, and tunica albuginea disruption (12,13). Pain and edema often limit the accuracy of physical examination, making ultrasonography indispensable in the acute phase (4,7,14).

Surgical exploration was required in 22.22% of cases, like the intervention rates reported in earlier series of blunt scrotal trauma (7–9). Both cases of testicular rupture in our cohort underwent exploration, with two requiring unilateral orchidectomy. Although testis-preserving procedures are recommended whenever feasible, severely fragmented parenchyma and nonviable tissue necessitated orchidectomy, as also described by Liguori et al. and Li et al. in severe trauma cases (6,7). The single postoperative wound infection aligns with expected complications reported in similar settings (5,8).

It is noteworthy that conservative management was effective in 77.78% of our patients. Similar outcomes have been observed in pediatric and adolescent populations where early imaging and structured follow-up facilitate successful non-operative management of uncomplicated hematomas and contusions (10,11). The complete recovery in 72.23% of patients at 6-month follow-up supports the safety and efficacy of such an approach. However, four hematoma patients were lost to follow-up, reflecting an important challenge in rural populations, possibly due to poor accessibility, financial constraints, or low perceived severity once symptoms subside. This is not uncommon in low-resource settings and warrants further community-level strategies for post-treatment adherence.

The higher incidence of isolated scrotal injuries in our population compared to earlier studies (16) may also be attributed to sociocultural and logistical factors unique to this region. Many children use bicycles for daily transport, often without adult supervision or protective gear. Additionally, the absence of designated cycling paths and uneven road conditions further increased

risk. Public education and community-level injury prevention programs focusing on protective equipment, supervised riding, and safer play environments may significantly reduce the burden of such injuries.

CONCLUSION

Isolated scrotal trauma due to bicycle accidents represents a significant pediatric population of rural and hilly regions such as Doda, J&K. Our study demonstrates that blunt scrotal injuries—particularly hematomas and contusions-are common and generally have excellent outcomes when promptly evaluated with Doppler ultrasonography and managed appropriately. Surgical exploration is required in a minority of cases, primarily when testicular rupture or compromised testicular viability is suspected.

Image 1: Laceration of Scrotal Skin With Bruise

Image 2: Scrotal Hematoma

Image 3: Severe Scrotal Trauma with Evisceration Of Both Testes.

Image 4a & 4b: Pre-Op And Post-Op Pics Of Scrotal Trauma With Testicular Evisceration On Right Side.

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