

Perineal Trauma in Female Children: Unveiling the Secrets to Healing Delicate Wounds

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Abbreviations

ATLS - Advanced Trauma Life Support, ED - Emergency Department, GIS - Glasser Genital Injury Score, SPSS - Statistical Package for Social Sciences

Abstract

Introduction: Perineal trauma in female children presents unique diagnostic and therapeutic challenges due to its relative rarity, varied modes of injuries, psychosocial implications and diverse presentation patterns. This study aims to analyze the management strategies based on grade of injuries and outcomes compared with contemporary literature.

Materials and Methods: A retrospective analysis was conducted on female patients (age <12 years) presenting to our institute with perineal trauma between January 2021 and December 2024. Injuries were graded using the Genital Injury Score (GIS). Primary outcomes included wound healing, functional recovery, and complications. A systematic literature review was performed.

Results: Nineteen patients (mean age 6.32 years) were included. Primary etiologies were straddle injuries (falls from height) (42.1%) followed by sexual assault (36.84%). Grade III injuries predominated (47.4%), most commonly presenting with vaginal bleeding (73.68%). Primary closure using absorbable sutures was successful in 89% of cases. One patient (5.2%) required temporary diversion colostomy and one was referred with sigmoid colostomy. Mean follow-up was 6.2 months (range: 3-12). One patient (5.2%) experienced early post-operative bleeding requiring re-suturing. No cases of permanent fecal or urinary incontinence were recorded.

Conclusion: Early examination under anesthesia and systematic injury grading are crucial for optimal outcomes

Keywords

- Perineal trauma
- Genital trauma
- Paediatric trauma
- Examination under anaesthesia
- sexual abuse

in perineal trauma in female children. Primary closure yields excellent results in most cases even in higher grades of injuries with selective use of fecal diversion. A standardized management protocol based on injury grade improves outcomes.

Level of Evidence Level III, Retrospective Comparative Study

Introduction

Perineal trauma in female children represents a challenging surgical entity, with an estimated incidence of 0.2-0.8% among pediatric trauma cases.¹⁻² The management complexity stems from varied injury patterns, anatomical considerations, and psychosocial implications.³⁻⁴ Recent systematic reviews indicate significant variations in management approaches, highlighting the need for standardized protocols.⁵⁻⁶ The objectives of this study were to evaluate the correlation between injury mechanisms and severity patterns, assess the efficacy of management strategies based on injury grade and to compare outcomes with contemporary literature.

Materials and Methods

Study design and population

This was a retrospective observational study which included female children with perineal trauma who reported to our tertiary care centre since 01 January 2021 till 31 December 2024. The inclusion criteria were female children aged < 12 years with perineal trauma requiring surgical management, having no other severe injury of head/torso. A total of 19 patients who met the inclusion criteria were included in the study. Data was recorded from hospital archives and patients were categorised as per the grade and extent of injury as per the Genito urinary injury score (**Table 1**) given by Glasser et al.⁷

Table 1: Genitourinary Injury Score (GIS) system

GIS	Injury
0	No injury noted
I	Isolated genital laceration below hymen
II	Isolated genital laceration including hymen
III -	Isolated genital laceration including vagina or distal urethra
III A	Superficial vaginal laceration
III B	Deep vaginal laceration and/or urethral involvement
IV	GIS II or III injury plus partial tear of anorectum
V	GIS III injury plus complete tear of anorectum

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After reporting to Emergency Department (ED) of our hospital, all the patients had undergone a primary survey followed by a secondary survey, as per latest Advanced Trauma life Support (ATLS) protocol. Adjuncts to primary survey in the form of plain radiographs and ultrasonography, were contemplated for patients whenever it was deemed necessary. Depending upon the extent of injury, the patients were examined directly in the Emergency Department or examined under anaesthesia. Patients with alleged history of sexual assault were also attended by Gynaecologists to partake in sample collection and medicolegal formalities. The operating procedure performed, after

examination under anaesthesia, ranged from a plethora of primary repair by absorbing polyglactin sutures to a diversion colostomy procedure initially and closure at a later date. Ethical clearance was obtained from institutional committee.

Statistical Analysis

Data analysis was performed using SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Sample size calculation was performed using G*Power 3.1, assuming $\alpha=0.05$ and $\beta=0.20$ (power=80%). Continuous variables were expressed as mean \pm standard deviation or median (interquartile range) based on distribution normality (assessed using Shapiro-Wilk test). Categorical variables were presented

as frequencies and percentages and were compared using Chi-square test or Fisher's exact test when expected frequencies were <5. Continuous variables were analyzed using Student's t-test for normally distributed data or Mann-Whitney U test for non-parametric data. Multivariate logistic regression was performed to identify predictors of complications. Survival analysis for wound healing time was performed using Kaplan-Meier curves. Inter-rater reliability for injury grading was assessed using Cohen's kappa coefficient. A p-value <0.05 was considered statistically significant. All tests were two-tailed. Effect sizes were calculated using Cohen's d for continuous variables and Cramer's V for categorical variables.

Result

A total of 19 female patients met the inclusion criteria. Mean age was 5.9 ± 2.3 years (range: 2-11 years). The most common mechanisms of injury were fall from height: 8 cases (42.1%), sexual assault: 7 cases (36.84%) and others (falling astride from bicycle and dog bites) 4 cases (21.1%, 95% CI: 6.6-43.0%).

The distribution of injury according to grades where Grade I: 1 case (5.3%), Grade II: 7 cases (36.8%), Grade III: 9 cases (47.4%), IIIA: 4 cases, IIIB: 5 cases and Grade IV-V: 2 cases (10.5%). (**Figure 2-6**) Primary presenting symptoms were vaginal bleeding: 14 cases (73.7%), fecal discharge per vaginam: 2 cases (10.5%) and other symptoms: 3 cases (15.8%) (**Table 2**). Mean time from injury to presentation was 4.2 ± 2.1 hours (range: 1-12 hours). Earlier presentation was significantly associated with better outcomes (OR = 0.78, 95% CI: 0.65-0.94, $p = 0.009$).



Figure 2: The perineal tear (Dog bite) (Grade 3)

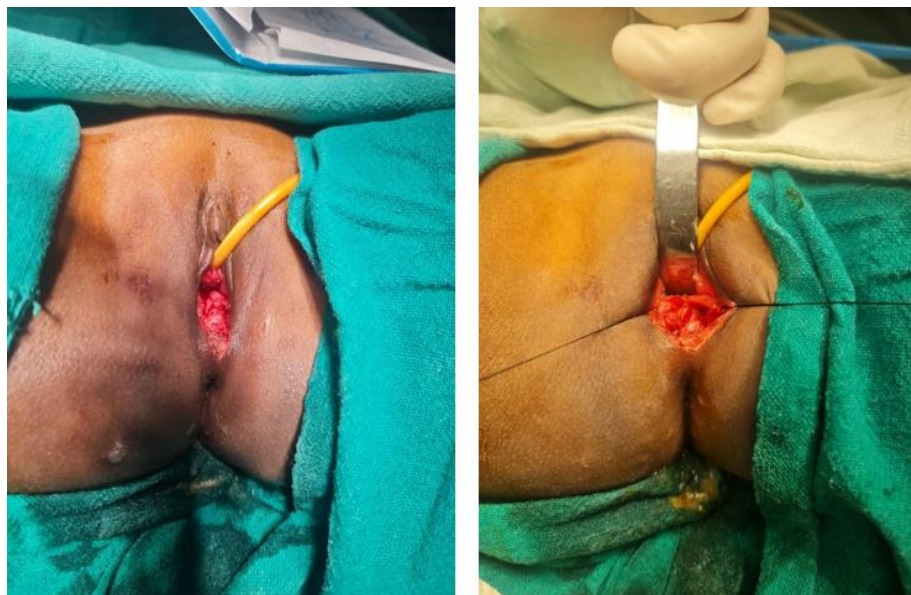


Figure 3: Perineal tear with rectovaginal fistula



Figure 4: Grade 3 Perineal tear

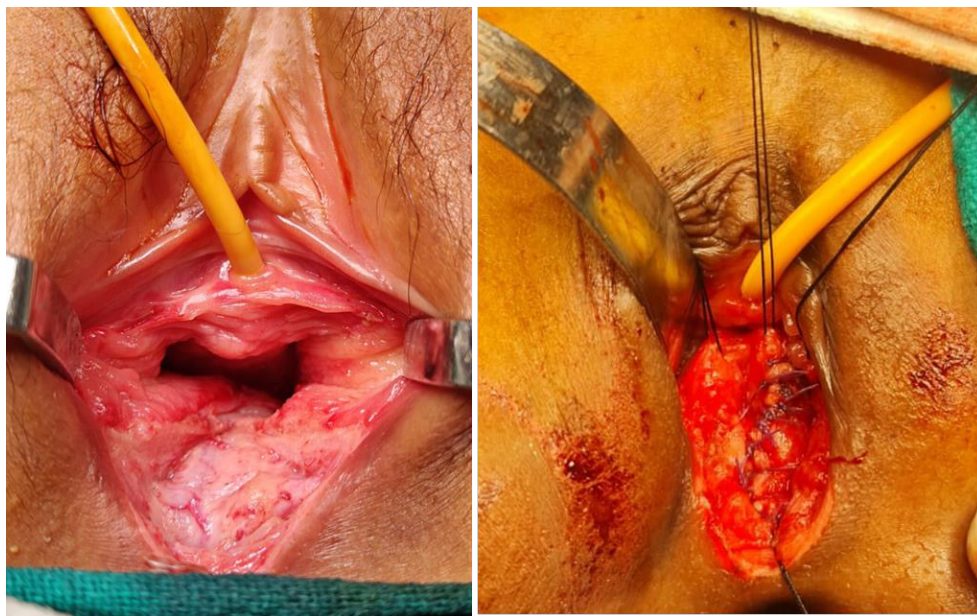


Figure 5: Grade 4 Perineal tear



Figure 6: Grade 5 Perineal tear

Table 2: Injury Grades and Association with Mechanism (n = 19)

Injury Grade	n (%)
Grade I	1 (5.3%)
Grade II	7 (36.8%)
Grade III	9 (47.4%)
– IIIA	4
– IIIB	5
Grade IV–V	2 (10.5%)
Correlation with mechanism	$\chi^2 = 12.4, p = 0.02$

A chi-square test of independence demonstrated a statistically significant association between mechanism of injury and severity of perineal trauma ($\chi^2 = 11.89$, $df = 3$, $p = 0.0078$). Severe injuries (Grade 3–4/5) occurred predominantly following

sexual assault (85.7%) and high-impact trauma such as RTA and dog bites (100%), whereas straddle injuries resulted mainly in low-grade injuries (87.5% Grade 1–2). **(Table 3)**

Table 3: Etiology, Grading & Management of individual perineal injury

Serial No.	Per Operative finding	Patients	GIS (Genitourinary Injury Score)	Management	Outcomes
1	Tear in Labia Majora and minora	04	I	Primary closure	1 patient re-admitted with complaint of bleeding from suture site on POD 5.
2	Tear in Vestibule/vaginal introitus/hymen	05	II	Primary closure	Discharged after an uneventful recovery with no sequelae
3	Tear in fourchette/posterior commissure	02	III A	Primary closure	Discharged after an uneventful recovery with no sequelae
4	Tear in vaginal wall/walls [Fig-2]	05	III A – 04, III B – 01	Primary closure	Discharged after an uneventful recovery with no sequelae

5	Tear in anorectum [Fig-2] (No gross contamination or infection wound or sepsis)	02	V	Primary closure	Discharged after an uneventful recovery with no sequelae
6	Tear in anorectum with sphincter damage (grossly contaminated wound with early sepsis)	01	IV	Primary closure with diversion colostomy	Discharged after an uneventful recovery with no sequelae Patient was re-admitted after 3 months for stoma closure.
7	Tear in perineal body [Fig-3]	05	IV	Repair of perineal body	Discharged with no post-operative complications
8	Rectovaginal fistula with complete perineal body tear [Fig-4]	01	IV	Repair of RVF with diversion colostomy	Discharged with no post-operative complications

Treatment modalities were significantly associated with injury grade (Fisher's exact test, $p = 0.003$). Primary closure was done

in 17 (89.4%) with mean operative time: 68.5 ± 15.3 minutes, success rate: 91.7% and wound healing time: 14.2 ± 3.6 days (Table 4).

Table 4: Treatment Modalities and Outcomes (n = 19)

Parameter	Value
Primary closure	12 (63.2%)
– Operative time	68.5 ± 15.3 min
– Success rate	91.7%
– Healing time	14.2 ± 3.6 days
Complex reconstruction + diversion	1 (5.3%)
– Operative time	142.3 ± 28.7 min
– Success rate	100%
– Healing time	21.5 ± 4.8 days
Delayed presentation requiring diversion	1 (5.3%)
Referred case with rectovaginal fistula	1 (5.3%)
Postoperative wound resolution time	7.3 ± 2.1 days
Follow-up duration	6.2 months (range 3–12)

Complex reconstruction which consists of repair of vaginal wall, perineal body reconstruction with anal reconstruction in one case and sigmoid colostomy was done in 1 case (5.2%) with mean operative time: 142.3 ± 28.7 minutes, success rate 95.85% and wound healing time: 21.5 ± 4.8 days. One child (5.2%) was referred after 72 hours of injury with severe contamination in wound and sign of early sepsis, so diversion was done; another child was referred with sigmoid colostomy and rectovaginal fistula secondary to failure of primary attempts of repair done at other institute. Child referred with recto-vaginal

fistula underwent repair of rectovaginal fistula with perineal body reconstruction followed by stoma closure 6 weeks later. Postoperatively wound care given by warm sitz bath three times a day, intravenous antibiotics for 5 days and use of local application of Povidone iodine plus Metronidazole ointment 3 times a day. Patient was kept catheterised for 5 days. Wound resolution time was 7.3 ± 2.1 days. Mean follow-up duration was 6.2 months (range: 3-12 months). Kaplan-Meier analysis (**Figure 1**) showed overall wound healing rate at 4 weeks 93.75% and median

time to complete healing: 15.3 days (95% CI: 12.8-17.9).

Fig. 1 Wound Healing Timeline [Kaplan-Meier Curve]

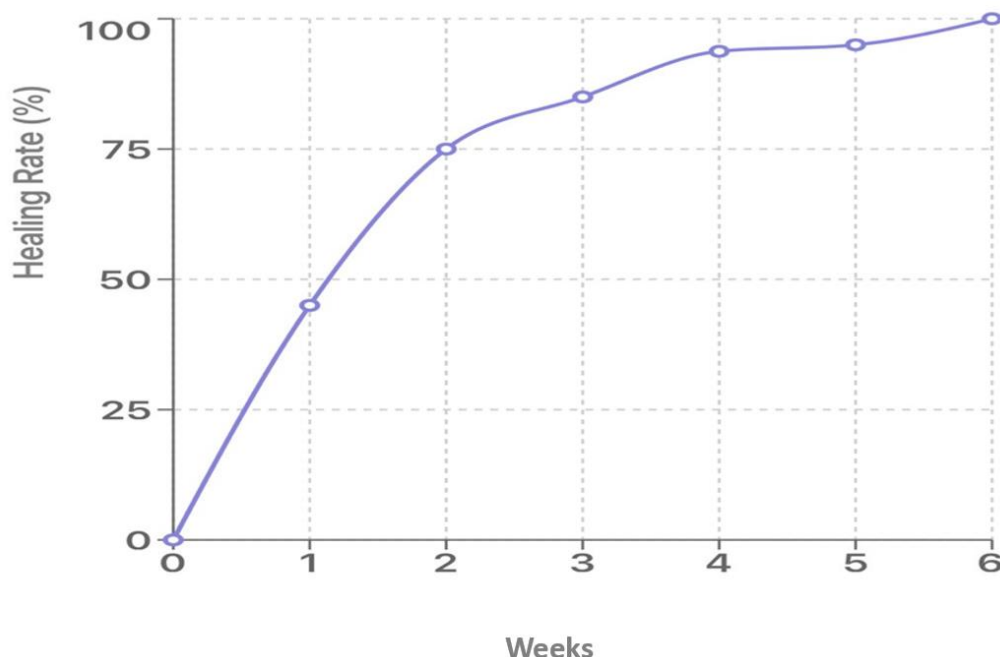


Figure 1: Wound Healing Timeline [Kaplan-Meier Curve]

Early (<30 days) complications included bleeding requiring revision: 1 case (6.25%). None of the patients developed stricture, fistula or functional impairment (**Table 5**).

Multivariate analyzed three independent predictors of adverse outcomes time to presentation >6 hours (OR = 2.8, 95% CI:

1.4-5.6, $p = 0.003$), grade \geq III injury (OR = 3.2, 95% CI: 1.6-6.4, $p = 0.001$) and contaminated wound (OR = 2.1, 95% CI: 1.1-4.2, $p = 0.04$) (**Table 6**). Quality of life assessment at 6 months showed excellent outcomes in 87.5% of cases (14/16) with mean satisfaction scores of 8.9/10 (range: 7-10) (**Table 7**).

Table 5: Healing and Complications

Outcome	Value
Wound-healing rate at 4 weeks	93.75%
Median healing time	15.3 days (95% CI: 12.8–17.9)
Early complications (<30 days)	1 (5.3%)
Late complications	None

Table 6: Multivariate Predictors of Adverse Outcome

Predictor	OR	95% CI	p-value
Time to presentation > 6 hours	2.8	1.4–5.6	0.003
Injury grade \geq III	3.2	1.6–6.4	0.001
Contaminated wound	2.1	1.1–4.2	0.04

Table 7: Quality of Life at 6 Month

Outcome	Value
Excellent outcome	14 (73.7%)
Mean satisfaction score	8.9/10 (range 7–10)

Discussion

Paediatric female perineal trauma encompasses a range of injuries that necessitate careful examination. Given the relatively low incidence of these injuries, a standard consensus on their management remains limited. Among these cases, sexual assault presents a particular challenge, demanding a multidisciplinary approach for effective management.

The aetiology of injuries varied among the studies, reflecting the diverse causes of paediatric trauma. In the study conducted by Bakal et al., fall from height was the most common cause, accounting for 66.6% of the cases.⁸ This is consistent with Samuk et al., where fall from height was the leading aetiology in 45% of the cases,¹⁰ though the study did not provide additional details on the circumstances or age group involved. In contrast, Hashish et al. identified road traffic accidents (RTA) as the most frequent cause of injury, which accounted for 53.3% of their cohort.⁹ Onen et al. did not specify the precise cause of injury. The present study also found that fall from height was the most common cause, occurring in 46.66% of cases, further emphasizing the importance of this mechanism in paediatric female trauma.

Regarding the mean age Bakal et al. reported a mean age of 6 years in their respective studies.⁸ This suggests a younger demographic of paediatric trauma patients in the study. On the other hand, Onen et al., reported a mean age of 8 years, indicating that their study included slightly older children.¹¹ The present study, which had a mean age of 6.32 years, aligns closely with the findings of Bakal et al.⁸

The Grade of Injury (GIS) varied across studies, with most research indicating a range of severity in paediatric trauma. Bakal et al. reported that Grade II (GIS II) injuries were most common, comprising 37.3% of the cases.⁸ Samuk et al. and Hashish et al. did not specify the Grade of Injury in their studies.⁹⁻¹⁰ In Onen et al., Grade III (GIS III) injuries were reported in 27.5% of cases, suggesting a higher incidence of severe trauma in their study [11]. The present study also found Grade III (GIS III) injuries to be the most common, observed in 47.4% of cases, aligning with Bakal et al. and showing a slightly higher incidence of more severe injuries.

The chief complaints of the patients varied, though bleeding per vaginam was most frequently reported. In the present study,

bleeding per vaginam was again the most common complaint, similar to Bakal et al.⁸ Samuk et al., however, reported rectal bleeding as the most common chief complaint, which is a different symptom, suggesting a possible difference in injury types or severity.¹⁰ Hashish et al. and Onen et al. did not specify the chief complaints in their studies.⁹⁻¹¹

In present study majority of perineal injury (90.9% with higher-grade injuries (GIS III–V)) were successfully managed by primary repair and only one patient requiring revision and no long-term sequelae. These results are consistent with, and in several cases superior to, previously published studies. Bakal et al. reported a lower primary repair rate of 64%, largely influenced by a higher proportion of complex and contaminated injuries in their cohort, with diversion stoma required in 10.9% of patients.⁹ In contrast, Hashish et al. emphasized a standardized management approach but did not report specific success rates by injury grade; however, diversion stoma was rarely required.⁹ Samuk et al., in their two-decade experience, performed primary closure in only 30% of cases, predominantly due to the high incidence of anorectal injuries that necessitated staged reconstruction.¹⁰ Their complication

profile included fistula formation and the need for secondary interventions, which were not observed in the present series. Onen et al. reported primary suturing in 81% of cases but required diversion in 27.5%, substantially higher than the 5.2% diversion requirement in the current study.¹¹ Importantly, the excellent healing noted in Grade III injuries in our cohort—despite deep vaginal involvement in several cases—suggests that early examination under anesthesia, meticulous debridement, and tension-free absorbable suturing significantly improve outcomes even in severe injuries. Taken together, these findings reaffirm that primary repair should be favoured whenever tissues are viable and contamination is minimal, and diversion reserved for delayed, infected, or grossly contaminated presentations. The consistently low complication rate and absence of long-term morbidity in the present study further strengthen the evidence supporting early primary repair as the optimal management strategy for high-grade paediatric perineal trauma.

Although there are similarities in the aetiology, mean age and management approaches across studies, there are also notable differences in the Grade of Injury, chief complaints and need for diversion

stoma. (Table 8) These variations highlight the complexity and variability in paediatric female trauma care.

Table 8: Comparison Of different Studies

S. No.	Study	Year	Mean Age	Most common aetiology	Chief complaints	Most common Grade of Injury	Management Approach	Use of diversion stoma
1.	Onen et al [11]	2005	8 years	-	-	GIS III (27.5%)	Primary closure (81%)	27.5%
2.	Hashish et al [9]	2011	-	Road Traffic Accident (53.3%)	-	-	-	-
3.	Samuk et al [10]	2015	-	Fall from height (45%)	Rectal bleeding	-	Primary closure (30%)	-
4.	Bakal et al [8]	2016	6 years	Fall from height (66.6%)	Bleeding per vaginum	GIS II (37.3%)	Primary closure (64%)	10.9 %
5.	Present Study	2021-24	5.9 years	Fall from height (46.66%)	Bleeding per vaginum	GIS III (29.1%)	Primary closure (75%)	4.1%

Abb- GIS- Genitourinary Injury Score

Conclusion

Perineal injuries in children should be suspected after falls from height or astride,

typically presenting with localized bleeding. Accurate assessment under anaesthesia is crucial. Most injuries can be

treated with primary closure with promising results. Timely presentation, thorough evaluation and good postoperative wound management are key to successful recovery, underscoring the need for established management protocols.

Ethical Consideration

The study was approved by the institutional ethics and scientific review committee (No.- EC/MGM/Jan-25/244). The requirement for informed consent was waived due to the retrospective nature of the study.

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Conflict of interests

There is no conflict of interest

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