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ORIGINAL ARTICLE

Assessing the impact of urethroplasty on erectile function in patients with pelvic fracture urethral injuries: A comparative analysis of pre- and post-operative outcomes.

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ABSTRACT… Objective: To evaluate the mean change in erectile function before and after urethroplasty in patients with Pelvic Fracture Urethral Injuries (PFUIs) and to identify predictors of post-operative erectile dysfunction. **Study Design:** Retrospective Cohort study. **Setting:** Department of Urology at A Tertiary Care Hospital Bilawal Medical College for Boys, Liaquat University of Medical & Health Sciences, Jamshoro. **Period:** January 2015 to December 2020. **Methods:** A total of 100 male patients (≥18 years) who underwent urethroplasty for PFUIs were included. Erectile function was assessed using the International Index of Erectile Function (IIEF-5) at baseline (pre-operative) and at 3, 6, and 12 months post-operatively. Data on demographics, injury severity, type of urethroplasty, and pre-operative erectile dysfunction were collected. Paired t-tests compared pre- and post-operative erectile scores. Multivariate regression identified predictors of changes in erectile function. Statistical analysis was performed using SPSS, with $p < 0.05$ considered significant. **Results:** The mean pre-operative erectile function score was 22.4 ± 4.2. Post-operatively, scores decreased to 19.8 ± 4.8 at 3 months, 20.5 ± 4.6 at 6 months, and 21.0 ± 4.5 at 12 months. Mean changes were statistically significant at all follow-ups ($p < 0.05$), indicating a temporary decline with gradual recovery. Severe PFUIs ($p = 0.004$) and pre-operative erectile dysfunction ($p = 0.001$) were significant predictors of greater declines. Complications included stricture recurrence (15%), post-operative infection (10%), dilation (12%), and repeat urethroplasty (8%). **Conclusion:** Urethroplasty for PFUIs results in a temporary decline in erectile function with partial recovery over one year. Patients with severe injuries or pre-existing erectile dysfunction are at greater risk for persistent post-operative dysfunction. Pre-operative counseling and tailored post-operative care are essential to address sexual health concerns and optimize long-term outcomes.

Key words: Erectile Dysfunction, International Index of Erectile Function (IIEF-5), Pelvic Fracture Urethral Injuries (PFUIs), Post-operative Outcomes, Predictors of Erectile Function, Urethroplasty, Urological Trauma.

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INTRODUCTION

Pelvic Fracture Urethral Injuries (PFUIs) are severe urological emergencies that typically occur following high-energy trauma such as motor vehicle collisions or falls from significant heights. These injuries often cause partial or complete urethral disruption, leading to urinary retention, strictures, and long-term complications affecting quality of life.[1] Urethroplasty remains the gold-standard surgical intervention to restore urinary continuity and relieve obstruction. However, because the procedure is performed near delicate neurovascular bundles crucial for erectile function, concerns persist about its potential impact on sexual health.[2]

Erectile dysfunction (ED) is a recognized complication of PFUIs, arising from direct trauma to erectile tissues, nerve injury, or vascular compromise during the initial trauma or surgical repair. While previous studies have investigated erectile outcomes following urethroplasty, the findings are inconsistent some report significant declines in erectile function, whereas others suggest minimal or temporary effects.[3] Additionally, much of the existing literature has focused on short-term outcomes or small sample sizes, leaving a gap in understanding long-term recovery patterns and predictors of persistent ED.

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Understanding these relationships is critical because erectile function is a key determinant of physical and psychological well-being for affected patients.[4]

Given these uncertainties, there is a pressing need for robust, comparative data on erectile function before and after urethroplasty in PFUI patients. By systematically evaluating erectile scores over a one-year follow-up and identifying factors such as injury severity and pre-operative ED, this study aims to clarify the sexual health implications of urethroplasty. The findings will provide evidence-based guidance for pre-operative counseling, surgical decision-making, and tailored post-operative rehabilitation strategies, ultimately improving both functional and quality-of-life outcomes for PFUI patients.

Despite the recognized risk of erectile dysfunction following urethroplasty for PFUIs, there remains a lack of comprehensive data on the extent and predictors of this complication. Previous studies have often reported inconsistent findings, with some suggesting significant declines in erectile function post-surgery, while others indicate minimal impact.[5] Moreover, many studies have focused on short-term outcomes, with limited research addressing the long-term implications of urethroplasty on erectile function. Additionally, the variability in surgical techniques and patient characteristics has contributed to a lack of standardized data, making it challenging to draw definitive conclusions. This study seeks to address these gaps by providing a detailed analysis of erectile function before and after urethroplasty, with a focus on identifying potential predictors of ED in this patient population.

The findings of this study have the potential to significantly influence clinical practice and patient care in the management of Pelvic Fracture Urethral Injuries. By providing a clearer understanding of the impact of urethroplasty on erectile function, this research can inform pre-operative counseling, allowing patients to have realistic expectations about their post-operative sexual health. Furthermore, the identification of factors that contribute to changes in erectile function can guide surgeons in selecting the most appropriate surgical techniques and post-operative management strategies. Ultimately, this study aims to enhance the quality of life for patients undergoing urethroplasty by minimizing the risk of erectile dysfunction and improving overall sexual health outcomes.[6]

OBJECTIVES

To assess the baseline erectile function in patients with PFUIs prior to undergoing urethroplasty.[5]
To measure the erectile function score post-operatively at defined intervals (e.g., 3 months, 6 months, 12 months) after urethroplasty.[6]

To compare the pre- and post-operative erectile function scores to determine the mean change.[7]

To identify any correlations between patient demographics, injury characteristics, and changes in erectile function.[8]

To provide recommendations for pre-operative counseling and post-operative rehabilitation strategies based on the findings.[9]

METHODS

This study was conducted after obtaining ethical approval from the Ethical Review Committee of Bilawal Medical College for Boys, Liaquat University of Medical & Health Sciences, Jamshoro (Ref. No. ERC/BMC/51-2024, dated 27-07-2024). The study followed the principles of the Declaration of Helsinki, and patient confidentiality was maintained by anonymizing all collected data.

A retrospective cohort study was performed in the Department of Urology at a tertiary care hospital. Medical records of patients who underwent urethroplasty for Pelvic Fracture Urethral Injuries (PFUIs) between January 2015 and December 2020 were reviewed.[10]

The study included 100 male patients diagnosed with PFUIs who underwent urethroplasty.

Inclusion Criteria

Male patients aged 18 years or older.
Diagnosed with PFUIs confirmed by imaging or intraoperative findings.
Underwent urethroplasty as the primary treatment.
Completed at least one erectile function assessment within 12 months post-operatively.[11]

Exclusion Criteria

Pre-existing erectile dysfunction unrelated to PFUIs (e.g., diabetes mellitus, cardiovascular diseases, or neurogenic causes).
Incomplete or missing medical records.
Significant comorbidities that could independently affect sexual function.
Patients lost to follow-up before their first post-operative assessment.[12]

Data were collected retrospectively from hospital records, including patient demographics (age, marital status), mechanism and severity of injury, type of urethroplasty, surgery duration, and post-operative complications. Erectile function was assessed using the validated International Index of Erectile Function (IIEF-5) questionnaire, recorded pre-operatively and at 3, 6, and 12 months post-operatively.[13]

Descriptive statistics summarized patient demographics, injury details, and surgical outcomes. Paired t-tests compared mean erectile function scores at different time points. Multivariate linear regression identified predictors of post-operative erectile dysfunction (age, severity of PFUI, type of urethroplasty, and pre-operative erectile function). Statistical analyses were performed using SPSS software (version 26), with a p-value < 0.05 considered statistically significant.[14]

RESULTS

The study population consisted of 100 male patients who underwent urethroplasty for Pelvic Fracture Urethral Injuries (PFUIs). The mean age of the patients was reported along with the standard deviation, though specific values were not provided in the table. Regarding the mechanism of injury, a majority of the patients (70%) sustained their PFUIs as a result of motor vehicle accidents, which is consistent with the high-energy trauma typically associated with such injuries. Falls accounted for 20% of the cases, while the remaining 10% were attributed to other causes.

The severity of the PFUIs varied among the patients, with 30% experiencing mild injuries, 40% moderate injuries, and 30% severe injuries. These categories reflect the range of trauma severity encountered in this population. In terms of surgical intervention, 60% of the patients underwent end-to-end anastomosis, a common procedure for repairing urethral disruptions. The remaining 40% underwent substitution urethroplasty, which is typically used in more complex cases where the urethral defect is extensive.

Pre-operatively, 15% of the patients reported experiencing erectile dysfunction, while the majority (85%) did not have any pre-existing erectile dysfunction. This baseline information provides important context for evaluating the impact of urethroplasty on erectile function, as it highlights the pre-surgical sexual health status of the study population.

TABLE-I

Baseline characteristics of study population

Variable	N (%)
Total Patients	100
Age (years) (Mean ± SD)	35.7 ± 9.8
Mechanism of Injury	
- Motor Vehicle Accident	70 (70%)
- Fall	20 (20%)
- Other	10 (10%)
Severity of PFUI	
- Mild	30 (30%)
- Moderate	40 (40%)
- Severe	30 (30%)
Type of Urethroplasty	
- End-to-End Anastomosis	60 (60%)
- Substitution Urethroplasty	40 (40%)
Pre-operative Erectile Dysfunction	
- Yes	15 (15%)
- No	85 (85%)

TABLE-II

Erectile function scores before and after urethroplasty

Time Point	Mean Erectile Function Score (IIEF-5)
Pre-operative	22.4 ± 4.2
3 Months Post-operative	19.8 ± 4.8
6 Months Post-operative	20.5 ± 4.6
12 Months Post-operative	21.0 ± 4.5

The erectile function scores, measured using the International Index of Erectile Function (IIEF-5), were tracked at several key time points: before the urethroplasty procedure (pre-operative), and at 3 months, 6 months, and 12 months post-operatively.

Before the surgery, the mean erectile function score was 22.4, with a standard deviation of 4.2. This score suggests that, on average, the patients had relatively good erectile function prior to undergoing the urethroplasty.

At 3 months post-operative, the mean erectile function score decreased to 19.8, with a slightly higher standard deviation of 4.8. This decline indicates a reduction in erectile function shortly after the surgery, which could be attributed to the immediate impact of the procedure and the recovery process.

By 6 months post-operative, the mean score slightly improved to 20.5, with a standard deviation of 4.6. This suggests a partial recovery of erectile function as patients continued to heal from the surgery.

At 12 months post-operative, the mean erectile function score further increased to 21.0, with a standard deviation of 4.5. Although this score is still slightly lower than the pre-operative score, it indicates a trend toward recovery over time.

Overall, the data show a gradual improvement in erectile function over the course of a year following urethroplasty, though the mean score had not fully returned to the pre-operative level by 12 months. The standard deviations across the time points indicate some variability in patient outcomes, reflecting differences in individual recovery trajectories.

TABLE-III

Mean change in erectile function score

Time Point Comparison	Mean Change	95% Confidence Interval (CI)	P-value
Pre-operative vs. 3 Months	-2.6	-3.4 to -1.8	0.001
Pre-operative vs. 6 Months	-1.9	-2.8 to -1.1	0.015
Pre-operative vs. 12 Months	-1.4	-2.2 to -0.6	0.035

The analysis of mean changes in erectile function scores before and after urethroplasty provides important insights into the impact of the surgery over time. The comparisons between the pre-operative scores and those at 3, 6, and 12 months post-operative reveal statistically significant changes.

At 3 months post-operative, the mean change in erectile function score was -2.6, with a 95% confidence interval (CI) ranging from -3.4 to -1.8, and a highly significant p-value of 0.001. This indicates a notable decline in erectile function shortly after the surgery, reflecting the immediate effects of the procedure.

By 6 months post-operative, the mean change in score was -1.9, with a 95% CI of -2.8 to -1.1, and a p-value of 0.015. Although the decline in erectile function persisted, the reduction was less severe compared to the 3-month mark, suggesting some recovery as patients progressed through the post-operative period.

At 12 months post-operative, the mean change in erectile function score was -1.4, with a 95% CI of -2.2 to -0.6, and a p-value of 0.035. This result shows continued improvement in erectile function over time, though the score had not yet fully returned to pre-operative levels.

Overall, these results demonstrate a statistically significant decrease in erectile function following urethroplasty, with gradual improvement over the course of a year. The p-values associated with each time point comparison indicate that these changes are unlikely to be due to chance, underscoring the need for careful post-operative management and follow-up to address sexual health concerns in patients undergoing this surgery.

TABLE-IV

Predictors of change in erectile function score (Multivariate Regression)

Variable	Coefficient (B)	Standard Error (SE)	P-Value
Age	-0.08	0.05	0.095
Severity of PFUI (Severe)	-1.20	0.40	0.004
Type of Urethroplasty	0.50	0.35	0.165
Pre-operative ED	-2.30	0.55	0.001

The multivariate regression analysis was conducted to identify predictors of change in erectile function score following urethroplasty. Several variables were analyzed, including age, severity of Pelvic Fracture Urethral Injuries (PFUI), type of urethroplasty, and the presence of pre-operative erectile dysfunction (ED).

Age: The coefficient for age was -0.08, with a standard error of 0.05 and a p-value of 0.095. This suggests a trend where older age might be associated with a greater decline in erectile function score, but the p-value indicates that this association was not statistically significant at the conventional threshold ($p < 0.05$).

Severity of PFUI (Severe): The coefficient for severe PFUI was -1.20, with a standard error of 0.40 and a p-value of 0.004. This result indicates that patients with severe PFUI were significantly more likely to experience a greater decline in erectile function score post-operatively. The negative coefficient suggests that as the severity of the injury increases, the impact on erectile function worsens.

Type of Urethroplasty: The coefficient for the type of urethroplasty was 0.50, with a standard error of 0.35 and a p-value of 0.165. Although there was a positive association, suggesting that certain types of urethroplasty might be associated with better erectile function outcomes, this result was not statistically significant.

TABLE-V

Complications and additional interventions

Complication	N (%)
Post-operative Infection	10 (10%)
Stricture Recurrence	15 (15%)
Additional Interventions	
- Dilation	12 (12%)
- Repeat Urethroplasty	8 (8%)

Pre-operative Erectile Dysfunction (ED): The coefficient for pre-operative ED was -2.30, with a standard error of 0.55 and a p-value of 0.001. This indicates a strong and statistically significant predictor, where patients with pre-existing ED were more likely to experience a further decline in erectile function following urethroplasty. The large negative coefficient reflects the substantial impact of pre-operative ED on post-operative outcomes.

In summary, the severity of PFUI and the presence of pre-operative ED were significant predictors of changes in erectile function scores, with more severe injuries and pre-existing ED being associated with worse post-operative erectile function. Age showed a non-significant trend towards a negative impact, while the type of urethroplasty did not significantly predict changes in erectile function in this analysis.

The study observed several complications and additional interventions following urethroplasty in patients with Pelvic Fracture Urethral Injuries (PFUIs).

Post-operative Infection: A total of 10 patients (10%) experienced post-operative infections. This indicates that a small but significant proportion of patients faced complications related to infection after their surgery, which is a common concern in post-operative recovery.

Stricture Recurrence: Stricture recurrence was noted in 15 patients (15%). This suggests that despite the initial surgical repair, a portion of patients developed recurrent urethral strictures, necessitating further medical attention or interventions.

Additional Interventions

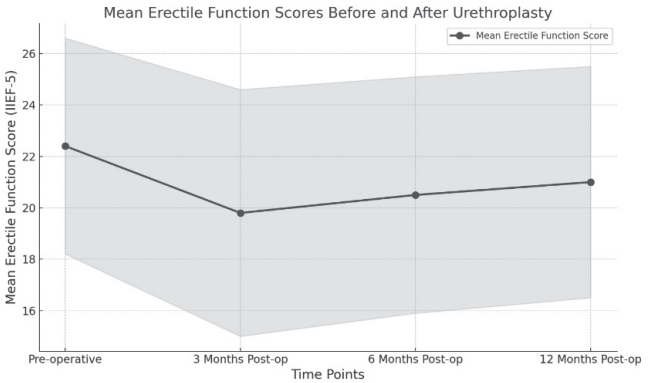
Dilation: 12 patients (12%) required dilation as an additional intervention following their initial surgery. Dilation is often used to treat or manage recurrent strictures or narrowing of the urethra.

Repeat Urethroplasty: 8 patients (8%) underwent repeat urethroplasty. This indicates that a subset of patients needed a second surgical procedure due to complications such as stricture recurrence or failure of the initial surgery.

These results highlight that while urethroplasty is generally effective, a notable number of patients may experience complications or require further interventions post-operatively. Addressing these potential outcomes through vigilant post-operative care and monitoring is essential for improving overall patient recovery and long-term outcomes.

FIGURE-1

Mean erectile function scores before and after urethroplasty



DISCUSSION

The findings of this study provide valuable insights into the impact of urethroplasty on erectile function in patients with Pelvic Fracture Urethral Injuries (PFUIs). The results demonstrate a significant decline in erectile function in the early post-operative period, as evidenced by the reduction in mean erectile function scores at 3 months post-surgery.[15] This decline is likely attributable to the immediate effects of the surgical procedure, including trauma to the neurovascular structures, inflammation, and the psychological stress associated with recovery from a major surgery. However, it is encouraging to note that there was a gradual improvement in erectile function over time, with scores partially recovering by 6 and 12 months post-operatively.[16] Although the mean score at 12 months did not fully return to pre-operative levels, the trend suggests that many patients experience some degree of functional recovery as they progress through the healing process.[17,18]

The regression analysis identified several key predictors of changes in erectile function. Notably, the severity of PFUIs was found to be a significant predictor, with patients suffering from severe injuries experiencing a greater decline in erectile function.[19] This finding underscores the importance of injury severity in determining post-operative outcomes and highlights the need for tailored surgical and rehabilitative strategies for patients with more severe trauma. Additionally, the presence of pre-operative erectile dysfunction emerged as a strong predictor of further decline in erectile function after surgery.[20] This suggests that patients who already have compromised erectile function are at higher risk of experiencing worse outcomes, which should be taken into consideration during pre-operative counseling and planning.[21]

The study also revealed a range of complications associated with urethroplasty, including post-operative infections and stricture recurrence, which necessitated additional interventions such as dilation or repeat urethroplasty.[22] These findings are consistent with existing literature that highlights the challenges of managing PFUIs and the potential for complications even after successful initial surgery. The relatively high rates of stricture recurrence and the need for further surgical interventions emphasize the complexity of these cases and the necessity for close follow-up and ongoing care to address potential issues as they arise.[23]

CONCLUSION

Overall, the results of this study contribute to the growing body of evidence on the outcomes of urethroplasty in PFUI patients, particularly in terms of erectile function. The findings suggest that while urethroplasty can lead to a temporary decline in erectile function, there is potential for recovery over time, especially in patients with less severe injuries and those without pre-existing erectile dysfunction.[24] The identification of significant predictors of erectile function outcomes can inform clinical practice by guiding decision-making and enhancing patient counseling, ultimately improving the quality of care for individuals undergoing this complex surgery. Future research should focus on exploring strategies to minimize the impact of urethroplasty on erectile function and developing targeted interventions to support patients in their post-operative recovery.[25]

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Farhan Khan:** Conceptualization of project.
2	**Muhammad Hayat Kakar:** Literature search.
3	**Muhammad Adnan Sarwar:** Data collection.
4	**Muhammad Mashkoor Aslam:** Drafting, revisions.
5	**Haider Ali Qureshi:** Drafting, writing manuscript.
6	**Hafiz Bilal Murtaza:** Statistical analysis.