RESEARCH ARTICLE

Long-term outcomes of anastomotic urethroplasty for pelvic fracture urethral injury. The experience of a decade at Sindh Institute of Urology and Transplantation

Mazahir Zulfiqar, Manzoor Hussain, Saeed Abedi, Tanzeel-Ur-Rahman Gazder, Syed Rabiullah, Sanjeet Kumar

Abstract

Objective: To determine the long-term outcomes of anastomotic urethroplasty in cases of pelvic fracture urethral injury.

Method: The retrospective study was conducted at a tertiary care hospital in Karachi, and comprised data from January 1, 2011, to December 31, 2020, related to all patients who had undergone anastomotic urethroplasty for pelvic fracture urethral injury. Clinical data as well as patient-reported outcomes were noted using a predesigned questionnaire. One-year follow-up data of those who expired was not used for analysis. Data was analysed using SPSS 22.

Results: Of the 440 patients with mean age 28.70±12.50 years, 2(0.45%) expired. Among the 438(99.55%) cases, success was observed in 350(79.9%). Spontaneous return of good erection was seen in 137 (60.2%) men, irrespective of the outcome of anastomotic urethroplasty. A successful case was found to have 35 (7.8%) fertility. Most patients reported high satisfaction with quality of life, surgical results, and genital appearance, while sexual performance and pain showed mixed outcomes.

Conclusion: Anastomotic urethroplasty was found to be effective in providing long-term restoration of urine flow. Improvement in erectile function, and restoration of fertility were seen in long-term successful cases.

Keywords: Pelvic fracture urethral injury, Anastomotic urethroplasty, Excision and primary anastomosis, EPA, Crural division, Inferior partial pubectomy, Progressive abdomino-perineal approach, Pelvic trauma, Urethral trauma.

(JPMA 75: 730; 2025) **DOI: https://doi.org/10.47391/JPMA.11611**

Introduction

Pelvic fracture urethral injury (PFUI) results in complete or partial disruption of the posterior urethra associated with or without concomitant complexities.[1] The objectives of a successful urethral stricture management are to restore normal voiding, preserving erectile function and fertility, and having a low risk of stricture recurrence.[2] To achieve this objective, there are many treatment options for PFUI,[3] like open-delayed anastomotic urethroplasty (AU), which is considered the gold standard treatment.[4]

In pelvic fractures, 10% cases are associated with urethral injuries. Road traffic accidents (RTA) remain the major cause, in Pakistan and neighbouring countries.

AU in PFUI is one of the greatest challenges, with its deeply placed anatomy in the perineum, surgical space constraints, risk of injury to collateral vessels, nerves, corporal body and sphincters, even the most experienced surgeons face.[5] The first urethroplasty should be the best urethroplasty, ensuring surgical finesse to provide the highest chance of success. Failure with subsequent interventions increases the risk of future failures, morbidity to the patient and an unsatisfactory lifestyle.

The current study was planned to determine the long-term outcomes of AU in PFUI cases.

Department of Urology, Sindh Institute of Urology and Transplantation, Karachi, Pakistan.

Correspondence: Tanzeel-Ur-Rahman Gazder. e-mail: tgazder11@gmail.com

ORCID ID: 0009-0001-9962-1303

Submission complete: 27-04-2024 **1st Revision received:** 29-06-2024

Acceptance: 01-02-2025 **Last Revision received:** 31-01-2025

Patients and Methods

The retrospective study was conducted at a tertiary care hospital in Karachi, and comprised data from January 1, 2011, to December 31, 2020, related to all patients who had undergone AU for PFUI and had remained on a minimum of one year of follow-up. The data was retrieved from September 2021 to January 2023 using nonprobability sampling technique. The data included history, physical examination, urethrogram findings, cystourethroscopy from per urethral and via supra-pubic tract (if done), complexity and length of the stricture from the information provided from both the urethrogram study and cystourethroscopy evaluation, approach (perineal or abdominoperineal) and surgical findings.

The sample size was determined based on a previous estimate of a 90% success rate reported in a similar study,[4] with 3% margin of error and 95% confidence interval (CI). Approval was obtained from the institutional ethics review committee of the Sindh Institute of Urology and Transplantation (SIUT).

AU was performed using the perineal or the abdomino-

perineal approach.[6] One-year follow-up data of those who expired was not used for analysis, but their pre-operative and surgical aspects were included.

Follow-up ultrasound of the bladder with pre-void, post-void residual urine (PVRU) measurement and uroflowmetry (UFM) was recorded. The patients were requested to visit the SIUT Stricture Clinic. They were questioned on their erectile dysfunction (ED) status (if married) as per the International Index of Erectile Function (IIEF), and whether they had had a child after the surgery. Patient-reported outcomes (PROMs), an institutionally designed questionnaire, was filled by the patients. The questionnaire was designed by senior consultant urologists and included 7 questions based on literature.[7] Questions were directed towards the degree of satisfaction after surgery in relation to the quality of life, result of surgery, sexual performance, ejaculation, appearance of genitalia, and the presence of chordee and painful erections.

Success was defined as a patient who, after a minimum of one-year of follow-up post-AU for PFUI, had a UFM >15ml/sec and PVRU <50ml and who had undergone no further urethral surgery except for a single diagnostic cystoscopy in equivocal cases.

Data was analysed using SPSS 23. Data was expressed as mean±standard deviation, median with interquartile range (IQR), or as frequencies and percentages, as appropriate. Comparative analysis was done using the chi-square test. P<0.05 was considered significant.

Results

Of the 440 patients with mean age 28.70±12.50 years, 2(0.45%) expired (Table 1); 1(50%) in a road traffic accident (RTA), and 1(50%) due to myocardial infarction (MI) 5 years after AU.

The mean length of the urethral defect was 2.9±1.3cm. The commonest site was membranous-prostatic 205(46.6%), followed by bulbo-membranous urethra 196(44.5%) (Table 2)

Table-1: Demographic characteristics (n=440).

Variable	n (%)
Status contact	
Visited	438 (97.10)
Expired	2 (0.40)
Age Groups (years)	
<15	14 (3.20)
15–24	189 (43.00)
25–34	123 (28.00)
35–44	52 (11.80)
45–54	43 (9.80)
>54	19 (4.30)
Provinces	
Balouchistan	36 (8.20)
Khyber Pakhtunkhwa	47 (10.70)
Punjab	148 (33.60)
Sindh	209 (47.50)
Initial Management regarding Trauma	
No Management	23 (5.20)
SPC	385 (87.50)
Endoscopic Realignment	11 (2.50)
Rail Road	20 (4.50)
Laparotomy	1 (0.20)
Duration till SIUT visit (months) Median (IQR)	5 (3-10)
≤ 6 months	260 (59.10)
> 6 months	180 (40.90)
Co-morbids	
No co-morbids	397 (90.20)
Renal Failure	8 (1.80)
Hypertension (HTN)	19 (4.30)
Diabetes mellitus (DM)	4 (0.90)
Hepatitis	6 (1.40)
Combined HTN and DM	6 (1.40)

SPC-Supra-pubic cystostomy; SIUT: Sindh Institute of Urology and Transplantation; IQR: Interquartile range.

Table-2: Preoperative findings and operative features (n=440).

Variable	n (%)
No Surgery post trauma	280 (63.60)
Surgery Outside:	160 (36.40)
Dilatation	35 (8.00)
DVIU	46 (10.50)
Urethroplasty	72 (16.40)
Laparotomy	7 (1.60)
Stricture length and region of stricture	
Mean Length of stricture (cm) (SD)	2.9±1.3
Bulbar	3 (0.70)
Bulbo-membranous	196 (44.50)
Membrano-prostatic	205 (46.60)
Bulbo-prostatic	36 (8.20)
Pre-Op Cystoscopy	
Done	357 (81.10)
Not Done	83 (18.90)
On Cystoscopy:	
Bladder Stone found	40 (11.20)
Bladder Neck	
Competent	303 (84.60)
Dysfunctional	55 (12.50)
Verumontanum	
Seen	332 (93.00)
Distorted	25 (7.00)
Approach	
Progressive Perineal	396 (90.00)
Abdominal Perineal	44 (10.00)
Urethral Length Gain Undertaken	
Urethral Mobilization only (UM)	22 (5.00)
UM + Crural Division (CD)	278 (63.20)
UM + CD + Inferior Partial Pubectomy	95 (21.60)
Abdomino Perineal Approach	44 (10.00)
Perineal Urethrostomy	1 (0.20)
Duration Surgery Median (IQR)	190 minutes (65 min – 400 max)

DVIU: Direct vision internal urethrotomy, SD: Standard deviation, IQR: Interquartile range.

Table-3: Surgical outcomes (n=438).

Variables			**(Less 2=Expired)**
Success			350 (79.90)
Failure (Stricture recurrence)			88 (20.10)
Mean UFM (ml/min)			19.40±9.70
Stricture recurrence (months) Median (IQR)			6 (3-6)
Success Vs Failure:			
	Perineal (%)	**Abdomino – Perineal** (%)	**Over all** (%)
Successful	324 (82.20)	26 (59.10)	350 (79.90)
Failure	70 (17.70)	18 (41.00)	88 (20.10)
Total Cases done	394 (89.90)	44 (10.10)	438(100.00)
Secondary Intervention given for failed cases:			
	Perineal (n=70)	**Abdomino–** Perineal (n=18)	**Total** (n=88)
Dilatation	12	4	16
Optical DVIU	19	6	25
Laser DVIU	11	1	12
Redo – Urethroplasty	27	0	27
Urinary Diversion	1	7	8
Urinary Incontinence			**n=92 (21% of 438)**
Stress			30 (6.80)
Urge			43 (9.80)
Mixed			16 (3.60)
Total			3 (0.70)

DVIU: Direct vision internal urethrotomy, UFM: Uroflowmetry, IQR: Interquartile range.

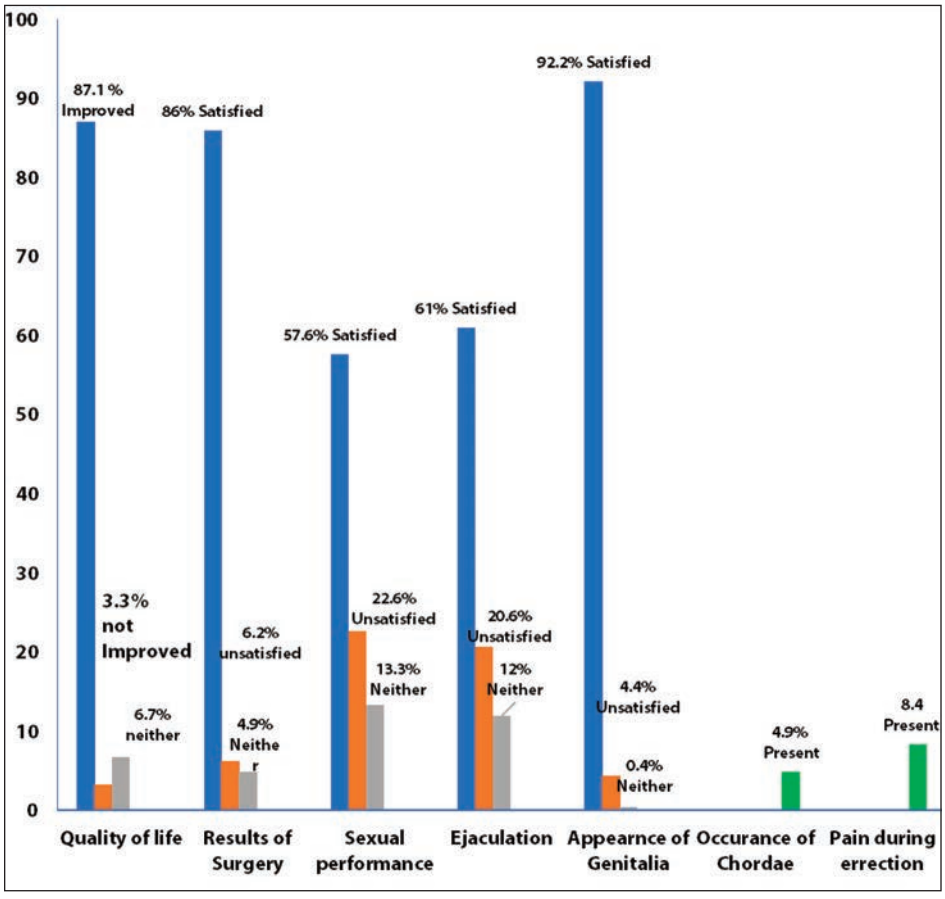

Figure: Patient-related outcomes (PROMs).

The commonest surgical approach was the progressive perineal approach (pEPA) 394(89.9%), followed by the combined abdomino-perineal approach (apEPA) 44(10%) (Table 3). Also, 1(0.22%) patient, due to significant urethral loss, old age, and co-morbidities, was offered a salvage perineal urethrostomy using the scrotal dropback technique.[8]

Overall, success was observed in 350(79.9%) patients, with a mean UFM 19.4±9.7ml/s. Recurrence of stricture (failure) was observed in 88 (20.1%) patients. All recurrences appeared within 6 months post-AU.

There were 7 (1.5%) patients who had recurrence of the stricture and were given permanent diversion in the form of Mitrofanoff catherisable channel.

ED post-urethroplasty as noted in 289(64.5%) married male subjects. The successful cohort had 229 (50.04%) patients, while the unsuccessful cohort had 28 (6.36%). In the successful cohort, 137(60.2%) patients had no to mild ED. In the unsuccessful cohort, the corresponding value was 14(51%). Besides, 35(7.8%) patients had had a child after successful urethroplasty.

PROM questionnaire showed high satisfaction rates among the patents (Figure).

Discussion

Urethral trauma can be catastrophic,[9] the commonest cause of PFUI being RTA1.[5,10,11] Urethrogram studies are commonly done to evaluate a PFUI in preparation for delayed posterior urethroplasty.[12]

To avoid increasing morbidity, prompt and appropriate management of PFUI is crucial.[13] A review in 1997 quoted 42/100 patients having PFUI. Some 23 years later, another review by the same author observed that in a cohort of 3,357 procedures, 40.7% patients had PFUI. In Khurshid A. et al. in their analysis of RTA fatalities in Karachi, reported that 4.5% RTAs in 2020 caused injuries to the pelvis.[14] Initial management should follow the acute trauma life support (ATLS) protocol. Supra-pubic diversion followed by AU has the lowest rate of stricture recurrence, concluded to be

14.4%.[1,3,4] In the current study, 87.5% of patients had supra-pubic catheterisation as their initial treatment in the acute setting, and the stricture recurrence rate after AU was 20.1%.

Saini et al.[4] reported a decade of experience with 226 AU post-PFUI cases with a mean follow-up of 34 months. Comparing it with the current study, the mean length of stricture was 2.7cm versus 2.9cm in this study. Length-gaining procedures included crural division (63.2% vs 39.38%), inferior pubectomy (21.6% vs 18.14%), corporal re-routing (0 vs 1 patient), and apEPA (44 vs 3 patients). It can be argued that the current study had comparatively more complex cases, and, hence, there was a lower overall success rate of 79.9% compared to 93.14%.[4] The outcome of AU is dependent on the severity of the pelvic injury, length of the stricture segment, and degree of proximity of the stricture to the bladder neck.

A review of 4 articles[1,3,4,6] addressing AU in PFUI showed an average success rate of 87.9% (range: 84.93%-93.14%). The current study was based on the strict notion that the first urethroplasty is the best urethroplasty. Parallel studies[3,4] have extensively reviewed the result of AU after PFUI, but the scale of UFM at which they defined success was missing. A study[1] comprising 1,307 surgeries from 1995 till 2018 defined success at UFM >12ml/s with minimum follow-up of 6 months. The reported success rate was 88.79% for primary cases. The lower success rate in the current study could also be explained by the fact that the definition of success comprised a higher UFM value. Furthermore, the follow-up was longer, with results generated after a minimum of 1 year.

Barratt et al.[3] reported that urinary incontinence (UI) ranged from 2.1% to 8%, while Joshi PM et al.[1] reported that UI ranged from 10% to 25%. The higher frequency of incontinence in the current study was related to the complexity of the cases. Also, 40.9% of the patients took >6 months to begin evaluation of their urethral injury at SIUT. Prolonged supra-pubic diversion can lead to long-term detrusor pathology, necessitating urodynamic studies. These patients were treated with anti-muscarinic drugs and pelvic floor muscle training.

It is debatable as to whether the cause of ED is the result of the primary trauma itself, or due to collateral neural damage from the AU procedure. Jennifer JT et al.[15] and Hosseini J et al.[16] proposed the former aetiology, while Benson et al.[17] and Barratt et al.[3] were of the latter opinion. Barret et al. proposed the baseline reference incidence of ED after PFUI to be 39%.[3] In the current study, the majority of patients, whether they had a successful or an unsuccessful AU, regained their erectile function, falling mostly into the 'No ED' to 'mild ED' group. It can be concluded from the current data that up to 50% of the patient would regain their erections within 10 years, irrespective of the success or failure of urethroplasty. Factors, such as elderly patients, the degree of pelvic diathesis from RTA, and pre-trauma ED, have been shown to have a negative effect on ED in the post-operative scenario. Jennifer JT et al.[15] evaluated ED in 26 patients with a mean follow-up of 4.4 years. No ED was found in 46% patients, while 31% had severe ED. Hosseini J et al.[16] studied 65 patients and followed them for 6 months post-AU, reporting that 15% had no ED before AU, and 6 months later, 17% of them had mild ED.

A study showed that there was potential delayed recovery up to 38% after urethral injury rather than reconstruction. Mundy AR[18] in his review shared that 5% still had long-term ED after AU. In the current study, 9% patients had ED prevalence even after 10 years post-AU.

In the current study, 7.8% patients bore a child after successful urethroplasty. The current data shows that patients with a long-term patent urethra have 7% chance of impregnating his partner. It needs ti be emphasised as well that ejaculation and fertility are dependent on many patient factors, including old age, patient's desire, ED and most importantly, sperm parameters post-AU. This requires a deeper study into the matter. Heinsimer K. et al.[19] concluded that ejaculatory function was better in patients aged <60 years.

The authors believe that patient-reported outcomes stand equal to the quantitative proof of a successful treatment. Both features together will help in following the principle of 'treating the patient as a whole'.

Conclusion

AU was found to be effective in providing long-term restoration of urine flow. Improvement in erectile function, and restoration of fertility were seen in long-term successful cases. AU, as such, remains the gold standard, with the outcome being dependent on the severity of the pelvic injury, length of the stricture segment, and degree of proximity of stricture to the bladder neck. There was spontaneous improvement towards good erection irrespective of the AU outcome. After a successful AU, there was a 7% chance of fertility. There were minimum long-term complications, and high patient satisfaction.

Acknowledgement: We are grateful to operation theatre (OT) manager Mrs Sehrish Urooj Hashmi, senior OT technicians Ms Madiha Raseed, Ms Saira Bano, Mr Javaid and Mr Akhtar, medical senior officers Ms Saira Fateh, Ms Sobia Imtiaz, Mrs Qurat ul Ain Mugal, and statistician Mr

Iqbal for facilitating the study.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: The Sindh Institute of Urology and Transplantation (SIUT), Karachi.

References

1. Joshi PM, Kulkarni SB. Management of pelvic fracture urethral injuries in the developing world. World J Urol 2020;38:3027-34. doi: 10.1007/s00345-019-02918-0.
2. Hussain M, Khan MS, Lal M, Hashmi A, Naqvi SAA, Rizvi SAH. Stricture of Urethra: Patterns and Outcomes of Management from a Single Centre in Pakistan Over 7 Years. J Coll Physicians Surg Pak 2020;30:79-84. doi: 10.29271/jcpsp.2020.01.79.
3. Barratt RC, Bernard J, Mundy AR, Greenwell TJ. Pelvic fracture urethral injury in males-mechanisms of injury, management options and outcomes. Transl Androl Urol 2018;7(Suppl 1):s29-62. doi: 10.21037/tau.2017.12.35.
4. Saini DK, Sinha RJ, Sokhal AK, Singh V. Analysis of anastomotic urethroplasty for pelvic fracture urethral distraction defect: Decadal experience from a high-volume tertiary care center. Urol Ann 2019;11:77-82. doi: 10.4103/UA.UA_48_17.
5. Gomez RG, Scarberry K. Anatomy and techniques in posterior urethroplasty. Transl Androl Urol 2018;7:567-79. doi: 10.21037/tau.2018.03.05.
6. Flynn BJ, Delvecchio FC, Webster GD. Perineal repair of pelvic fracture urethral distraction defects: experience in 120 patients during the last 10 years. J Urol 2003;170:1877-80. doi: 10.1097/01.ju.0000091642.41368.f5.
7. Redmond E, Bekkema J, Rourke K. Comprehensive prospective assessment of patient-reported outcomes following urethroplasty. Urology 2020;141:162-7.
8. Hussain M, Soomro RA, Hashmi A, Hussain Z, Naqvi SA, Rizvi SA. Urethral stricture disease: A review of 100 cases. Pak J Surg 1997;13:117-9.
9. Qadri SJF, Rashid A, Mahmood M, Khanday ZS, Chalkoo M, Qadri A. Progressive Perineal Urethroplasty for Pelvic Fracture Urethral Distraction Defect an Early Single Centre Experience. Eur J Cardiovasc Med 2023;13:960-63.
10. Joshi PM, Batra V, Kulkarni SB. Controversies in the management of pelvic fracture urethral distraction defects. Turk J Urol 2019;45:1-6. doi: 10.5152/tud.2018.57699.
11. Eshiobo I, Ernest U. A Review of the epidemiology and management of urethral stricture disease in Sub-Saharan Africa. Curr Med Issues 2019;17:118-24.
12. Jackson E;Andrew P. MRI in preoperative planning for the repair of pelvic fracture urethral distraction defects: a new tool for determining reconstructive options. JU Open Plus 2023;1:e00008. DOI: 10.1097/JU9.0000000000000001.
13. Kassiri B, Zhang TR, Alford, AV, Lee YS, Zhao LC. Management of Pelvic Trauma-Associated Urethral Injury in Men. Curr Surg Rep 2023;11:243–50. doi: 10.1007/s40137-023-00365-w.
14. Khurshid A, Sohail A, Khurshid M, Shah MU, Jaffry AA. Analysis of Road Traffic Accident Fatalities in Karachi, Pakistan: An Autopsy-Based Study. Cureus 2021;13:e14459. doi: 10.7759/cureus.14459.
15. Anger JT, Sherman ND, Dielubanza E, Webster GD, Hegarty PK. Erectile function after posterior urethroplasty for pelvic fracture-urethral distraction defect injuries. BJU Int 2009;104:1126-9. doi: 10.1111/j.1464-410X.2009.08589.x.
16. Hosseini J, Soleimanzadeh Ardebili F, Fadavi B, Haghighatkhah H. Effects of Anastomotic Posterior Urethroplasty (Simple or Complex) on Erectile Function: a Prospective Study. Urol J 2018;15:33-7. doi: 10.22037/uj.v0i0.3805.
17. Benson CR, Hoang L, Clavell-Hernández J, Wang R. Sexual Dysfunction in Urethral Reconstruction: A Review of the Literature. Sex Med Rev 2018;6:492-503. doi: 10.1016/j.sxmr.2017.09.002.
18. Mundy AR. Results and complications of urethroplasty and its future. Br J Urol 1993;71:322-5. doi: 10.1111/j.1464-410x.1993.tb15951.x.
19. Heinsimer K, Wiegand L. Erectile and Ejaculatory Dysfunction After Urethroplasty. Curr Urol Rep 2021;22:19. doi: 10.1007/s11934-021-01039-9.

Author Contribution:

MZ, MH, SA, TURG, SR & SK: Concept, design, data analysis, interpretation, critical analysis, final approval and agreement to be accountable for all aspects of the work.