

Original Article



Management of Pelvic Fracture Urethral Injury- 147 Cases

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Abstract

Background: Dhaka Medical College Hospital is the highest referral center for PFUI. As anastomotic urethroplasty is a challenging surgery and most of the surgeons refer these type of injuries to our center, we performed this study to evaluate the outcome of our cases. **Objective:** This study aims to find the outcome and complications of perineal end to end anastomotic urethroplasty in the management of posterior urethral injury resulting from pelvic fracture. **Materials and Methods:** We performed 147 perineal bulbo-prostatic anastomotic urethroplasty for PFUIs from January, 2013 to May, 2019. Mean age was 37 years with majority between 21 to 50 years (>85%). Nine patients had history of failed anastomotic urethroplasty. After surgical intervention patients were discharged with a supra-pubic catheter (SPC) and per urethral catheter in situ. On 22nd POD urethral catheter was removed and SPC on the next day if patient can void normally. 1st and 2nd follow up done on 3rd and 6th month respectively following surgery. If patient voided well and $Q_{max} > 15\text{ml/sec}$; repair was defined as successful. **Results:** Success rate of anastomotic urethroplasty for PFUI was 93.87%. Total 9 procedures were failed including 2 urethro-cutaneous fistula and needed re-do anastomosis. Erectile dysfunction (ED) was present in 18 patients before operation and after surgery 12 more patients developed ED and total number was 30 during first follow up, which reduced to 24 during second follow-up. Two patient developed incontinence which improved in subsequent follow-up. **Conclusion:** Anastomotic urethroplasty remains the gold standard in the management of PFUI. Erectile dysfunction is the main issue to be concerned and need special attention.

Keywords: Perineal bulbo-prostatic anastomotic urethroplasty, posterior urethral injury, pelvic fracture urethral injury (PFUI), supra-pubic catheter (SPC), failed anastomosis, erectile dysfunction (ED).

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Introduction

Pelvic fracture urethral injury (PFUI) is a major complication of urethral rupture, and is very difficult to treat. Anastomotic urethroplasty remains one of the most complicated urological procedures but gives an excellent result. PFUIs often result from high-velocity injuries that are associated with disruption of the pelvic ring.¹ With an estimated prevalence of 296 to 627 per 100,000 men, male urethral stricture disease imposes a significant burden on the health care system.^{2,3} Urethral injuries associated with PFUIs were initially termed pelvic fracture urethral distraction defects (PFUDDs) by Turner-Warwick.⁴ The reported incidence of PFUIs varies greatly, at 5-25% of pelvic fractures.^{2,5} PFUI is much more common in men than women (25% vs 4.9%) due to a shorter urethra and lack of urethral attachments to the pubis in females.⁶ Contrary to the initial thought that most PFUIs are prostatico-

membranous disruptions,⁷ most injuries occur at the bulbo-membranous junction.⁸⁻¹⁰ Most pelvic fractures by themselves do not cause urethral injuries, but urethral injuries result from the rupture of ligamentous attachments during pelvic-ring disruption. A PFUI occurs when the ligament ruptures at its urethral attachment.¹⁰ In complete urethral injuries, the periprostatic venous plexus can be injured, with subsequent large haematoma formation, displacing the prostate cephalad and posterior.¹¹

Surgery for posterior urethral strictures has inherent problems related to difficult access, limited urethral length, surrounding fibrosis, and the small calibre of the bulbar urethra that makes it susceptible to ischaemic insults.¹² As a result, reported complications associated with anastomotic urethroplasty

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include urinary incontinence, erectile dysfunction (ED), rectal injury and urethro-cutaneous fistula. Postoperative recurrence of stricture is also a problem with this procedure.¹³

Success rate of perineal anastomotic urethroplasty is 82% to 95% in different studies.¹⁴ Since Webster and Roman reported results of trans-perineal anastomotic urethroplasty for post-traumatic urethral disruption (currently termed as PFUI) with very high success-rate (96%), the method has been considered a gold standard surgery.¹⁵

After a PFUI, many steps can be required to realign and repair the urethra. Four key steps of anastomotic urethroplasty are: circumferential mobilization of bulbar urethra, division of crura along avascular plane, inferior pubectomy if required and supracrural re-routing and finally, excision of stricture segment and end to end spatulated anastomosis. The key to anastomotic urethroplasty lies in two anatomical points: first, the bulbar urethra is elastic and can be stretched for 2±4 cm to overcome a defect and allow an overlapping spatulated anastomosis; and second, the natural course of the bulbar urethra is nearly semicircular so that by straightening out the natural curve even longer defects can be bridged than by elasticity alone.¹⁶ Some 2±4 cm of elastic lengthening can be gained by bulbar urethral mobilization, but 1 cm will be lost from this because of the need to spatulate the end of the urethra for anastomosis to the similarly spatulated prostatic urethra. This spatulation allows adequate patency of the urethral lumen when there is some contraction of the anastomosis after surgery.

For longer defects (which are the majority) bulbar urethral mobilization will not be enough and the urethra will require straightening. The anatomical structures that produce the normal curved course of the bulbar urethra are the fusion of the crura of the penis and the underlying inferior pubic arch. The proximal 5±7 cm of the fused crura can be separated in an avascular plane before (more distally) this plane dissipates and the corporal bodies merge together on the shaft of the penis. If splitting the corpora is not sufficient for tension-free anastomosis, then a wedge of the inferior pubic arch can be taken out to straighten the course of the bulbar urethra further. If these two maneuvers together still fail to allow the bulbar urethra to reach the prostatic urethra above the level of the urethral stricture or defect, then the urethra can be re-routed around the shaft of the penis.

In this article, we systematically described the procedure, outcome and complications of perineal bulbo-prostatic end-to-end anastomotic urethroplasty for posterior urethral injury from pelvic fracture of 147 patients on the basis of comprehensive review of the published studies on the treatment methods for PFUIs.

Materials and Methods

This was a prospective experimental study of outcome after perineal anastomotic urethroplasty in patients with posterior urethral injury from pelvic fracture. Patients were admitted in department of Urology of Dhaka medical college hospital (DMCH) suffering from PFUI with SPC in situ and underwent

anastomotic urethroplasty within the period of January 2013 to May 2019. Total 156 patients were selected and these were considered as the study population. Among them 9 were excluded as they were lost to follow-ups. So, 147 were the ultimate sample size remained for analysis. Purposive sampling technique was adopted.

All male patients of PFUI who have given consent for operation, anaesthesia, record and study purpose were included in this study. Female patients, anterior urethral strictures, history of urethral injury less than 6 months, non traumatic disruption of urethra (i.e. radical prostatectomy, urethral surgery and/or pelvic radiation therapy), pre-existing urethro-rectal fistula, inability to have squatting position, refusal of consent, symptoms of urinary outflow obstruction prior to urethral injury, patients with stroke and spinal cord injury were excluded. Their mean age was 37 (7-72) years. 2 patients were diabetic and 4 patients were hypertensive. Nine patients had history of failed anastomotic urethroplasty and re-do anastomoses were done. Minimum interval from pelvic fracture to urethroplasty was 6 months. Pre-operative evaluation included clinical history, physical examination, urine culture and retrograde urethrogram and micturating cystourethrogram (RGU & MCU).

Relevant pre-operative investigation reports were checked and recorded. Patients were prepared for operation after adequate counseling. All patients underwent perineal excision and primary anastomotic urethroplasty in lithotomy position. A stepwise approach for urethral mobilization was used consisting of complete circumferential mobilization of bulbar urethra, separation of crura, and inferior pubectomy to accomplish tension free anastomosis. Inferior pubectomy was done in 11 patients for adequate mobilization and apposition of proximal and distal stump of urethra. All 9 patients who needed re-do anastomosis after previous failure of urethroplasty, required inferior pubectomy. After excision of stricture, cystoscope inserted proximally to see any associated bladder neck injury and bladder wall pathology. Proximal lumen was confirmed by inserting bougie dilator through SPC site. Spatulation ensures an anastomosis of wide calibre. Both sides of urethral stumps were anastomosed with 8 interrupted suture, using 4/0 vicryl. We did not perform supra-crural re-routing in any patient as we were able to get adequate length of both ends of the urethra to perform tension free anastomosis. A 14 Fr Foley catheter was placed in urethral lumen and 16 Fr catheter in SPC site. A latex strip drain was placed for perineal wound. Drain was removed after 48 hours of operation and fresh dressing done on 3rd POD. Patients were usually discharged in between 4th to 5th POD with definite follow up protocol and medications with SPC and per urethral catheters in situ. 5 patients who had wound infections and 2 patients with scrotal hematoma were discharged on an average of 10th POD after proper wound care. On 22nd POD urethral catheter was removed. SPC was removed on the next day if patient can void normally. The critical surgical goals, which were followed here, are: liberal distal mobilization of the corpus spongiosum from the corpora cavernosa, complete excision of existing fibrotic scar, and achievement of a tension free anastomosis apposing urethral epithelium to prostatic epithelium.

Complete excision of periurethral scar tissue is the most important detail for achieving a successful outcome from posterior urethral reconstruction.

1st and 2nd follow up were done at the completion of 3rd and 6th month respectively. During each follow-up; clinical history, physical examination, urine routine microscopic examination and culture, serum creatinine, uroflowmetry were performed. During 2nd follow-up at 6th month RGU and MCU were done if there was significant urinary obstruction on uroflowmetry. The prevalence of post-operative sexual disorders was investigated using the International Index of Erectile Function-5 questionnaire during follow-up. Evaluations were performed at three time points: pre-injury, 1st follow-up at 3rd month, 2nd follow-up at 6th month. For evaluation of pre-injury erectile function, the patients were asked to recall their erectile function before trauma.

Data were collected in a pre-designed and pretested semi structured data collection sheet.

Results

Among 147 perineal anastomtic urethroplasty performed, 11 required inferior pubectomy. Success rate of perineal anastomotic urethroplasty for PFUI was 93.87% (138 out of 147 patients) and failure rate was 6.12% (9 out of 147 patients). All 9 patients who underwent re-do anastomosis did not develop any recurrent stricture or fibrosis after 6 months of follow-up. The mean (SD) maximum urinary flow rate assessed by uroflowmetry at 3rd month after surgery, was 20.52 (5.1) ml/s.

Table I: Demographic variables

No. of patients	147
Mean (range) age, years	37 (7-72)
Co-morbidity, <i>n</i>	
Diabetes mellitus (type-II)	2
Hypertension	4
Previous treatment, <i>n</i>	
Urethroplasty	9
Interval between pelvic trauma to urethroplasty, months	6-15

Urethral strictures recurred in 7 patients (4.7%), including 5 (3.4%) case during first follow-up at 3rd month and 2 (1.3%) cases recurring between 3 to 6 months after surgery and did not improve after periodic dilatation, internal urethrotomy; so they required re-anastomosis. Urinary incontinence developed in 2 (1.3%) patient who was diabetic during first follow-up, but after conservative treatment patient improved during second follow-up at 6th month. Urethro-cutaneous fistula developed in 2 patient during first follow-up and did not improve during second follow-up after 6 months; and therefore required re-anastomosis. Erectile dysfunction (ED) was present in 18 patients after trauma, before surgery and after surgery the number increased to 30 during first follow-up. So, they were treated with Tadalafil (5 mg) once daily dose during first follow-up. At 6th month 6 patients found improved. These 6 patients did not have pre-operative ED.

Table II: Complications of posterior perineal bulbo-prostatic anastomotic urethroplasty for PFUI

Complications	1st F/U at 3rd month n (%)	2nd F/U at 6th month n (%)
Recurrent stricture	5 (3.4%)	2 (1.3%)
Incontinence	1 (0.6%)	0
Urethro-cutaneous fistula	2 (1.3%)	2 (1.3%)
Erectile dysfunction	30 (20%)	24 (16.3%)

Discussion

Perineal Urethroplasty is difficult to perform and had been a challenge since long.¹⁷ First end-to-end urethroplasty was performed by Heusner in 1883, initial success with stricture excision and sutured anastomosis was poor.¹⁸ Waston and Cunningham reviewed 13 patients in 1908 more than 1 year after surgery and found only five patients who had satisfactory.¹⁹ centers. One article published by Subhani GM et al. showed his success rate 87.5%.¹⁷ Gorraz Ortizma et al. evaluated long term results of end-to-end Urethroplasty and obtained 92% results.²⁰ In our study the outcome of perineal anastomotic urethroplasty is fairly good and success rate was 93.87%. The results were classified as successful when the patient voided well, Qmax>15 mL/s. The need for periodic dilation, optical urethrotomy, or repeat urethroplasty was considered failure. Our failure rate was 6.12% which is nearly similar, carried out in most advanced center. We had a Previous studie which revealed success rate 87%. So in time our success rate improved due to increased skill of surgeon. Orabis S. did Urethroplasty in children with good result.¹⁷ In our study we did not compare the results of children with adults. There are some complications, such as Urethro-cutaneous fistula, failed anastomosis and erectile dysfunction we have encountered. The major cause of recurrence is the incomplete excision of the scar tissue around the urethra during surgery. In our study, most recurrences were short in length, occurred at the anastomotic site and responded to optical urethrotomy or again anastomotic urethroplasty. Similarly, other investigators have reported successful endoscopic management of recurrent anastomotic strictures and attributed this success to the short length of the stricture as well as a decrease in periurethral fibrosis after perineal repair.^{21, 22} We are concerned about erectile dysfunction and we will do further study for reducing the rate of iatrogenic erectile dysfunction.

We agree that urethral anastomosis should initially be attempted by a perineal approach alone. More recently, we have found inferior pubectomy to be adequate in most instances when some form of pubectomy is indicated. Most strictures were amenable to direct anastomosis without pubectomy. We believe that careful and complete excision of periurethral scar tissue is the single most important detail for achieving a successful outcome for posterior urethral reconstruction.

The present study has got some limitations. There was a selection bias because this study did not include patients with anterior urethral stricture or injury, rectal fistula, false passage and bladder neck injury. We did not measure the stricture length of the urethral injury preoperatively. The relation of ED with operative procedure was not measured statistically. Finally, the follow-up duration was only 6 months and if we can follow-up for longer period like one year or more, recurrence rate may be a little higher.

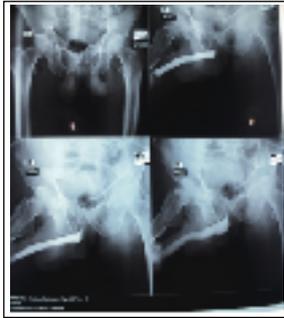


Figure 1: X-ray RGU & MCU.

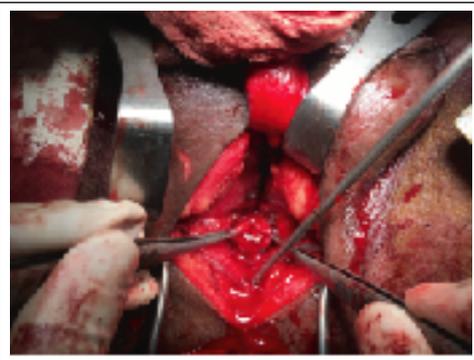


Figure 2: Stricture segment.

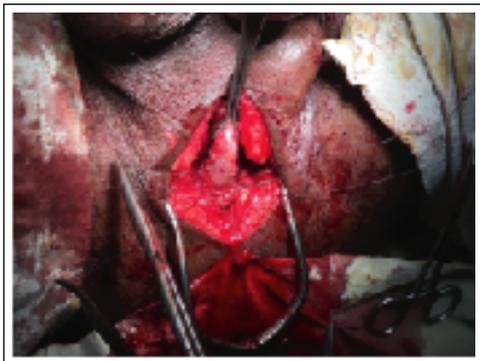


Figure 3: After anastomosis.

Conclusion

Pelvic fracture urethral injuries are challenging for urologists to treat. The success rate of this operation always more than 90% in developed countries but in our country we find a good number of patients are always recycling and we even do not

know the exact statistics of these patients. This study give us idea about outcome of these patients in one of the major institutes of the country and what can be done in future to improve the outcome. If we can follow up these patients for a period of 5 to 10 years and by the time manage complications, this can give us valuable information to formulate further definitive management plan for them.

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