

OUTCOME OF PERINEAL ANASTOMOTIC URETHROPLASTY IN THE MANAGEMENT OF PELVIC FRACTURE URETHRAL INJURY

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Abstract:

Purpose: This study aims at finding the outcome and complications of perineal end to end posterior anastomotic urethroplasty in the management of posterior urethral injury resulting from pelvic fracture.

Methods: We performed 49 perineal bulbo-prostatic anastomotic urethroplasty for PFUIs from January, 2013 to April, 2017. Mean age was 37 years with majority between 21 to 50 years (>85%). All were male patients. Three patients had history of failed anastomotic urethroplasty. Patients were selected as per selection criteria; detailed history and pre-operative investigations were done and were prepared for operation after adequate counseling. 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 of 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 perineal bulbo-prostatic anastomotic urethroplasty for pelvic fracture urethral injury was 89.79%. Total 5 procedures were failed including 1 urethrocutaneous fistula and needed re-do anastomosis. Erectile dysfunction (ED) was present in 6 patients before operation and after surgery 4 more patients developed ED and total number was 10 during first follow up, which reduced to 8 during second follow-up. One patient developed incontinence which improved in subsequent follow-up.

Conclusions: Anastomotic urethroplasty remains the cornerstone in the management of PFUI. A long term follow-up for at least 5 to 10 years is needed to make a comment on ultimate outcome of this procedure which may have positive impact in future patient management.

Key Words: 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. Pelvic fracture urethral injuries (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

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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 prostatomembranous disruptions[7], most injuries occur at the bulbomembranous junction[8,9,10]. 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 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 pelvic fracture urethral injury, 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 49 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 suffering from PFUI with suprapubic catheter in situ and underwent anastomotic urethroplasty within the period of January, 2013 to April, 2017. Total 53 patients were selected and these were considered as the study population. Among them 4 were excluded as they were lost to follow-ups. So, 49 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 12 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. 1 patient was diabetic and 2 patients were hypertensive. 3 patients had history of failed anastomotic urethroplasty and re-do anastomoses were done. Minimum interval from pelvic fracture to urethroplasty was 12 months (range:12-15) [Table 1]. Pre-operative evaluation included clinical history, physical examination, urine culture, uroflowmetry 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 ($n=7$) with removal of bone tissue at the bottom side of the pubis to accomplish tension free anastomosis. Partial pubectomy was done in 5 patients and complete pubectomy was required in two patients for adequate mobilization and apposition of proximal and distal stump of urethra. All 3 patients who needed re-do anastomosis after previous failure of urethroplasty, required inferior pubectomy. Among them, 2 patients had partial pubectomy and 1 patient had complete 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. Because the anterior prostate is much thinner than its posterior aspect, we spatulated anteriorly on the prostatic urethra and posteriorly on the opposing bulbar urethra. Spatulation ensures an anastomosis of wide calibre. Both sides of urethral stumps were anastomosed with 6-8 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 post-operative day (POD). Patients were usually discharged in between 5th to 7th POD with definite follow up protocol and medications with supra

pubic catheters (SPC) and per urethral catheters in situ. 3 patients who had wound infections and 1 patient with scrotal hematoma were discharged on an average of 14th POD (13th-15th) after proper wound care by regular dressing and secondary closure of perineal wound. 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 & culture, serum creatinine, uroflowmetry were performed. During 2nd follow-up at 6th month retrograde urethrogram & micturating cystourethrogram (RGU & MCU) was done additionally. 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 timepoints: 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; direct input was given in MS Excel and MS Access data entry form.

Results

Among 49 perineal anastomotic urethroplasty performed, 5 required partial pubectomy and 2 patients required complete pubectomy. Success rate of perineal anastomotic urethroplasty for posterior urethral distraction defect was 89.79% (44 out of 49 patients) and failure rate was 10.21% (5 out of 49 patients). All 3 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	49
Mean (range) age, years	37 (7-72)
Co-morbidity, <i>n</i>	
Diabetes mellitus (type-II)	1
Hypertension	2
Previous treatment, <i>n</i>	
Urethroplasty	3
Interval between pelvic trauma to urethroplasty, months	12-15

Urethral strictures recurred in 4 patients (8%), including 1 (2%) case during first follow-up at 3rd month and 3 (6%) cases recurring between 3 to 6 months after surgery and did not improve after periodic dilatation, internal urethrotomy; so they required re-anastomosis. These are not included in this study. Urinary incontinence developed in 1 (2%) 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 1 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 10 patients. Among them 6 already had ED after trauma before surgery and after surgery the number increased to 10 during first follow-up. So, they were treated with Tadalafil (5 mg) once daily dose during first follow-up. At 6th month 2 patients found improved. These 2 patients did not have pre-operative ED (Table II).

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

Complications	1st F/U at	2nd F/U at
	3rd month	6th month
	<i>n</i> (%)	<i>n</i> (%)
Recurrent stricture	4 (8%)	4 (8%)
Incontinence	1 (2%)	0
Urethro-cutaneous fistula	1 (2%)	1 (2%)
Erectile dysfunction	4 (8%)	2 (4%)

Discussion

The outcome of perineal anastomotic urethroplasty is fairly good. Previous studies also revealed high success rate of this procedure for pelvic fracture urethral injuries. Urethro-cutaneous fistula and failed anastomosis needed re-anastomosis. The results were classified as successful when the patient voided as before the original trauma, Qmax>15 mL/s and urethrography showed a wide caliber urethra at the site of repair. In our study, success rate was 89.79%.

The results were classified as failure if patient could not void as before the trauma or Qmax< 15ml and narrowing or arrest of contrast medium was demonstrated at the site of repair on urethrography. The need for periodic dilation, optical urethrotomy, or repeat urethroplasty was considered failure. Our failure rate was 10.21% which is little higher than normal, carried out in most advanced centers.

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, and we now perform complete pubectomy only in the most severe cases. We have performed complete pubectomy in only 2 (4%) cases. 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. Another limitation is its descriptive nature. We did not measure the stricture length of the urethral injury preoperatively. The changes in the recurrence of the strictures over time were not quantified. 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.

Conclusion and recommendations

Pelvic fracture urethral injuries are challenging for urologists to treat. Since development of anastomotic urethroplasty, it has been possible to resolve this cumbersome problem to a great extent. We can see that 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.

We went for this type of study so that it can 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. Although this procedure is associated with multiple complications, they are avoidable to a great extent by meticulous preoperative evaluation to define the anatomy, and careful intraoperative manipulation. If we can follow up these patients for a period of 5 to 10 years and by the time manage complications they develop, this can give us valuable information to formulate further definitive management plan for them.

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