



## Management of Pelvic Fracture Urethral Injury in Pediatric Patients

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### Abstract:

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**Purpose:** Pediatric urethral surgery represents a significant surgical challenge due to smaller pelvis, decreased caliber and increased tissue fragility. 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.

**Methods:** We performed 47 perineal bulbo-prostatic anastomotic urethroplasty for PFUIs from January, 2013 to January 2020. Mean age was 13 years with majority between 10 to 18 years (>85%). All were male patients. Two patients had history of failed anastomotic urethroplasty. Patients were selected as per selection criteria 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 22<sup>nd</sup> POD urethral catheter was removed and SPC on the next day if patient can void normally. 1<sup>st</sup> and 2<sup>nd</sup> follow up done on of 3<sup>rd</sup> and 6<sup>th</sup> 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 91.47%. Total 4 procedures were failed including 1 urethro-cutaneous fistula and needed re-do anastomosis. We could not evaluate erectile dysfunction (ED) as many patients were unable to give appropriate information. Two patient developed incontinence which improved in subsequent follow-up.

**Keywords:** .Perineal bulbo-prostatic anastomotic urethroplasty, Posterior urethral injury, Pelvic fracture urethral injury (PFUI), Supra-pubic catheter (SPC), Erectile dysfunction (ED).

**Conclusions:** Anastomotic urethroplasty remains the gold standard in the management of PFUI. Operative series of pediatric urethral reconstruction usually involve small numbers. Experiences of anastomotic urethroplasty in large volume adult series reflects the higher outcome in pediatric patients.

### Introduction

Pediatric pelvic fractures are uncommon injuries, accounts for 1-2% of pediatric fractures.<sup>1</sup> Urethral trauma producing stricture disease in pediatric patients most often results from fracture of the pelvis, straddle

injuries or iatrogenic urethral manipulation,<sup>2</sup> but results in devastating effect. In childhood, the majority of pediatric pelvic fracture urethral injuries (PFUI) occur as pedestrians hit by a motor vehicle rather than as passengers of a vehicle involved in an accident.<sup>3-5</sup>

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Pediatric PFUIs have similar pattern to adult pelvic fracture urethral injuries, but some key points should be kept under consideration. Some authors have inferred that the location of the traumatic urethral injury in children is less predictable due to the abdominal position of the bladder and immaturity of the prostate.<sup>6</sup> Further factors to consider in pediatric patients include: (a) urethral distraction defects tend to be longer than in adults because of marked upwards displacement of the bladder and prostate, (b) double injuries at the bladder neck and the membranous urethra are more frequently observed and (c) prepubertal perineum size may make it difficult to reach a high lying proximal urethral end.<sup>7-9</sup> Principles of repair of PFUIs in children are the same as in adults. However, children differ in having a more abdominally located bladder and prostate, smaller pelvis, decreased caliber and increased tissue fragility. Because of these differences it has been claimed that transperineal anastomotic urethroplasty is successful in adults and technically more difficult in children.<sup>10,11</sup> As a result, reported complications associated with anastomotic urethroplasty include urinary incontinence, erectile dysfunction (ED), rectal injury, urethro-cutaneous fistula, postoperative recurrence of stricture are problems with this procedure.<sup>12</sup>

We present here our experience of perineal anastomotic urethroplasty in children with pelvic fracture urethral injury (PFUI).

### Patients and method

This is a prospective study of outcome after perineal anastomotic urethroplasty in patients with PFUI. Patients were admitted in department of Urology of Dhaka medical college hospital (DMCH) suffering from PFUI and underwent anastomotic urethroplasty. Our primary management strategy is fixation of a suprapubic catheter and definitive repair at least after 3 months, which is recommended by many authors.<sup>13,14</sup> Some prefer to do repair after 6 months of injury.<sup>15</sup>

We performed 47 perineal bulbo-prostatic anastomotic urethroplasty for PFUIs from January, 2013 to January 2020. Mean age was 13 years ranging within 10 to 18 years. All were male patients. Two patients had history of failed anastomotic urethroplasty. 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 with their respective guardians. All patients underwent perineal spatulated end to end anastomotic urethroplasty in lithotomy position. A stepwise approach for urethral mobilization was used consisting of complete circumferential mobilization of urethra, separation of crura to accomplish tension free anastomosis. Proximal lumen was confirmed by inserting bougie dilator through SPC site. After excision of stricture, cystoscope inserted proximally to see any associated bladder neck injury and bladder wall pathology. Neither supra-crural re-routing nor inferior pubectomy was done in any patient. Spatulation ensures an anastomosis of wide calibre. Both sides of urethral stumps were anastomosed with 8 interrupted suture, using 5/0 vicryl. During intervention patients were given 10 Fr size silicone supra-pubic catheter (SPC) and per urethral 8 Fr size silicone catheter. Drain tube was placed in perineal space before closure.

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. Two patients who had wound infections and 2 patients with scrotal hematoma were discharged on an average of 10th POD after proper wound care. On 22<sup>nd</sup> POD urethral catheter was removed and SPC 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. Complete excision of periurethral scar tissue is the most important detail for achieving a successful outcome from posterior urethral reconstruction.

If patient voided well and  $Q_{max} > 15 \text{ ml/sec}$ ; repair was defined as successful. 1<sup>st</sup> and 2<sup>nd</sup> follow up were done on 3<sup>rd</sup> and 6<sup>th</sup> month respectively following surgery. During each follow-up; clinical history, physical examination, urine routine microscopic examination, uroflowmetry were performed. During 2<sup>nd</sup> follow-up at 6th month RGU and MCU were done in 4 patients as they had significant urinary obstruction on uroflowmetry.

**Results**

All patients underwent perineal anastomotic urethroplasty without inferior pubectomy and supra-crural re-routing. The operative time ranged between 100 and 300 min (mean 200 min). Overall intraoperative blood loss ranged between 80 and 500 cc with a mean of 290 cc. The stricture length and location were analysed by reviewing urethrography and operative details; the length of the distraction defect or stricture ranged between 2.2 and 5 cm (mean 2.4 cm).

**Table I: Demographic variables.**

|   |            |
|---|------------|
| Total number of patients (n)                          | 47         |
| Mean Age (Range), year                                | 13 (10-18) |
| Previous failed urethroplasty (n)                     | 2          |
| Duration from trauma to definitive repair (n), months | 3-6 months |

Distal mobilization of the urethra and separation of corporeal bodies were used in all of our patients. Success rate of anastomotic urethroplasty for PFUI was 91.47% (43 out of 47). Patients were discharged after 5<sup>th</sup> POD, except 2 patients were discharged after 2 weeks who developed wound infection. During immediate post-operative period 2 patients had wound infection at 5<sup>th</sup> POD and 2 patients were found to have urinary incontinence on 1<sup>st</sup> follow-up at 3<sup>rd</sup> month which resolved during 2<sup>nd</sup> follow-up at 6<sup>th</sup> month. Total 4 procedures failed including 3 recurrent stricture at 6<sup>th</sup> month of follow-up and 1 urethro-cutaneous fistula and needed re-do anastomosis. During 2<sup>nd</sup> follow-up at 6<sup>th</sup> month RGU and MCU were done in these 4 patients as they had significant urinary obstruction on uroflowmetry. The mean (SD) maximum urinary flow rate assessed by uroflowmetry at 3<sup>rd</sup> month after surgery, was 22.52ml/s. There was no chordae, urethral shortening or urethral diverticula during the follow-up.

We could not evaluate erectile dysfunction (ED) as many patients were unable to give appropriate information. Intermittent catheterization was not required in any patient to maintain patent urethra on follow-up.

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

| Complication              | 1 <sup>st</sup> follow-up (n) at 3 <sup>rd</sup> month | 2 <sup>nd</sup> follow-up (n) at 6 <sup>th</sup> month |
|---------------------------|--|--|
| Recurrent stricture       | 3  | 3  |
| Urinary incontinence      | 2  | 0  |
| Urethro-cutaneous fistula | 1  | 1  |

**Discussion**

Paediatric pelvic fracture urethral injury represents an uncommon but difficult urological problem. Perineal Urethroplasty is difficult to perform and had been a challenge since long.<sup>16</sup> The aim of urethral reconstruction for children with PFUI is to restore urethral continuity with an adequate caliber and minimal life-long complications, as recurrent strictures, incontinence or erectile dysfunction.<sup>7</sup>

At the present day, there is almost complete consensus that restoration of urethral continuity in children and adults with PFPUIs by anastomotic bulbo-prostatic repair is the gold standard procedure, provided the anterior urethra is healthy.<sup>7, 17,18,19</sup> Success in anastomotic urethroplasty is dependent on adequate surgical exposure, excision of all fibrous tissue, mobilization of the normal urethra, fixation of healthy mucosa at the edges of the bulbar and prostatic urethral and performing a tension-free spatulated anastomosis, when appropriate blood supply is present through the urethra.<sup>20,21</sup>

In our study, success rate is 91.47% which is compatible with the large series of post-traumatic membranous urethral disruptions in children reported by Koraitim,<sup>7</sup> which had a high success rate (93%) using the perineal approach. Success rate was 80% in a study conducted by El-Sheikh in 15 pediatric patients.<sup>22</sup> Hafez et al. reported an 89% success rate in 35 children with posttraumatic urethral strictures managed by perineal anastomotic urethroplasty.<sup>23</sup> Singla et al. in 28 patients with PFUI whose mean age was 12 years at the time of injury, performed perineal anastomotic repair in 27 cases, with a success rate of 75%.<sup>24</sup> Urethral dilatation and internal urethrotomies for PFUIs are not acceptable in children; reported results have been poor, and patients undergoing these procedures required additional surgical operations.<sup>25, 26</sup>

In this study, four patients had failed anastomotic urethroplasty (8.51%) including 3 patients had recurrent strictures and 1 urethro-cutaneous fistula. Podesta conducted a study where 15 boys with PFUIs treated with perineal bulboprostatic anastomosis where failed anastomotic urethroplasty was in 4 patients, 1 patient developed incontinence.<sup>15</sup>

In the present series all bulbar urethral strictures and membranous urethral disruptions were reconstructed through a single perineal incision, with no retropubic or transpubic dissection. We do not favour a transpubic

approach, and at least in one large series of adult posterior strictures it has not been necessary.<sup>27</sup> The increased morbidity of the transpubic approach was described in adults.<sup>28</sup> Difficulties during stricture repair because of the smaller urethra in children are offset by a shorter stricture and more superficial placement of the urethra in the perineum.

Even though the longer the follow-up period the better the assessment of durability of repair, many authors have concluded that most if not all failures after anastomotic urethroplasty occur within the first postoperative year, and the results are sustained thereafter.<sup>14</sup> Other studies also reported early rather than delayed failures. Corriere in his study of 60 cases of bulboprostatic anastomosis limited the follow-up to only 1 year.<sup>29</sup> Also, Hafez et al. revealed in his study that all the treatment failures were at the anastomosis and were within the first year.<sup>23</sup> In our study, the failures were reported during first follow-up at 3rd month.

Open reconstruction of urethral strictures in children has generally given satisfactory results, but most published series of open perineal urethral reconstruction in children have included few patients<sup>30-33</sup> or had only a short follow-up duration.<sup>9, 34, 35</sup> This series also included 47 patients and follow-up was for 6 months.

### Conclusion

Though urethral injury is rare in children, but remains an important cause of morbidity. As evidenced in this review and comparing with other studies, delayed open reconstruction by end-to-end tension free anastomosis through perineal incision is the gold standard technique to treat pediatric PFUI. Experiences of anastomotic urethroplasty in large volume adult series reflect the higher outcome in pediatric patients. But so far the evidence suggests, open urethral reconstruction of pediatric urethral injury is associated with excellent long-term results with minimal patient morbidity.

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