Transperineal bulboprostatic anastomotic repair of pelvic fracture urethral distraction defect and role of ancillary maneuver: A retrospective study in 172 patients

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Abstract

Objective: We present our experience with transperineal bulboprostatic anastomosis procedure and compare the results with age of patients, length of urethral stricture, effect of previous treatment and need for ancillary procedures.

Materials and Methods: We retrospectively reviewed the outcome of 172 patients who underwent perineal urethroplasty procedure for traumatic stricture in our institute. Simple perineal anastomosis was done in 92 patients. Perineal anastomosis and corporal separation were done in 52 patients. Perineal anastomosis with inferior pubectomy was done in 25 patients. Perineal anastomosis with rerouting was done in three patients. Age, prior treatment, length of stricture, and ancillary techniques required during reconstruction were compiled. The clinical outcome was considered as failure when any postoperative instrumentation was needed.

Results: Out of 172 cases that underwent transperineal urethroplasty procedure, 157 (91.28%) were successful. Simple perineal urethroplasty procedure showed a success rate of 93.4%, perineal anastomosis with separation of corporal bodies had a success rate of 90.4%, perineal anastomosis with inferior pubectomy had a success rate of 88% and perineal anastomosis with rerouting of urethra around the corpora had a success rate of 66.7%.

Conclusion: The success rate of delayed progressive perineal urethroplasty procedure for post-traumatic stricture urethra is excellent and majority of the failures occurs in prepubescent boys and in those undergoing secondary repair.

Key Words: Ancillary maneuver, pelvic fracture, perineal urethroplasty, urethral stricture

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INTRODUCTION

Posterior urethral injury most commonly occurs as a consequence of pelvic fracture and may occur in up to 10% of cases.[1]

In 1977, Turner-Warwick popularized a distinction between simple and complex posterior urethral strictures resulting from pelvic fracture urethral distraction defect (PFUDD). Most post-traumatic strictures are simple and are suitable for one stage transperinal bulboprostate anastomosis. Complex stricture associated with fistula, false passage, chronic periurethral abscess, osteomyelitis or damage to bladder neck may require a more extensive abdominoperineal approach.[2]

The aim of surgical reconstruction for urethral stricture is to provide an adequate caliber, compliant and stable urethra. In 1983, Webster and Raman popularized an elaborated perineal approach for the reconstruction of pelvic fracture related urethral distraction injury in which urethral mobilization is augmented by progressing through additional steps of corporal splitting, inferior pubectomy and supracrural urethral rerouting,

as needed, to bridge long or complex urethral defect.[3] In 1990s, this approach became the gold standard for the treatment of traumatic posterior urethral stricture.[4]

In 2003, Flynn *et al.* reported the long-term result of this progressive one stage perineal anastomosis repair in 120 patients with PFUDD.[4] This technique was successful in 95% of adults, 73% of prepubescent boys and 86% of patients undergoing secondary repair.

Conversely, Kizer *et al.* suggested that ancillary procedures such as corporal splitting, inferior pubectomy and corporal rerouting are seldom required for successful posterior urethral reconstruction.[5]

Earlier reports regarding the role of ancillary maneuver in transpeirneal bulboprostatic anastomotic repair of PFUDD are not uniform. Some authors recommended this procedure while others suggested that the ancillary procedures are seldom required for successful posterior urethral reconstruction. Also, records of most of the previous studies on measurement of outcome after urethroplasty relied on qualitative data in follow up rather than quantitative data and there are very few studies from developing countries, where incidence of PFUDD is more, than those from developed countries.

Therefore, we planned retrospectively to review our experience in Indian population that underwent transperineal bulboprostatic anastomosis, in respect of patient age, length of urethral stricture, effect of previous treatment and need for ancillary procedures.

MATERIALS AND METHODS

From January 2002 to December 2008, a total of 172 male patients, who underwent transperineal bulboprostatic anastomotic urethroplasty for traumatic posterior urethral stricture, were retrospectively reviewed at our institute. Average patient age was 34 (range 5–68) years. Blunt injury with pelvic fracture was caused by roadside accidents in all the patients. Preoperative evaluation included history, physical examination, complete urine analysis, urine culture, retrograde and voiding cystourethrography. The length of stricture was measured by a combined film of retrogradeurethrography and micturating cystourethrography, and was also confirmed by urethroscopy and antegrade cystourethroscopy via suprapubic tract, simultaneously at the time of surgery. The malleable semirigid strip was used for measurement. Delayed transperineal bulboprostatic urethroplasty was performed 3–12 months (mean 5 months) after pelvic injury or previous failed urethroplasty. Out of 172 patients, 38 had previously undergone internal urethrotomy and 37 had previously undergone perineal urethroplasty procedure. Broad spectrum antibiotics were given before induction of anesthesia in all patients.

Urethral reconstruction techniques

All the patients were placed in exaggerated lithotomy position. The operative technique comprises four sequential maneuvers to achieve a tension-free anastomosis.

Simple perineal anastomosis (92 patients, group 1)

All the patients underwent vertical perineal incision. The bulbar urethra was completely mobilized and transected at the distal extent of the stricture. The stricture was excised under the guidance of metallic sound in the proximal urethra through the suprapubic cystostomy tract. Periurethral fibrosis was accessed. All scars and fibrotic tissue occupying the distraction defect were excised with a scalpel blade.

Perineal anastomosis with corporal separation (52 patients, group II)

Cavernosa septum was incised in midline plane beginning from crus to approximately 4–5 cm and distal urethra was inserted through the septum. This maneuver reduced the tension of end to end anastomosis.

Perineal anstomosis with inferior pubectomy (25 patients, group III)

In this maneuver, after displacing the dorsal vein. a wedge of bone was excised from the inferior aspect of the pubis. This allows the urethra to be redirected cephalad resulting in an additional 1–2 cm of apparent urethral length. Hemostasis was achieved with bone wax.

Perineal anastomosis with rerouting of urethra around the corpora cavernosa (3 patients, group IV)

This final maneuver involved rerouting the urethra around the corporal body through a bony defect created by further pubectomy, shortening the distance to anastomosis up to an additional 2 cm.

In all cases, distal urethral end spatulated at 12 o'clock position and proximal urethra spatulated at 6 o'clock position (posterior) to achieve anastomosis of approximately 40 Fr. A tension-free mucosa to mucosa anastomosis was performed with eight interrupted sutures of 4-0 polyglycolic acid over a 18-F silicon catheter. Corrugated drains were placed which were removed after 48 hours of surgery. Stitches were removed on the eighth postoperative day. Pericatheter retrograde urethrogram was performed 3 weeks after repair, and if there was no extravasation, the urethral catheter was removed.

Suprapubic catheter was removed on the same day of removal of urethral catheter, when patient voided smoothly.

Outcome analysis

Postoperative retrograde urethrogram was performed at 3 weeks, 3 months and 12 months after surgery. The uroflowmetry was done at yearly follow up. Charts were reviewed for age of patients, prior treatment, ancillary techniques used during reconstruction, length of defect and erectile function. Surgical outcome and need for subsequent procedure were also analyzed. The mean follow-up period was 26 months (range 12–42 months).

Urethroplasty was considered successful when the patient was voiding well and did not require any further intervention.

Urethroplasty was considered a failure in the following cases:

1. If the stricture remained
2. If there was recurrent stenosis
3. The patient needed repeated urethral dilatation
4. There was a necessity of clean intermittent catheterization.

Statistical analysis was done by using chi-square test.

RESULTS

In this study, 71 patients had bulbomembranous, 64 had membranous and 37 had bulboprostatic strictures (recurrent). Out of 172 perineal urethroplasty procedures, 157 (91.28%) were successful and 15 (8.72%) were unsuccessful. Simple perineal anastomosis without ancillary procedure was successful in 93.47% (86/92) of the patients and unsuccessful in 6.53% (6/92) of the patients [Table 1]. Patients with bulbomembranous stricture had better success rate than those with membranous and bulboprostatic strictures in our study.

Among the 15 unsuccessful cases, 8 were successfully salvaged by redo-urethroplasty. Four patients had a satisfactory outcome with internal urethrotomy. Three patients were awaiting further treatment.

Success rate was 80% in five patients of age 5–15 years with statistically significant difference between <15 years of age and other groups ($P = 1.90 \times 10^{-18}$, <0.05) [Table 2].

Success rate according to stricture length showed that short stricture had a better success rate than larger one but it also showed a statistically insignificant difference between urethral stricture length between 3–10 and <3 cm (P=0.92, >0.05) [Table 3].

The recurrent stricture patients had a stricture length of 0.5–3.5 cm (mean 2.1 cm) and at the bulboprotatic anastomotic site. Duration after initial repair was 3–9 months.

Success rate was 94.8% in patients who had not undergone previous treatment and 86.65% in patients who had undergone previous treatment and was statistically insignificant (P=0.059, >0.05) [Table 4].

Continence

All the patients were continent after urethroplasty procedure.

Effect on erectile dysfunction

Data on preoperative and postoperative erectile functions were available in 150 patients. All stated that they were sexually active before trauma and 60 patients (40%) reported significant erectile dysfunction after the trauma. After urethroplasty, 12 patients (8%) had diminished erectile function. Details of patients' evaluation and treatment records of the erectile dysfunction were not available.

DISCUSSION

In developing countries, more patients are reported with PFUDD due to prevalent agricultural activity. Also, accidents on the work site have not dramatically lessened and bicycles

Table 1: Success rate according to surgical techniques

Group	No. of patients	Surgical procedure	Success rate
1.	92	Simple perineal anastomosis	86 (93.47)
2.	52	Perineal anastomosis with separation of the corporal body	47 (90.38)
3.	25	Perineal anastomosis with inferior pubectomy	22 (88)
4.	3	Perineal anastomosis with rerouting of the urethra around the corpora cavernosa	2 (66.67)

Figures in parentheses are in percentage

Table 2: Success rate according to patient age

Patients age (in years)	No. of patients	Success rate
5–15	5	4 (80)
16–40	120	110 (92)
41–60	36	33 (91.6)
>60	11	10 (90.9)

Figures in parentheses are in percentage

Table 3: Success rate on the basis of stricture length

Stricture length (cm)	No. of patients	Success rate
<1	52	49 (94.2)
1–2	56	52 (92.8)
2–3	42	38 (90.5)
3–10	22	18 (81.8)

Figures in parentheses are in percentage

Table 4: Success rate according to previous treatment

Previous treatment	No. of patients	Success rate
None	97	92 (94.8)
Urethrotomy	38	33 (86.8)
Urethroplasty	37	32 (86.5)

Figures in parentheses are in percentage

and motor cycles are the most popularly used vehicles.[6]

Surgery for posterior urethral stricture is beset with problems of access, limited urethral length, surrounding fibrosis and the small caliber of the bulbar urethra that is susceptible to ischemic insult.[7] Recently, Koraitim determined the influence of bulbar urethral length on the outcome of bulboprostatic anastomosis.[8]

Optimal timing (immediate vs. delayed) and surgical approach (endoscopic vs. open) of PFUDD remain controversial. Some advocate immediate urethral realignment[9,10] and some suggest suprapubic cystostomy alone at the time of injury with delayed repair of the ensuring distraction defect.[11] There are circumstances in which immediate surgical exploration with pelvic hematoma evacuation and urethral realignment is generally indicated. These include concomitant bladder neck injury, severe prostatomembranous dislocation with pie in the sky bladder or rectal injury.[2,11] Immediate open realignment of these injuries is associated with an unacceptable high morbidity and a high incidence of recurrent stricture (69%), urinary incontinence (20%) and erectile dysfunction (40%).

In our experience and as reported by others, delayed repair is invariably accomplished with a perineal approach resulting in stricture free healing and minimal associated morbidity.[3,11,12,13,14]

Delayed endoscopic cut to the light techniques for PFUDD has been performed primarily for short stricture.[15] The exact role of this approach needs to be established with respect to which distraction defects (in terms of length ,etiology and prior treatment) are amenable to this management and what the optimal timing for this intervention is.[4] Many of these patients subsequently require urethrotomy and self-calibration and this outcome must be objectively compared to contemporary series of delayed perineal repair with their predictable success rate in excess of 90% and minimal morbidity.[3,11,14] Furthermore, as in the series of delayed perineal repair, successful outcome should be defined as urethral patency independent of periodic self-calibration.[3,11,14]

In this study we included the patients of simple posterior urethral stricture as defined in classification by Turner-Warwick 1977.[2] We evaluated our results according to factors that are reported to influence the result of urethroplasty, which are patient's age, stricture length and previous treatment.

Children and prepubescent boys in our study had a lower success rate than that of adults, similar to some earlier reports. Prepubescent patients may have insufficient vascular connection in the glans, resulting in inadequate retrograde blood flow to the distally based bulbar urethral flap. This compromised retrograde blood flow to the anastmotic site and may explain the lower success rate.[7] For this reason, posterior urethroplasty in children still represents a difficult problem. In our series, children and preadolescent boys (5–15 years) showed a lower success rate of 80%, whereas adults had a success rate of more than 90% and it was statistically significant.

In our study, success rates were 94.2, 92.8, 90.5 and 81.8% for <1, 1–2, 2–3 and >3 cm stricture lengths, respectively. The relation of the success rate to stricture length showed that short stricture had a better success rate than larger one but not statistically significant. Strictures of 1–2 or 2–3 cm lengths had similar success rates.

In our study, only three patients required urethral rerouting to achieve a tension-free anastmosis. It is likely that the length of stricture is not the only feature influencing the surgical steps, in posterior urethroplasty[7]

Koraitim[8] suggested that the length of bulbar urethra may be a primary factor influencing the surgical steps and the outcome of bulboprostatic anastomosis. Further studies are necessary to clarify the role of stricture length (gapometry) and elastic lengthening of bulbar urethra (urethrometry).[8]

In our studies, the success rate was higher in patients who had not undergone previous treatment than in patients who had undergone previous urethroplasty, a finding which is similar to other reports.[6]

Most of our patients underwent perineal urethroplasty via urethral mobilization alone and the success rate was high (93.47%).

Kizer *et al*.[5] reported that 67% of patients requiring posterior urethroplasty were managed by direct anastomosis after scar excision and urethral mobilization alone without any ancillary procedure. Distal mobilization of bulbous urethra from external sphincter to penoscrotal junction is known to provide 4–5 cm of urethral length. This step alone should be sufficient to allow tension-free reconstruction in the majority of posterior urethral injuries.[5]

Recurrence of stricture is troublesome during follow up. The major cause of recurrence is the incomplete excision of the scar tissue around the urethra during surgery, which resulted in contracture of postoperative scar. Incomplete mobilization of distal urethra resulting in high tension on anastomosis is also a cause of postoperative stricture.

In our study, most recurrences were short in length, occurred

at the anastmotic site and responded to optical urethrotomy (four patients) or redo-perineal anastomotic repair (eight patients).

Similarly, other investigators have reported successful endoscopic management of recurrent anastomotic stricture and attributed this success to the short length of the stricture as well as a decrease in periurethral fibrosis after perineal repair.[13,14]

The limitation of this study was that our institution is a tertiary care center and most of the patients included in this study were referred from other hospitals. So, details of initial trauma severity, investigations and treatment were limited. Furthermore, in this retrospective study, detailed evaluation and treatment records for the erectile dysfunction were not available.

CONCLUSION

The results of perineal anastomotic repair of PFUDD are excellent. The progressive perineal urethroplasty approach progressing sequentially through urethral mobilization, corporal body separation, inferior pubectomy and supracrural rerouting, enables tension-free anastomosis in defects up to 10 cm. Majority of failures occur in prepubescent boys and those undergoing secondary repair.

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