

Management of Posterior Urethral Stricture in Children by Transpubic Urethroplasty

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Abstract

Background: Trauma is a major cause of morbidity and mortality in children. Management of partial or complete traumatic urethral disruptions of the posterior urethra in children and adolescents, secondary to pelvic fracture poses a challenge. Controversy exists as to the correct acute treatment of posterior urethral injuries and delayed management of PFPUDDs. TPUP is one technique with which satisfactory results have been reported in experienced hands.

Aims and Objective: To review the management of posterior urethral stricture in children by transpubic Urethroplasty.

Material and Methods: This Prospective study conducted in in Surat during the period between Jan 2007 and Dec 2018 on 12 patients who were between 4-13 years of age and who underwent Transpubic urethroplasty. On admission to hospital, a detailed history and clinical examination was carried out. Operative technique to prevent complications is emphasized. Initial management whether in the form of suprapubic diversion, primary anastomosis or any other form was noted. Management of some patients presented directly to us as pelvic fracture was noted.

Results: The present study conducted on 12 patients who underwent transpubic urethroplasty, ranging from 4 years to 13 years of age in which 9 patients were above seven years and 4 were below 7 years of age. Among all 10 patients were male and 2 were females. Data suggests that 10 patients came with vehicular accidents, one with fall while one case did not have any pelvis trauma but presented with congenital stricture of urethra. During the investigations, urine culture showed no growth in 6 cases while remaining six cases showed growth of gram-negative organisms. Urethroscopy was performed in all patients but antegrade scopy through SPC fistula was performed only in 3 patients and in one (No.12) scopy was tried from above and below but both way it was not possible due to the distortion and obliteration of normal anatomy.

Conclusion: Transpubic urethroplasty for complex posterior urethral disruptions is still a viable alternative with excellent results and minimal morbidity.

Keywords: Posterior Urethral Strictures, Transpubic Urethroplasty, Urethral Disruptions.

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Introduction

Trauma is a major cause of morbidity and mortality in children [1]. Urethral trauma producing stricture disease in pediatric

patients most often results from fracture of the pelvis, straddle injuries or iatrogenic urethral manipulation [2]. The incidence of

pelvic fracture urethral disease (PFUI) in children has been estimated to be between 1-5%; however, Tarman et al. reported in a series of 212 children with fracture of the pelvis that the occurrence of urethral lesions was <1% [3, 4].

It is a genuine surgical challenge to treat post traumatic stricture of posterior urethra especially in its complex form. Although the last 3 decades have witnessed evolution of various procedures in the management of this problem, considerable debate still exists regarding many issues. Prostatomembranous urethral rupture caused by pelvic fracture is one of the most devastating childhood injuries with an incidence varying from 5-25 % of all pelvic injuries.[5] Initial management of posterior urethral injury with rupture consists of (i) simple suprapubic urinary diversion (ii) primary urethral anastomosis or (iii) suprapubic cystostomy (SPC) plus primary realignment.[6-8] Regardless of which initial treatment is selected 25 % to 100 % of patients require secondary management because of the development of posterior urethral strictures (PUS). Transpubic urethroplasty (TPUP) is one of the versatile techniques used in the treatment of PUS.

Outlook for children with posttraumatic PUS has greatly improved in the last decade, since the introduction of new surgical techniques. TPUP is one technique with which satisfactory results have been reported in experienced hands. This study was carried out in multiple hospitals but all cases were operated by a single surgeon.

Material and Methods:

This study was conducted in Surat during the period between Jan 2007 and Dec 2018 on 12 patients who were between 4-13 years of age and who underwent Transpubic urethroplasty. On admission to hospital, a detailed history and clinical examination was carried out. Operative technique to prevent complications is emphasized.

Data pertaining to the patients, viz., name, age, sex, address, registration, date of admission, duration of indoor stay and discharge were recorded. Initial management whether in the form of suprapubic diversion, primary anastomosis or any other form was noted. Management of some patients presented directly to us as pelvic fracture was noted. Injuries to rectum, leg or any other part of body was noted. Presence of indwelling catheter, any sinus, colostomy, previous scar or injury to genitals were noted. Besides a routine hemogram, complete urinalysis was done and urine was sent for culture and sensitivity. Blood urea nitrogen, creatinine and electrolytes were also done.

Antegrade cystography and retrograde urethrography were done in all patients. These studies gave idea about the presence of stricture, length of stricture, bladder outline, associated paraurethral diverticulae, bladder diverticulae, state of fracture line and displacement of pubic symphysis from the midline.

CT scan of pelvic region was routinely done to know the bony details and with the use of contrast, pelvic organs were better visualized. 3 D computerized images further delineated the pelvic bone disposition and alignment. Postoperative micturating cystourethrography was performed in four patients only.

Cystoscopy through the suprapubic cystostomy sinus and anterior urethroscopy were performed for complete radiologic evaluation in all patients.

General anesthesia was used. Patient was placed in a supine position and a low midline incision was made that ended in a reversed 'V' at the base of the penis. The peri vesical space was entered between the rectus muscles, while inferiorly the suspensory ligaments of the penis were incised. The penis was retracted downward until the entire pubic symphysis was exposed. The fingers were passed through

the retropubic space and a right angle clamp was pushed through the urogenital diaphragm beneath the pubic arc, avoiding the dorsal vein of the penis and the retropubic venous plexus. This opening was enlarged bilaterally through an avascular plane. After isolation of the pubis, the peritoneum was stripped from the pubic bone about 2 cm to each side of the midline. After removal of pubic bone (approximately 3cm in diameter) or after segment symphysiotomy excellent exposure of posterior urethra was obtained. Special care was taken to not damage posterior urethra. In some cases pubic bone had to be removed piecemeal. Integrity of obturator foramen was preserved during pubectomy. A self-retaining retractor was put between pubic bones for better exposure. The stricture was identified by passing sounds from above (after opening the bladder) and below and the normal urethra was cut on either side at the level of the tips of sounds. Fibrous tissue was excised until normal mucosa was apparent on each end of the urethra. Now bladder was filled with saline to check if patient is continent or not. The proximal and most distal urethral ends were mobilized by sharp dissections very carefully to provide an anastomosis free of tension. Minimal dissection was performed around the bladder neck. Identification of false passages and para urethral diverticula were performed with great attention to detail. Both urethral ends were spatulated and anastomosis was performed with 5-0 interrupted vicryl sutures over a no.14 Foley's catheter. After obtaining meticulous hemostasis with electro cautery and bone wax, a corrugated rubber drain was kept in retropubic space. Periosteum was re approximated when it was available and mobile enough. A suprapubic and urethral catheter were inserted into the bladder and urethra. The suprapubic catheter was threaded with black silk which

in turn was brought out through the suprapubic wound so as to fix the SPC. Both the catheters were kept for 21 days and during this period patient was observed for fever, urine output, urine infection, catheter blockage, retropubic drainage etc. Retropubic drain was removed on 4th or 5th day depending on amount of drainage.

On 21st day Foley's catheter was removed and suprapubic catheter was clamped. If the patient is able to pass urine normally, the patient was posted for cystourethroscopy to see for the anastomosis, stricture, edema, inflammation or any midline deviation. If everything was alright suprapubic catheter was removed and patient allowed to pass freely. Suprapubic wound healed in short course of time. If patient was found to be having any incontinence he was advised perineal exercises after which most of the patients improved.

These patients were followed up initially at monthly intervals for 3 months, 3 monthly for 1 year and yearly intervals for five years. During these follow ups if patient had any symptoms suggestive of recurrent or residual strictures, repeat scopies were performed and if found, regular dilatations were to be offered.

Results:

The present study conducted on 12 patients who underwent transpubic urethroplasty, ranging from 4 years to 13 years of age in which 9 patients were above seven years and 4 were below 7 years of age. Among all 10 patients were male and 2 were females. Data suggests that 10 patients came with vehicular accidents, one with fall while one case did not have any pelvis trauma but presented with congenital stricture of urethra. Demographic and other parameters like associated injuries and initial management of the patients is shown in table number 1 below

Table 1: Distribution of the patients

Parameters	Males	Females	Total
Age Group			
4-7 yrs	2	1	3
7-10 yrs	7	0	7
10-13 yrs	1	1	2
Mode of Injury			
Road Traffic Accident	8	2	10
Fall	1	0	1
No Injury	1	0	1
Associated Injury			
Fracture pelvis	5	1	6
With rectal injury	2	0	2
With vaginal injury	0	1	1
With fracture ribs	1	0	1
No associated Injury	2	0	2
Initial Management			
SPC only	6	2	8
SPC with attempted repair	2	0	2
SPC with attempted dilatation	1	0	1
Per Urethral Catheter	1	0	1

During the investigations, urine culture showed no growth in 6 cases while remaining six cases showed growth of gram negative organisms. Sterility of the urine may be there because of the antibiotic coverages these children were having. Antegrade cystogram and DRU were performed simultaneously in all patients soon after their first referrals but when minimum 2-3 months elapsed after their injury so that acute phase subsided and associated edema was over. These films were evaluated for approximate inflammation length of stricture and completeness and incompleteness of the disruption. Urethroscopy was performed in all patients but antegrade scopy through SPC fistula was performed only in 3 patients and in one (No.12) scopy was tried

from above and below but both way it was not possible due to the distortion and obliteration of normal anatomy. Urethroscopy showed complete obstruction at the level of urethra without the visibility of veru in 3 patients (no.1,3,8). Complete obstruction along with paraurethral diverticula was visible in one patient (no.2). In 2 patients veru was visible with complete obstruction. In patient 4 findings suggestive of corkscrew urethra was seen. Patients 9 had evidence of false passages on scopy and of these patients, no.10 had history of dilatation before being referred to our hospital. In all 3 patients where antegrade cystoscopy was possible all had obstruction beyond the bladder neck thus establishing the intact continence mechanism after injury.

Table 2: Investigations of the patients

Parameters	Males	Females	Total
Growth			
Sterile	5	1	6
E-coli	2	1	3
Pseudomonas	2	0	2
Klebsiella	1	0	1
Length of Stricture			
2 - 3 cm.	5	2	7
3 - 4 cm.	3	0	3
> 4 cm.	2	0	2
Complete obstruction	10	1	11
Incomplete Obstruction	One patient had corkscrew urethra	0	0
Scopy Findings			
Complete obstruction	9	1	10
False Passage with Complete Obstruction	2	0	2
Complete obstruction with para urethral diverticula	1	0	1
Other	One patient had corkscrew urethra	Scopy not possible in one patient	

Ten cases (except no.5 & 6) underwent excision of pubis during the operation. Size of pubis part which was removed varied from 1.5 to 2.5 and in 7 cases it was removed piecemeal. In one case (no. 10) initially symphysiotomy was done but due to inadequate exposure and some deviation of the urethra we had to do

pubectomy. In remaining cases (no.5, 6) only symphysiotomy sufficed in giving proper exposure to the operative field. One remaining case was of congenital urethral. 8 cases required 2-4 units of transfusion while only one case required more than 4 units of transfusion.

Table 3: Operative details of the patients

Operative details	Males	Females	Total
Operative Details			
Pubectomy	9	1	10
Symphysiotomy	1	1	2
Duration			
3 - 5hrs.	2	1	3
5 - 7 hrs	7	0	7
> 7 hrs.	1	1	2
Transfution Required			
1 - 2 units	1	1	2
2 - 4 units	8	0	8
> 4 units	1	1	2

Table 4: Outcome of the patients

Outcomes	Males	Females	Total
Duration of Recovery			
6 - 9 months	4	1	5
9 - 12 months	3	1	4
> 12 months	2	0	2
Continenence present			
Before Operation	10	2	12
During Operation	9	2	11
After Operation	9	1, to be seen in one	

Duration between injury and transpubic repair ranged from 6 months to 14 months. Of these, 5 cases were taken for operation between 6-9 months, 4 cases (2,8,9,12) were more than 9 months but less than 1 year, while 2 cases (no.1,11) were operated more than 1 year after the injury. Before the injury all patients were continent as per history given by parents. However, continence assessment after injury but before operation was not possible because all patients were having supra pubic diversion. It was tested by putting the saline in the bladder after opening it and after the complete dissection of the prostatic urethra and around the bladder neck. Thereafter, we observed if it comes from the cut end of posterior urethra. In all, but one patient (no.5) continence was proved. However, patient no.5 did not pass this test of continence per operatively. Here again 10 out of 11 patients who were found continent per operatively were positive postoperatively also. However continence in remaining one case (no.12) could not be seen as this patient didn't turn up after surgery.

Discussion:

The young patient who sustains a pelvic fracture is much more unfortunate than the adult who receives the same bone injury. Certain characteristics that set them apart

form an older patients are, i) The fracture is more liable to be one of the serious fractures that causes a higher incidence of urethral injury, ii) Urethral injury is more likely to be a complete rupture in children than in adults with a higher chance of stricture formation, iii) The delicate puboprostatic ligaments of children are readily sheared off by sudden displacement of the fractured pubic rami with a high incidence of proximal dislocation of the prostate rendering repair of an ensuing stricture more difficulty, iv) Urethral dilatation and internal urethrotomy may be helpful in adults but they are unsatisfactory or unacceptable in young patients.

Most of the patients in our series were above 6 years conforming with the age incidence in other series [9,10,11]. Also the significant male preponderance of our patients further strengthens the view propounded by others that males are more vulnerable to urethral injury in fracture pelvis and as such fracture pelvis due to any cause is more in males probably because of their more outdoor activities and frequency of urethral injuries may be because of more vulnerable anatomic disposition of male urethra.

Mode of injury in our series was road traffic accident in most of cases supported by other studies [9,10,11,12]. Multiple injuries were

due to the serious vehicular accidents observed in the study. Initial treatment consisted of suprapubic cystostomy in most of the cases with some attempts of definitive management in 3 cases. Previous reports also suggest SPC in most of the cases with or without any attempt at primary realignment. We could not find any report about primary transpubic urethroplasty. From the literature it is clearly seen that complication rates are more in the patients where primary attempts of repair has been attempted. [12]

Fracture pelvis being a part of the multiple trauma, is often associated with other major injuries as reported by various authors [11, 10, 12]. This was seen in our series too, where 2 cases had rectal injuries and were referred to us with colostomies.

Great care should be taken when interpreting the urethrogram of patients with a stricture complicating pelvic fracture urethral disruption. In our series, only in 2 cases the level of urethral disruption through the prostate was at or proximal to the verumontanum. Rest all males were having the site of primary urethral disruption as distal to the level of verumontanum. But in Koranitim [11] series all cases had the disruption distal to verumontanum.

Presently there are two main modifications of transpubic urethroplasty. 1. Waterhouse technique [13] which combines perineal mobilization of anterior urethra with transpubic anastomosis to a wider anterior prostatic window 2. Pains and coombes [14] described direct transpubic excision of the stricture coupled with primary reanastomosis of urethral ends. Same was also reported by Allen [15] and it has achieved popularity because of its ease and success as well as the need for only one incision. Certain aspects of the operation must be emphasized to prevent morbidity and enhance the chances for satisfactory results.

Although theoretical concerns have been raised with respect to symphysiotomy, with the help of self-retaining chest wall retractor, which we used, excellent exposure has been obtained through symphysiotomy and pubectomy and none of the patients have had postoperative orthopedic problem. Meehrnet et al designed a special self-retaining retractor for this surgery only and were satisfied with the use. It is easier and safer to use the retractor in pediatric patients because of the high elasticity of the pelvis and sacroiliac ligament in this age group.

We didn't perform bladder neck reconstruction or extensive dissection of prostatic urethra at the time of stricture repair and we preferred to observe progress and reevaluate the situation later, a policy which gave highly satisfactory results in our series as only one patients had postoperative continence. [16,17,18]

Peroperative continence assessment was performed by us before going for the anastomosis. None of the previous series had performed this peroperative continence. Before performing anastomosis, it is very important to identify the true urethra and differentiate it from false passages.

A suprapubic cystostomy is necessary for primary urinary drainage postoperatively. Although fenestrated urethral catheter is considered to be more useful by some authors [19] we have not observed any adverse effects with use of Foley's catheters. We have not found it necessary to pack the retropubic dead space with omentum, which is believed to be associated with a risk of intestinal hernia [16]

Criteria for successful management of posterior urethral strictures are a satisfactory urinary stream, absence of urinary infection and presence of urinary continence and sexual potency. The literature review showed that there is

minimal tendency towards aggressive stricture formation after TPUP and strictures are relieved easily by dilation [16,17,20]. In our series, only one patients developed postoperative stricture who hasn't yet required and dialation and is going well conservatively. In our series infection rate was 50% as 6 out of 12 aptients had growth of gram negative organisms on culture. Previous studies reported higher infection rate may be because of the antibiotic coverage patients get after SPC.

Major problems noted during long term follow up is sphincter deficiency, incontinence and sexual impotence [21]. Our case 5 who had postoperative incontinence is using penile clamp and is waiting for definitive surgery for incontinence. 2 patients (case 3 and 11) had stress incontinence which improved over 1-2 years of time. We only offered perineal exercises.

Incidence of urinary incontinence in our series is quite less to that reported in literature [10, 16, 17, 20]. Although previous unsuccessful surgery is believed to play a major role in the incontinence, the possible adverse effect of our technique i.e development of incontinence should be kept in mind. In this particular case extensive dissection bladder neck may be the cause.

Conclusion:

From overall observation and results we can conclude that outlook for children with post traumatic posterior urethral strictures has improved greatly in the las decade, since the introduction new surgical techniques. Transpubic urethroplasty is one of the techniques with which satisfactory results have been reported in experienced hands. This specialized procedure allows improved visualisations of the prostatomebraneous urethra and bladder neck, permitting more accurate delineation of the anatomy as well as adequate room for

the optimal urethral reconstruction in selected cases.

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