Comprehensive Analysis and Urethroscopic Evaluation of “U” Shaped Prostatobulbar Anastomotic Urethroplasty

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OBJECTIVE: To evaluate efficacy of “U” shaped prostatobulbar anastamosis [USPBA] in a posterior urethral stricture along with its urethroscopic evaluation to let us assess the process of neourethrisation in successful cases as well as pathogenesis of restricture in failure cases.

METHODS: We analysed results of “U” shaped prostato-bulbar anastamosis in 132 patients with posterior urethral stricture, preoperatively and postoperatively with a retrograde urethrogram, urethrosogram, uroflowmetry and patient satisfaction (based on symptoms). With comparative analysis, results were categorised as good, fair and poor. Twenty patients were randomly selected for urethroscopic evaluation to directly visualise the anastomotic site.

RESULTS: Good and fair results were counted as successful. On immediate postoperative evaluation the success rate was 96.2%, which remained almost the same at 6 months but decreased to 92.42% at 12 months and 90.9% at 24 months. Urethroscopy showed mucosal covering at the area of the roof of neourethra in patients having good results with patent and distensible lumen. Cases with fair results showed similar findings except for some narrowing at places and mucosal irregularities. Poor result cases mostly showed dense fibrosis with collapsed lumen or circumferential scarring leading to constricting stricture.


Key Words: posterior urethral stricture, “U” shaped urethroplasty, urethroscopy

Introduction

Urethral stricture disease is better to discuss than to suffer. The incidence of urethral stricture has increased over past years, the reason being industrialisation and an increasing burden of vehicles on roads, has lead to increased incidence of road traffic accidents which directly correlates with incidence of pelvic fracture. Urethral trauma is very debilitating and particularly with posterior urethral injuries, if not managed properly, can lead to condition in which the person will not be able to void or have sexual satisfaction, which is an immense psychocological burden.

Posterior urethral stricture poses a bigger challenge than anterior urethral stricture for surgeons, as location of the stricture makes it difficult to assess as well as access. Moreover the available techniques are not easy to perform and take time for one to master them. So even a good technique in the hands of newer surgeon can force a patient to follow the dictum, “once a stricture always...”
a stricture”. Henceforth the quest finding an operative procedure that is easy to perform and still effective is endless.

Traumatic disruption of the posterior urethra occurs in about 5% to 10% of patients with pelvic fracture.1-3 It is said that about 66% of posterior urethral injuries are complete ruptures. The membranous urethra is most commonly injured in pelvic fractures due to the fixity of the apex of the prostate to the pubic bone by puboprostatic ligaments. Posterior urethral injuries may be complicated by associated bladder injuries in one third of patients which include extra peritoneal rupture in 85% of patients.4

The term “posterior urethral stricture” is widely used for all strictures of posterior urethra. There are different types of posterior urethral strictures namely, simple sphincter stricture, subprostatic pelvic fracture urethral distraction defect (PFUDD), stricture after transurethral resection of prostate (TURP) or radical prostatectomy. There is difference in pathology of different strictures. Strictures after TURP and radical prostatectomy are generally proximal to that of distal sphincters so sphincter function is almost always affected. In PFUDD however the urethra is generally transected distal to the sphincter so the urethral sphincter is generally preserved.5

Posterior urethral injuries should be promptly and accurately managed as the complications of urethral stricture surgery, in the form of incontinence and/or impotence can be even more debilitating to the patient than the stricture itself. The majority of posterior urethral injuries are due to pelvic fractures, which leads to PFUDD. The consensus regarding the management of posterior urethral strictures remains suprapubic catheterisation for 3 months and end-to-end bulboprostatic anastamosis.

For distraction defects of less than 2.5 cm an ordinary perineal approach is used, and if defect is more than 2.5 cm an elaborate perineal or perineo-abdominal transpubic, approach is used.6

We have described a urethroscopic analysis of a technique of delayed anastamotic urethroplasty in which bulboprostatic anastamosis is performed in a “U” shape by a perineal approach. In this technique the roof of the neo urethra is formed proximally by the perineal membrane and distally by the tunica albugenia of corpus cavernosa. There are no sutures from the 2 to 10 o’clock position, hence it is a wide anastamosis, so therefore the chances of restenosis are less. This spares the neurovascular bundles which enter the corpus cavernosa at the 11 and 1 o’clock positions, hence a lower incidence of postoperative erectile dysfunction and a lower rate of restenosis results.7 The “U” shaped prostatabulbar anastomosis (USPBA) technique has been reported previously.8

**Patients and Methods**

We describe in our study experience with 132 patients of posterior urethral injuries over a period of 10 years from 1998–2008 with a mean age of 41 years (10–66 years). Most of the patients presented at the emergency department and had associated orthopedic injuries. Patients were managed initially by suprapubic cystostomy and were assessed after 6 weeks when orthopedic aspects had recovered. The spectrum of the severity of disease ranged from simple PFUDD to complex cases. Complex cases included the combined strictures of both the anterior and posterior urethra and the posterior urethral strictures with false passages resulting from multiple attempts of urethral instrumentation before the patients were referred to our centre. A detailed preoperative assessment was done by history taking, routine investigations, a retrograde cystourethrogram, urethronogram and uroflowmetry (in those patients who did not have a suprapubic cystostomy done). After the patient was ambulatory, anaesthetic assessment was done and with preoperative preparation after taking informed consent, the “U” shaped urethroplasty was done. The patient was catheterised with an all silicone catheter for 3 weeks in simple urethral strictures, and 6 weeks in complex urethral strictures. A complex stricture is defined as a stricture length more than 3 cm, or one with associated perineal fistulas, rectourethral fistulas, periurethral cavities, false passages, open bladder necks or previous failed repair.9 After removal of the catheter patients were re-evaluated by the same three investigations (Table 1 and Figure 1). During the period from September 2007 to October 2008, 20 patients were lined up for urethroscopic evaluation after 3 months of their urethroplasty.

Urethroscopy was done to directly visualise the site of the prostatabulbar anastomosis in randomly selected patients irrespective of postoperative retrograde urethrogram (RGU and uroflowmetry) findings. In successful patients urethroscopy was performed to postulate, how dorsally present tunica albuginea of corpus cavernosa (distally) and perineal membrane (proximally) are maintaining the patency of neo-urethra without the need of
any graft or flap. Failed cases were analysed to let us understand the process of restructure.

**Results**

Most of our patients were of the age group 20–40 years, were labourer by occupation, belonged to lower socioeconomic groups and were breadwinners of their family. Hence it is not the patient alone but the whole family which is affected by pelvic trauma. Out of 132 patients 118 the cause of their stricture was pelvic trauma which reveals the magnitude of the problem in our society. None of the patients had any emergency intervention done and were managed only by suprapubic cystostomy.

The success rate was determined by adding (A) good and (B) fair results. On immediate postoperative evaluation the success rate was 96.2% (A = 122 + B = 5), which remained almost the same at 6 months. This decreased to 92.42% (A = 120 + B = 2) at 12 months and 90.9% (A = 102 + B = 4) at 24 months.

Among 20 patients who we taken for urethroscopy 11 patients belonged to good result group, five were in the fair group and four had poor results. Urethroscopy was done after taking informed consent and the findings of urethroscopy are shown in Table 2 and Figure 2.

**Discussion**

Pelvic fractures are the main culprit causing posterior urethral injuries. The posterior urethra is most commonly injured by direct shearing force which ruptures the puboprostatic ligaments. It is seen that the proximal bulbar urethra is almost always involved in the fibrous process so it is the bulbomembranous junction and not the prostatomembranous junction that is ruptured in pelvic fracture. In children posterior urethral injuries involve the proximal prostatic urethra and even the bladder neck because the prostate is underdeveloped and provides less protection. Occasionally the urethra and bladder neck are injured directly by sharp bony fragments.

We can predict the pattern of urethral injury on the basis of the type of pelvic fracture. The highest risk of
urethral injury is found in a straddle fracture combined with diastasis of the sacroiliac joint.\textsuperscript{11}

For every 1 mm increase of the pubic symphysis diastasis or displacement of the inferomedial pubic bone fracture fragments, the risk of urethral injury increases by 10%.\textsuperscript{12} There are various treatment modalities available, each having their advantages and disadvantages (Table 3).

From the above studies we can conclude that though primary repair and endoscopic realignment seems an attractive option but the incidence of impotence is definitely higher with these treatment modalities and after endoscopic realignment 93–100% patients require multiple repeated instrumentations.\textsuperscript{13,14} Hence it is the general consensus that early SPC followed by delayed repair is the preferred treatment modality. The major advantage of delayed urethral reconstruction in posterior urethral stricture due to pelvic trauma is that, it is done under controlled conditions when the patient has recovered from major associated injuries.\textsuperscript{2,15} Success rates ranging from 88% to 97% have been reported with delayed end to end anastomosis of urethra.\textsuperscript{6,16–19}

\begin{table}[h]
\centering
\caption{Urethroscopy findings}
\begin{tabular}{|l|l|l|}
\hline
Result & Good & Fair & Poor \\
\hline
Urethroscopy findings & Patent distensible lumen with smooth mucosa & Patent distensible lumen with mucosal irregularity & Lumen obliterated with dense fibrosis \\
\hline
\end{tabular}
\end{table}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image.png}
\caption{(A) Good result showing patent lumen and smooth mucosa. (B) Fair result showing patent lumen with irregular mucosa. (C) Poor result showing stricture with obstructed lumen.}
\end{figure}

\begin{table}[h]
\centering
\caption{Incidence of complications after various modalities}
\begin{tabular}{|l|c|c|c|}
\hline
Procedure & Incontinence & Impotence & Stricture \\
\hline
Immediate repair & 21\% & 56\% & - \\
Immediate endoscopic realignment & - & 36\% & 53\% \\
Suprapubic cystostomy and delayed repair & - & 19\% & 97\% \\
\hline
\end{tabular}
\end{table}
In anastomotic urethroplasty it is accepted that spatulation of both the proximal and distal urethral end results in wide anastomosis and spatulation has been recommended to reduce the disadvantages of ring anastomosis. In “U” shape urethroplasty, the slit opened edges of the urethra are sutured in such a manner that it provides wide anastomosis, hence reducing the chances of restenosis. Recurrence of stricture after urethroplasty was 3.8% immediately to 9.1% after 24 months.

The impotence rate was also significantly lower at 1.4% which is quite acceptable in comparison to other studies. Although studies support impotence after a posterior urethral injury due to a pelvic fracture may be due to the injury itself rather than the fault of surgical technique. Impotence after a pelvic fracture can result from neurovascular disruption of cavernous nerves and internal pudendal arteries when they pass in the region prostatic apex, hence there is a correlation between impotence and shearing of the prostatic apex from the urogenital diaphragm. None of the patients in our study was incontinent as bladder neck function was adequate in keeping the patient continent in the absence of a distal sphincter function.

Spatulation has been recommended over circular ring anastomosis so as to avoid constricting scar formation at the site of the anastomosis. Studies show that making too many stitches is an invitation for increased inflammation and scar formation ultimately leading to restenosis. So even after spatulation, round the clock sutures taken to anastomose the ends of the urethra cause inflammation and may lead to restenosis. Moreover spatulation and anastomasis is not an easy technique to master.

USPBA is on the one hand an easy technique to learn and also avoids ring anastomosis. There are only three sutures taken at the 9, 3, and 6 o’clock position, hence minimal inflammation is caused by sutures. Therefore all the technical reasons for stricture to recur are avoided.

The next challenge was to confirm the above inference, so following the dictum “seeing is believing”, urethroscopy was performed in representative cases of each group (good, fair and poor). Urethroscopy showed mucosal covering at the area of the roof of neourethra with patent and distensible lumen in patients having good results. Cases with fair results showed similar findings except for some narrowing in places and mucosal irregularities. This meant the urothelium had regrown over the roof formed by the tunica albugenia of corpora cavernosa distally and the perineal membrane proximally. The ability of tunica albugenia to maintain the patency of neourethra has been proven in cases of anterior urethral stricture.

Poor result cases mostly showed dense fibrosis with collapsed lumen and an impassable scope or circumferential scarring leading to constricting strictures. With the understanding of the procedure of USPBA and our observations of urethroscopy we conclude that dense fibrotic scarring was mostly in cases with associated inflammatory etiology. Therefore it may be the result of a preoperative poor prognostic factor rather than an error in technique. Ongoing inflammation in the proximal end (pre-stricture, due to ballooning) of the urethra is an important cause of circumferential scarring (hence restricture) in the pre-anastomotic area. So the suprapubic catheterisation should have a protective role. In our setting most patients with posterior urethral stricture had SPC, so the above findings were not common.

USPBA is an easier technique master which restores basic fundamentals of urethroplasty and it is an effective treatment option for posterior urethral stricture. With further urethroscopic evaluation and a longer follow-up of urethroplasty patients, we expect to substantiate our hypothesis. The technique involves complete excision of the strictured segment with a wide “U” shaped anastomosis hence a lower incidence of restenosis. In our technique we avoided complete ring anastomosis which may be a cause in ring stenosis and partly we avoided taking sutures from 2 to 10 o’clock positions which may have two advantages. By avoiding too many sutures the chances of restenosis is reduced and also by avoiding sutures from 2 to 10 o’clock positions there are reduced chances of injury to neurovascular bundles which enter the corpora cavernosa at 1 and 11 o’clock positions. This means less chance of impotence and restenosis. Many more aspects of pelvic fracture with bulbomembranous stricture associated fibrosis and prostatobulbar anastomasis are yet to be explored in this ongoing process and will be revealed in the years to come.

References


