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PROF-638

STRICTURE URETHRA;

A CLINICAL STUDY OF 100 CONSECUTIVE CASES AT ALLIED HOSPITAL, FAISALABAD.

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ABSTRACT

AIMS & OBJECTIVES: 1. To demonstrate different etiological factors of stricture urethra. 2. To demonstrate different anatomical sites of urethra involved. 3. To describe management as being done at Allied Hospital, Faisalabad and suggest methods to improve it. **STUDY DESIGN:** Prospective. **SETTING:** Allied Hospital, Faisalabad. **PERIOD:** April 1996 to Aug 1998. **PATIENTS & METHODS:** A total of 100 consecutive male patients ranging from 6-80 years presenting to Surgical Unit II of Allied Hospital, Faisalabad with clinical diagnosis of stricture urethra were included in the study. After history and examination, baseline investigations and retrograde urethrography were performed in all patients and micturating cystourethrography in patients with blind strictures. Treatment as being done was also recorded. Follow up ranges from 4-24 months. **RESULTS:** Trauma was the most common cause of urethral stricture. Fracture pelvis alone was responsible for half of the strictures while straddle injury accounted for another 20%. The incidence of iatrogenic, infective and congenital stricture was found to be 24%, 4% and 2% respectively. Most of the posterior urethral strictures (86%) were due to indirect urethral trauma (fracture pelvis). Anterior urethra was the site of infective, congenital and iatrogenic strictures as well as strictures following direct urethral trauma. Internal urethrotomy was the treatment of first choice and was performed in 73% patients with satisfactory results. Urethroplasty was performed in 27% patients. Clean Intermittent Self Catheterization and active urethral dilatation was performed as adjuvant treatment to prevent the recurrence of stricture. **CONCLUSIONS;** The etiological factors of stricture urethra and anatomical sites involved are comparable to international literature. Internal Urethrotomy is safe and reliable procedure for simple urethral strictures while urethroplasty should be considered for complex strictures. Active urethral dilatation at repeated intervals still has a role in preventing recurrence or stricture after initial treatment with internal urethrotomy and urethroplasty.

INTRODUCTION

Stricture urethra is one of the commonest ailments seen in the urological and surgical practice. The etiological classification of stricture urethra includes, congenital, traumatic, iatrogenic, infective and miscellaneous varieties.

Congenital strictures are mostly located in the proximal bulbar urethra^{1,2,3} and are thought to be due to the incomplete disappearance of cloacal membrane at its

junction with the urogenital sinus.¹

Traumatic strictures can either be due to direct trauma or indirect violence. Strictures of anterior urethra usually result from direct trauma that may be either blunt (straddle Injuries 70-80%), penetrating (due to gun shot or ice pick) or due to intraluminal manipulations (self inflicted or iatrogenic)⁴. Indirect violence due to fracture pelvis is the main cause in the pathogenesis of posterior urethral strictures. Though the incidence of fracture pelvis is rising due to increasing

road traffic accidents, fortunately the urethra is ruptured in only about 10% of these cases.^{5,6} The usual location of urethral rupture and subsequent stricture in the adults is within 2 cm of sphincter-active sub-prostatic urethra⁵.

Iatrogenic urethral strictures may result from the manipulation of urethra, inadvertent use of catheters or mismanagement of urethral injuries in the emergency department⁵. The principal cause of iatrogenic urethral stricture still remains the use of urethral catheters despite constant improvement in the material used^{7,8}. With the introduction of silicon catheters, the incidence of post catheterization urethral strictures is on the decline⁹. Incidence of stricture urethra following trans-urethral resections ranges from 9-15%. Most of these are located in the penile urethra^{10,11}. The main risk factors remain post-operative catheterization and size of the resectoscope. Recently, electric burn to the urethra through the sheath has been proposed as one of the contributory factors for the stricture formation after transurethral resections.^{12,13} In early 80's epidemic of urethral strictures was observed in patients who had undergone cardiovascular surgery with extra corporeal circulation¹⁴. Multiple studies confirmed the role of catheter toxicity and episodes of local ischaemia during extra corporeal circulation. The incidence of stricture has significantly reduced with supra-pubic diversion and use of silicone catheters of small caliber (if urethral catheterization is necessary)^{14,15}.

Inflammatory strictures are still a common entity in certain parts of the world^{16,17,18}. Among rare causes of urethral stricture, cancerous strictures have to be considered¹⁹. Urethral lymphangioma has also been reported as rare cause of urethral stricture.²⁰

Like rest of the world, stricture urethra is a common problem seen in routine surgical practice in Pakistan. A retrospective study was conducted at the Department of Urology at Lahore General Hospital. This study showed that during the period of eight years (1983-90), 524 (10.14%) patients were admitted for the management of

Complete clinical history of each patient was taken and recorded in structured format for uniformity of the data collected. History of urethral trauma, previous urethral surgery, urethral catheterization and urethral discharge was carefully sought. In cases of suspected infective strictures, history of sexual contact was also inquired.

urethral strictures out of 5169 total urological admissions²¹.

Before starting our study we went through the records of patients admitted in Allied Hospital, Faisalabad in the Surgical Department and we found that during one year period i.e., from May, 1995 to April, 1996 patients with stricture urethra constituted a little more than 3% of total surgical admission. Similarly, during 1993 & 1994, surgical operations done for urethral stricture constituted 16.58% of urological procedures and 3.29% of all the surgical procedures done during that period. Allied Hospital, Faisalabad is a tertiary hospital providing health facilities for the people of Faisalabad and Sargodha divisions. Despite the importance and magnitude of the problem, no scientific study has been carried out on this subject in this area. So present study was carried out with the following aims and objectives.

AIMS & OBJECTIVES

1. To demonstrate different etiological factors of stricture urethra.
2. To demonstrate different anatomical sites of urethra involved.
3. To describe management as being done at Allied Hospital, Faisalabad and suggest methods to improve it.

PATIENTS & METHODS

100 consecutive male patients who presented at Surgical Unit-II of Allied Hospital, Faisalabad with the clinical diagnosis of stricture urethra were included in the study over a period of little more than two years, i.e., from April, 1996 to August, 1998.

The protocol included complete clinical history, thorough physical examination, appropriate investigations and recording of the operative treatment.

Events following urethral trauma and history of surgical interventions was noted in detail.

A thorough general and systemic physical examination was carried out. Urethra was palpated and external urethral meatus was examined for stenosis.

The investigations included Complete urine examination, Hemoglobin percent estimation, Total and Differential leukocyte count, Erythrocyte Sedimentation Rate, Blood sugar, Serum creatinine and urea level, Ultrasound of KUB and retrograde urethrography in all patients and antegrade micturating cystourethrography in patients with blind urethral strictures to visualize urethra proximal to the stricture and the probable length of the stricture evaluated.

The operative findings and procedure was also recorded in each case and the patients were followed up. The follow up range from 4 to 24 months.

RESULTS

Age:

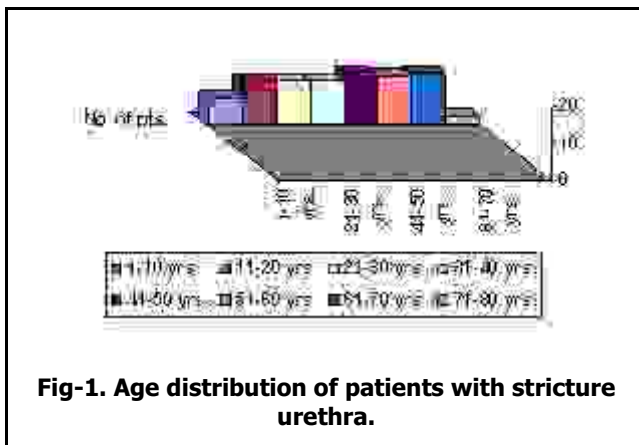


Fig-1. Age distribution of patients with stricture urethra.

The age range was 3 - 80 years. No age was found to be exempt for the disease. The number of patients was almost same in all age groups except, of course, at the extremes of ages. (Fig. 1)

Etiology:

Regarding the etiology, in 51% patients, the stricture was a consequence of rupture of urethra due to fracture of the pelvis. In 20% patients, history of straddle injury was present while 3% patients had direct penile trauma. There were 4% patients with infective strictures. All these patients gave past history of gross pyuria. The history of extramarital sexual contact was present in two of these patients.(Fig 2)

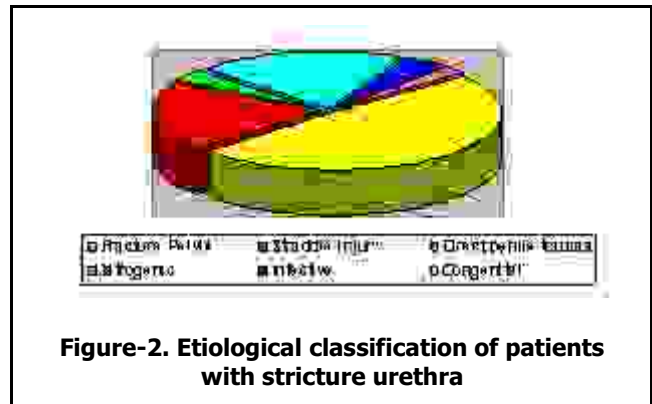


Figure-2. Etiological classification of patients with stricture urethra

The stricture was found to be due to the iatrogenic causes in 20% patients (Fig 2). Among these, four strictures followed trans-urethral resections (3 TURP & 1 TURBT), six followed trans-vesical prostatectomy while urethral catheterization following non-urological procedure was found to be responsible for the stricture formation in ten patients. One patient had acid burns and meatal and anterior urethral stricture formation following acid application to glans and dilatation of urethra with wooden pieces (foreign body) by a non-qualified person.

In two patients, no factor could be identified as a cause of stricture. Both these patients were in their teens at the time of presentation and had short bulbar urethral strictures. Therefore, they were labeled as congenital urethral strictures.

Site:

The stricture was located in bulbar urethra in 24% cases, in membranous urethra in 21%, in penile part in 18%, and in the prostatic part in 3% patients, while 34% patients had long strictures involving more than one part of urethra (Table-I). Regarding clinical division of anterior and posterior urethra, stricture was found in anterior urethra in 42% patients, in posterior urethra in 24% patients while in 34% patients, both the anterior and the posterior urethra were involved (Bulbo-membranous strictures (Table I).

Table-I. Anatomic sites of urethra involved

Part of Urethra Involved	No of Pts
Penile urethra	19
Bulbar urethra	23

Membranous urethra	21
Prostatic urethra	03
Membrano-prostatic/Membrano-bulbar urethra	34

Etiology vs Site:

Anterior urethra was mainly the site of infective, congenital and iatrogenic strictures as well as strictures following direct urethral trauma while strictures due to indirect urethral injury (due to fracture of pelvis) were mainly located in the posterior urethra (Fig 3,4).

There were two congenital urethral strictures and both were present in the bulbar part. Similarly, eighteen out of twenty patients with history of straddle injury had short bulbar strictures, while one patient had stricture of bulbo-membranous part and another had even longer stricture involving whole of the posterior urethra as well as the bulbar part.

All the four infective strictures were present in the anterior urethra (two each in the penile and the bulbar part). (Table II)

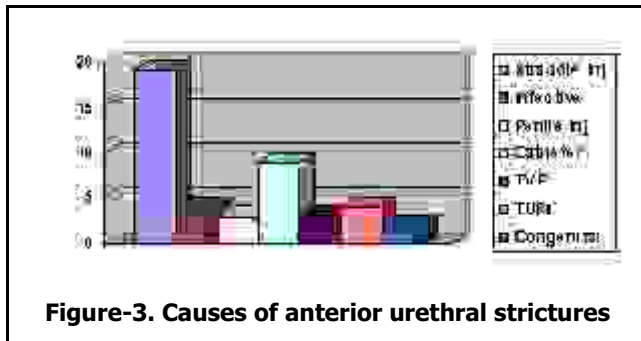


Figure-3. Causes of anterior urethral strictures

21% patients with history of fracture pelvis had short (< 2 cm) membranous strictures while 30% patients had long strictures involving bulbo-membranous or membrano-prostatic urethra.(Table-II)

Table-I. Anatomic sites of urethra involved

Part of Urethra Involved	No of Pts
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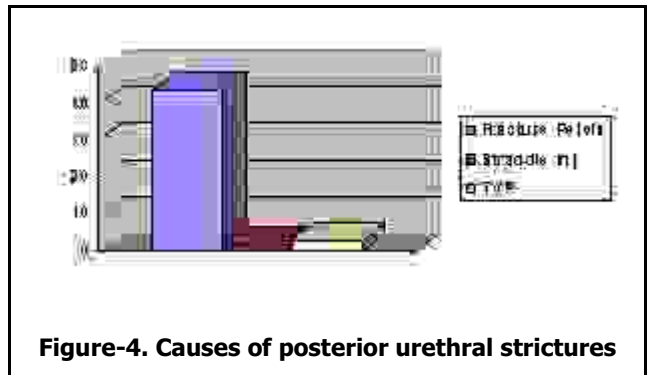


Figure-4. Causes of posterior urethral strictures

Sixteen of the iatrogenic strictures were present in the anterior (penile and / or bulbar) urethra while three of the strictures following TVP were present in the prostatic part. (Table II)

Internal urethrotomy was the treatment of first choice in most of the patients and was done in 73% patients (Table-III). In patients with blind urethral strictures, duplex approach was adopted..

Table-III. Treatment options applied

Internal urethrotmy	69%
Urethroplasty	27%
• Anastomotic	23%
• Substitution	04%
• Scrotal flap	02%
• Penile graft	02%
Adjuvant treatment	
• Clean intermittent self catheterization	
• Active urethral dilatations	

A second urethroscope was introduced into the internal urethral meatus through the suprapubic cystostomy and (cut to the light) procedure was done. A single internal urethrotomy was sufficient in 52% of these patients while 21% patients needed two or more internal urethrotomies. In 10% patients, after multiple attempts with internal urethrotomy, urethroplasty was performed (Table-III).

Table-II. Etiology/Site relationship of urethral stricture

Etiology	Part of urethra involved				
	Penile %	Bulbar %	Membranous %	Prostatic %	Memb-bulbo-prostatic %
Fracture pelvis			21		30
Straddle injury		17			3
Penile trauma	03				
TUR	3	1			
TVP	3			3	
Catheterization	7	2			1
Infective	3	1			
Congenital		2			

Urethroplasty was done in 27% patients (Table-III). In 23% cases, after the excision of the scar tissue, tension free anastomosis was possible between the cut ends of the urethra. Four patients had longer strictures and required substitution urethroplasty. Scrotal flap was applied as the substitute in two patients. In the other two, full thickness skin graft from the penile shaft was used to reconstruct urethral tube after excision of the scar tissue (Table- III). Patients with scrotal flap urethroplasty developed short strictures at the anastomotic site but they were easily managed by subsequent internal urethrotomy. Long term results are still awaited in patients with free penile grafts as the postoperative follow up period is relatively short.

Clean Intermittent Self Catheterization with 12 Fr. Nelaton tube and frequent active urethral dilatations were performed as adjuvant treatment in patients with complex and recurrent strictures (Table-III). Unfortunately, the outcome of intermittent clean self catheterization was not good due to patients non-compliance. Active urethral dilatations with Lister Bougies at increasing intervals was found to be a better alternative in these patients.

DISCUSSION

Urethral stricture is one the oldest known urological disease and is still a common urological ailment seen in routine clinical practice with high recurrence rate^{22,23}. The main etiological factors include direct or indirect

urethral trauma and infection.

In our series, most (74%) of the strictures were traumatic. In 51% patients, the stricture was a consequence of rupture of urethra following fracture of pelvis in various accidents. This is an unfortunate price of modernization. With increasing mechanization and fast moving traffic, the incidence of fracture pelvis is also on the rise. Luckily, urethra is injured only in about 10% of these cases^{5,6}.

21% patients had short membranous strictures (less than 2 cm) while 30% patients had long strictures involving bulbo-membranous or membrano-prostatic urethra. This is consistent with the mechanism of injury. The urogenital diaphragm attached to the ischiopubic rami contains the membranous urethra fixing it in position. The prostate is attached to the pubis by the pubo-prostatic ligament. Distortion or distraction of these points of fixation may result in shearing force, thus traumatizing the urethra. The injury involves the urethra located in or below the urogenital diaphragm. When the pelvic fracture causes displacement of the pubis, the prostate gland, mobilized by its ligamentous attachments, rises up into the pelvis with the bone fragments, disrupting the urethra below it²⁴.

There are two types of fracture pelvis in which urethra is injured. In the more common Type-I injury, the pelvis is compressed antero-posteriorly and the ischiopubic rami fracture. The symphysis is forced behind carrying

bladder with it. The prostate, firmly attached to the symphysis also moves back away from the corpora and the urethral bulb which remains attached to the ischial rami.

The urethra stretches until it tears. In Type-II injury, the force is transmitted up the lower limb to wrench the hemi-pelvis out of alignment and dislocate the sacro-iliac joint. The bladder and the prostate are carried up with the dislocated hemi-pelvis while the bulbar urethra remains attached to the ischial ramus on the other side and the urethra ruptures²⁵. The severity of initial trauma as well as the amount of hematoma will determine the length and complexity of the subsequent stricture.

In 20% patients, the history of blunt perineal trauma (straddle injury) was present. Seventeen patients had classical short bulbar strictures while three patients had long (> 2 cm) strictures. Out of them, one patient had a very bad injury involving whole of perineum including rectal injury. He presented with the stricture of bulbo-membranous urethra and recto-urethral fistula. The other patient had even longer stricture involving bulbo-membrano-prostatic urethra. He got straddle injury fifteen years ago and gave history of rail road catheterization and multiple urethral dilatations. The badly stenosed and distorted urethra may be attributed to these blind procedures. Rail road catheterization was the treatment of choice for urethral disruption some years ago^{26,27} but now it is not recommended and only supra-pubic diversion is advocated^{28,29}. Some of these urethral injuries are only partial injuries and may heal spontaneously. Moreover, rail road catheterization is a blind procedure without any knowledge of whether the true urethra has been cannulated or a false passage is created²⁸. Morehouse and Mackinnon, while managing posterior urethral strictures with Johnson's urethroplasty noted that the amount of scarring at the site of urethral reconstruction was minimal if the retro-pubic space had not been explored earlier³⁰.

The stricture was found to be due to iatrogenic causes in 20% patients. Four strictures followed transurethral resections (3 TURP & 1 TURBT), six followed trans-vesical prostatectomies, while ten strictures followed catheterization during some non urological operation. Out of these, seventeen strictures were present in anterior urethra and three in the prostatic

urethra.

The anterior urethral strictures may be attributed to the inflammatory response to catheter or injury during instrumentation or passage of stray current through the sheath. The urethral stricture is one of the common complications of trans-urethral resections^{10,11,18,31}. Similarly, the use of urethral catheter is also a well documented cause of urethral stricture^{9,32}. There were three strictures present in the prostatic urethra. Both these patients gave history of transvesical/retro-pubic prostatectomy. The formation of anastomotic urethral strictures after radical prostatectomy is documented in the literature^{33,34}. The prostatic urethral stricture in our series may be caused by over enthusiastic suturing at the bladder neck to stop bleeding during open prostatectomy.

One of our patients had a unique history. He was an old man of about 75 years. He developed symptoms of bladder outflow obstruction due to the enlarging prostate and went to a non-qualified person for treatment. The quack applied acid to the glans penis and inserted straws (taken from the dusting broom) into the urethra in order to relieve obstruction and caused acid burns to the glans and the external urethral meatus. Moreover, the dirty straws caused urethritis and subsequent stricture of the penile urethra. These dirty straws were still present in the external urethral meatus when he presented to us in the emergency department. He developed meatal stenosis and penile urethral stricture. Such an example is hard to find in the international literature and it is very unfortunate that at the verge of 21st century, such type of quackery is still a common practice in our country.

The incidence of infective urethral strictures is still very high in certain parts of the world. Osoba has shown a high incidence of post-gonococcal urethral strictures in Tropical Africa¹⁶. In another study carried out at Tygerberg Hospital in South Africa, specific urethritis was found to be the main etiological factor for stricture formation. About half of the urethral strictures in this series were caused by gonococcal infection. The prevalence was highest among middle aged colored males with little schooling and multiple sexual partners³⁶. Similarly, poor genital hygiene was described as the major cause of urethral strictures by Palaniswamy and Bhandari in 1983³⁸. They also found frank

balantitis, sub-preputial calculi and infected urine in the preputial sac in these patients. In our study, there were only four patients with infective strictures. The history of extramarital sexual contact was positive in two of them. Good personal hygiene specially adequate toilet after micturition and the practice of neonatal circumcision may be one of the causes of low incidence of infective strictures in our country. Similarly, relatively low incidence of extramarital sexual relationship may be another cause.

There were two patients with short bulbar strictures. Both patients were in their teens and no factor could be identified as the cause of stricture. These could have been congenital urethral strictures. Other urological surgeons have also described congenital bulbar urethral strictures^{1,2,38}. Internal urethrotomy was found to be the treatment of first choice in most of the patients. The results were excellent in 73% patients. In patients with blind urethral strictures, duplex approach was adopted. A second urethroscope was introduced into the internal urethral meatus through the suprapubic cystostomy and (cut to the light) procedure was performed. A single internal urethrotomy was sufficient in 52% of these patients, while 21% patients required two or more internal urethrotomies due to recurrence of strictures. These results are comparable with most of other studies.^{39,40,41,42}

Urethroplasty was done in 27% patients. Most of these patients had recurrent strictures despite repeated internal urethrotomies. Albers et al, have recommended urethroplasty in patients with recurrent strictures after internal urethrotomy⁴³. Excision of the scar tissue and tension free anastomosis was possible between the cut ends of the urethra in 23% cases. Four patients had longer strictures and needed substitution urethroplasty. Scrotal flap was applied for the reconstruction of urethra in two cases with good results. Although they developed short strictures at the anastomotic site but they were easily managed by subsequent internal urethrotomy and urethral dilatations. Fortunately, complications such as hair ball and recurrent urethral infections were not encountered. In the other two patients, free penile skin was applied to substitute the fibrosed urethra. These patients are being followed up and the long term results are still awaited. The use of scrotal flap and penile skin for urethral reconstruction is documented in the international literature^{44,45,46,47}.

Clean Intermittent Self Catheterization and frequent active urethral dilatations were performed as adjuvant treatment in patients with complex and recurrent strictures. Both these modalities are being applied for the prevention of recurrent stricture formation after internal urethrotomy and urethroplasty.^{48,49}

CONCLUSIONS

1. The urethral trauma (Direct or Indirect) is the most common cause of stricture urethra and about two third of the patients presented with post traumatic urethral strictures.
2. Fracture pelvis (indirect urethral injury) alone, was responsible for stricture formation in half of the patients.
3. The incidence of iatrogenic strictures was also high as about twenty percent patients presented with iatrogenic strictures.
4. The incidence of infective strictures was found to be low in our series.
5. Most of the posterior urethral strictures (86%) were due to indirect urethral trauma (fracture pelvis).
6. Anterior urethra was the site of infective, congenital and iatrogenic strictures as well as strictures following direct urethral trauma (straddle injury).
7. The etiology/site relationship in our series is comparable to the international literature.
8. Internal urethrotomy is a safe and reliable procedure for simple urethral strictures with good results.
9. Urethroplasty is a preferred method to treat recurrent and complex strictures.
10. Active urethral dilatations at repeated intervals still has a role in preventing recurrence of strictures after initial treatment with internal urethrotomy or urethroplasty.

REFERENCES

1. Rao, K.G.: Congenital proximal bulbar strictures in adults. *Urology*. 6(5):576-9; 1975.
2. Donnellan, S.M. & Costello, A.J.: Congenital bulbar urethral strictures in three brothers. *Aust. N Z J Surg*. 67(8):573; 1997.
3. Nonomura, K., Kanno, T., Kakizaki, H., Koyama, T., Yamashita, T & Koyanagi, T.: Impact of congenital narrowing of the bulbar urethra (Cobb(s collar) and its transurethral resection in children. *Eur. Urol*. (Aug); 36(2):1448; 1999.
4. Pierce Jr., J.M.: Disruption of anterior urethra. *Urological Clinics of North America*. 16(2):329-34; 1989.
5. Warwick, R.T.: Prevention of complications resulting from pelvic urethral injuries __ and from their surgical management. *Urological Clinics of North America*. 16(2):335-58; 1989.
6. Webster, G.D. & Ramon, J.: Repair of pelvic fracture posterior urethral defects using an elaborated perineal approach: Experience of 74 cases. *Br. J. Urol*. 145:167-78; 1991.
7. Viville, C. & Weltzer, T.: Iatrogenic stenosis of male urethra. *J. Urol. Paris*. 87(7):413-8; 1981.
8. Boujneh, H., Abid, I., Trabelsi, N. & Zmerli, S.: Iatrogenic urethral stenosis. A propos of 100 cases. *J. Chir. Paris*. 126(3):163-8; 1989.
9. Blacklock, N.J.: Catheters and urethral strictures. *Br. J. Urol*. 58:475-8; 1986.
10. Ehren, I. & Kinn, A.C.: Urethral stricture complicating transurethral prostatic surgery. *Int. Urol. Nephrol*. 18(4):429-32; 1986.
11. Nielsen, K.K. & Nordling, J.: Urethral strictures following transurethral prostatectomy. *Urology*. 35(1):18-24; 1990.
12. Zheng, W., Vilos, G., McCulloch, S., Borg, P. & Denstedt, J.D.: Electric burn of urethra as cause of stricture after transurethral resections. *J.EndoUrol*. Mar; 14(2):225-8; 2000.
13. Sofer, M., Vilos, G., Borg, P., Zheng, W. & Denstedt, J.D.: Stray radiofrequency current as a cause of urethral stricture after transurethral resection of prostate. *J. Endo-Urol*. 15(2):221-25; 2001.
14. Abdel Hakim, A., Bernstein, J., Teijeira, J. & Elhilali, M.M.: Urethral strictures after cardiovascular surgery, a retrospective and a prospective study. *J. Urol*. 130(6):1100-2; 1983.
15. Bernstein, J., Teijeira, J. & Elhilali, M.M.: Urethral stenosis following cardiac surgery. *J. Urol*. 89(2):101-3; 1983.
16. Osoba, A.O.: Sexually transmitted diseases in the Tropical Africa. A review of the present situation. *Br. J. Vener. Dis*. 57(2):89-94; 1981.
17. Tazi, K. et al.: Treatment of inflammatory urethral stenosis with internal urethrotomy. *Ann. Urol (Paris)*. 34(3):184-8; 2000.
18. Slavov, C., Panchev, P., Kirilov, S., Simeonov, P. & Kumanov, K.: Strictures of the urethra (The etiological factors and therapeutic management. *Khirurgiia (Sofia)* 50(1):37-40; 1997.
19. Rognon, L.M.: Cancerous strictures of the urethra. *Ann. Urol. Paris*. 27(4):253-4; 1993.
20. Tahtali, N., Yazicioglu, A., Dalva, I., Sargin, S. & Setin, S.: An unusual cause of urethral stricture: Urethral lymphangioma. *Eur. Urol*. 26(4):347-8; 1994.
21. Javed, S.H., Khan, J.H. & Khan, F.A.: Retrospective analysis of urology service at Lahore General Hospital, Lahore. *Pakistan Postgraduate Medical Journal*. 2-3(1-4,1-2):20-8; 1991-2.
22. Attwater, H.L.: The history of urethral strictures. *Br. J. Urol*. 15:39; 1943.
23. Yelderman, J.J. & Weaver, R.G.: The behaviour and treatment of urethral strictures. *J. Urol*. 1040; 1967; 97.
24. Devine, C.J.JR., Jordan, G.H. & Devine, P.C.: Primary realignment of the disrupted prostatic-membranous urethra. *Urological Clinics of North America*. 16(2):291-5; 1989.
25. Blandy, J. & Fowler, C.: Urethra and penis__Structure and function In: *Urology*. 2nd edition, Blackwell Science Ltd., Oxford. pp. 429-39; 1996.

26. Mitchell, J.P.: Injuries of the urethra. *Br. J. Urol.* 50:649-70; 1968.
27. Morehouse, D.D., Belitsky, P. & Mackinon, K.: Rupture of the posterior urethra. *J. Urol.* 107:255-8; 1972.
28. Fowler, J.W., Watson, G., Smith, M. F. & MacFarlane, J.R.: Diagnosis and treatment of posterior urethral injury. *Br. J. Urol.* 58:167-73; 1986.
29. Shuja Tahir: Urethral disruption. *The Professional.* 4(1):21-8; 1997.
30. Morehouse, D.D. & Mackinon, K.: Management of prostatic-membranous disruption — 13 year experience. *J. Urol.* 123:174-5; 1980.
31. Nielsen, K.K. & Nordling, J.: Urethral strictures following transurethral prostatectomy. *Urology.* 35(1):18-24; 1990.
32. Ruutu, M., Alfthan, O., Talja, M. & Andersson, L.C.: Cytotoxicity of latex urinary catheters. *Br. J. Urol.* 57(1):82-7; 1985.
33. Surya, B.V., Provet, J., Johanson, K.E. & Brown, J.: Anastomotic stricture following radical prostatectomy: Risk factors and management. *J. Urol.* 143:755-8; 1990.
34. Kao, T.C. et al.: Multi center patient self reporting questionnaire in impotence, incontinence and stricture after radical prostatectomy. *J. Urol.* 163(3):858-64; 2000.
35. Dalkin, B.L.: Endoscopic evaluation and treatment of anastomotic strictures after radical retropubic prostatectomy. *J. Urol.* 155:206-8; 1996.
36. Steenkamp, J.W. & de-Kock, M.L.: Epidemiology of urethral stricture at Tygerberg Hospital. *S. Afr. Med. J.* 84(5):267-8; 1994.
37. Palaniswamy, R. & Bhandari.: Point of focus: poor genital hygiene and terminal urethral strictures. *Trop. Geogr. Med.* 35(2):139-43; 1983.
38. Narborough, G.C., Elliot, S. & Minford, J.E.: Congenital strictures of the urethra. *Clin. Radiol.* 42(6):402-6; 1990.
39. Smith, P.J.B., Roberts, J.B.M., Ball, A.J. & Kaisary, A.V.: Long-term results of optical urethrotomy. *Br. J. Urol.* 55:698-700; 1983.
40. Chilton, C.P., Shah, P.J.R., Fowler, C.G., Tiptaft, R.C. & Blandy, J.P.: The impact of optical urethrotomy on the management of urethral strictures. *Br. J. Urol.* 55:705-10; 1983.
41. Ishigooka, M., Tomaru, M., Hashimoto, T., Sasagara, I., Nakeda, T. & Mitobe, K.: Recurrence of urethra stricture after single internal urethrotomy. *Int. Urol. Nephrol.* 27(1):101-6; 1995.
42. Albers, P., Fichtner, J., Bruhl, P. & Muller, S.C.: Long term results of internal urethrotomy. *J. Urol.* 156(5):1611-4; 1996.
43. Mundy, A.R.: The long term results of skin inlay urethroplasty. *Br. J. Urol.* 75:59; 1995.
44. Provert, J.A., Surya, B.V., Grunberger, I., Johanson, K. & Brown, J.: Scrotal island flap urethroplasty in the management of bulbar urethral strictures. *J. Urol.* 142:1455-8; 1989.
45. ElKesaby, A.W., Alla, M.F., Noweir, A., Mourad, S. & Youssef, A.H.: One stage anterior urethroplasty. *J. Urol.* 156(3):975-8; 1996.
46. Mitra, A.L. & Arap, S.: Penile circular fasciocutaneous skin flap in 1-stage reconstruction of complex anterior urethral strictures. *J.Urol.* 160:2163-4; 1998.
47. Rosette, J.J.M.C.H., De Vries, J.D.M., Lock, M.T.W.T. & Debruyne, F.M.J.: Urethroplasty using the pedicled island flap technique in complicated urethral strictures. *J. Urol.* 146:40-2; 1991.
48. Gnanaraj, J., Devaria, A., Kinanaraj, K. & Pandey, A.P.: Intermittent self clean catheterization vs regular outpatient dilatations in urethra stricture; a comparison. *Aust.N.Z.J.Surg.* 69(1):41-3; 1999.
49. Steenkamp, J.W., Heyns, S.C.F & de Kock, M.L.: OPD treatment of male urethral strictures--- dilatations vs internal urethrotomy. *S.Africa.J.Surg.* 35(3):125-30; 1997.

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