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# PRIMARY BLADDER NECK OBSTRUCTION (PBNO): A CAUSE OF LUTS IN YOUNG MEN

Lower urinary tract symptoms (LUTS) are quite common in young men, though not as common as in elderly. Until recently, the conditions causing LUTS like primary bladder neck obstruction (PBNO), bladder pain syndrome (BPS), urethral syndrome, etc. were less discussed and remained unidentified. Among them, the PBNO, is now thought to be the most common condition in young men presenting with LUTS. Patients with PBNO are frequently misdiagnosed and treated empirically with antibiotics or anticholinergics, without diagnostic evaluation. The condition has a variable natural history and can result in relatively severe voiding dysfunction with long term consequences if goes unrecognized.

Primary bladder neck obstruction (PBNO), first described by Marion[1], is a condition in which the bladder neck fails to open sufficiently during voiding, resulting in a weak urinary stream. The condition is suggested by a history of mixed voiding and storage complaints with predominant obstructive symptoms, in the absence of prior infection, injury, neurological or other anatomic obstructive lesions. It may or may not be accompanied by supra-pubic, pelvic and/or testicular pain. The patients express a varying degree of distress with sleep disturbance, work loss and psychological impact. Physical examination is unremarkable except in decompensated bladder. Superimposed urinary infection may complicate the situation.

A comprehensive assessment of the symptoms and signs in combination with urinalysis, urine culture, and uroflowmetry can identify patients who should undergo more invasive testing required for accurate diagnosis. In symptomatic patients, a combination of uroflow and videourodynamics (VUDS) is highly accurate for the diagnosis[2]. Poor funneling of the bladder neck and high-pressure voiding confirm the diagnosis. However, voiding pressure may remain in the normal range with inadequate funneling[3]. In case of non-availability of VUDS, conventional urodynamics along with a separate retrograde and micturating cysto-urethrogram (RGU & MCU) may diagnose the condition. Moreover, as renal functional deterioration is related to exposure of the upper tract to high intravesical pressure, urodynamics can identify patients most likely to be benefited from aggressive treatment.

With an appropriate diagnosis, the therapy results in good outcome in the majority of patients,  $\alpha$ -blockers have been the mainstay of medical treatment for PBNO. However the results of treatment with  $\alpha$ -blockers have varied greatly. Most studies are small, non-randomized and non-controlled and the types and dosages of drugs are not consistent. Although  $\alpha$ -blockers are effective and safe for treating young men with PBNO<sup>4-5</sup>, the compliance to treatment is poor<sup>3</sup>. Successful treatment is achieved more in urodynamically obstructed cases<sup>5</sup>. Transurethral bladder neck incision (BNl) is an effective surgical treatment of PBNO, but the major concern in classic bilateral BNI is postoperative retrograde ejaculation and consequent fertility issue in young men. Retrograde ejaculation (27-100% in bilateral BNI) is less likely to occur in unilateral BNI or when part of the supramontanal tissue is preserved in bilateral BNI. The concern is great when the disease affects a young man having no child yet.

Further research is needed to find out a diagnostic method suitable for our population within the available facilities, the appropriate medical therapy with low cost drugs and an optimal surgical technique including its appropriate timing.

*Bangladesh J. Urol. 2016; 19(2): 57*

### **Prof. AKM Anwarul Islam**

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# LAPAROSCOPIC DISMEMBERED PYELOPLASTY FOR URETEROPELVIC JUNCTION OBSTRUCTION: OUR PRELIMINARY EXPERIENCE

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### Abstract

**Objective:** To evaluate prospectively the results obtained in 16 patients undergoing laparoscopic pyeloplasty through trans-peritoneal access.

**Materials and Methods:** The study was conducted in the department of urology, BSMMU, Dhaka between the periods of March 2013 and June 2014, sixteen patients between 15 and 48 years old, were treated for ureteropelvic junction obstruction (UPJO) via a transperitoneal laparoscopy. All patients had clinical symptoms of urinary obstruction and hydronephrosis were confirmed by imaging methods. Anderson-Hynes dismembered pyeloplasty was performed in all patients. Patients were clinically and imaging evaluated in the postoperative period at 6 and 12 weeks.

**Results:** Most of the patients were male (68.75%) and female were 31.25%. The mean operative time was 127.37 ( $\pm 15.67$ ) minutes ranged from 95 to 240 minutes. Pain score in first postoperative day and third postoperative day following pyeloplasty were 20.87 ( $\pm 6.83$ ) and 4.75 ( $\pm 3.34$ ) respectively. The mean hospital stay was 4.25 ( $\pm 1.34$ ) days. Anomalous vessels were identified in 4 patients, intrinsic stenosis in 12 patients. Postoperative urine leakage and UTI were seen 18.75%, 12.50% subject respectively. Split renal function and GFR were significantly improved ( $p < 0.05$ ) and improvement of renal functional outcome was 87.50%.

**Conclusion:** Laparoscopic pyeloplasty had the advantages like less postoperative pain and shorter hospital stay.

**Key words:** laparoscopy; pyeloplasty;

Bangladesh J. Urol. 2016; 19(2): 59-63

### Introduction

Ureteropelvic junction (UPJ) obstruction is one of the most common ureteric intrinsic pathology, generally manifested by back pain, renal colic and urinary tract infection but it may be asymptomatic. It can lead to progressive hydronephrosis and renal dysfunction. Surgical management of ureteropelvic junction obstruction aims to provide symptomatic relief and

improve renal function or preserve remaining renal function. The gold standard treatment of ureteropelvic junction obstruction is Anderson-Hynes dismembered pyeloplasty, traditionally performed in a conventional open procedure, with success rates over 90%[1]. Laparoscopic pyeloplasty was first reported in 1993, both by Schuessler and co workers and by Kavoussi and Peters, who utilized the dismembered pyeloplasty

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technique[2] with excellent functional results and significant reductions in morbidity[3]. Laparoscopic pyeloplasty can be performed via a retroperitoneal or a transperitoneal approach. Equivalent success rates have been quoted in the literature for both of these methods[4,5]. Present study was conducted by the transperitoneal approach for all the patients, as this approach offered ease in identifying, dissecting and mobilizing the intra-abdominal structures, while the potential disadvantages included a prolonged ileus, adhesion formation, and injury to the adjacent viscera. The aim of the study is to assess the potential advantages of laparoscopic pyeloplasty and to share our experience. These are less post-operative pain, a shorter period of hospitalization and relief of renal obstruction.

### Materials and Methods

Purposive Sampling technique was applied to collect the sample from study population. In this prospective study sixteen consecutive patients were selected by inclusion and exclusion criteria. In the period from March 2013 to June 2016, 16 patients, 11 men and 5 women, aged between 15 and 48 years old were treated for UPJ obstruction through transperitoneal laparoscopy (Table-I). All patients had clinical symptoms of high urinary obstruction and hydronephrosis, confirmed by intravenous urogram and GFR. None of them had undergone any previous treatment.

**Table-I**  
*Summary of patient*

Number	
Male	11
Female	05
Age (years)	
Mean	22.81 ( $\pm$ 8.86)
Range	15-50
Laterality	
Right	06
Left	10

This present study had been conducted on the patients with ureteropelvic junction obstruction admitted in the department of urology, Bangabandhu Sheikh Mujib Medical University, Dhaka. All patients were evaluated by history, physical examination and investigations. Pre-

operative IVU was done in all the patients to see the condition of kidney. Diuretic  $^{99m}\text{Tc}$ -DTPA (diethylenetriaminepentacetate) renogram was done in all patients to see the preoperative split renal function (SRF) in percentage and glomerular filtration rate (GFR). Patients with documented UTI were treated with appropriate antibiotic before the procedure.

With all preoperative preparation general anaesthesia was given, the patient was positioned into contralateral 45<sup>o</sup> lateral decubitus position and kidney bridge was elevated. The Veress needle was placed in the midclavicular line 2 cm below the costal margin and pneumoperitoneum to a pressure of 15 mm Hg was established. The primary 10 mm trocar was placed in the midclavicular line about 5 cm above and lateral to the umbilicus and diagnostic laparoscopy was performed. Secondary ports were placed four fingerbreadths apart in a triangulated manner. Sometimes additional port was placed according to requirements. For right sided operations one additional 5 mm port was placed in the midline beneath the xiphoid process for liver retraction. The retroperitoneal space was entered by incising the peritoneum overlying the medial aspect of the kidney and allowing the colon to be displaced medially. The renal pelvis was then dissected completely free of all attachments. Laparoscopic scissors were used to dismember the ureter and pelvis and the stenotic ureteropelvic junction segment was excised. The repair was then completed by anastomosing the ureter to the renal pelvis using interrupted and continuous 4/0 polyglactin suture after placement of double J stent at the ureter. Percutaneous drain was placed. If crossing vessel was present, the repair was performed anterior to the vessel. In the follow up study all cases were evaluated after six weeks and three months postoperatively. The double J stent was removed after six weeks. Every case was evaluated by history i.e. symptomatic improvement (pain free or complain of pain), clinical examination, urinalysis, IVU, ultrasonography of KUB and  $^{99m}\text{Tc}$ -DTPA renography after three months postoperatively.

### Results

The operative and post-operative results are distributed in Table-2. 19 patients were operated initially. But 3 patients were lost during follow up. Most of the patients were male (68.75%). The mean operative time was 127.37 ( $\pm$ 15.67) minutes *ranged from 95 to 240 minutes*. There



was a progressive decrease in operative time after the first few cases. Anomalous vessels were **identified in 4 patients, intrinsic stenosis in 12 patients.**

Pain score in first postoperative day and third postoperative day following pyeloplasty were 20.87 ( $\pm 6.83$ ) and 4.75 ( $\pm 3.34$ ) respectively. Intensity of pain following pyeloplasty was significantly less ( $p < 0.05$ ).

Urine leakage and UTI were seen 18.75% and 12.50% subject respectively. No wound infection occurred following laparoscopic pyeloplasty. The mean hospital stay following laparoscopy was 4.25 ( $\pm 1.34$ ) days. Hospital stay was significantly shorter in laparoscopic pyeloplasty group ( $p < 0.05$ ).

In the present study, 87.5% cases were improved i.e. completely pain free after removal of double J stent. In the study group, pre and post-operative split renal function in percentage were 28.85 ( $\pm 11.35$ ) and 35.64 ( $\pm 9.78$ ) respectively and GFR were 20.03 ( $\pm 4.22$ ) ml/min and 27.48 ( $\pm 5.05$ ) ml/min respectively. Split renal function and GFR were significantly improved after operation ( $p < 0.05$ ) and improvement of renal functional outcome was 87.50%.

**Table-II**  
Summary of results

Operative time(minutes)	
Mean	127.37 ( $\pm 15.67$ )
Range	95 to 240
Pain score(100 mm scale)	
First postoperative day(Mean)	20.87 ( $\pm 6.83$ )
Third postoperative day(Mean)	4.75 ( $\pm 3.34$ )
Hospital stay (Days)	
Mean	4.25 ( $\pm 1.34$ )
Range	2-14
Complications( in percentage)	
Urine leakage	18.75%
UTI	12.50%
GFR( ml/min)	
Preoperative (Mean)	20.03 ( $\pm 4.22$ )
Postoperative(Mean)	27.48 ( $\pm 5.05$ )
Split renal function( in percentage)	
Preoperative	28.85 ( $\pm 11.35$ )
Postoperative	35.64 ( $\pm 9.78$ )
Success rate( in percentage)	87.50%

## Discussion

Open Anderson-Hynes pyeloplasty is the gold standard for surgical treatment of ureteropelvic junction obstruction, a long-term success rate exceeding 90%[6]. This procedure requires a muscle cutting incision that causes some degree of morbidity. Ureteropelvic junction obstruction causes hydronephrosis and progressive renal impairment if left untreated. The optimum surgical correction of UPJO has been a urological challenge for over a century. Open pyeloplasty originally described by Anderson and Hynes remains the gold standard against which new technique may be compared. The morbidity associated with flank incision, however has lead to development of minimally invasive approaches to UPJ repair.

Minimally invasive procedures have emerged with the aim of reducing the morbidity in the open surgery. Retrograde and antegrade endopyelotomy, pneumatic balloon dilatation, Acucise, cold Knife and more recently the use of laser were used for the purpose of treatment of UPJ stenosis. Such procedures have low morbidity, but lower rates of success[7,8]. Moreover, there is evidence that patients with large re-nal pelvis, poor kidney function and anomalous vessel are not good candidates for endoluminal techniques. Added to this, the long-term results are also worse, at around 63% with more frequent relapses[9].

Anderson-Hynes dismembered technique is used in most series of published laparoscopic pyelo-plasties, reflecting an attempt to reproduce the well-established principles of open surgery[3,10], besides being more effective than other minimally invasive procedures[7,8,9]. The dismembered technique should always be considered, even in the presence of anomalous vessel, because in more than half of the cases there is an associated intrinsic stenosis[11].

Laparoscopic pyeloplasty can be performed via a retroperitoneal or a transperitoneal approach. Equivalent success rates have been quoted in the literature for both these methods. The present study used a transperitoneal approach for all the patients, as this approach offered ease in identifying, dissecting and mobilizing ureter and pelvis of the kidney.

The results of laparoscopic pyeloplasty from several institutions which was reported on the adult series, suggested that this procedure was a viable alternative to both open and endoscopic procedures.

In this study, mean operative time was 127.37 ( $\pm 15.67$ ) minutes. Operative time was significantly longer in

laparoscopic pyeloplasty like previous studies due to proximal ureteric spatulation and laparoscopic intracorporeal stitching. Bansal observed that total operative time with stent placement in laparoscopic pyeloplasty was 244.2 min (188-300 min)[12]. There was a significant and progressive decrease in operative time during this series associated with greater experience acquired by the surgeon.

Intensity of pain following operation was significantly less. Klingler[13] performed a study where it was seen that postoperative pain score was lower in the laparoscopic group (day 1 3.5+/-1.6 vs. 5.4+/-3.1, day 5 0.9+/-1.2 vs. 3.1+/-1.8, p=0.001). Analgesic doses were also less after laparoscopy[12,14]. There is very small port incision and tissue trauma during laparoscopy. So, patient can be discharged early than open surgery. In current study, the mean hospital stay was 4.25 (±1.34) days which was comparable to other published data. urine leakage was seen in case of laparoscopic pyeloplasty which might be due to inappropriate ligature and knotting during procedure. In the present study, it was found in 18.75% patients which was also comparable to other study.

Open pyeloplasty has been the gold standard for the treatment of UPJ stenosis since its establishment, with long-term success rates higher than 90%[1]. However, its morbidity is high especially related to chronic pain, risk of incisional hernia and later return to 'daily activities'[3]. The success rates of laparoscopic pyeloplasty were comparable to those of open surgery with long-term rates as high as 98%[15-21].

In this series, there was a success rate of 87.50%, consistent with the data presented in the literature for laparoscopic and open pyeloplasty.

### Conclusion

Laparoscopic pyeloplasty has functional results comparable to the conventional open technique and better than the other endoluminal procedures. It is a safe and effective alternative for the treatment of UPJ obstruction and it can be considered as first choice by surgeons with experience in laparoscopy.

**Conflict of Interest** : None

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# OUTCOME OF BUCCAL MUCOSAL GRAFT URETHROPLASTY IN LONG SEGMENT ANTERIOR URETHRAL STRICTURE

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## Abstract:

**Objective:** To assess the success of BMG urethroplasty in long segment anterior urethral stricture.

**Method:** From January 2014 to December 2015, twenty male patients with long anterior segment urethral stricture were managed by BMG urethroplasty. After voiding trial they were followed up at 3 month with Uroflowmetry, RGU & MCU and PVR measurement by USG. Patients were further followed up with Uroflowmetry and PVR at 6 months interval. Successful outcome was defined as normal voiding with a maximum flow rate >15ml /sec and PVR<50 ml with consideration of maximum one attempt of OIU after catheter removal.

**Results:** Mean stricture length was 5.2 cm (range 3-9 cm) and mean follow-up was 15.55 months (range 6-23 months). Only two patients developed stricture at proximal anastomotic site during follow-up. One of them voided normally after single attempt of OIU. Other one required second attempt of OIU and was considered as failure (5%).

**Conclusion:** BMG urethroplasty is a simple technique with good surgical outcome.

**Key words:** Buccal mucosal graft urethroplasty, Uroflowmetry, PVR

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## Introduction

Long-segment anterior urethral stricture management remains a challenge in reconstructive urology. Day by day different methods and techniques are coming in the field of management of stricture and some of them have been considered better. The surgical treatment of urethral strictures varies according to etiology, location, length, density of the lesion and fibrosis involving surrounding tissue[1,2,3].

Although much has been written on the various techniques used to reconstruct the urethra, there is little evidence comparing the outcomes of the different approaches. There is also no clear data to establish which type of urethroplasty is to perform under which particular condition, with the exception of open perineal

end to end anastomosis for the treatment of short segment bulbar strictures[4,5].

Open urethroplasty has become the gold standard for definitive treatment of urethral strictures<sup>6</sup>. It demonstrates high success rate (up to 95%) compared to alternative treatments such as direct visual internal urethrotomy (DVIU) and dilatation, both of which show long term recurrence rates of over 50%[7]. Many urological surgeons still believe reconstructive urethral surgery should only be offered as a last resort[8,9].

Patients with long segment strictures (>2 cm) are not suitable for end to end anastomotic urethroplasty due to the risk of post-operative chordee formation[10]. Substitution urethroplasty is ideal for the management of long anterior urethral strictures. The ideal material for substitution urethroplasty remains controversial<sup>11</sup>. Urethra is the best substitute for urethra – Turner Warwick's opinion is still true<sup>10</sup>. So use of other

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substitute for urethra always has a compromised outcome state. Urethral substitution has long been accomplished by using genital skin flaps, grafts of genital or extra-genital tissues. However, use of genital skin pedicle flap is a difficult procedure requiring extensive penile and scrotal dissection to mobilize the flap to the deep perineum and associated with post-operative torsion and penile scarring[12,13]. Except these, post auricular full thickness free grafts, bladder mucosa, full thickness hairless abdominal wall skin, have been used as alternative free graft sources, the overwhelming majority of cases are most easily treated with buccal mucosal grafts[14].

Buccal mucosa has recently gained its popularity as a substitute for urethral reconstruction for both stricture and complex hypospadias[15,16]. It can be accustomed to a wet environment, having good vascularity, hairless, easy to harvest, thick epithelium making it easy to handle and less chance of graft contracture, having a thin lamina propria allowing easy inosculation, and reduced chance of pseudo-diverticula formation[11].

In our study, we described our initial experience in long segment anterior urethral stricture management using buccal mucosal graft (BMG) urethroplasty. Here unilateral mobilization of urethra (Left) and dorsolateral graft placement technique was adapted.

#### **Materials and Method:**

From January 2014 to December 2015, twenty patients with long segment anterior urethral strictures were managed by single stage BMG urethroplasty. Each patient was evaluated with detailed case history, physical examination, imaging study with retrograde urethrogram (RGU) and micturating cystourethrogram (MCU), uroflowmetry, USG of KUB region with PVR measurement, and other routine investigations required for anesthetic fitness. Of the strictures 11 were associated with Lichen sclerosus (BXO), 4 were traumatic, 2 were infective, and 3 were idiopathic in origin (Table I). Mean stricture length as measured by preoperative RGU and MCU was 5.2 cm (range 3-9 cm)(Table III). The sites of strictures were pan urethral in 4 patients, penile in 7 patients and bulbar in 9 patients (Table II).

Operation was performed under regional anesthesia (SAB) and the patient put in exaggerated lithotomy position. Operation was done in a 2- team approach – one team engaged in urethral procedure and other team in harvesting the buccal mucosa. Through a midline

perineal incision, the bulbospongiosus muscle was divided, exposing the corpus spongiosum of the anterior urethra. Then unilateral (left) mobilization of the corpus spongiosum up to the line just beyond the dorsal midline was done by invaginating the penis into perineal wound. Next, the strictured segment of the urethra was identified and evaluated the length. The other team then harvested the buccal mucosal graft of adequate length from the inner cheek area, below the Stensen's duct without injuring it.

Then the dissected urethra was rotated and dorsolateral surface was exposed. Next, the strictured segment was opened vertically through the dorsal midline extending the incision for about 1 cm both proximally and distally into the normal urethral lumen. Then the graft was placed on the corpus cavernosum dorsolaterally according to the length and position of the strictured segment and quilted over the corpora cavernosum using few 5/0 polyglactine quilting sutures for reinforcement with good support and minimizing the dead space. Next, the right margin of the graft sutured with the corresponding margin of the splitted urethra and a 16 Fr pure silicone Foley's catheter was inserted through the urethra into the urinary bladder. Then invaginated penis was repositioned and perineal wound was closed layer by layer. At the end of the procedure suprapubic catheter was placed in every case.

After 3 weeks of operation, per urethral catheter was removed and a voiding trial was done then retrograde contrast study was performed. If patient could successfully voiding, and no extravasation of contrast then suprapubic catheter was removed after 3-5 days.

At 3 months after catheter removal- uroflowmetry, RGU and PVR measurement by USG were performed. Patients were further followed up with uroflowmetry and PVR measurement at 6 months interval. A successful outcome was defined as normal voiding with the need for maximum one attempt of subsequent OIU.

#### **Result:**

A total 20 patients (mean age—35 years, range—20 to 60 years) underwent BMG urethroplasty through unilateral (Lt.) urethral mobilization and dorsolateral onlay graft placement technique between January 2014 to December 2015. Mean operating time was 117 minutes (range—90 to 150 minutes) and mean follow up period was 15.55 months (range-6 to 23 months). Only 3 patients required post-operative 1 unit blood transfusion. Mean duration of hospital stay was 6.7 days (range—5

to 10 days). One patient showed extravasation of contrast on RGU after 3 weeks of operation at proximal anastomotic site and successfully managed by extended suprapubic catheterization for another 2 weeks. Two patients developed stricture at proximal anastomotic sites and 1 of them voided normally after single attempt of OIU. But other required second attempt of OIU and then voided normally. The last one was considered as failure (5%). Three patients developed wound infection managed successfully with change in antibiotic according to the wound swab culture sensitivity test. No patient developed diverticulum, fistula, sacculation or protrusion of the graft at external meatus. Peak urinary flow rate improved from a mean of 7.35 ml/sec (range-4 to 12 ml/sec) preoperatively to 24.15 ml/sec (range-16 to 30 ml/sec) after 3 months postoperatively (Table IV).

**Table-I**  
*Aetiology of strictures:*

Cause of strictures	No of patients
BXO	11
Traumatic	04
Infective	02
Idiopathic	03
Total	20

**Table-II**  
*Location(site of strictures):*

Location of strictures	No of patients
Panurethral	04
Penile	07
Bulbar	09
Total	20

**Table-III**  
*Length of strictures:*

Length of strictures	No of patients	Mean Length
2-4 cm	8	
5-7 cm	8	5.2 cm
8-10 cm	4	

PVR on USG decreased from a mean of 145.95 ml (range—60 to 300 ml) preoperatively to a mean of 18.5 ml (range—8 to 40 ml) after 3 months postoperatively (Table IV). In our series, minimum follow up was 6 months and maximum follow up was 23 months from the date of catheter removal.



Fig.-1: Long segment anterior urethral stricture

**Table-IV**  
*Improvement in Q-max and PVR score after operation:*

Assessment Criteria	Preoperative	Postoperative (After 3 months)	p Value
Mean Q-max (range)	7.35ml/sec(4-12)	24.15 ml/sec(16-30)	<0.00001
Mean PVR (range)	145.95ml(60-300)	18.5ml(8-40)	<0.00001

**Discussion:**

Long anterior urethral stricture (>2cm) should be treated with substitution urethroplasty to avoid post-operative chordee formation[10]. Substitution urethroplasty may be a patch graft or tube graft[17,18,19,20].

Humby was the first to use buccal mucosal graft for urethral reconstruction in a series of single stage hypospadias repair[21]. However, BMG urethroplasty has emerged as a popular technique in 1990s. But whether to place the graft dorsally, ventrally, or laterally is still controversial. Ventral onlay graft is more prone to fistula formation, sacculation and diverticula formation leading to urinary stasis and ejaculatory dysfunction[11]. On the other hand, dorsal onlay graft provides the advantage of better mechanical support by the corporal bodies for the graft's better take up and less incidence of sacculation & fistula formation[22,23].

In different series, ventral onlay urethroplasty has revealed a success rate of 57.1% to 100% with a follow up ranging from 20 to 64 months[24,25]. On the other hand, dorsal onlay BMG urethroplasty has shown a success rate from 85.5% to 100% with a follow up ranging from 22 to 41 months[24,25].

Recently, Barbagli et al. Published retrospective study of 50 cases with bulbar urethral stricture where buccal mucosal graft urethroplasty were done. In their study, grafts were placed as ventral, dorsal and lateral onlay in 17, 27 and 6 patients respectively. After a mean follow up of 42 months, placement of graft into ventral, dorsal and lateral surface of the bulbar urethra showed the similar success rates[26].

Circumferential mobilization of the urethra, as suggested in the original dorsal onlay graft technique causes damage the vascular connections between the corpus spongiosus and the tunica albuginea and the lateral vascular connection between the urethra and the superficial perineal tissue on both sides[27,28,29]. On the other hand, unilateral mobilization is a minimally invasive approach where there is a preservation of the one-sided vascular supply to the urethra and its entire muscular and neurogenic support represents a slight but significant step toward perfecting the surgical technique of urethral reconstruction[30].

In our series of 20 cases, only two patients developed stricture at proximal anastomotic sites and one of them voided normally after single attempt of OIU and other patient required 2 attempt of OIU and considered as failure case i.e. 5% failure. No one developed

diverticulum, sacculation, or fistula. Maximum urinary flow rate improved from a mean of 7.35 ml/sec to 24.15 ml/sec and post voidal residual urine reduced from a mean of 145.95 ml to a mean of 18.5 ml.

So, there was an inverse relationship between peak urinary flow rate and post voidal residual urine and there was a statistically significant improvement of peak urinary flow rate before and after operation. The success rate was similar to the universe (95%).

**Conclusion:**

In our study, it has been shown that dorsolateral BMG urethroplasty through unilateral urethral mobilization is a reliable and satisfactory procedure to manage long anterior urethral strictures with minimum complications. Harvesting the graft is simple, only requiring good coordination between two teams of surgeons. Few cases, considered as failure with stricture formation can be managed with OIU. Our follow-up is considerable but not long term. So, further long term follow-up should be continued to confirm the durability of the results. The question of placing the BMG dorsally, ventrally or laterally is still unresolved. A randomized controlled trial with careful patient selection and long-term evaluation of results is required to solve this controversial issue.

**Conflict of Interest : None****References**

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# THE SURGICAL INTERVENTION IN GENITOURINARY TUBERCULOSIS

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## Abstract

**Introduction:** Genitourinary tuberculosis (GUTB) is the leading cause of morbidity and mortality worldwide especially in developing countries. Surgery is an essential management modality in genitourinary tuberculosis when indicated.

**Objective:** This study aims to document the role of surgery for genitourinary tuberculosis according to the organ involved.

**Materials and Methods:** Retrospective review of 33 GUTB cases was done that underwent surgery at department of urology, Bangabandhu Sheikh Mujib Medical University from January 2008 to December 2014. Patient's baseline characteristics, mode of presentation, organ involvement, investigation, surgical intervention and follow up were studied.

**Results:** Among enrolled patients, mean age at presentation was 31.5 years and 64% (21, 33) were male. The most common presentation was irritative voiding symptoms. Kidney was the most common organ involved in 39% (13, 33) cases, and next common site was bladder in 30% (10, 33) cases. Preoperative bacteriologic diagnosis was confirmed only in 21% (7, 33) cases. A total of 41 surgical procedures were performed as some patients needed more than one procedure. These included 13 endoscopic, 6 temporary diversion, 19 ablative procedures and 3 reconstructive procedures. Post surgical follow up of all the patients were given after 3, 6 and 12 months. Then the patients were followed with RFT and ultrasonography 6 monthly for 3 years and then annually. The intravenous urography and diethylenetriamine pentaacetic acid scan were performed when indicated.

**Conclusion:** Multidrug chemotherapy with judicious surgery when indicated is the ideal treatment. Surgery plays an important role in symptomatic relief and helps to lead a normal life. The results of reconstructive surgery are good and should be done when possible. Rigorous and long term follow up is necessary in patients undergoing reconstructive surgery.

**Key Words:** Tuberculosis, reconstructive surgery, urogenital.

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## Introduction:

Tuberculosis (TB) is a major public health problem in developing as well as de-veloped countries. The recent surge in reported cases of TB is mainly attributable to Human Immunodeficiency virus (HIV) infection, emergence of resistant bacilli and human migration [1]. The World Health Organization (WHO) estimates that 9.27 million new cases of TB occurred in 2007,

compared with 9.24million new cases (140 per 100,000) in 2006. An estimated 1.37million (14.8%) of the cases in 2007 were HIV-positive. Pulmonary sites account for 10% of tuberculosis cases. Genitourinary TB accounts for 30% to 40% of all extrapulmonary TB, second only to lymphonodal affection. In developed countries, urogenital tuberculosis occurs in 2% to 10%of cases of pulmonary tuberculosis, while in developing countries it occurs in as many as 15% to 20% of cases[2].

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Diagnosis of genitourinary tuberculosis (GUTB) are not straight forward and the low yield of current available investigations, the disease remains subclinical for long

time before initiation of chemotherapy, that leads to distorted and dysfunctional anatomical changes in the genitourinary tract. Therefore, Surgery still continues to play a major role despite effective chemotherapy for tuberculosis. It is estimated that approximately 55% of patients with GUTB require surgical intervention[3]. In this study, we assessed the role of surgical intervention in GUTB. Both ablative and reconstructive surgery have role to eradicate the disease and prevent relapse as well as to preserve or to restore the function of the organs.

### Materials and methods

This retrospective study was conducted in Department of Urology of our institution, a tertiary care center of Dhaka, Bangladesh. A total of 33 patients diagnosed as GUTB were admitted and undergone surgery for different indication, from January 2008 to December 2014. Evaluation included detailed clinical history and physical examination, followed by a complete blood count, renal function test (RFT) and liver function tests. Urine examination, including bacterial cultures, was performed. Urine for acid-fast bacteria (AFB) smear was done on 3 consecutive days, and mycobacterial culture was obtained. Radiological evaluation included chest X-ray, X-ray of kidneys-ureters-bladder (KUB) was performed in all cases and intravenous urogram when serum creatinine was normal. Gene Xpert test for urine and body fluid was also done in selected cases.

A voiding cystourethrogram, nephrostogram and retrograde pyelogram, ultrasound study of KUB region and computerized tomography were obtained when necessary. Cystoscopy and bladder biopsy were done wherever indicated. Fine needle aspiration cytology (FNAC) was performed in cases with epididymal nodule. Biopsy from fistulous or sinus tract were also taken when indicated.

Renal dynamic scans were used selectively to ascertain renal function in compromised kidneys. Polymerase chain reaction (PCR) was done in cases to assist in diagnosis. All patients received antitubercular drug therapy with 4 drugs (rifampicin, ethambutol, isoniazid and pyrazinamide) for 2 months followed by 2 drugs (rifampicin and isoniazid) for 4-7 months. Temporary urinary diversion was performed in case of obstruction. The operative procedure was selected depending upon the organ involved, the extent of disease, functional status of the involved organs and overall renal function. Follow-up included history, physical examination and investigations like complete blood count, liver function

tests and RFT at 3 and 6 months. The intravenous urography and diethylenetriamine pentaacetic acid (DTPA) scan were performed when indicated. Then the patients were followed with RFT and ultrasonography 6 monthly for 3 years and then annually. Data were collected from departmental register in a predefined proforma. Analyses were done with SPSS version 19.

### Results:

There were 21 males and 12 females. Mean age of the patients was 31.5 years with a range of 15-57 years. The most common symptom was irritative voiding symptoms in all 33 patients, 20 had constitutional symptoms, 15 patients had haematuria, 12 had sterile pyuria, 3 had discharging scrotal sinus 1 had nephrocutaneous fistula 3 had renal failure [Table 1]. The most commonly involved organ was the kidney cases 13, followed by the bladder in 10, ureteral lesions were found in 09 cases, epididymis in 05 and complex lesions in 04 cases [Table 2].

**Table-I**

*Distribution of presenting symptoms and signs among studied patients*

Presenting symptoms	Number of patients (n 33)
Irritative voiding symptoms	33
Constitutional symptoms	20
Haematuria	15
Sterile pyuria	12
Discharging scrotal sinus	3
Nephrocutaneous fistula	1
Renal failure	3

Most patients had more than one symptoms

**Table-II**

*Distribution of organ involvement*

Organ involved	Number(n 33)
Renal lesions	13
Ureteropelvic junction obstruction	4
Ureteral lesions	9
Upper	2
Middle	3
Lower	4
Bladder	10
Epididymis	5
Complex (more than two sites)	4

Radiological evidence suggestive of TB such as calcification, caliceal destruction, infundibular stenosis, cavitation, ureteral stricture, urethral stricture and small capacity bladder was apparent in 29 cases [Table 3]. Raised ESR was found in 25 patients. Mountoux test (MT) was positive in 9 patients. Urine culture for AFB was found positive in 7 while pus culture for AFB resulted positive in 6 patients. Among serological tests Polymerase Chain Reaction (PCR) suggestive of TB was in 4 patients while the newly available Gene Xpert test for TB was positive in 3 cases. Cystourethroscopy was performed in 13 cases. The bladder had evidence of chronic cystitis in the vast majority of cases Bladder biopsy was diagnostic of TB in 5 cases. FNAC was performed in 5 cases with epididymal swelling and was suggestive of TB. Patients received antitubercular therapy (ATT) for a total of 6-9 months with 4 drugs for 2 months, and 2 drugs for another 4-7 month. Abnormal liver function, drug intolerance or hypersensitivity was seen in 2 patients. The offending drug was excluded thereafter for that particular patient, and the second-line drug introduced as and when necessary.

**Table-II**  
*Distribution of patients with abnormal laboratory and radiological investigation*

Investigations	Number of patients (n 33)
Raised ESR	25
Positive Mountoux test	9
Positive AFB urine culture	7
Positive AFB pus culture	6
Positive bladder biopsy	5
Positive PCR	4
Positive Gene Xpert test	3
Positive FNAC	5
Positive radiological evidence	29

A total of 41 surgical procedures were performed [Table 4]. Of the procedures, Endoscopic was 13, in the form of bladder biopsy (5), retrograde DJ stenting of ureter (6) and antegrade stenting (2). Temporary diversion by percutaneous nephrostomy was done in 6 patients. In our study 19 ablative procedures was done. Of them nephrectomy 10, nephroureterectomy 4 and epididymectomy in 5 cases. Augmentation cystoplasty for small capacity refluxing bladder by ileocystoplasty

was done in 3 cases that needed intermittent catheterization. Post operative complications were found as wound infection in two cases and fever in one case, both were managed conservatively.

**Table-IV**  
*Pattern of surgical interventions among studied patients*

Surgical interventions	Number (n 33)
Bladder biopsy	5
Retrograde ureteric stenting	6
Antegrade stenting	2
PCN	6
Nephrectomy	10
Nephroureterectomy	4
Epididymectomy	5
Augmentation cystoplasty	3

**Discussion**

The term GUTB was first introduced by Willbolz *et al.* It is the second most common form of extra-pulmonary tuberculosis after lymph node involvement. Although GUTB was the most common sub-type of extra-pulmonary tuberculosis (EPTB), it was recently reported to account for <5% of all patients with EPTB. Eight to 15% of patients with pulmonary tuberculosis are supposed to be at risk of developing GUTB. In our study, 19.6% of patients had the history of pulmonary tuberculosis. Active GUTB usually presents 5-25 years after the primary infection. The primary organ affected in urinary tract is kidney. Renal involvement is usually slow, progressive and destructive. It may lead to unilateral renal loss and renal failure in bilateral involvement. Other part of urinary tract is involved as extension of disease from kidney[4].

TB is an important cause of morbidity and mortality, especially with the emergence of treatment resistant bacilli and HIV infections[5]. GUTB, a common type of extrapulmonary TB, can have a variable presentation; the severity of the disease is related to the time of diagnosis[6]. Human infection is mainly caused by Mycobacterium tuberculosis and M. bovis. Immunity is predominantly mediated by T-helper cells, cytokines and the genetic make up of the host[7].

Reconstructive surgery for GUTB is required for cases with grossly distorted and dysfunctional anatomy that

are unlikely to regress with chemotherapy alone[8]. Reconstructive surgery has a role in the management of GUTB, despite the presence of effective ATT. The various procedures of reconstructive bladder surgery can be used according to the various indications in an individual patient. It affects males and females equally and is commonest in the fourth decade of life[9].

In the present study there were 21 males and 12 females. Mean age of the patients was 31.5 years with a range of 15-57 years. The most common symptom was irritative voiding symptoms in all 33 patients, 20 had constitutional symptoms, 15 patients had haematuria, 12 had sterile pyuria, 3 had discharging scrotal sinus 1 had nephrocutaneous fistula 3 had renal failure.

The most commonly involved organ was the kidney cases 13, followed by the bladder in 10, ureteral lesions were found in 09 cases, epididymis in 05 and complex lesions in 04 cases. These findings correlates well with Bansal p et al. as their frequency of organ involved. Paul DK et al. in 2015 found kidney as the most commonly involved organ. Radiological evidence suggestive of TB such as calcification, caliceal destruction, infundibular stenosis, cavitation, ureteral stricture, urethral stricture and small capacity bladder was apparent in 29 cases in present series. GUTB is diagnosed by demonstration of mycobacterium in urine or body fluid and granulomatous lesion on histopathology. Other features which help in diagnosis are changes in radiographic study (IVU, CT scan and Chest X-ray) and raised ESR[10,11]. Although urine AFB test is simple, economical, and rapid, it has low sensitivity and specificity for *M. tuberculosis*. In urine examination, sterile pyuria is a classical finding, but demonstration of mycobacterium is used as primary test for Diagnosis. The yield of direct A.F.B. smear is low and it is positive in 30% of cases[11]. The culture in special medium takes six-eight weeks, but it is sensitive in 20- 97% of cases and has a higher specificity compared with the urine AFB test[11,12]. Urine PCR can detect the presence of *M. tuberculosis* within a few hours of DNA extraction from the sample, even when the urine AFB test and the urine *M. tuberculosis* culture test are negative. It has a reported sensitivity approach to 94% with specificity 88%[13].

In the present study raised ESR was found in 25 patients. Moutoux test (MT) was positive in 9 patients. Urine culture for AFB was found positive in 7 while pus culture for AFB resulted positive in 6 patients. Among serological tests Polymerase Chain Reaction (PCR)

suggestive of TB was in 4 patients while the newly available Gene Xpert test for TB was positive in 3 cases. Cystourethroscopy was performed in 13 cases. The bladder had evidence of chronic cystitis in the vast majority of cases. Bladder biopsy diagnostic of TB was 5 in number. FNAC was performed in 5 cases of epididymal swelling and was suggestive of TB. Pus from pyonephrotic kidneys and other sites revealed AFB in 6 cases. Singh JP et al. in 2012 and Chandra s et al. in 2012 found similar results in their study.

Patients received antitubercular therapy (ATT) for a total of 6-9 months with 4 drugs for 2 months, and 2 drugs for another 4-7 month. Abnormal liver function, drug intolerance or hypersensitivity was seen in 2 patients. The offending drug was excluded thereafter for that particular patient, and the second-line drug introduced as and when necessary.

A total of 41 surgical procedures were performed. Of the procedures, Endoscopic was 13, in the form of bladder biopsy (5), retrograde DJ stenting of ureter (6) and antegrade stenting (2). Temporary diversion by percutaneous nephrostomy was done in 6 patients. In our study 19 ablative procedure was done. Recently with effective chemotherapy, the role of nephrectomy has been reassessed. Wechsler and associates found that nephrectomy is not mandatory in incidentally diagnosed, asymptomatic patients. Gupta et al in 2008 reported an incidence of nephrectomy of 33% of the patients and Paul DK et al. in 2015 reported 28.57% in their series. In our series, nephrectomy 10 and nephroureterectomy was performed in 4 patients which is similar to other studies. Epididymectomy was performed in 5 cases who were refractory to anti tubercular chemotherapy. Augmentation cystoplasty for small capacity refluxing bladder by ileocystoplasty was done in 3 cases, bladder capacity improved significantly in all 3 cases but needed intermittent catheterization. Post operative complications was found as wound infection in two cases and fever in one case, both were managed conservatively.

Follow-up included history, physical examination and investigations like complete blood count, liver function tests and renal function tests at 3 and 6 months. The intravenous urography and diethylenetriamine pentaacetic acid (DTPA) scan were performed when indicated. Then the patients were followed with RFT and ultrasonography 6 monthly for 3 years and then annually.

### Conclusion:

Many patients of urogenital TB present late with cicatrization sequelae. Multidrug chemotherapy with judicious surgery when indicated is the ideal treatment. Surgery plays an important role in symptomatic relief and helps to lead a normal life. The results of reconstructive surgery are good and should be done when possible. Rigorous and long term follow up is necessary in patients undergoing reconstructive surgery.

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# URODYNAMIC PRESSURE-FLOW STUDY (PFS) FOR THE PREDICTION OF SURGICAL OUTCOME IN BPH WITH URINARY RETENTION

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## Abstract:

**Introduction:** Urinary retention can be either chronic or acute in onset. Urinary retention can result from impaired detrusor contractility or obstruction of bladder outlet. Twenty five to 30% of men with decreased flow are not obstructed<sup>1</sup>. Either uroflowmetry or post-void residue (PVR) can not differentiate obstruction from impaired detrusor contractility. In this study, an effort has been paid to know the usefulness of pressure-flow study in urinary retention due to suspected benign prostatic hyperplasia (BPH) cases for predicting the outcome of surgery.

**Methods:** This is a before after clinical study, conducted in Bangabandhu Sheikh Mujib Medical University, Dhaka. Total 32 patients were selected for the study. Patients age ranges from 49-78 years. Patients with chronic and refractory urinary retention due to BPH were enrolled for the study. They were divided into group A (pre-operative) and group B (Post-operative). TURP was done in all 32 patients by single surgeon. Study variables were detrusor pressure at maximum flow (Pdet@Qmax), bladder outlet obstruction index (BOOI), bladder contractility index (BCI) and post void residue (PVR).

**Result:** Total number of patients was 32. Age ranges from 49-78 years. Twenty one (65.6%) had BPH with chronic retention and 11 (34.4%) had BPH with refractory retention. Pdet@Qmax between Group A and Group B was highly significant ( $p=0.001$ ). But difference is not significant in Pdet@Qmax > 40 subgroup of patients ( $p=0.673$ ). Bladder outlet obstruction index between Group A and Group B is highly significantly ( $p=0.001$ ), but, that does not observed in BOOI < 20 subgroup ( $p=0.600$ ).

Bladder contractility index in both Normal (BCI 100-150) and strong (BCI > 150) subgroups are significant ( $p=0.001$  and  $0.001$  respectively). But it is not significant in BCI < 100 subgroup ( $p=0.021$ ).

Post void residue between Group A and Group B is highly significant ( $p=0.001$ ). But in PVR > 300ml subgroup, difference is insignificant ( $p=0.120$ ).

**Conclusion:** In this study, overall favorable outcome observed in all patients after TURP but Pdet@Qmax < 40 cm of water, BOOI < 20, BCI < 100 and PVR > 300 ml groups of patients are at high risk of unfavorable clinical outcome after TURP. With the help of pressure flow study (PFS) prior knowledge of these factors, it is possible to predict postoperative outcome.

**Key words:** Detrusor underactivity, pressure-flow study, urinary retention

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Urinary retention can be either chronic or acute in onset. Urinary retention can result from impaired detrusor contractility or obstruction of bladder outlet. Twenty five to 30% of men with decreased flow are not obstructed<sup>1</sup>. Either uroflowmetry or post-void residue (PVR) can not differentiate obstruction from impaired detrusor contractility. In this study, an effort has been paid to know the usefulness of pressure-flow study in urinary retention due to suspected benign prostatic hyperplasia(BPH) cases for predicting the outcome of surgery.

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**Result:**

Total number of patients was 32. Age ranges from 49-78 years. Twenty one (65.6%) had BPH with chronic retention and 11 (34.4%) had BPH with refractory retention.

Detrusor pressure at maximum flow between Group A and Group B was highly significant (p=0.001). But difference is not significant in Pdet@Qmax d" 40 subgroup of patients (p=0.673). It indicates that when bladder outlet obstruction is the cause of reduced flow, patient's symptoms improve after TURP.

Bladder outlet obstruction index between Group A and Group B is highly significantly (p=0.001). But, that does

not observed in BOOI <20 subgroup(p=0.600). It indicates that TURP is useful in obstructed group and has no value in unobstructed group.

Bladder contractility index in both Normal ( BCI 100-150 ) and strong ( BCI >150 ) subgroups are significant ( p=0.001 and 0.001 respectively ). But it is not significant in BCI<100 sub group (p=0.021). It indicates that TURP is useful in normal and strong subgroups but has no value in weak subgroup patients.

Post void residue between Group A and Group B is highly significant (p=0.001). But in PVR >300 subgroup, difference is insignificant (p=0.120). It indicates that patients improve well after TURP when PVR is less than 300 ml. But does not improve well when PVR is more than 300 ml.

**Table I**  
*Distribution of study subjects by age group*

Age	Frequency	Percentage
≤50	2	6.3
51 - 55	9	28.1
56 - 60	6	18.8
61 - 65	1	3.1
66 - 70	9	28.1
≥70	5	15.6
Total	32	100.0

**Table II**  
*Distribution of study subjects by type of retention*

Type of retention	Frequency	Percentage
BPH with Chronic retention	21	65.6
BPH with Refractory retention	11	34.4
Total	32	100.0

**Table III**  
*Detrusor pressure at maximum flow of study subjects*

Group	Group		P value
	Group A (Mean ± SD)	Group B (Mean ± SD)	
All patients	75.64 ± 29.66	47.09 ± 8.22	0.001
BPH with Chronic Retention	80.03 ± 32.81	46.90 ± 8.40	0.001
PVR (<300ml)	83.24 ± 34.22	47.57 ± 8.88	0.001
PVR (>300ml)	60.80 ± 12.99	42.83 ± 2.71	0.094
BPH with Refractory Retention	67.25 ± 21.33	47.45 ± 8.24	0.001
PdetQmax d" 40	31.50 ± 4.70	31.23 ± 4.04	0.673
PdetQmax > 40	80.21 ± 27.24	48.73 ± 6.62	0.001

Paired simple t test is done to measure the level of significance

**Table IV**  
*Bladder outlet obstruction index of study subjects*

Group	Group		p value
	Group A Mean ± SD	Group B Mean ± SD	
All patients	60.35 ± 29.60	13.53 ± 5.55	0.001
BOOI <20	10.00 ± 1.55	8.60 ± 0.42	0.600
BOOI (20 – 40)	27.92 ± 3.30	12.60 ± 5.10	0.006
BOOI >40	70.86 ± 24.17	14.11 ± 5.73	0.001
BPH with Chronic Retention	64.70 ± 33.21	13.10 ± 5.55	0.001
PVR (<300ml)	67.56 ± 34.67	13.74 ± 5.53	0.001
PVR (>300ml)	47.53 ± 17.26	9.30 ± 1.90	0.050
BPH with Refractory Retention	52.03 ± 19.85	14.34 ± 6.06	0.001

Paired simple t test is done to measure the level of significance

**Table V**  
*Bladder contractility index of study subjects*

Group	Group		p value
	Group A Mean ± SD	Group B Mean ± SD	
All patients	112.27 ± 35.57	132.15 ± 22.00	0.001
BCI >150	85.32 ± 8.55	118.07 ± 20.50	0.001
BCI (100 – 150)	125.92 ± 14.80	144.74 ± 8.54	0.001
BCI <100	176.60 ± 17.29	154.84 ± 4.81	0.021
BPH with Chronic Retention	118.79 ± 39.51	133.01 ± 22.53	0.014
BPH with Refractory Retention	99.83 ± 23.27	130.49 ± 21.92	0.001

Paired simple t test is done to measure the level of significance

**Table VI**  
*Post void residue of study subjects*

Group	Group		p value
	Group A Mean ± SD	Group B Mean ± SD	
All patients	197.37 ± 154.77	59.66 ± 59.55	0.001
BPH with Chronic Retention	218.28 ± 182.36	62.72 ± 71.48	0.001
PVR (<300ml)	154.50 ± 52.23	60.40 ± 66.35	0.001
PVR (>300ml)	601.00 ± 230.36	76.67 ± 115.45	0.120
BPH with Refractory Retention	157.45 ± 71.22	53.81 ± 26.83	0.001

Paired simple t test is done to measure the level of significance



### Discussion:

Benign prostatic hyperplasia (BPH) is observed in about 70% of men in the eighth decade of life. However, only 50% of men have symptoms of infravesical obstruction. It is estimated that out of these 50% men 20% to 25% seek medical counseling, including surgical treatment<sup>2</sup>. A small proportion of those who undergo surgery will not improve as expected because of either inadequate diagnosis of obstruction or more importantly impaired contraction of detrusor muscle. Thus, good surgical results can only be achieved with the correct diagnosis of infravesical obstruction and status of detrusor muscle function. Urodynamic pressure-flow study has the ability to diagnose both of the aforementioned components.

The International Continence Society (2002) refers to the condition of detrusor underactivity, defined as a contraction of reduced strength and/or duration, resulting in prolonged bladder emptying and/or failure to achieve complete bladder emptying within a usual time span. This condition has also been referred to as Hypotonic Bladder, Flaccid bladder, Lazy bladder and Detrusor Hypoactivity. Detrusor underactivity is a medical diagnostic term based on urodynamic testing.

There are multiple possible causes of bladder muscle underactivity. It is sometimes a result of neurological damage, surgery, side effect of drugs and infection. In addition to these sources, the simple act of aging can result in the decline of bladder volume and elasticity.

Djavan et al stated that transurethral prostatic resection led to considerable improvement in symptoms and quality of life, especially in the obstructed group (detrusor pressure at maximum flow rate greater than 70 cm. H<sub>2</sub>O)<sup>3</sup>. Even more evident was the fact that the group without urodynamic obstruction (detrusor pressure at maximum flow rate less than 40 cm. H<sub>2</sub>O) showed no statistically significant postoperative difference from the preoperative urodynamic data and clinical assessment, leading to the conclusion that the operation was of no benefit in these cases.

Nitti wrote that, bladder outlet obstruction index (BOOI) is represented by the equation:  $BOOI = P_{det} @ Q_{max} - 2 Q_{max}$ .  $BOOI > 40 =$  obstructed;  $BOOI 20-40 =$  equivocal; and  $BOOI < 20 =$  unobstructed<sup>1</sup>.

Similarly, The bladder contractility index (BCI) is represented by the following formula:  $BCI = P_{det} Q_{max} + 5 Q_{max}$ . Using this formula, contractility can be divided into strong  $> 150$ , normal 100-150, and weak  $< 100$ <sup>1</sup>.

Both the index require urodynamic pressure-flow testing, which is somewhat invasive, in spite of that, pressure-flow analysis remains the gold standard<sup>1</sup>.

Tomoaki et al. studied on the backgrounds of patients with weak detrusor contractility and found that patients with weak detrusor contractility had poor flow and low voided volume compared to patients with normal or strong detrusor contractility<sup>4</sup>.

In a study, Stephan et al. found that, 60% of all men older than 80 years did not have urodynamic obstruction despite a decreased maximum flow rate of 10 to 15 ml. per second, all patients meeting these criteria and having symptoms bothersome enough to justify surgery should undergo pressure-flow studies before surgical intervention<sup>5</sup>.

### Conclusion

Transurethral prostatic resection led to considerable improvement in symptoms and quality of life, especially in the obstructed groups. Even more evident was the fact that the patients without urodynamic obstruction (detrusor pressure at maximum flow rate less than 40 cm. H<sub>2</sub>O, BOOI < 20) and weak bladder contractility index (BCI < 100) showed no statistically significant postoperative difference from the preoperative urodynamic data and clinical assessment, leading to the conclusion that the operation was of no benefit in these cases. Furthermore, On the basis of this result, prior knowledge of the degree of infravesical obstruction and status of detrusor function makes it possible to predict postoperative clinical outcome.

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# OUTCOME OF SINGLE STAGE OMG URETHROPLASTY BY KULKARNI TECHNIQUE IN COMPARISON WITH JOHANSON'S STAGED URETHROPLASTY FOR MANAGEMENT OF PAN-URETHRAL STRICTURE

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## Abstract

**Purpose:** To observe the outcome of single stage buccal mucosal graft and Johanson's staged urethroplasty for treatment of pan- urethral stricture.

**Materials and Methods:** A total of 60 patients with an average age of 42 years (21-55) underwent OMG urethroplasty and Johanson's staged urethroplasty between March 2008 to September 2015 for pan-urethral stricture of different etiology. OMG was always harvested from cheek using 2 team approaches. Graft was placed using Kulkarni technique. Clinical outcome was considered success or failure if any post operative procedure needed. Mean follow up was 45 month (6-95)

**Results:** Total 60 patients were included for final calculation, 31 patients with buccal mucosal graft (Group A) and 29 patients with Johanson's staged urethroplasty (Group B) were followed up for average 45 months. Success rate of group A was 93.5% at 3 months and 77.4% at 3 years and in group B 65.5% at 3 months and 44.8% at 3 years follow up which is statistically significant ( $p < .05$ ). Postoperative complications were significantly higher in group-B.

**Conclusion:** Repair of pan-urethral stricture in a single-stage OMG by Kulkarni technique is simple, fast, safe, effective and reproducible in the hand of any surgeon.

**Key Words:** urethra, urethral stricture, oral mucosa, urethroplasty.

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## Introduction

Urethral stricture is one of the oldest problem faced by the urologist occurs due to fibrotic narrowing of urethral lumen and fibrosis usually extend into the surrounding corpus spongiosum causing spongiobrosis[1]. Many management options are available for urethral stricture disease, ranging from simple dilation to complex multistage procedure but none claims to be the best for all patients. Significant progress made over last 30 years allows many of the complex strictures to be reliably reconstructed in one stage [2].

Panurethral stricture disease is a process that encompasses the full length of the urethra from meatus to the proximal bulbar urethra. The incidence of

panurethral strictures continues to rise, particularly in Indian and Asian countries, where the primary etiology is lichen sclerosis. Prevalence of iatrogenic strictures has also increased, as endoscopic instrumentation of the urethra may result in iatrogenic panurethral strictures[3].

The gold standard treatment of urethral stricture is urethroplasty [4]. The use of oral mucosa was first described in 1941[5] and reintroduced in 1992[6]. Buccal mucosa is tough, resilient, easy to harvest, easy to handle, resistant to skin diseases e.g. BXO and also resistant to infection. Buccal mucosa is architecturally similar to stratified squamous epithelium of penile and

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glanular urethra making it exceptionally adaptable for urethral reconstruction[7].

Surgical approach to long segment anterior and pan-urethral stricture is more controversial[8]. Currently, there is a paucity of evidence supporting specific management options for pan-urethral stricture disease. The conventional approach for the management of pan-urethral stricture is Two stage Johanson repair[9]. Here in stage -I , a hypospadias is created by incising the stricture segment of urethra by longitudinal midline ventral incision and lay open by marsupialization of urethral mucosa to adjacent penile or perineal skin according to the site of stricture. Then after a specific interval, stage-II procedure performed. Currently substitution urethroplasty (OMG) has been suggested for pan-urethral stricture with a promising result[10]. It may be in single stage or multiple stage.

The present study is designed to observe the outcome of Johanson's staged urethroplasty and single stage buccal mucosal graft for treatment of pan-urethral stricture.

#### Patients and Methods

A hospital based, prospective and comparative study was conducted in the department of urology, National Institute of Kidney Diseases & Urology (NIKDU) from March 2008 to September 2015 to evaluate the results of substitution urethroplasty using dorsolateral onlay buccal mucosa and Johanson's staged urethroplasty for pan-urethral stricture to determine the better option.

We included patients who presented for primary consultation as well as those patients with previous failed repair. Exclusion criteria included patients with malignant urethral lesions. All the male patients of anterior urethral stricture were evaluation with clinical history, physical examination, urine culture, uroflowmetry, residual urine



**Fig.-1** Urethrogram in a patient with pan-urethral stricture.

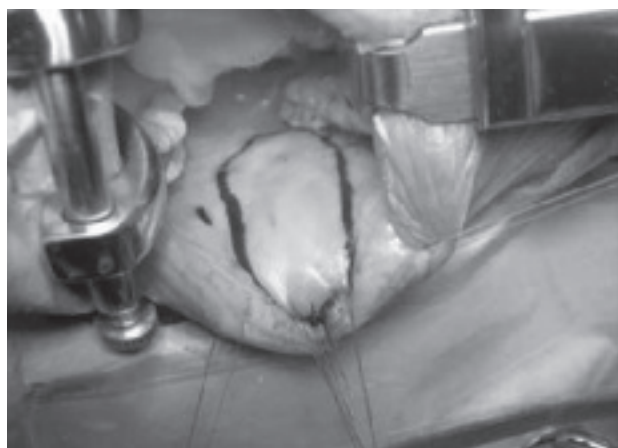
measurement, retrograde and voiding urethrography and urethroscopy using a 4.5 or 6 Fr. Ureteroscope.

The primary outcome measure of this study was success of surgery, defined as freedom of postoperative instrumentation or dilatation.

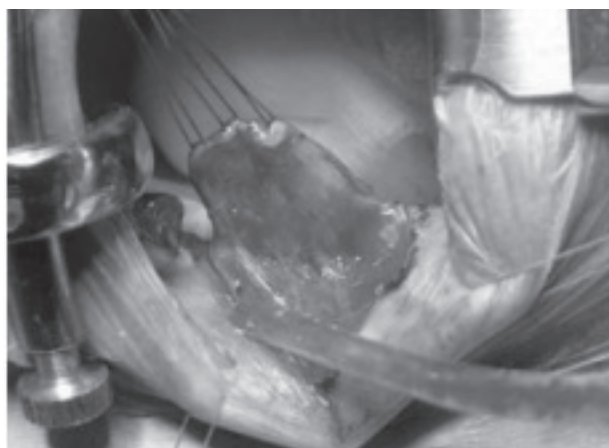
#### Surgical technique (OMG Urethroplasty)

All patients were treated using the one-stage OMG urethroplasty through a perineal incision previously described by Kulkarni et al.[11–13].

The patient is first either orally or nasally intubated. The patient is placed in simple lithotomy position, with heels carefully placed in with care to minimize pressure on the calves to avoid peroneal nerve injury. The suprapubic, scrotal and perineal skin is shaved, disinfected using chlorhexidine, and draped. Two teams work simultaneously at the donor and recipient site, with separate sets of instruments. The oral mucosa is harvested from both cheeks as described by Barbagli et al.[14].



**Fig.-2 :** Harvesting of OMG



Preoperatively, urethroscopy is performed using a 4.5 or 6 Fr. Semirigid Ureteroscope. Methylene blue is injected into the urethra and a midline perineal incision is made. The bulbar urethra is dissected along the left lateral border. The bulbospongiosus muscle and central tendon of the perineum are left intact ventrally. The urethra is then mobilized across the midline to the contralateral attachment to the corpora cavernosa, which is left intact. This helps to preserve the neurovascular supply to the urethra. The penis is then invaginated into the perineum. This can be accomplished by applying steady pressure on the penis from above while sharply incising the thin fascia over the urethra. This should be continued to the glans to allow full mobilization of the urethra.

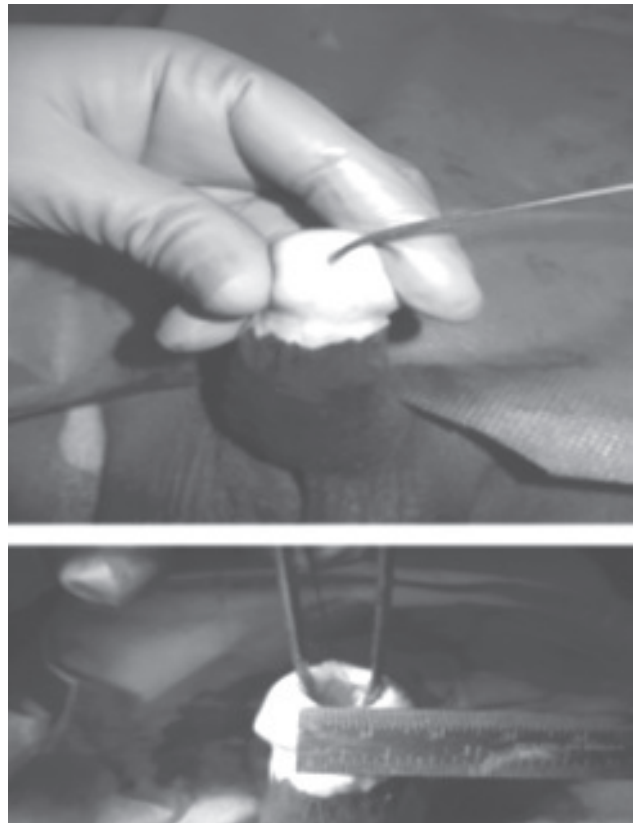
Mobilization of the urethra off the corpora cavernosa is continued from proximal to distal, ending at the coronal sulcus (Fig. 3). Once mobilization is complete, the dorsal aspect of the urethra is exposed and opened longitudinally (Fig. 4.). An additional wide dorsal meatotomy may be performed externally (Fig. 5).



**Fig.-4:** Urethra opened along dorsal aspect longitudinally.



**Fig.-3** One-sided dissection of the entire anterior urethra.



**Fig.- 5** (a) Initial Meatus. (b) After dorsal meatotomy.

The OMG are then passed into the field. The first is sutured to the dorsal apex of the meatus, and then passed through to the penile urethra fixed to the corpora cavernosa over the midline. The second graft is applied to the corpora cavernosa opposing the bulbar urethra. The grafts are 1.5 cm in width, and are spread and fixed to the corpora with quilting sutures.

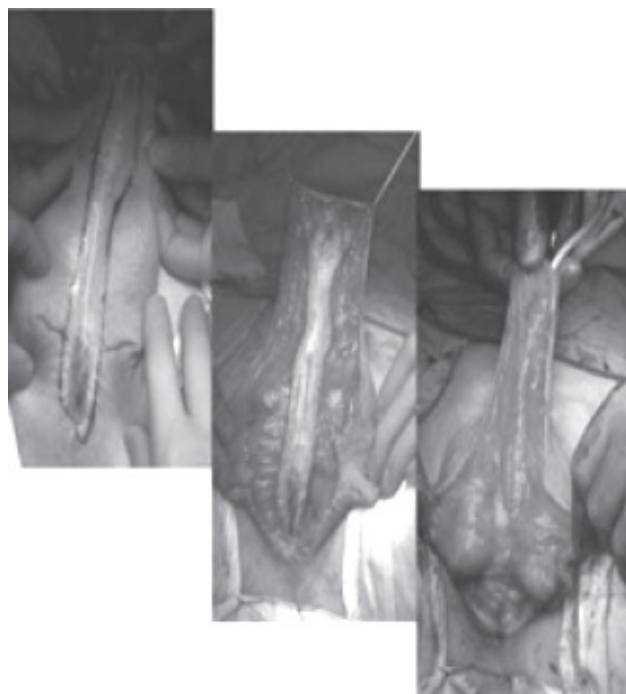
Once quilting of the graft is completed, the OMG margin is sutured to the urethral plate. A 14 Fr silicone urethral catheter is inserted. The urethra is rotated back to its original position and a continuous 5-0 polyglactin suture is used to approximate the urethral margin to the OMG and the corpora cavernosa on the left. The separated ends of the bulbocavernosus muscle are reapproximated. At the end of the procedure, the graft is completely covered by the urethra and bulbospongiosus muscle. A 3-layer closure of perineal fat, Colles' fascia, and skin is completed in a running fashion.

**Johanson's staged urethroplasty:** (Modified from Donald, et al, 1956; Jack Lapides, 1959)

All patients underwent surgery under spinal anesthesia. The patient placed in a mild lithotomy position, so that either perineal or suprapubic regions can easily be exposed. The operation is divided in two stages. In the first stage a hypospadias is created in the strictured

region—the narrowed urethra is laid open and its incised edges anastomosed to adjacent skin. If the stricture is so severe that proximal end cannot be identified accurately, a supra pubic cystostomy and passage of a sound through the vesical neck down to stricture site may be performed. The skin edges of the penis are then sutured to the edges of the urethral mucosa with mucosa with 5/0 vicryl. If the strictured area extend into the perineal portion of the urethra, a flap of scrotal tissue must be inverted to give one enough skin for closure of the urethra in the second stage operation. In this area it is very important to excise all fistulous tracts and surrounding scar tissue completely. A 18 Fr Foley catheteris left indwelling for 3-4 days after this procedure. Johanson insists that even if hair bearing areas are inverted, the hair will soon disappear and afford no hazards.

The interval between varies with the healing power of patient and averages from eight to ten weeks. The second stage technique is universal. Urinary diversion should be performed and was done by suprapubic cystostomy in all our patients. A strip of urethra and surrounding skin approximately 2 cm wide, or 75 percent of the circumference of the urethra desired is left intact. The lateral skin edges of the penis or scrotum are freed for a distance of 2-3 cm, so that the skin edges can be approximated over the buried strip without tension. A



**Fig.-6: Johanson's two stage repair (1953)**

dorsal relaxation incision is made if necessary. The skin is closed with interrupted sutures of 5-0 polyglactin. The patient is allowed to void on tenth day if wound appear solid.

#### Postoperative care and follow-up criteria

Patients are ambulated on postoperative day 1 and kept in hospital until postoperative day 2. They receive a single dose of broad spectrum IV antibiotics, and are then transitioned to oral antibiotics from day 2 until catheter discharge. We do not routinely performed pericatheter urethrogram prior to removal of foley catheter. We do employ this investigation for cases of redo urethroplasty; pericatheter RUG is performed at 4 weeks postoperatively, and catheter is removed if there is no evidence of contrast extravasation. Patients are followed at 3, 6, and 9 months postoperatively, and the nannually thereafter. We recommend use of uroflometry at these time intervals, and any time there is clinical indication. A clinical history of subjective decrease flow should be investigated by uroflometry; a flow rate less than 12 ml/s should promptly secondary investigations including a repeat retrograde urethrography and urethrocystoscopy.

#### Results

A total of 60 patients were included for analysis. Age distribution of Group-A was 21-55 years and Group-B was from 22-54 years. The mean  $\pm$  SD age of group-A and Group-B were  $42.13 \pm 7.65$  and  $41.10 \pm 8.85$  years respectively. The overall median follow-up was 45 months. Etiology of the stricture were as follows: LS 39 patients (65%), non-LS (including catheter related, idiopathic, iatrogenic, failed hypospadias, and trauma) in 21 patients (35%). The mean stricture length was 11.5 cm, with a range of 8–15 cm. Of 60 patients, 52 (86.7%) had no previous urethral surgery, and 8 (13.3%) had a previous failed urethroplasty or DVIU.

Preoperatively on Uroflowmetry maximum flow rate (Qmax) varied from 6-10ml/sec. On 2<sup>nd</sup> day after removal of catheter, in group A Qmax was good ( $>15$  ml/sec) in 93.5%. But in group B this rate was 65.5%. Significant difference was observed between the groups in terms of peak urinary flow rate (Qmax) and voided volume on 2<sup>nd</sup> day after removal of catheter ( $p = 0.003$  and  $p = 0.002$ ).

Evaluation of outcome 3 months after operation shows Peak urinary flow rate(Qmax) and voided urinary volume were considerably higher in buccal mucosal graft than those in the Johanson's urethroplasty (29 vs 19 pt) (93.5% vs 65.5%) and the difference between the groups was significant ( $p = 0.000$  and  $p = 0.001$  respectively).

The frequency of UTI and recurrence of stricture were significantly less in the buccal mucosal graft than those in the Johanson's urethroplasty ( $p = 0.039$  and  $p = 0.014$  respectively).

Evaluation of outcome 1year after operation shows success rate in terms of Peak urinary flow rate(Qmax) and voided urinary volume were considerably higher in buccal mucosal graft than those in the Johanson's urethroplasty (27 vs 16) (87%vs55.1%) and the difference between the groups was significant ( $p = 0.000$  and  $p = 0.001$ respectively). The frequency of recurrence of stricture and UTI were significantly less in the buccal mucosal graft than those in the Johanson's urethroplasty( 4 vs 13) ( $p = 0.007$  and  $p = 0.014$  respectively).

Evaluation of outcome 3 year after operation shows success rate in terms of Peak urinary flow rate(Qmax) and voided urinary volume were considerably higher in buccal mucosal graft than those in the Johanson's urethroplasty(24 vs 13)(77.4% vs 44.8%) and the difference between the groups was highly significant ( $p < .001$ ) The frequency of recurrence of stricture was significantly less in the buccal mucosal graft than those in the Johanson's urethroplasty( 6 vs 16) ( $p < 0.05$ ).

#### Discussion

Panurethral strictures by definition involve the whole anterior urethra and form a complex subset of urethral stricture disease. Lichen sclerosus remains a primary etiology for panurethral stricture disease, particularly in the Asian subcontinent. Recently, however, there has been a trend in etiology, favoring more iatrogenic panurethral strictures. Prolonged catheterization or traumatic catheterization results in panurethral stricture secondary to inflammation and ischemia of the urethra. Another proposed mechanism includes local allergic reaction to the catheter or lubricant used at time of placement. Endoscopic instrumentation of the urethra, particularly with transurethral resection of the prostate, can also lead to urethral trauma and ischemia, resulting in stricture formation. Aside from technical considerations (obvious catheter trauma or complicated procedures), it remains difficult to identify those at higher risk for pan-urethral stricture.

In order to differentiate between the 2 most common etiologies, it is helpful to inspect the meatus. Panurethral strictures secondary to lichen sclerosus almost always involve the meatus. In iatrogenic and catheter induced strictures, the meatus is often spared.

Historically, two-stage urethroplasty was favored for the management of panurethral strictures. The Johanson's two-stage technique, first described in 1953, involves buried epithelium (originally local skin, which later evolved to autologous graft) based on the Denis-Browne principle [15]. It allows setting of the tissue and resolution of inflammatory response if any, which is adventitious. But it requires much more hospitalization time, repetitive anesthesia administration, more working hour loss, more waiting period between stages (8 weeks to 8 month or more) [16]. Upon review of the literature, several institutions have experimented with other tissue transfer techniques, including fasciocutaneous skin flap with or without simultaneous use of buccal mucosa graft [17,18], or tunica albuginea [19]. There has been long standing view of using two-stage urethroplasty for Panurethral strictures. Our primary concern with the two-stage Johanson's technique is that it relies on genital skin for the neourethra. As was shown in our series, more than 50% of panurethral strictures are secondary to lichen sclerosus. Any two-stage procedure with genital skin will have a high risk of recurrence secondary to incorporation of diseased skin in urethra[20].

Large number of patients (34.5%) had poor urinary flow (<10 ml/sec) after Johanson's II urethroplasty (group B) due to development of re- stricture, pseudo-diverticulum and urethrocutaneous fistulas. In the study of Johanson's himself 25% patient developed restenosis, 50% developed diverticulum and 11% developed fistula. Overall initial success rate was 67%. Whereas in this study success rate at 3 month is 65.5% in group B and 93.5% in group A but at 1 year it was 55.1% and 87% and at 3 year follow up it was 44.8% and 77.4%. This is comparable with Asopa et al. (2001), Raber et al. (2005) also showed 91.6% and 85% success after 1 year by RGU after BMG and Farnandes and draper(1997), Ali and Hajaj (2007) showed 68% and 60% success after 1 year by RGU after Johanson's urethroplasty in long segment and pan-urethral stricture.

Post operative complications in this series was evaluated. At 3 month, Out of 31 patients in group A 4 patients develop wound infection. After regular dressing infection subsided but fistula was observed in 1 patient after removal of catheter, which was resolved spontaneously with 2 weeks further catheterization. Two patient develop recurrence which was managed by internal urethrotomy. In group B of 9 patients develop wound infection which was managed as previous group but of them 5 patients develop fistula which was also

managed by 2 weeks further catheterization. 10 patients develop recurrence which was also managed by internal urethrotomy. Andrich and mundy (2001) reported 11% of recurrent stricture of buccal mucosa graft urethroplasty. International studies of Johanson's urethroplasty shows complications rate- urethrocutaneous fistula 7.8% by Culp and associates (1957), restenosis 25% by Johanson (1953) himself, diverticulum 12% by Bogas and Lasky (1999) All above complications were observed to be higher in the group B compared to those in the group A, the differences between the groups reach the level of significance ( $p > 0.05$ ). With progression of time, this study shows that re-stricture rate increases in both group but more in group-B. the rate is extremely higher (66.6%) in those patient with BXO undergone johanson's staged urethroplasty.

A very recent multi-center study from high volume urethroplasty units concluded that single stage buccal graft urethroplasty was more successful than 2 stage procedures. Flaps have higher complication rates as compared to one stage urethroplasty [21].

Dubey et al. reported on their experience comparing the one-stage Kulkarni technique and two-stage repairs for panurethral strictures secondary to lichen-sclerosus [22]. They concluded that one-stage procedures had better success, and while staged procedures could be successful, they were fraught with technical difficulties and multiple revisions. [23] The Johanson staged repair has long fallen out of favor as first-line therapy. It can still be employed to salvage the most complex urethral strictures [24].

## Conclusion

Panurethral stricture disease is a complex process. One stage OMG Urethroplasty by Kulkarni Technique for panurethral stricture is a minimally invasive, with excellent postoperative outcomes, improved cosmesis, and excellent functional outcomes. Johanson's staged urethroplasty should be obsolete for long segment and pan-urethral stricture due to lichen sclerosus due to extremely high re-strictue rate. But where Penis is not normal as in hypospadias or history failed urethroplasty, too narrow urethra, history multiple re-operations and if there is fistulas and inflammation— Johansson's staged Urethroplasty can be performed.

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# PREVALENCE OF PROSTATE CANCER AT SERUM PSA LEVEL BETWEEN 2.5 AND 4.0 NG/ML IN BANGLADESHI MEN

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## Abstract

**Background:** Prostate cancer is the most common cancer in men. The most common prostate cancer test is the prostate-specific antigen (PSA) test. This is a simple blood test that measures the presence of prostate-specific antigen circulating in bloodstream. This test is usually the first step in any prostate cancer diagnosis.

**Objective:** To detect the occurrence of prostate cancer at different level of serum PSA level between 2.5ng/ml and 4ng/ml.

**Method:** This hospital based cross sectional analytical study was conducted between the periods of January 2012 to April 2013. A total of 30 patients with features of lower urinary tract symptoms with enlarged prostate attending to the Department of Urology, National Institute of Kidney Diseases & Urology (NIKDU), Sher-E-Bangla Nagar, Dhaka were purposively selected as study population by taking the permission of ethical committee. Patients more than 50 years old with lower urinary tract symptoms at S. PSA level 2.5 - 4 ng/ml and enlarged prostate in DRE were selected as study population. Patients with bleeding disorder, anorectal pathology, active UTI or prostatitis or urethral stricture were excluded from this study. DRE was done to see the size, consistency and nodularity of prostate. Those who had enlarged prostate found on DRE, they were sent for biopsy multi parametric MRI (MPMRI) & Prostate Imaging Reporting and Data system (PIRAD) score may be applied.

**Result:** The mean age of the patients was 66.87±10.13 years with a range of 52-90 years. Among 30 patients 10 (33.3%) were in the age group of 51-60 years, 10 (33.3%) were in the age group of 61 - 70 years, 5 (16.7%) were in the age group of 71 - 80 years and 5 (16.7%) were in the age group >80 years. Among 30 patients 4 (13.3%) had malignant lesion and 26 (86.7%) had benign lesion. Mean serum PSA level among the patients with histopathological findings benign and malignant were 3.34±0.51 and 3.47±0.43 ng/ml respectively. Out of 4 patients with malignant lesion, 1(25.0%) had serum PSA level within 2.50-2.99 ng/ml, another 1(25.0%) had 3.00-3.49 ng/ml and 2(50.0%) had serum PSA level within 3.50-4.00 ng/ml. There is no statistically significant difference observed in serum PSA level among the patients with histopathological findings benign and malignant ( $P>0.05$ ).

**Conclusion:** For early diagnosis of prostate cancer cut-off value of serum PSA of 2.5 ng/ml may be used as an indication for prostate biopsy.

**Key words:** Prostate cancer, PSA (prostate-specific antigen), cut-off value, prostate

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## Introduction

Worldwide, prostate cancer (PCa) is the fourth most common cancer in men with incidence and mortality rates that vary markedly among and within different countries[1]. The highest incidence of PCa is in the Western world and the lowest in Asian countries[2]. PCa is the most common malignancy in males and the second leading cause of male cancer death in the United States. The estimated lifetime risk of disease is 17.6% for whites and 20.6% for African Americans, with a lifetime risk of death of 2.8% and 4.7% respectively[3]. Despite decades of research, there is no reasonable prospect that prostate cancer can be cured once it has metastasized. The greatest hope of reducing prostate cancer mortality is therefore through early detection and prevention. Moreover, because no important carcinogen or modifiable risk factor has been identified, prevention of prostate cancer is largely a matter of early detection [4].

Prostate cancer is uncommon before the age of 50 years, till its frequency climbs steeply with age to peak or plateau upto the 9th decade for both incidence and mortality rate. [5] Unfortunately, the disease is uniformly fatal once the tumour metastasizes outside the gland. But if diagnosed early, surgery provides excellent results with regard to local disease control and the prospect for long-term, disease-free survival. In the absence of effective treatment options for advanced prostate cancer, intensive efforts to detect low stage, curable cancers may help to improve prostate cancer-specific survival[6].

Digital rectal examination (DRE) has been used for diagnosis and screening for prostate cancer since the early 1900s, and its importance is well-established[7]. But there remain a considerable number of prostate cancer not detectable by rectal examination even in the presence of symptomatic disease.

One of the most important diagnostic tools used to detect prostate cancer is PSA, yet increased PSA alone does not reflect the presence of prostate cancer. Other pathological prostatic conditions such as prostatitis and benign prostatic hyperplasia (BPH) may also increase the level of PSA. However, unlike in other prostate diseases, PSA has a key role in the diagnosis and management of prostate cancer[2]. Prostate imaging

reporting and data system (PIRAD score) refers to a structured reporting scheme for evaluating the prostate for prostate cancer.

The widespread use of serum Prostate Specific Antigen testing has increased proportion of early stage cancers detection and partially responsible for the recent decrease in prostate cancer mortality rates in the United States. A PSA cutoff of 4ng/ml is generally used for recommending a biopsy[8]. Multi parametric MRI (MPMRI) can detect specific cancer cells from prostatic nodules in any where even in anterior & central zone of prostate. This fusion biopsy has higher cancer detection rate than USG.

According to a study, cancer is detected in initial or early follow-up biopsies in more than one third of man with PSA levels > 4 ng/ml[9]. It is informative that cancer cells (CaP) liberate 10 times more PSA than benign cells (BPH) due to lack of basement membrane [6].

Traditionally normal level of recommending serum PSA 0-4ng/ml but no identifiable PSA level guarantees normalcy. Carcinoma prostate may be found in S. PSA level "0" on the contrary, carcinoma prostate may not be found even in S. PSA level "100"[10]. But it is remarkable that high S. PSA causes relatively increased risk of carcinoma prostate and it must be proved by prostate biopsy. Initially, a threshold of 4.0ng/ml was the recommended level at which a man should undergo prostate biopsy. A level between 4.0-10ng/ml thinks to be "diagnostic gray zone" [11]. Conventionally cut-off value has taken as 4.0ng/ml. Using the cut-off value of 4.0ng/ml, the sensitivity, specificity and PPV were 89.88% 37% & 49% respectively. [10] By raising the cut-off value to 10ng/ml increases the specificity and PPV to 66% and 63% respectively, while the sensitivity is reduced to 83.7% [10] .

It has recently been suggested that the diagnostic threshold for the prostate specific antigen (PSA) assay be lowered to enhance prostate cancer detection. A 22% incidence of prostate cancer has been reported in men with PSA between 2.5 and 4.0 ng/ml (Babaian et al. 2001) [12] .

Prostate cancer is not uncommon in Bangladesh. Therefore, present study is designed to determine occurrence of prostate cancer at serum PSA between 2.5ng/ml and 4ng/ml which will help to find out a new

cut-off value for early diagnosis, effective treatment, increase survival and decrease disease specific mortality.

**Method:**

This hospital based cross sectional analytical study was conducted between the periods of January 2012 to April 2013 in the Department of Urology, National Institute of Kidney Diseases & Urology (NIKDU), Sher-e-Bangla Nagar, Dhaka. By taking informed written consent a total of 30 patients with features of lower urinary tract symptoms with enlarged prostate attending to Department of Urology, National Institute of Kidney Diseases & Urology (NIKDU), Sher-e-Bangla Nagar, Dhaka were purposively selected as study population. Patients more than 50 years old with lower urinary tract symptoms at S. PSA level 2.5 - 4 ng/ml and enlarged prostate in DRE were selected as study population. Patients with bleeding disorder, anorectal pathology, active UTI or prostatitis or urethral stricture were excluded from this study. After proper counseling and consent, DRE was done to see the size, consistency and nodularity of prostate. Those who had enlarged prostate found on DRE, they were sent for TRUS (Trans rectal Ultrasonogram) guided biopsy. Before taking biopsy patients were again judged by inclusion and exclusion criteria.

**Results:**

The mean age of the patients was 66.87±10.13 years with a range of 52-90 years. Among 30 patients 10 (33.3%) were in the age group of 51-60 years, 10 (33.3%) were in the age group of 61 - 70 years, 5 (16.7%) were in the age group of 71 - 80 years and 5 (16.7%) were in the age group >80 years (Table I).

**Table I**  
*Distribution of patients by age group (n=30)*

Age(Year)	Frequency	Percentage
51-60	10	33.3
61-70	10	33.3
71-80	05	16.7
>80	05	16.7
Total	30	100.0

Mean ± SD (Range)66.87 ± 10.13 (52-90)

Among 30 patients 4 (13.3%) had malignant lesion and 26 (86.7%) had benign lesion. (Table II).

**Table II**  
*Distribution of patients by histopathological findings (n=30)*

Histopathological finding	Frequency	Percentage
Benign	26	86.7
Malignant	4	13.3

Mean serum PSA level among the patients with histopathological findings benign and malignant were 3.34±0.51 and 3.47±0.43 ng/ml respectively. There was no statistically significant difference observed in mean serum PSA level among the patients with histopathological findings benign and malignant (P>0.05). Out of 4 patients with malignant lesion, 1(25.0%) had serum PSA level within 2.50-2.99 ng/ml, another 1(25.0%) had 3.00-3.49 ng/ml and 2(50.0%) had serum PSA level within 3.50-4.00 ng/ml. There is no statistically significant difference observed in serum PSA level among the patients with histopathological findings benign and malignant (P>0.05).

**Table III**  
*Distribution of patients by histopathological finding and serum PSA level (n=30)*

Serum PSA level (ng/ml)	Histopathology		Total	p value
	Benignn (%)	Malignantn (%)		
2.50-2.99	09(34.6)	1(25.0) <sup>#</sup>	10 (33.3)	
3.00-3.49	04(15.4)	1(25.0)	05 (16.7)	
3.50-4.00	13(50.0)	2(50.0)	15 (50.0)	
Total	26(100.0)	4(100.0)	30 (100.0)	
Mean ± SD	3.34 ± 0.51	3.47 ± 0.43	3.35 ± 0.50	0.625

t test is done to measure the level of significance

**Discussion:**

Prostate cancer (PCa) is the most common urological malignancy in males and incidence of PCa varies from country to country[2]. One of the most important diagnostic tools used to detect prostate cancer is PSA, yet increased PSA alone does not reflect the presence of prostate cancer[2]. This non-invasive serological test has tasted a new light in the diagnosis of prostate cancer. The value of S. PSA as a tumour marker is limited by the fact that it is organ-specific rather than cancer-specific and there appears to be no non-invasive accurate means of distinguishing an elevated PSA secondary to nodular hyperplasia from that due to PCa. Other pathological prostatic conditions such as prostatitis and benign prostatic hyperplasia (BPH) may also increase the level of PSA. However, unlike in other prostate diseases, S. PSA has a key role in the diagnosis and management of prostate cancer [2].

The present study conducted to find out the occurrence of prostate cancer at different level of serum PSA between 2.5 and 4 ng/ml. It also examined the histopathological characteristics of detected cancer in different levels of S. PSA values between 2.5ng/ml and 4ng/ml. Total 30 patients were included in the present study.

In the present study, the mean age of the patients was  $66.87 \pm 10.13$  years with a range of 52 to 90 years. Among 30 patients one third (33.3%) were in the age group of 51-60 years, another one third (33.3%) were in the age group of 61 to 70 years, 5 (16.7%) were in the age group of 71 to 80 years and 5 (16.7%) were in the age group >81 (Table I). Babaian et al in their study reported the median age of men with cancer was 62 years (range 43 to 74)[12].

Among 30 patients 4 (13.3%) had malignant lesion and 26 (86.7%) had benign lesion. (Table II).

Mean serum PSA level among the patients with histopathological findings benign and malignant were  $3.34 \pm 0.51$  and  $3.47 \pm 0.43$  ng/ml respectively. There was no statistically significant difference observed in mean serum PSA level among the patients with histopathological findings benign and malignant ( $P > 0.05$ ). Out of 4 patients with malignant lesion, 1(25.0%) had serum PSA level within 2.50-2.99 ng/ml, another 1(25.0%) had 3.00-3.49 ng/ml and 2(50.0%) had serum PSA level within 3.50-4.00 ng/ml. There is no statistically significant difference observed in serum PSA level among the patients with histopathological findings benign and malignant ( $P > 0.05$ ) (Table III). According to

a study by Shekariz et al. cancer is detected in initial or early follow-up biopsies in more than one third of man with PSA levels > 4 ng/ml[9].

The widespread use of serum Prostate Specific Antigen testing has increased proportion of early stage cancers detection and partially responsible for the recent decrease in prostate cancer mortality rates in the United States. A S. PSA cut-off of 4ng/ml is generally used for recommending a biopsy[8]. It is informative that cancer cells (CaP) liberate 10 times more PSA than benign cells (BPH) due to lack of basement membrane[6]. In the present study mean serum PSA level among the patients with histopathological findings benign and malignant were  $3.34 \pm 0.51$  and  $3.47 \pm 0.43$  ng/ml respectively. There is no statistically significant difference observed in mean serum PSA level among the patients with histopathological findings benign and malignant ( $P > 0.05$ ). Out of 26 patients with benign lesion, 9 (34.6%) had serum PSA level within 2.50-2.99 ng/ml, 4(15.4%) had 3.00-3.49 ng/ml and 13(50.0%) had serum PSA level within 3.50-4.00 ng/ml. Out of 4 patients with malignant lesion, 1(25.0%) had serum PSA level within 2.50-2.99 ng/ml, another 1(25.0%) had 3.00-3.49 ng/ml and 2(50.0%) had serum PSA level within 3.50-4.00 ng/ml. There is no statistically significant difference observed in serum PSA level among the patients with histopathological findings benign and malignant ( $P > 0.05$ ) (Table IV). According to a study by Shekariz et al. cancer is detected in initial or early follow-up biopsies in more than one third of man with PSA levels > 4 ng/ml[9]. Rashid et al. in a study recommended that for early diagnosis of prostate cancer cut-off value of serum PSA of 2.5 ng/ml can be an indication for prostate biopsy[13]. Babaian et al. in their study reported that a significant incidence of cancer (24.5%, 37 of 51) in men with serum PSA between 2.5 and 4.0 ng/ml[12].

**Conclusion:**

The more S. PSA testing, the more will be the diagnosis of low stage disease and lower the prostate cancer death rate. In this study, 13.3% of prostate cancer cases could be missed if serum PSA level 4 ng/ml was taken as cut off value. For early diagnosis of prostate cancer serum PSA level 2.5 ng/ml may be used as an indication for prostate biopsy. PSA screening has lead to a substantial increased in the diagnosis of incidence of prostate cancer. This increased detection rate of diagnosis of prostate cancer has caused to decrease the advanced stage disease at a dramatic rate.

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# STONE DENSITY DETECTED BY NON CONTRAST COMPUTED TOMOGRAPHY (LOW DOSE) IS A PREDICTOR OF SUCCESSFUL OUTCOME OF RENAL STONE CLEARANCE BY EXTRA CORPOREAL SHOCK WAVE LITHOTRIPSY

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## Abstract

**Objective-** To evaluate the usefulness of measuring stone density in Hounsfield Unit by Low-dose Non Contrast Computed Tomography scan in predicting the outcome of extracorporeal shockwave lithotripsy for renal stone clearance.

**Materials & Methods** - A total of 96 patients with renal stone size d" 20 mm attending at the OPD of BSMMU were included in this study. The outcome measures were complete clearance of stone, number of ESWL sessions and number of shock waves required to become stone free.

**Result-** The mean size of the stone was  $1.8 \pm 0.3$  cm. The mean stone density was  $663.7 \pm 69.8$  HU. 25% of the patients underwent 2 sessions of ESWL, 52.1% three sessions and 22.9% more than 3 sessions. Of the patients 83.3 % were successfully cleared of their stone. The mean number of shock waves  $6689.2 \pm 268.4$  required for stone fragmentation of d" 750 HU and  $9945 \pm 375.7$  required > 750 HU stone density respectively. 85.5% of the patients with stone density d" 750 HU needed d" 3 sessions to become stone-free; whereas only 55.5% of the patients with stone density > 750 HU became stone-free in d" 3 sessions. 14.5% patients needed > 3 sessions of ESWL with stone density of e" 750 HU. 78.8% of the patients with stone density d" 750 HU exhibited complete clearance of stone as opposed to 37.5% of those with stone density > 750 HU. The chance of having complete stone clearance is 6-fold (95% CI = 1.9-19.4) higher in patients with low density stone (d" 750 HU) than that in patients with high density stone (d" 750 HU) ( $p = 0.002$ ).

**Conclusion-** In conclusion a stone density less than 750 HU should be treated with ESWL as first choice of treatment.

**Key wards-** Stone, Density, ESWL

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## Introduction:

The incidence of nephrolithiasis is reported to be increasing across the world[1,2]. This increase is seen regardless of factors such as age, sex and race. However, obesity, diminished intake of fluid, increased consumption of calcium, sodium, oxalate, animal protein are considered the most important risk factors for renal

stone formation[3,4]. Because of its high frequency, urolithiasis is of particular concern of health economics as well as increased of total annual cost. Therefore, scheduling the management of the urolithiasis is of utmost importance in decreasing the subsequent cost after diagnosis.

Since 1980, extracorporeal shock wave lithotripsy is the first-line of treatment for renal stones of < 2 cm in diameter[5]. Analyzing different series, its success rates

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varies from 60 – 99%[6]. However, the outcome of ESWL depends on many factors, like stone size, composition, fragility, the shock wave generator, the presence of obstruction or infection and the distance from the skin to stone[7,80]. After the introduction of the concept of fragility, stone composition has emerged as the main factor influencing the efficacy of ESWL[9].

Non Contrast CT (NCCT) has long been used to evaluate causes of radiolucent filling defects using measurements of substance density in Hounsfield units (HU) to distinguish calculi from tumours or blood clot[10,11]. As it provides greater density discrimination than a conventional plain skiagram of abdomen, it is now the preferred method to evaluate which patients with urinary calculi will have successful outcome following ESWL<sup>[12]</sup>. Its ability to detect density differences as low as 0.5% has been exploited to determine the composition and fragility of urinary stones<sup>[9,13]</sup>. The density of stone varies with composition and affects the fragility of a calculus, which ultimately governs the clinical outcome in ESWL. Therefore, knowing the fragility of a calculus before ESWL is of utmost importance to increase the efficacy and reduce the number of hospital visits and cost of treatment.

The stone density and ability of a stone to resist ESWL is based in the part on the composition as well as microcrystal of the stone. Stone composed of calcium oxalate dihydrate, magnesium ammonium phosphate, uric acid tend to be softer and to fragment more easily with ESWL. Stone composed of calcium oxalate monohydrate, cystine stone are less susceptible to ESWL. The more crystalline dehydrate stones are easiest to break. The monohydrates stones are much harder to break. Therefore, Low density renal stone easily fragments by ESWL and High density renal stone difficult to fragments or not fragmented by ESWL[13].

Repeated ESWL use causes various complications like peri-renal, subscapular or intra-renal hemorrhage, post ESWL hematuria, recurrent urinary tract infection, stone fragments inducing obstructive uropathy and hypertension.

For that reason to reduce the number and complication of the stone diseases, this study proposed to find out the outcome of treatment of renal stone clearance by extra corporeal shockwave lithotripsy after evaluating the stone density detected by non-contrast computed tomography (Low-dose).

## Materials and Method:

This prospective observational type of study was carried out in the Department of Urology, BSMMU, Dhaka over a period of 18 months between January 2013 to June 2014 with patients of renal stone attending at the department.

Total 96 adult patients were selected by standard statistical sampling formula and inclusion & exclusion criteria, with solitary renal stone (size>5 mm and d” 20 mm) except in lower calyx and residual single stone after surgery were included in this study in. All patients were included with informed written consent.

Data were collected using a structured questionnaire (Research Instrument) containing all the variables of interest. The questionnaire were finalized following pre testing. Collected data were checked daily and edited. Data were processed and analysed using computer software SPSS (Statistical Package for Social Sciences). The test statistics used for analysis of data are Chi-square Test (for comparison of categorical data between groups) and Student’s t-Test (for comparison of continuous data between groups). The association between stone density and outcome ESWL were tested by means of univariate analyses. Level of significance was set at 0.05 and  $p < 0.05$  were considered significant.

## Detailed procedure:

All patients were evaluated by: Hematological test like CBC and Coagulation profile, Biochemical tests like S. Creatinine, Blood urea, Urine RME and C/S, Plain X ray of KUB region, USG of whole abdomen, Intravenous urography, Non contrast computed tomography (NCCT).

### Non Contrast CT scans procedure:

Pre procedural radiological evaluation included plain x-ray of the kidney-ureter-bladder region and non contrast CT of KUB region on a multi-slice CT scanner. All images were obtained with a 4<sup>th</sup> generation Hitachi CT scanner (appendix-v) without intravenous or oral administration of contrast medium. The section thickness and interval was 3 to 5 mm. Images were obtained with 0.8-second gantry rotation by Low-dose CT protocol that is 120 kVp and 80 mA. ( BSMMU CT protocol for abdomen is 140 kVp and 150 mA). Hence HU for each stone were determined on the pretreatment NCCT and only single shot will be taken. Stone size, stone location (pelvis, calyx), stone attenuation values (Hounsfield units) and skin to stone distance were recorded. The lowest, highest and most common attenuation values were recorded and the mean calculus attenuation value was

calculated. The skin-to stone distance (SSD) was calculated by measuring three distances from the stone to the skin at 0°, 45° and 90° using radiographic calipers, and the average of these values was calculated to represent SSD for each stone. Whole procedure was done in the department of radiology and imaging of BSMMU and reported by expert radiologist in that department.

#### **ESWL Procedure:**

ESWL monotherapy with 3<sup>rd</sup> generation Siemens Lithoskop lithotripter was used to treat all the enrolled patients with structured procedure followed. The number of shock waves to be delivered to the stone by expert operator during each session. Standard number of shock waves 2000 to 2500 with frequency 90 P/min per session and energy setting of 3.5 KV was applied in each session for lithotripsy. A change in stone size or outline or separation of stone fragments indicated fragmentation which was observed by fluoroscopy. The procedure was terminated if satisfactory fragmentation was noted before 3 session of ESWL or no change in stone size and outline up to 3 session of ESWL. All patients were hospitalized during ESWL procedure and served as day care service. All patients were under antibiotic prophylaxis during the procedure.

#### **Post ESWL evaluation:**

Patients were advised to come after 4 weeks with a plain X-ray of KUB region. In the follow up study, history, clinical examination and relevant investigations like urine routine examination, culture and sensitivity were done and data on post ESWL clearance were recorded in data sheet for assessing the outcome. ESWL success is defined as patients being stone free or with remaining stone fragments of <4 mm after three session which is considered as clinically insignificant residual fragments (CIRF) considered as the success of ESWL and complete stone clearance. Remaining fragments of >4 mm or non-fragmented stone were considered as ESWL failure as well as for other treatment option should be choice<sup>[14]</sup>.

#### **Results and observation:**

The result shows that mean age of the total 96 patients was 49.4±8.2 years and the youngest and the oldest patients were 35 and 68 years old respectively (Table – I). The majority (77.1%) of the patients were male (74) with male to female (22) ratio is 3:1. Out of 96 patients 36% patients having normal BMI and needed d" 3 sessions of ESWL where as 64% patients having overweight needed >3 sessions of ESWL. In relation to

BMI, complete stone clearance between overweight and normal was 63.8% and 36.2%. But no stone clearance between these was 60.0% and 40.0%. p-value was significant. The association between skin to stone distance and number of ESWL session, shows that the mean skin to stone distance in case of d"3 ESWL session was 84.2±2.9 and >3 ESWL was 87.9±1.8 respectively (Table-II). Statistically significant difference present between these groups (p-value < 0.05). The stone characteristics associated with stone clearance, shows 55.2% of the patients had left kidney and 44.8% had right kidney stone involvement of which 62.5% of the patients had stone in the renal pelvis and 37.5% of the patients had calyceal stone. The mean size of the stone was 1.8 ± 0.3 cm (range: 0.98 – 2 cm). The mean stone density was 663.7 ± 69.8 HU (range: 133 – 1485 HU). The location of stones in calices, this study showed no significant difference was observed in complete stone clearance in relation to site and location of stones (p > 0.05). The mean of stone density in complete stone clearance was 478.3 ± 38.2 (range: 133 – 750 HU) and incomplete stone clearance was 943.6 ± 50.9 (range: 751 – 1485 HU) that was statistically significant (p< 0.001).

The number of ESWL session and stone size in this study shows that 25% of the patients underwent 2 sessions where stone size was 0.98 cm to 1.10 cm. 52.1% of patients needed three sessions where stone size 1.11 cm to 1.94 cm and 22.9% of patients needed more than 3 sessions where stone size were 1.95 cm to 2.0 cm. 83.3% of the patients successfully cleared off stone by ESWL.

The relation between the number of ESWL session and stone density shows that 85.5% of the patients with stone density d" 750 HU needed 3 or less session to have their stone cleared and the rest (14.5%) needed > 3 session with same density. In patients with stone density > 750 HU, 55.5% needed 3 or less session and 44.5% needed >3 sessions. p-value is significant (p<0.001) (Table-III).

The association of the amount of shock wave and stone density shows that 79.7% patients having stone density d"750 needed d" 7500 shock wave of ESWL and 20.3% patients needed >7500 shock wave. 74.1% of patients having stone density >750 needed d"7500 shock wave and 25.9% of patients needed >7500 shock wave of ESWL. The mean shock wave is 6689.2±268.4 in d"750 HU stone and 9945.2±375.7 in >750 HU stone. There was significant difference in amount of shock wave of ESWL and stone density (p<0.05) (Table-IV).



The stone density and complete clearance of stone showed 78.8% of the patients with stone density  $\leq$  750 HU exhibited complete clearance of stone as opposed to 37.5% of those with stone density  $>$  750 HU. The chance of having complete stone clearance is 6-fold (95% CI = 1.9-19.4) higher in patients with low density stone ( $\leq$  750 HU) than that of patients with high density stone ( $>$  750 HU) ( $p = 0.002$ ). (Table-V).

**Table I**  
Distribution of patients by their age ( $n = 96$ )

Age (Years)*	Number of patients	Percentage
<40	18	18.8
40-50	38	39.6
50-60	31	32.3
$\geq$ 60	9	9.4

\*Mean age =  $(49.4 \pm 8.2)$  years; range =  $(35 - 68)$  years#

**Table-III**  
Association between number of ESWL session and stone density ( $n = 96$ )

Number of ESWL sessions	Stone density (HU)		p-value#
	$\leq$ 750 ( $n = 69$ )	$>$ 750 ( $n = 27$ )	
$\leq$ 3	59(85.5)	15(55.5)	< 0.001
$>$ 3	10(14.5)	12(44.5)	
Mean $\pm$ SD	$2.7 \pm 0.7$	$3.2 \pm 1.1$	

# Data were analyses using **Chi-square ( $\chi^2$ ) Test**. Figures in the parentheses denote corresponding percentage. Table III shows that 85.5% of the patients with stone density  $\leq$  750 HU needed 3 or less session to have their stone cleared and the rest (14.5%) needed  $>$  3 session with same density. In patients with stone density  $>$  750 HU, 55.5% needed 3 or less session and 44.5% needed  $>$  3 sessions. p-value is significant ( $p < 0.001$ ).

**Table-IV**  
Association between amount of shock wave and stone density ( $n=96$ )

Shock wave¶	Stone density (HU)		p-value
	$\leq$ 750 ( $n = 69$ )	$>$ 750 ( $n = 27$ )	
$\leq$ 7500	55(79.7)	20(74.1)	0.05
$>$ 7500	14(20.3)	7(25.9)	
Average Shock wave#	$6689.2 \pm 268.4$	$9945.2 \pm 375.7$	<0.001

¶ Data were analyses using Chi-square ( $\chi^2$ ) Test and were presented as n (%.)

#Data were analyses using Unpaired t-Test and were presented as mean  $\pm$  SD.

**Table II**  
Distribution of patients in relation to number of ESWL session and stone size ( $n=96$ )

Number of ESWL session	Stone size in cm	Number of patients	Percentage
2	0.98 – 1.20	24	25.0
3	1.21 – 1.96	50	52.1
$>$ 3	1.97 – 2.0	22	22.9
Stone free rate		80	83.3

Table II shows that 25% of the patients underwent 2 sessions where stone size was 0.98 cm to 1.10 cm. 52.1% of patients needed three sessions where stone size 1.11 cm to 1.94 cm and 22.9% of patients needed more than 3 sessions where stone size were 1.95 cm to 2.0 cm. 83.3% of the patients successfully cleared off stone by ESWL.

**Table –V**  
*Association between stone density and complete clearance of stone (n=96)*

Stone density (HU)	Complete clearance		Risk Ratio (95% CI of RR)	p-value
	Yes(n = 80)	No(n = 16)		
≤ 750	63(78.8)	6(37.5)	6.1(1.9 – 19.4)	0.002
> 750	17(21.2)	10(62.5)		

# Data were analyses using Chi-square ( $\chi^2$ ) Test. Figures in the parentheses denote corresponding percentage

### Discussion:

Extracorporeal shockwave lithotripsy is one of the preferred treatment modality for calculus in the upper urinary tract since its introduction[5]. It can clear up to 90% of stone in adults[15]. However, shockwave lithotripsy monotherapy is not successful in 9.4% to 26.3% of renal and proximal ureteral stones[16]. The outcome of ESWL depends on many factors, including stone size, location, composition and fragility, number of shockwave generator, and presence of distal obstruction as well as characteristics of the patient. Failure of ESWL leads to increased costs with requirement of auxiliary procedure to clear the stones. It would be useful if we can predict the stones that will be fragmented by ESWL.

In addition to history, physical examination and urinalysis, routine assessment of a patient presenting with renal colic currently includes NCCT in many centers, though it is not a regular practice in our country. This radiographic modality allows rapid and accurate determination of renal stone. Many investigators have studied the usefulness of NCCT for evaluating urinary calculi and observed that it is superior to traditional imaging such as excretory urography[17]. This study provides compelling data suggesting the importance of measuring HU in all patients who undergo NCCT to evaluate urinary calculi. By evaluating patients undergoing ESWL for renal calculi determined whether the success of this procedure could be predicted by pretreatment HU values on NCCT. The ability to assess renal stone characteristics and determine susceptibility to fragmentation is not a new phenomenon. In a study it was compared stone radiodensity with that of spine and concluded that stones are less likely to break if their radiodensity is greater than that of spine[18]. Others studied the opacity of calculi of similar sizes and concluded that fragmentation is less likely with higher opacity[19]. Although these studies provide insight into information needed for therapeutic considerations, they

were based on qualitative observations, making them highly subjective and difficult to standardize. CT has long been used clinically to evaluate radiolucent filling defects, using measurements of substance density in HU to distinguish calculi from tumors or blood clots. The ability of CT scan to detect density differences as low as 0.5% has been exploited to determine the composition and fragility of urinary stones[13]. The density of stone affects the fragility, which ultimately governs the clinical outcome of ESWL. Therefore, stone opacity were assessed by using a quantitative measurement to evaluate treatment outcomes. HU calculated on pretreatment NCCT in patients who underwent ESWL provide a simple, easily reproducible and readily available measure of stone opacity. Using this objective study design this study observed that HU determination on NCCT provides crucial information for the treatment (ESWL) outcome was analyzed.

In the present study the mean age of the patients was 49.4 years with a male preponderance (male to female ratio roughly 3:1). There were 55.2% of the patients had left kidney and 44.8% had right kidney involvement. The mean size of the stone was  $1.8 \pm 0.3$  cm. There were 62.5% of the patients had stone in the renal pelvis and 37.5% in calyceal stone except lower calyx. The mean stone density was  $663.7 \pm 69.8$  HU. 25% of the patients underwent 2 ESWL sessions, 52.1% patients underwent 3 sessions and 22.9% more than 3 sessions. Successful stone clearance by ESWL was found to 80%.

BMI is an objective measure of obesity, defined as a person's weight in kilograms divided by their height in square meters ( $\text{kg}/\text{m}^2$ ). The American Society of Clinical Nutrition has defined a BMI of less than 25 as normal, 25-29 as overweight and 30 or greater as obese<sup>[20]</sup>. In present study BMI has no significant effect to stone clearance by ESWL because in our context patients were no so healthy and bulky like American or European people. Therefore, statistically no significance was found

in overweight and normal BMI. In a study same result was observed showed a significant negative impact of higher BMI on stone free rate after ESWL[21].

Skin to stone distance (SSD) is an easily measured parameter on NCCT which correlates with ESWL efficacy in the treatment of stones in all locations independent of other factors[22]. This study assessed the SSD in all patients, because the SSD calculated on pretreatment NCCT provides a simple, easily reproducible and readily available quantitative measurement. It is the average of three distances (true posterior, 45° lateral and true lateral) on NCCT. In this current analysis this study included that the mean SSD was 84.2±2.9 where d" 3 ESWL sessions is needed and 87.9±1.8 where > 3 session ESWL session is needed to fragment the stone and SSD ranges from 80-88 mm. So it affects the treatment outcome by ESWL. It was described the SSD to be significantly associated with complete stone clearance[21].

In this study, it also assessed that the mean number of shock waves 6689.2±268.4 required for stone fragmentation of d" 750 HU and 9945±375.7 required > 750 HU stone density respectively. It was concluded that high density renal stone needed greater number of shock waves for complete clearance of stone[23].

The study demonstrated that majority (78.8%) of the patients with stone density d" 750 HU experienced complete clearance of stone compared to 37.5% of those with stone density d" 750 HU (< 0.001). 85.5% of the patients with stone density d" 750 HU needed 3 or less session to become stone-free; whereas only 55.5% of patients with stone density >750 HU not stone-free in 3 or < 3 sessions and the rest required 4 or more sessions. In a study it was demonstrated a linear relationship between the calculus density and number of ESWL sessions required. 41 (80%) of patients with stone density of < or = 750 HU, needed three or fewer ESWL sessions and 45 (88%) had complete clearance (24). Of patients 41 (72%) with stone density of >750 HU, required more than three ESWL sessions, and 37 (65%) had complete clearance. The best outcome was in patients with calculus diameters of < 1.1 cm and mean densities of < or = 750 HU; 34 (83%) needed three or fewer ESWL sessions, and the clearance rate was 90%. The worst outcome was in patients with calculus densities of > 750 HU and diameters of > 1.1 cm; 23 (77%) needed more than 3 ESWL sessions and the clearance rate was only 60%.

Since 1980, NCCT scan has been studied as a possible useful tool to predict stone composition through density measurements (Hounsfield Units). It was stated that NCCT scan could only differentiate the uric acid stones from the rest[25,26]. On the other hand, in a study it was reassured that this instrument can identify uric acid and calcium oxalate stones[27]. Although the development in the technology of endourologic procedures and ESWL increases the management options of renal stones, it also increases the need for more evaluation of their efficacy and indications. Patient, stone and radiographic parameters have been studied as potential predictors of ESWL success. In particular HU attenuation value of NCCT has been shown to be a potentially useful independent predictor of ESWL outcome. Although CT is associated with greater radiation exposure and costs than plain radiography, NCCT stone characteristics predict ESWL success for renal stone. Patient characteristics are not so much predictive. By knowing the composition of a urinary calculus through density measurement is frequently a key factor in determining its most appropriate management. Whether the stone be amenable to extracorporeal shock wave lithotripsy, or should ureteroscopy or percutaneous nephrolithotomy be attempted can anticipated beforehand. Urine pH, urinary crystals, prior stone history, the presence of urea-splitting organisms, and plain radiography are tools currently used to infer the stone composition[28]. Several *in vitro* studies have suggested that NCCT can extend these tools by demonstrating measured differences in radio density among different urinary stones[13,29].

The density of stone depends upon its composition and affects the fragility of a calculus, which ultimately governs the clinical outcome of ESWL. Therefore, assessing the density of a calculus before ESWL session starts is of immense significance to increase the efficacy of the procedure and reduce the number of hospital visits and treatment cost.

NCCT has emerged as the modality of choice in the evaluation of acute flank pain. It is safe, rapid, and accurate, with one series reporting 96% sensitivity, 99% specificity, and 98% accuracy in the diagnosis of urolithiasis. Once urinary stone disease is identified, NCCT is also useful in providing information necessary for the management of the stone.

### Conclusion:

Based on this prospective study we concluded that Low density (d" 750HU) renal stone fragmented successfully

by extra corporeal shock wave lithotripsy but stone of high density (e" 750 HU) suggest a poor chance of clearance and could help to plane alternative treatment options, thus reduce the burden of the patients..

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# PENILE FRACTURE-REPORT OF TWO CASES AND REVIEW OF CURRENT LITERATURES

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### Abstract

*Penile fracture is an uncommon urological emergency especially in Bangladesh. The other name is traumatic rupture of the tunica albugenia and corpora cavernosa in erect penis. It occurs when an erect penis face to buckle under the pressure of a blunt sexual trauma. Patient gives the typical history of immediate detumescence, severe pain, swelling and eggplant deformity of the penile shaft due to penile injury. Immediate surgical exploration and repair of corpora cavernosa with tunica albugenia is the most effective treatment modality. In normal cases diagnosis is made from history, physical examination alone. In some special cases ultrasonogram, radiological images, including retrograde urethrography or cavernosography are mandatory for proper diagnosis. Herein, we report 2 cases of penile fracture with review of current literature regarding treatment options.*

**Key words:** Cavernosography, Penile fracture, Tunica Albugenia rupture, Urethrography.

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### Introduction:

Penile fracture is rupture of one or both of the tunica albuginea, the fibrous coverings that envelop the penis's corpora cavernosa. During vaginal or anal intercourse, or aggressive masturbation it is caused by rapid blunt force to an erect penis[1]. Partial or complete rupture of the urethra or injury to the dorsal nerves, veins and arteries are sometimes involve[2]. It is an urological emergency that always deems attention[3]. Although penile fracture is easily recognized and therefore classified as a "first-look diagnosis," this clinical entity is always embarrassing for patients as well as partners and goes unreported many times 4. Eminently it is an entity of clinical diagnosis[5]. Therefore the management of a penile fracture should not include any further investigation rather than surgical exploration. The need for immediate surgery is emphasized, in order to avoid erectile failure and curvature. Many conditions can simulate fracture penis as dorsal vein tears[6,7,8]. Authors reviewed the literatures of penile fracture and reported two cases of 21 and 50-year-old men who presented with egg-plant deformity of penile shaft and

discoloration of penile skin and swelling penis after cracking sound during forceful bending of penile shaft followed by severe pain at the time of fracture. The main aim of this study was to describe treatment option of 2 patients with fracture penis in our urology department and reviewed of literatures.

### Case 1

We report the case of a 21-year-old unmarried student who presented to the emergency department few hours following blunt injury of the penis during forceful bending of erect penis. The patient reported a "tearing/popping" sensation, rapid detumescence, severe penile pain and no blood per urethra, after erection in morning when he tried to bend the penis by himself. The patient was able to void without any voiding sensation, following the injury. On physical examination the penis was found swollen, discoloration of penile skin, scrotum and part of perineum. eggplant deformity of penile shaft. Figure 1 shows eggplant deformity of penile shaft. "Rolling sign" was present bilaterally, palpated at the sites of tunica albugenia disruption about 1 cm from the base of the penis and the penis was not tender on examination. Clinically diagnosed as penile fracture.

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**Case 2**

A 50-year-old married business male presented with a history of bending of his penis during vigorous coitus with his wife after taking an erotic stimulant drug at 12.30 night. During coitus he felt sudden thrust with body of his wife followed by cracking sound, sudden detumescence, swelling and deformity of penis, scrotum. On physical examination, penis was swollen, discoloration of penile skin, eggplant deformity of penis and “Rolling sign” was present. On the basis of his clinical presentation a diagnosis of penile fracture was made. A penile catheter of 16F was inserted per urethra to serve as stent. Vital signs were normal. Pathological examinations like CBC, BT,CT, S.creatinine, RBS were done. Immediate surgical exploration and repair of rupture tunica albugenia and corpora cavernosa was done under spinal anesthesia. In both cases a sub coronal circumscribes degloving incision was given. A tear in tunica albugenia and corpora cavernos was found on left side and 2 cm distal to the root of the penis and there was blood clot. Repair of corpora cavernosa and tunica albugenia with sutures of vicryl 2-0 was performed after removing the clot (Figure 2). Post-operatively patient was prescribed antibiotics, analgesic and the urethral catheter was kept for 10 days, which was subsequently removed before discharge (Figure 3). Both of them were asked to abstain from masturbation or intercourse until complete healing occurred. At 3 months interval the optimal voiding function, erection function and cosmetic result were achieved in one case and in other case urethral stricture developed, which was repaired successfully after 4 months with end to end anastomosis. Based on our experience, this management approach results an excellent preservation of both penile anatomy and function.



**Fig.-1:** Eggplant deformity of penile shaft after penile fracture



**Fig.-2:** Fracture of Tunica Albugenia and Corpora Caverosa



**Fig.-3 :** Just after repair of penile fracture

**Discussion**

Penile fracture is a rare urologic emergency condition that affects all social strata. It has an incidence of 1 in 175,000 admissions and is commoner in countries where there is segregation of the sexes for social and religious reasons, where its etiologic factor is mostly from self manipulation[9,10]. Mechanism of fracture: During an erection, the penis is engorged with blood. If the penis is bent suddenly or forcefully while it's engorged, the trauma may rupture tunica albuginea, the lining of corpora cavernosa responsible for erections - resulting penile fracture. As the penis changes from a flaccid state to an erect state, the thick tunica albugenia becomes very thin. The tunica albugenia is the fibrous

covering of the penile corpora cavernosa and is directly involved in maintaining an erection. During erection it thins from 2 mm to 0.25 - 0.5 mm, stiffens and becomes less elastic and easily fracturable. Sudden direct trauma or abnormal bending in erect state causes tearing of the tunica albugenia, usually in transversal direction, rarely oblique or irregular[5]. Penile fractures have been classified as simple and compound[11]. Simple penile fractures are those with intact skin and urethra while those with urethral rupture are compound. One patients treated in our department had simple fractures another was compound fracture involving the urethra which was reported later having urethral stricture that was corrected surgically.. oncomitant urethral injury occurs in about 10-58% of cases[12]. Associated urethral rupture is seen more in coital fractures than those following manipulations that was found in our one case also[11]. The predisposing factor to concomitant urethral injury in penile fracture is not clear but it is postulated to be due to a more vigorous force applied during coitus compared with the prolonged but lesser force involved in masturbation[11,13]. Penile fracture may present with classic "eggplant deformity" of swollen penis along with ecchymosis confined to Buck's fascia[11]. The patient usually describe a cracking or popping sound during injury as tunica tears, followed by pain, rapid detumescence, discoloration and swelling of penile shaft[1,2,3]. Fracture typically occurs during vigorous sexual inter-course, when the erect penis slips out of the vagina and strikes the perineum or pubic bone, Other causes may be masturbation with or without devices. It can happen from any type of blunt trauma affecting the tumescent shaft. Falling out of bed with an erection, extreme sexual activity, especially during coitus in which the female is on top, forceful correction of a congenital chordee and even tucking an erect penis into underwear. In the Middle East self inflicted fractures predominate. Taqaandan also a cause of penile fracture. It comes from a Kurdish word meaning "to click," involves bending the top part of the erect penis while holding the lower part of the shaft in place, until a click is heard and felt.

Penile fracture can usually be diagnosed based solely on history and physical examination findings. Sometimes in complicated cases ,and to find out associated injury ultrasonogram, urethrogram, cavernosogram, MRI should be performed. Because of fear and embarrassment the patient present to health care professional sometimes significantly in delay. But in our case both the victim gave detail history when we asked.

False fracture penis has been reported in literature, who presented with penile swelling and ecchymosis. In those case they did not describe classic "snap-pop" or rapid detumescence "egg-plant" deformity of the shaft, whose features are associated with fracture penis. Physical examination may not be adequate for confirm diagnosis. Dorsal penile artery or vein injury during sexual intercourse, mimic penile fracture. Lacerations of the corpus cavernosa from gunshot and sporting injuries to the flaccid penis are not considered as penile fractures since they lack the fulcrum for snapping[12]. In western countries upto 50% of penile fracture occurs during vigorous intercourse. Other causes include industrial accidents, masturbation, gunshot wound or other mechanical trauma that causing forceful breaking of an erect penis. In Middle East the injuries occurs due to penile manipulation to achieve detumescence. Another causes are turning over in bed, a direct blow or forceful bending of penis. In Nigeria reported causes of fracture are masturbation, stuttering priapism, vigorous sexual intercourse, turning in bed, forceful bending in erect penis by locally made bamboo bed[13]. Recent finding indicate that penile fracture appear to be in those population who use sexual xciting drugs before sexual intercourse. The case reported above was having coitus with wife sing sexual stimulant drugs and another was masturbation.

Treatment may be either conservative or surgical. The conservative management of penile fracture includes splinting, cold compresses, and a combination of anti-inflammatory, analgesic medications and fibrinolytics. In our 2 cases we did surgical exploration immediately after fracture and repaired. This concept has fallen into disfavor because of the high complication rates (29-53%) of nonoperative therapy[14].

Commonly complications encountered following conservative management as reported in literatures are penile angulation, painful erection and coitus, A-V fistula, infected hematoma, abscess formation and impotence[3]. For these complications immediate surgical intervention is advocated as we did in our cases[15]. The goal of immediate surgical correction to the fracture penis are restoration of penis to its preinjur state, prevent erectile dysfunction, maintain penile length and allow normal voiding[3]. It causes short term hospital stay, patient satisfaction, safe from penile deformity development and erectile dysfunction. Ideal management of penile fracture include identification of proper injury site, evacuation of hematoma, removal of corporal



debridement, properly closure of tunica albugenia, corpora and ligation of any bleeding vessels [16]. Three types of incisions are advocated in literatures: direct incision over corpus cavernosum causes minimal dissection of the neurovascular bundles, less trauma and even local anesthesia can be used but it does not allow complete repair. Some did repair with general anesthesia, but in our cases we did repair with spinal anesthesia and achieved good result. There was no impaired penile sensation or distal skin necrosis as described by others. That's why sub-coronal incision with spinal anesthesia appears to be satisfactory than other incisions. Treatment options for partial urethral tears include urethral catheterization, primary closure with nonabsorbable suture, or suprapubic cystostomy tube.

Penile fracture is a urologic emergency that may have devastating physiologic and psychologic consequences. However, with prompt diagnosis and expedient surgical management, outcomes remain excellent and complications are minimal[17,18,19].

### Conclusion

The diagnosis of penile fracture is mostly a clinical one. Prompt surgical exploration and repair are advocated in almost all cases. Most commonly, the rupture occurs on the lateral side of the proximal corpora, but it can occur anywhere along the corpora and produce a variety of swelling patterns. Hematuria and voiding symptoms are not specific to a urethral injury. Their presence should prompt the performance of retrograde urethrography. Corporal cavernosography might aid in localizing an unusual injury prior to surgery; however, the procedure is limited by technical requirements and the possibility of false-negative results. Immediate surgery reduces long-term complications; posttraumatic penile curvature remains the most common long-term complaint.

### Learning points

- Fracture of has a typical history with special clinical findings It should be identified clinically and explore surgically as early as possible to avoid penile deformity, painful erections or erectile dysfunction.
- Complete degloving of the penile shaft should be done to locate the exact site of rupture and to repair properly.

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## CASE REPORT

# URETHRAL FOREIGN BODY MANAGEMENT: A CASE REPORT

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### Introduction :

Some Homosexuals insert objects into their penis for pleasure. These includes pencils, pens, swizzle sticks, buckshot and glass beads[1]. Goldstone described the case of a man who inserted a piano wire in his penis & it ended up knotted in his bladder<sup>(1)</sup>. The surgeon could not get it through a scope & the man had to have his bladder open up.

Van ophoven and deKernion reviewed 800 cases of penile foreign body insertion from 1755 to 1999[2]. The inserted objects fall into the following categories: Animals or parts of animals (coyote's rib, dog's penis, beech, snails, animal bones etc), plants & vegetables (slippery elm, grass, cucumber, pistachio shells, etc.) Sharp & lacerating objects (pencils, pins, needles etc), wire like objects (cable, catheter, rubber tube etc) and fluids and powders (nasal mucus, glue, cocaine, etc)[2]. Jaiswal described a 28 years old man with a penicillin bottle containing tincture of iodine, in the preputial sac[3]. The patient had inserted the bottle to tickle his glass penis during masturbation. The bottle was so firmly impacted the general anaesthesia was required to removed it.

The most common motive associated with foreign bodies of the genitourinary tract is to get sexual pleasure[4]. Penile foreign objects occurred with such frequency that every urologist & practitioner may expect to treat them.

But this was a case of introduction of foreign body into the urethra of a 26 years old male named Alamin by group of people as punishment of a girl & that foreign body was wooden thorn (Bet Kata). This is not reported in the literature.

Insertion of the objects into penis is rarely fatal. However, Byard et al, described a 40 years old man who inserted a pencil into his penis, where upon could not retrieve. He developed a septic condition, did not seek medical help & subsequently died[5].

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The management of urethral foreign body may require the use of various surgical techniques. A review of the literature revealed multiple methods for their extraction. We report a case of urethral foreign body, a wooden thorn (Bet Kata) not traversing the prostatic urethra & lodging in the bulbar urethra & penile urethra, the tip of the foreign body were outside the urethra (about 2cm outside from the tip) & 15cm inside the urethra, as it was thorned & it was hook like and concavity inward, so it was indrawing inside slowly as it was about 6cm outside the urethra after 3 hours it was only 2cm & it could not come out through the tip of the penis because if we tried then there was every chance of lacerated injury of the urethra on each side of the foreign body as the thorns all around the foreign body. The foreign body was removed using a small perineal incision and urethrotomy, avoiding the need for general anaesthesia.

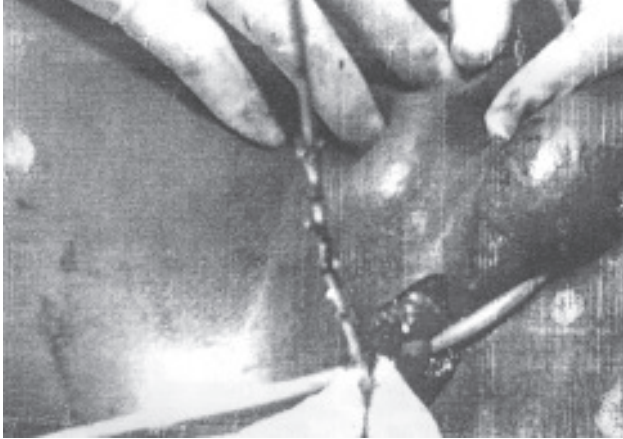
To our knowledge, the use of percutaneous and endoscopic techniques for urethral foreign body management has previously reported only one case[2], but removal of horny wooden beads (Bet Kata) not previously been reported.

### Case Report

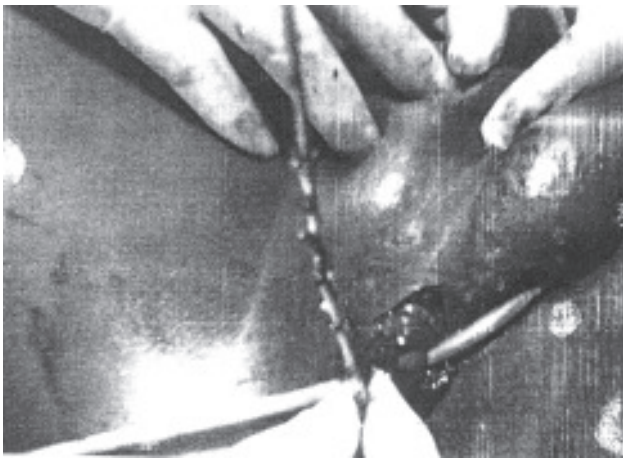
A 26 years old male presented to the MSU-1 (Urology Ward) in SBMCH with a history of introduction of a foreign body (Bet Kata) by few people as a punishment to tear a girl in a village, he presented with the history of perineal pain & penile pain with hematuria with distension of urinary bladder for 24 hours. The patient was unable to pass urine. Physical examination was significant for a visible tip of foreign body at the tip (about 2cm outside) of penis & for a palpable foreign body in the midline perineum & also at the under surface of penis.

On digital rectal examination, the foreign body was palpable along the ant. rectal wall.

Using regional anaesthesia (spinal block), a small incision was made along the perineal raphe down to the foreign body & open the bulbar urethra. This incision



**Fig.-1**



**Fig.-2**

facilitated the removal of the inner pole of Bet Kata, however, the outer pole also comes out with gentle traction through that incision & the foreign body was identified as wooden thorn (Bet Kata). A 20 french council tip foley's catheter was placed into the urethra & the perineal incision was closed in two layers with absorbable sutures.

The catheter was left indwelling for 3 weeks. A retrograde urethrogram (RUG) obtained after catheter removal revealed no evidence of extravasation or stricture. One

year after the foreign body removal the patient still reports no voiding difficulties.

**Conclusion:**

Several cases of urethral foreign bodies have been described in literature<sup>[2,6-7]</sup>. The reasons for urethral insertion are multifold ranging from dementia<sup>[6]</sup> to intoxication<sup>[2]</sup> to sexual experimentation & / or play<sup>[7]</sup>, regardless of the motive for placement of this foreign body & its extrication can be challenging & may require the creative use of urologists surgical armament in its removal. In this reported case a minimally invasive technique was employed to remove the urethral foreign body (Bet Kata) avoiding to use general anaesthesia. A small perineal incision was successfully used for this potentially challenging clinical dilemma. In conclusion, the technique of urethral foreign body removal should be as varied as the foreign bodies themselves & should be dictated by the needs by individual case.

To our knowledge, the removal of Bet Kata as a urethral foreign body which was introduced by few people as a punishment of tissing girls has not been previously reported.

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