

TRANSURETHRAL RESECTION OF BLADDER NECK IN THE MANAGEMENT OF PRIMARY BLADDER NECK OBSTRUCTION IN FEMALE: OUR PRELIMINARY EXPERIENCE IN BANGLADESH

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Abstract:

Objectives: To determine the effectiveness of transurethral resection of bladder neck in the management of primary bladder neck obstruction (PBNO) in female

Patients and Methods: This prospective study has been done with thirty female patients aged from 27 to 48 years who were presented with difficult micturition or urinary retention. These patients had unremarkable physical findings with normal perianal sensation, anal sphincter tone and lower extremity reflexes. Patients associated with cystocele, meatal stenosis, stricture urethra, urethral caruncle and urethral diverticula that may lead to mechanical bladder outflow obstruction were excluded from the study. Preoperative investigations include uroflowmetry, ultrasonography, serum creatinine, urethrocytostcopy with simultaneous "water flow test" was done. Seven patients presented with obstructed voiding symptom without renal impairment (serum creatinine, mean \pm SEM 1.24 \pm 0.04) and were initially treated with α -blocker (category A). Among the other 23 patients those had renal impairment 18 presented with near retention and these patients were on indwelling catheterization before operation (category B, serum creatinine, mean \pm SEM 2.72 \pm 0.13). Rest of the 5 patients presented with nausea, vomiting, and disorientation in addition to near retention and were put on haemodialysis along with indwelling catheterization to reach near normal creatinine level before operation (category C, serum creatinine, mean \pm SEM, 9.34 \pm 0.96). PBNO causing voiding difficulty were diagnosed in all the cases and were undergone transurethral bladder neck resection (BNR). Three months after operations, their pre- and post-operative symptoms were analyzed, and serum creatinine levels, ultrasonographic findings (MCC, PVR), uroflowmetric study were compared.

Results: Twenty-nine (96.33%) Patients become symptom free. Their average pre- and post-operative values of MCC (Maximum Cystometric Capacity), PVR (Post Voidal Residual urine), Qmax (Peak urinary flow during uroflowmetric study, Serum creatinine level were changed from 679.50 to 482.17ml, from 574.50 to 29.37ml, from 8.43 to 29.37ml/sec, from 3.48 to 1.13 mg/dl respectively. One patient (3.33%) did not continent ever postoperatively. One patient had become dry after using pad for stress incontinent for one month only. Serum creatinine level of category C patient did not reach to the normal level (post operative creatinine level Mean \pm SEM, 2.8 \pm 0.15) within this three months follow up period.

Conclusions: Our short term follow-up suggests that judicious Transurethral BNR is effective in relieving voiding difficulty due to primary bladder neck obstruction in female. A thorough gynaecological, neurological and urological examination is essential along with uroflowmetric, ultrasonographic and cystoscopic study to reach a correct diagnosis and making a treatment plan.

Key words: PBNO, Female, Clinical category, BNR

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Introduction:

PBNO in female is not a common urologic problem. Women with this condition usually present with VD predominantly of obstructive type. A broad range of definitions of VD in women have been suggested. Stanton et al defined it as "a condition in which the bladder fails to empty completely and easily after micturition"[6]. Urodynamic evidence of VD was defined as repeated peak flow of \hat{A} 15 ml/sec and / or 200ml or more residual urine. Among the several etiologies of voiding dysfunction PBNO is observed between 1% and 16% of women deemed to have bladder outlet obstruction. However determining PBNO in female still remains an intriguing proposition because the etiological factors for bladder outlet obstruction are more diverse in females than males[7]. Secondly, the urodynamic criteria so well searched for the diagnosis of bladder outflow obstruction in male, are not applicable to female bladder outlet due to a different pressure flow relation. Lastly the dynamics of voiding in female also is more complex than the males, presumably due to mobility of bladder neck and proximal urethra as well as due to action of pelvic floor movements and fascia over urethra⁷. Besides, presence of pelvic organ prolapsed adds a different dimension to the dynamics of voiding in female.

PBNO in female remains a poorly understood and improperly diagnosed clinical entity. Its incidence variously estimated at between 1% and 3% of women with LUTS, although in specific populations it has sometime been more prevalent[1]. Patients of PBNO may present with LUTS including urgency, nocturia, urge incontinence, intermittency, slow stream, and post micturition dribble. It can predispose to acute or chronic urinary retention. Among the common cause of bladder outflow obstruction in women that lead to voiding difficulty are urinary tract infection (cystitis, urethritis), different degree of genital prolapse, cystocele, atrophic vaginitis, urethral diverticulum, stricture urethra, meatal stenosis, neurogenic bladder, detrusor external sphincter dyssynergia[2]. PBNO is an uncommon cause of bladder outflow obstruction considered recently. It is much more commonly diagnosed in men[3]. In both sex PPBNO may be a progressive clinical disorder leading to end stage renal failure if not corrected at an appropriate time.

The role of α -blocker in treating PBNO in men is well established and bladder neck incision is a treatment option in a subgroup of patients with good results[4]. Considering the similarity in symptoms and the distribution of \hat{a} -adrenergic receptor in female bladder

neck and urethra, we started α -blocker in female patients with suspected of PBNO and effectiveness of this pharmacological therapy lead us to consider that PBNO might be a cause of voiding difficulty in female. We then tried to investigate to find out PBNO in our female patients by our available investigative tools. The easy availability of multichannel urodynamic study facility in the developed countries made it possible to define PBNO as the cause of bladder outflow obstruction in female. To our knowledge, no Urological centre in Bangladesh searched for the presence of PBNO before us. Our urology department is the first centre herein to find out such etiology and we introduce the technique of endoscopic bladder neck resection (BNR) in women successfully.

Patients and Methods

This prospective study was carried out in the department of Urology, Rangpur Medical College, Rangpur from August 2011 to December 2013. Thirty female patients were included in the present study aged from 27 to 48 years who presented with the complaint of weak or intermittent stream, urinary hesitancy, and sense of incomplete voiding, straining at micturition, inability to pass urine with or without nausea, vomiting and dyspnoea. General and physical examination, urinalysis, HbA1c and serum creatinine was estimated in all cases. Genital system examination was reviewed by one of our author from the department of Gynaecology. Any patient with cystocele, any grade genital prolapse, atrophic vaginitis, urethral caruncle and urethral diverticulum was excluded from the study. Furthermore, perianal sensation, anal sphincter tone and lower extremity reflexes were reviewed by another author of Neurology department. No patient had abnormalities suggesting cerebrovascular disease, spinal cord injury, cauda equina syndrom or neurogenic/neuropathic bladder. Preoperative cystoscopy was performed in all the cases. Any grade trabeculation as well as sacculation demanded careful study of the bladder neck and in cases of recent onset of voiding difficulty (VD) it was absent. In long standing cases bladder neck was white, thickend or rigid. The mucosa of bladder neck was oedematous, swollen in cases associated with urinary tract infection and these cases were treated accordingly before being investigated for PBNO. For the purpose of comparative study all the patients were divided broadly into three categories.

Category A: n=7, patients presented with VD without renal impairment aged from 27 to 38 years old, mean age 31.86 years. These patients had been suffering from LUTS for 2 years and improved with α_{1a} -blocker. They become symptomatic after omission of the drug.

Cystoscopic examination in these cases revealed mild trabeculation and the bladder neck was mildly rigid. Their measured MCC and PVR were gradually raised while Q_{max} became reduces associated with worsening of LUTS which become much bothersome and patients were advised to perform CISC but they wishes to undergo surgical procedure.

Category B: n=18, aged from 28 to 48 years, mean age 35 years. These patients presented with history of long standing LUTS for more than 3 years with recurrent attack of urinary tract infection(UTI) which were treated accordingly. They were admitted to urology department when their VD become more severe and they develop renal impairment. Initially they were managed by indwelling catheterization. When their serum creatinine level reached within normal range their catheters were removed, and ultrasonography, uroflowmetry and cystoscopy were performed. Ultrasonography showed bilateral hydroureteronephrosis and their MCC and PVR were measured. Cystoscopic examination showed almost rigid bladder neck with moderate trabeculation and small sacculation in bladder. Unfortunately one patient of this category developed incontinence due to over resection and excluded from the comparison study.

Category C: n=5, aged from 38 to 48 years, mean age 40.80 years. These patients also consulted for their long standing LUTS along with recurrent episode of UTI for more than 5 years and were treated accordingly. They were admitted into urology department with near retention along with nausea, vomiting, dyspnoea. In all the cases there were bilateral hydroureteronephrosis, electrolyte imbalance and serum creatinine level were more than 7 mg/dl. They needed urgent dialysis to settle and their serum electrolytes imbalances were corrected. When their serum creatinine levels felt below 3mg/dl,

catheters were removed. Then MCC and PVR were measured by ultrasonography and uroflowmetric study was done. Cystoscopy were performed that showed severe trabeculation and sacculation. In two cases small diverticulum were also noted.

Surgical technique: Preliminary cystoscopy was performed in all the cases and water flow test was done after filling the bladder and then removing the cystoscope and then pressing the suprapubic region to empty the bladder. Flow was poor in all the cases. Then BNR was performed by using adult resectoscope and diathermy electrode using a 110W cutting current. Incisions were given at the 5 and 7 o'clock positions with a Collings Knife extending from just inside the vesical neck through the proximal third of urethra. Then using a cutting loop small interposing tissues within the proximal third of the urethra were resected. At the end of the procedure and before introducing Trichannel catheter flow was checked again and it was satisfactory.

The postoperative MCC, PVR and Q_{max} were measured during discharge and at 3-months follow up period. The values of MCC, PVR, Q_{max} except the serum creatinine level were measured at least two separate days and their average values were taken for comparison study among different groups. Their values are presented as mean \pm SEM. A paired t-test was employed to make comparisons between pre- and post-operative values of same group of patients. A probability level of ≤ 0.05 was considered statistically significant.

Results

Patients who presented with comparatively shorter duration of LUTS were younger than others and as age advances their symptom become more severe, bladder neck become more rigid and changes within bladder were more remarkable (Table-I).

Table-I
Age, clinical presentation and cystoscopic findings

Patient Category	Age Range, Average (years)	Symptoms	Duration of symptom (years)	Cystoscopic findings
Category A N=7	27-38 31.85	Hesitency Nocturia	≥ 02	Bladder Neck: Mildly rigid
Category B N=18	28-48 34.83	Hesitancy, Nocturia, Enuresis, Near retention, Distended bladder	≥ 03	Bladder: Featureless Bladder neck: moderately rigid Bladder: Moderate trabeculation and sacculation
Category C N=5	38-45 40.8	Retention, nausea, vomiting, dyspnoea, disorientation, distended bladder	≥ 05	Bladder Neck: White and rigid, Bladder: trabeculation and sacculation and in two cases small diverticulum.

These findings were consistent in all categories of patients. The peak flow micturition before operation in all categories of patients reflected the state of bladder outflow obstruction (defined Q_{max} for bladder outflow obstruction is less than 15ml/sec)⁵.

Category A patients presented at an early stage of disease (table-I) without any renal impairment (table 5) and their maximum capacity of bladder was nearly within physiological limit for adults (table-II).

Table-II
Distribution of patients by MCC

Category	MCC before operation (ml) Mean±SEM	MCC after operation (ml) Mean±SEM	P-value
A	543.57±29.27	509.29±28.04	0.01
B	714.44±44.40	536.11±15.16	0.00
C	744.00±233.50	670.00±135.68	0.75

After operation their peak flow increased significantly and they could be able to empty their bladder (table III, IV,).

Table-III
Distribution of patients by PVR

Category	PVR before operation (ml) Mean±SEM	PVR after operation (ml) Mean±SEM	P-values
A	337.14±44.18	12.57±0.68	0.00
B	621.91±52.83	27.00±2.08	0.00
C	736.00±238.08	61.40±1.86	0.04

Table-IV
Distribution of patients by Qmax

Category	Q_{max} before operation (ml/sec) Mean±SEM	Q_{max} after operation (ml/sec) Mean±SEM	P-value
A	10.86±0.63	27.29±0.56	0.00
B	8.39±0.77	23.22±0.56	0.00
C	5.20 ±0.73	18.40±0.92	0.00

Category B patients LUTS were more bothersome and their compensated bladder capacity become larger than normal capacity which was reduced after procedure

(table-II). As they achieve good urinary flow after BNR, they have insignificant residual urine (table III, IV). Despite they presented later than Category A and with impaired renal function, it was recovered after BNR and maintained within normal range reflecting the reversible state changes in the upper tract due to PBNO (table V).

Table-V
Distribution of patients by serum creatinine level

Category	Serum creatinine Before operation (mg/dl) Mean±SEM	Serum creatinine after operation (mg/dl) Mean±SEM	P-value
A	1.24±0.04	0.80±0.03	0.00
B	2.72±0.13	0.79±0.03	0.00
C	9.34±0.96	2.8±0.15	0.00

Category C had longer duration of LUTS than other two groups and they presented with worse condition than others (table I). Their upper tract deterioration were also worse than category B. Though they achieve an unobstructed pattern of peak flow (table 4) their bladder capacity did not reduced to significant size (table-II). Though statistically insignificant, they had some amount of residual urine (table III) in their bladder reflected their decompensated state. Again that state correlated well with their irreversible functional state as their postoperative serum creatinine level showed statistical difference with preoperative values, these were actually higher than normal range (table V).

Discussion:

Patients of PBNO usually presents with obstructive voiding symptoms. Until to days three factors were considered in this type of bladder outflow obstruction, namely hormonal factor, activity of adrenergic receptor in bladder neck region and organic changes in bladder neck. According to the hormonal responsiveness hypothesis the female bladder and urethra are sensitive to the action of oestrogens. In one study it was speculated that female urethra was susceptible to atrophic senile urethritis compared to senile vaginitis as result of oestrogen deprivation[7]. Furthermore, it was suggested that relative loss of urethral wall compliance was responsible for obstruction in the urethra in post menopausal women. However, there is no conclusive evidence that hormone replacement therapy either systemic or topical has any significant role in the management of bladder outflow obstruction in females.

As the age of our patients ranged from 27 to 48 years, all categories of patients were in their reproductive age and thus excluded having atrophic vaginitis as well as senile urethritis. So hormone replacement therapy either systemic or topical was not advised to any cases.

We have interpreted the history of urinary symptoms in our patients with cautions and complemented these by the clinical examination of our expert authors of different fields of medicine as well as ultrasound imaging and other laboratory parameters in order to reach a precise diagnosis PBNO in our patients. However in our socioeconomic context we could not performed multichannel urodynamics in our patients and as such we did not apply the Blaivas-Groutz nomogram used for defining bladder outlet obstruction in female[8]. With this limitation in investigation we divided the patients clinically into three categories and analyzed our results. Poor urinary stream, hesitancy, straining during micturition and sense of incomplete emptying in our patients suggested the bladder outlet obstruction. Again neurological and gynaecological examination in our patients excluded the mechanical as well as neurological causes of outflow obstruction. The huge PVR measured by ultrasonographic scan in all categories of patient in our study associated with a peak flow of less than 12 ml/sec in all categories of patients strongly suggested that voiding difficulties in our patient might be due to bladder outflow obstruction. Furthermore, normalization or near normalization of serum creatinine level after indwelling catheterization and maintenance of their values after bladder neck resection along with reduction of PVR and rise of peak flow highly suggested that our patient had primary bladder neck obstruction.

Kihara et al found that bladder neck and urethra receive noradrenergic excitatory impulses from the rostral lumbar spinal cord which travel through the sympathetic chain ganglia and then via the hypogastric nerves to the pelvic ganglia[9]. Anderson et al showed that this sympathetic impulse is mediated by α_1 -adrenergic receptor[10]. Later on, Yablonsky et al found that α_{1A} -subtype is predominant in the bladder neck smooth muscle and urethra¹¹. While others suggested that the α -adrenergic antagonists increase urethral flow rate and reduce residual urine volume in patients with neurogenic bladder or obstruction[12]. So, α -blockers have been used infrequently to treat female bladder neck obstruction. Kawabe and Nijima reported increase in peakflow and decrease in residual urine volume in 80% of cases with an α -blocker agent[13]. Our category A patients were initially treated with Tamsulosin, an α_{1A} -blocker agent and they also noticed improvement of their symptoms as well as peak flow rate and residual urine volume. These patients were enrolled for BNR when therapy was discontinued due to economic reasons or side effects

of α -blocker. These patients had significant improvement with the BNR procedure.

Thomas et al studied the changes in the bladder neck in urinary obstruction in female[12]. They performed transurethral resection of bladder neck and did histological examination of the resected tissue that shown glandular hyperplasia and fibrosis or muscular hypertrophy. Folsom et al also impressed that the glandular hyperplasia was so great that the tissue histologically resembled that removed from the bladder neck in male¹⁵. Both the groups found excellent result of BNR for PBNO. Xun-bo Jin et al performed BNR in 30 cases and found subjective and objective improvement in 25 patients¹⁶. The result of BNR in our study was comparable to this finding. However, although all patients in our study become symptom free, category B and C patients had still some amount of residual urine volume. This was directly related to the decompensate state of urinary bladder. Kumar et al also noticed significant amount of residual urine in their decompensate bladder cases[12]. Furthermore, category C patients were operated when their serum creatinine reached below 3mg/dl and patients were reasonably well. However no patient's serum creatinine level in this category reached to the normal level during these three months follow up period suggested that they developed CKD (Chronic Kidney Disease) due to long standing bladder outflow obstruction.

The importance of bladder neck in urinary continence as the principal zone remains controversial. Chapple et al found that the maintenance of continence in men and women with destruction or opening of bladder neck argues that the bladder neck may not be the principle site of urinary continence¹⁷. Others found that the urethra is composed of tissues that aid continence rather than a single discrete and visible sphincter[18]. On the basis of that fundamental knowledge, we performed BNR in our patients. All of our patients except two were doing well at a mean follow up of 3 months. Among these two cases, one patient never continent. Over jealous resection was performed by an inexperienced hand in this case and another patient had become continent within one month follow up. Bhatnagar et al also demonstrated 15.3% incidence of incontinence in a large series BNR in the early post operative period but in 76% of these patients symptom resolved without further treatment¹⁹. Delaere et al suggested that to avoid this severe troublesome unwelcome complication it was better to perform repeat BNR rather than over jealous resection and in their series 28.8% patients needed repeat BNR to become symptom free[20]. Considering all these reports and result of our study we think transurethral resection of bladder neck can be used as a definitive treatment for PBNO.

Conclusions

Our observation suggest that female in reproductive age if present with voiding difficulty should undergo urological evaluation after exclusion of neurological and gynaecological causes to rule out less uncommon disorder like PBNO. The longer the duration of the obstruction more prominent the changes in the bladder neck, bladder and upper tract and the worse the condition of the patient of PBNO. These patients should be divided broadly into three categories and treatment protocol should be individualized as done in the present study. Patients of Category A present earlier without renal impairment and may be benefited from pharmacological therapy with α_{1A} -adrenergic blocker. If they discontinue this therapy due to any reason they should receive BNR as a better alternative. On the other hand, patients of category B and C present with retention/near retention of urine with features of reversible and irreversible renal impairment respectively; initially they should be managed with indwelling catheterization or indwelling catheterization and haemodialysis to reach normal or near normal serum creatinine level but soon they should undergo BNR procedure without trial of pharmacological therapy. A few patients of BNR procedure may suffer from urinary incontinence, an undesirable serious bothersome complication that usually happens if over jealous resection is performed; otherwise BNR is the excellent treatment option for PBNO in women if done judiciously by an experienced hand in an appropriate time. However, as our observation time is short and our study comprises small population of patients, so long term follow up in a large population of patient is warranted.

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Conflict of Interest: None Declared

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Abbreviations:

- BNR : Bladder Neck Resection
 PBNO : Primary bladder neck obstruction
 VD : Voiding Dysfunction