

# Efficacy of Transurethral Bladder Neck Incision with 2-Micron Continuous Wave Laser (RevoLix) for the Management of Bladder Outlet Stricture in Women

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**Purpose:** To report the short-term outcome of transurethral bladder neck incision with 2-micron continuous wave laser (RevoLix) in the management of bladder outlet stricture in women.

**Materials and Methods:** In a prospective study, between January 2011 and February 2012, a total of 14 patients with the complaint of difficulty in voiding underwent transurethral bladder neck incision with 2-micron 120-W continuous wave laser (RevoLix) using low energy setting (24 W). Pre-operative investigations included international prostate symptom score (IPSS) and quality of life index evaluation, multi-channel urodynamic study, and urethrocystoscopy. Postoperative clinical and urodynamic improvement were compared with the pre-operative data.

**Results:** Of 14 patients, 4 and 10 subjects suffered from chronic urinary retention and difficulty in voiding, respectively. The mean age of the patients was 55.1 years (range, 40 to 67 years). Mean operation time and postoperative follow-up period were 23.8 minutes (range, 15 to 30 minutes) and 10.2 months (range, 6 to 18 months), respectively. Median IPSS improved significantly from 28 points at baseline to 11 points postoperatively ( $P = .005$ ). Median quality of life score also improved from 4.2 points to 1.5 points ( $P = .005$ ). None of the patients needed re-operation. Median post void residual urine decreased significantly after the procedure (101 mL versus 17 mL;  $P = .003$ ). No significant complications and de-novo incontinence were noted in this study.

**Conclusion:** Transurethral bladder neck incision with 2-micron continuous wave laser (RevoLix) may be used safely in the management of bladder outlet stricture in women with satisfactory short-term clinical outcomes.

**Keywords:** female, laser, urinary incontinence, urodynamics, prospective studies

## INTRODUCTION

Although bladder neck obstruction is prevalent in patients with urological problems,<sup>(1)</sup> its management has been addressed more among men in comparison with women. The overall incidence of urethral obstruction in women is estimated between 1% and 30% (according to various definitions and diagnosis modalities) of cases with lower urinary tract symptoms.<sup>(2)</sup>

Various treatment modalities are reported for bladder neck obstruction in literature, including medical therapy, clean intermittent catheterization (CIC), urethral dilator, and endoscopic incision.<sup>(3-8)</sup> However, there are no sufficient studies to evaluate efficacy and safety of bladder neck laser in women. In this prospective study, we report our experience in the management of refractory bladder neck stenosis (BNS) by transurethral bladder neck incision using 2-micron continuous wave laser (RevoLix).

## MATERIALS AND METHODS

Between January 2011 and February 2012, of 200 women who suffered from difficulty in voiding, 14 were included in the study. There was no dropout. Inclusion criteria were patients who had received medical therapy ( $\alpha$ -adrenergic blockers) for more than 3 months and had undergone at least two sessions of bladder neck dilation without satisfactory response.

Urodynamic study (TRITON/ Laborie Medical Technologies Corp product, Canada) was performed on all the patients before the surgery according to International Continence Society standards and cystourethroscopy. Diagnosis of BNS was documented according to the following criteria: Obstructive lower urinary tract symptoms, Urodynamic study signs of obstruction, including low peak flow rate (PFR) and high maximum voiding pressure,<sup>(9,10)</sup> and Cystourethroscopic appearance, which revealed narrow and fibrotic bladder neck. We excluded patients with detrusor hypocontractility (bladder contractility index <100) from our study. All the patients had previously received medical treatment, such as  $\alpha$ -adrenergic blockers, for more than 3 months, and had undergone at least two sessions of bladder dilation, but without satisfactory results.<sup>(3,4,11)</sup> All the patients had a negative urine culture before the procedure. International prostate symptom

score (IPSS), quality of life index, and residual urine were recorded.

After the diagnosis of BNS was made, transurethral incision of the bladder neck was performed. Follow-up visits were carried out one and then every six months, postoperatively. At one-month postoperative visit, the changes were evaluated in IPSS, quality of life index, and post void residual (PVR) urine using post void urethral catheterization. Urodynamic study was performed to record objective results of the procedure, including PFR and maximum voiding pressure. In latter visits (every 6 months), only IPSS and quality of life index were evaluated. In postoperative follow-up visit analysis, mean IPSS and quality of life index of all postoperative visits were reported for each patient.

## Operation Technique

The operation was performed by a cystourethroscopy 24F, using 2-micron 120-W continuous wave laser (RevoLix, LISA laser products, Katlenburg, Germany) under general or spinal anesthesia. The bladder neck and proximal urethra were incised at 5 and 7 positions using low energy (24 W). No attempt was made to see deep musculature and fat. Bladder neck was open in all the patients after surgery. After the procedure, a 16F Foley catheter was placed into the bladder to evaluate quality of incision. If there was an easy passage without significant resistance, the procedure was terminated. Patients were discharged on the same day, and oral antibiotic and pain control medications were administered. The Foley catheter was removed 3 days later in the office.

The non-parametric test (Wilcoxon test) was used to analyze the results. A *P* value less than .05 was considered statistically significant.

## RESULTS

All the 14 patients were followed up according to the study protocol. The mean age of the patients was 55.1 years (range, 40 to 67 years). History of cesarean section surgery, rectocele/cystocele repair, and abdominal hysterectomy was reported by 3, 3, and 2 patients, respectively. Two patients had diabetes mellitus and 4 had history of urinary retention. Pre-operative stress and urge urinary incontinence were detected in 1 and 4 subjects, respectively, which did not change after

the procedure. The mean times of bladder neck dilation before the procedure was 2.2 times (range, 2 to 4 times).

During cystourethroscopy, fibrotic narrow bladder neck was found in all the subjects. Five patients had moderate to severe trabeculation of the bladder. Mean operation time (excluding anesthesia time) was 23.8 minutes (range, 15 to 30 minutes). The mean postoperative follow-up period was 10.2 months (range, 6 to 18 months). There was no de-novo stress incontinence after the surgery. Median IPSS improved significantly from 28 points (range, 21 to 35 points) pre-operatively to 11 points (range, 0 to 25 points) post-operatively at the end of the follow-up period ( $P = .005$ ). Median quality of life score also improved from 4.2 points (range, 4 to 6 points) pre-operatively to 1.5 points (range, 0 to 4 points) postoperatively ( $P = .005$ ). No cases needed re-operation. However, one patient is still under CIC (three times per day) due to high PVR urine (100 mL). Table shows urodynamic characteristics of patients before and one month after the procedure.

Urodynamic characteristics of patients before and one month after the procedure.

Variable	Pre-operative	Postoperative	P
Median peak flow rate (range), mL/s	8 (2.7 to 12)	11 (9.1 to 16)	.005
Median maximum voiding pressure (range), cm H <sub>2</sub> O	67.5 (13.3 to 155.5)	55 (33 to 81.9)	.59
Median post void residual urine (range), mL	101 (30 to 300)	17 (0 to 100)	.003

Although maximum voiding pressure decreased postoperatively, it was not statistically significant ( $P = .59$ ). Compared to the pre-operative data, statistically significantly decrease in PVR urine volume ( $P = .003$ ) and increase in PFR ( $P = .005$ ) were noted postoperatively. No voiding dysfunction, such as pelvic floor hyperactivity, was noticed in urodynamic study in all 14 patients before and after the procedure. There were no major complications, including refractory gross hematuria, febrile urinary tract infection, urinary sepsis, bladder perforation, deep venous thrombosis, or pulmonary emboli.

## DISCUSSION

Urologists commonly visit women with lower urinary tract symptoms during their practice, mostly caused by BNS, neurogenic bladder disorders, urinary tract infection, and inflammatory bladder conditions. Bladder neck stenosis in women is not as common as men. Furthermore, due to lack of universal criteria for diagnosis of BNS in women, urologists face several difficulties in management of this condition.

Farrar and colleagues used the following criteria for the diagnosis of lower urinary tract obstruction in women: A Qmax <15 mL/s, sustained detrusor contraction ranging from 20 to 120 cmH<sub>2</sub>O, and voiding volumes >200 mL.<sup>(12)</sup> In another study, Zhang and associates performed transurethral incision of the bladder neck for the management of female bladder outlet obstruction. Using video-urodynamic study, radiological evidence of narrowing bladder neck, voiding pressure >20 cmH<sub>2</sub>O, and maximum flow rate <12 mL/s confirmed bladder outlet obstruction.<sup>(11)</sup> Klijer and coworkers concluded that pressure-flow studies and voiding cystourethrography can be considered as reliable modalities for confirming bladder outlet obstruction.<sup>(4)</sup> In another study, it was recommended that a full video-urodynamic evaluation is essential for correct diagnosis and selection of appropriate treatment plan.<sup>(3)</sup> In our study, we used combination of symptoms score, multichannel urodynamic parameters, and cystourethroscopic appearance of the bladder neck to confirm BNS. Refractory cases to conservative therapy can be considered as indication for surgical intervention. After making decision for surgical intervention, patients should be informed about possible urinary incontinence.<sup>(5,7,13)</sup> Endoscopic management of BNS has been used with acceptable outcomes. These modalities include cold-knife incision, electrocautery of the bladder neck, and mechanical dilation of the stenosis. Bladder neck incision has been reported to improve voiding symptoms in 68% to 100% of patients with BNS in studies with various follow-up durations.<sup>(14-16)</sup> Neykov and associates evaluated late results of transurethral bladder neck incision in 73 men with regard to symptoms and urodynamic findings. They reported 74% and 78% postoperative improvement in symptoms and PFR above 15 mL/s, respectively. They concluded that these improvements were durable up to 64 months after bladder neck incision.<sup>(17)</sup> In another study,

modified transurethral incision of the bladder neck (at 4 different sites, including 3, 6, 9, and 12 O'clock positions) was performed for the management of 30 women suffering from primary bladder neck obstruction. Improvements in IPSS, quality of life scores, PVR, PFR, and voiding detrusor pressure were observed at the end of the 5-year follow-up for 25 patients. Reported de-novo stress urinary incontinence rate was 3% (1 patient). It was concluded that the mentioned technique may be considered as a safe and durable therapeutic modality in the management of female primary bladder neck obstruction.<sup>(7)</sup>

Recently, laser energy has been evaluated as a promising utility in management of bladder neck obstruction. Fu and Xu assessed efficacy of transurethral incision of the bladder neck using potassium titanyl phosphate (KTP) in 40 women with BNS. They reported clinical and urodynamic improvement, and concluded that KTP has great efficacy in the treatment of female BNS.<sup>(2)</sup> Two-micron continuous wave laser (RevoLix) is a new laser that permits surgeon to perform simultaneous cutting and coagulation of perfused, avascular, and either hardly vascularized tissues, such as scars.<sup>(18)</sup> In another study, efficacy of bladder neck incision using 2-micron continuous wave laser (RevoLix) was evaluated in treatment of 14 men with BNS. It was concluded that bladder neck incision with the RevoLix laser can be considered as a fast and safe procedure in the treatment of recurrent bladder neck sclerosis.<sup>(18)</sup> But no study demonstrated its efficacy in women with the same condition. In the present study, we revealed obvious improvements in patients' symptoms after the procedure. However, no significant difference was noted in maximum detrusor pressure before and after the surgery.

There are several limitations to the present study. First, due to lack of universal criteria for diagnosis of BNS in women, we used combination of diagnostic modalities, including IPSS, quality of life index, urodynamic, and cystourethroscopic findings, which may have some defects. Second, this study was our first experience with the RevoLix laser in treatment of BNS in women. Therefore, we preferred to perform superficial rather than too deep incision of the bladder neck to prevent possible postoperative incontinence. This strategy can explain nondesirable post surgery maximum detrusor pressure. However, acceptable objective improvement was

noted in lower urinary tract symptoms and quality of life as well as decrease in postoperative PVR and increase in PFR. Perhaps, a deeper bladder neck incision can be performed without adverse effect on functional outcomes. Third, due to short follow-up period in this study, persistent and durable effects of this modality are unknown. Despite above limitations, women with refractory BNS (unsatisfactory response to medical therapy for at least three months and at least two session urethral dilation) may benefit from this procedure.

## COCLUSION

Transurethral bladder neck incision with RevoLix laser is a safe and effective modality with acceptable clinical outcomes in the management of bladder outlet stricture in women.

## CONFLICT OF INTEREST

None declared.

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