

Original research article

Outcome Assessment of Dorsal Versus Ventral Onlay Buccal Mucosa Graft Urethroplasty in Female Urethral Stricture

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Abstract

Aim: The purpose of the present study was to evaluate and compare the 2 surgical approaches of urethral reconstruction for management of refractory female urethral strictures (FUS).

Methods: The present study was performed in the Department of urology, Rajendra Institute of medical sciences (RIMS), Ranchi, Jharkhand, India for the period of 1 year to evaluate both surgical approaches and make a direct comparison between the two with total of 20 patients. The study was approved by the institutional ethics committee and written informed consent was obtained from all patients and provided guarantees of confidentiality.

Results: The average age of patients in our study was 45 years (range 27-68). The demographic data of both the study groups was comparable. All patients presented with severe LUT symptoms with average AUA symptom severity score in patients preoperatively being 26. Eighty percent (16 out of 20) of patients had a history of undergoing multiple dilatations in the past, resulting in only temporary symptomatic relief. On preoperative uroflowmetry all patients had an obstructive flow with average Qmax of 7.0 mL/s (1.4-14 mL/s) and an average post void residual volume of 101 mL (range: 0-350 mL).

Conclusion: Both dorsal and ventral approaches appear efficacious and provided good results. With further research into this domain, new insights will widen the repertoire and knowledge of reconstructive surgeons to provide the best treatment strategy for this condition. Dorsal approach appears more favorable in cases of stricture involving the distal most parts of the urethra.

Keywords: Female urethral stricture, Dorsal onlay, Ventral onlay

Introduction

Female urethral stricture (FUS) is an uncommon condition. Diagnosing bladder outlet obstruction in females is a challenge. Gravina has shown that bladder outflow obstruction index and peak flow identify women with functional and anatomical obstruction.¹ The most common etiology of FUS is iatrogenic due to repeated instrumentation.

This trauma of repeated instrumentation results in a breach in the mucosa that causes extravasation. This is an irritant leading to fibrosis as a response to the chemical stimulus,

finally resulting in stricture formation.² Traditionally, the treatment has been urethral dilatation and/or urethrotomy. In recent years, there is a surge of interest in surgical reconstruction. Substitution urethroplasty using different grafts and local flaps either with dorsal or ventral approach has been performed with promising results. These substitutions have been done either as onlay or inlay.

Female urethral stricture (FUS) is relatively rare condition but can cause bothersome lower urinary tract symptoms (LUTS). It has been observed that bladder outlet obstruction (BOO) accounts for 2.7% to 8% of LUTS in women.³⁻⁶ In female patients with known BOO, FUS accounts for between 4% and 8% of these cases.^{7,8} Symptoms of FUS are variable, but usually include hesitancy, poor flow, frequency, urgency and dysuria and may lead to recurrent urinary tract infections⁹ and overt urinary retention. No strict diagnostic criteria have been documented for FUS because of its rare incidence.¹⁰ The rarity of occurrence and difficulty of making a diagnosis make the management of female urethral strictures quite challenging.

The treatment options include observation, urethral dilation, self-catheterization, urethrotomy and reconstruction depending on the severity and location of the stricture. Urethral dilation is usually the first-line treatment albeit no specific treatment algorithm exists. Urethral dilation has been shown to have a recurrence rate as high as 94% at a mean follow-up of 2 years.¹¹ A ventral approach theoretically, avoids dissection around dorsal neurovascular bundle which reduces sexual complications and also avoids division of pubo-urethral ligaments and urethral sphincter at dorsal position, which reduces the risk of incontinence.^{12,13} Ventral approach is a more familiar approach for most surgeons and also provides a wider field of dissection. Proponents of dorsal approach claim to achieve a more natural urinary stream by avoiding a hypospadiatic meatus, a more vascular bed for the graft and reduced risk of urethro-vaginal fistula.^{13,14}

The purpose of the present study was to evaluate and compare the 2 surgical approaches of urethral reconstruction for management of refractory female urethral strictures (FUS).

METHODOLOGY

The present study was performed in the Department of urology, Rajendra Institute of medical sciences (RIMS), Ranchi, Jharkhand, India for the period of 1 year to evaluate both surgical approaches and make a direct comparison between the two with total of 20 patients. The study was approved by the institutional ethics committee and written informed consent was obtained from all patients and provided guarantees of confidentiality.

The study included all females between ages 18-65 years, presenting with predominantly voiding LUTS with AUA symptom score of greater than 7 and Qmax (maximum voiding velocity) of less than 15 mL/s. Patients after a thorough history were subjected to an in-depth physical examination to rule out any other cause of voiding LUTS such as a urethral caruncle, cystocele/ prolapse or a neurogenic cause of symptoms. The exclusion criteria were being neurogenic bladder, history of prior bladder or urethral surgery, concomitant genitourinary malignancy or history of pelvic fracture/urethral disruption.

Apart from routine blood investigations, urine microscopy and culture, patients were evaluated by uroflowmetry, ultrasonography of kidney, ureter and bladder with post void residue assessment. Patients were then subjected to a micturating cystourethrogram, urethral

calibration with 14Fr catheter, urodynamic study and diagnostic urethroscopy with a 6.4 Fr ureteroscope performed at least 2 weeks prior to planned intervention. A finding of focal narrowing of urethra with proximal urethral dilatation on MCU, failure to calibrate urethra with a 14Fr latex catheter and unequivocal evidence of bladder outlet obstruction on urodynamic testing in the form of poor flow despite high detrusor pressure in voiding phase was used to arrive at the diagnosis of urethral stricture disease.

During preoperative evaluation by cystourethroscopy the short strictures were sequentially dilated and managed. Only those patients having a definitive diagnosis of a long and dense urethral stricture, were randomized into either of the 2 groups, a dorsal or ventral onlay graft urethral group using block randomization system. The potential graft harvest sites were carefully assessed. For this study the graft used was only buccal mucosa and the patients who had good mouth opening and good quality of buccal mucosa were included for study. All patients were followed up for at least 12 months on outpatient basis with review of complications of both donor site and symptoms associated with catheter, peak and average urinary flow rates and usg bladder for wall thickness PVR assessment at 3, 6 and 9 months. Primary outcome was defined by clinical resolution of symptoms and improvement in AUA symptom score. Patients who failed to have improvement of symptoms or recurrence in symptoms during the evaluation period underwent further investigation with cystourethroscopy to diagnose a residual or recurrent stricture. Perioperative and postoperative complications were recorded, and data was analyzed using Mann-Whitney U test; Chi-square test & Wilcoxon signed-rank test.

SURGICAL TECHNIQUE

All urethroplasties were carried out by 2 surgeons versed in the surgical procedure in the standard lithotomy position. Preoperative antibiotic prophylaxis by aminoglycoside and cephalosporin was used in all cases after a skin sensitivity test. Adequate exposure by either suturing of labia majora with silk number 1-0 suture was used.

After induction of general anesthesia and nasal intubation, cysto-urethroscopy was performed with a 7.2 Fr ureteroscope to confirm the stricture details while taking care not to inadvertently dilate the stricture site. A guide wire was passed under vision and a 6 Fr. ureteric catheter slid over it. In the ventral approach for urethroplasty an inverted "U" shaped incision was used for the creation of anterior vaginal wall flaps. The paraurethral plane was used at 3-9-o'clock area to access the ventral aspect of female urethra. Ventral stricturotomy was made sharply at 6-o'clock to open up the stricture urethra till healthy mucosa on either side upto 5mm. In the dorsal onlay technique for stricturoplasty the dissection was carried from 9-o'clock to 3-o'clock position staying close to the urethra till the bladder neck as noted. Hemostasis was achieved and subsequently stricturotomy performed which extended approximately 5 mm beyond the strictured segment into the healthy mucosa. Intraoperative urethroscopy was performed intermittently to confirm the adequacy of stricturotomy. An attempt to preserve the external meatus as made wherever possible in both the surgical approaches. Buccal mucosal graft (BMG) of sufficient length and width was harvested according to length of stricturotomy, and a mucosa-to-mucosa anastomosis was done with absorbable sutures by three point fixation technique. The oral graft harvest site was primarily closed by absorbable sutures or left open according to hemostasis. The BMG graft was sutured to the stricturotomy with running 4/0 polyglactin sutures. Periurethral tissue cover was obtained by approximating the periurethral spongiosal tissues with 3/0 or 4/0 polyglactin suture over the stricturotomy site and a 16 Fr silicone catheter passed. Vaginal flap was

closed in 2 layers with 3/0 polyglactin sutures. Betadine soaked vaginal pack was inserted which was to be removed the next morning. Patient was discharged on catheter on postoperative day 4 with advice on usual peri catheter hygiene and sexual abstinence for 3 months. Catheter was removed after 3 weeks and patients were followed up on outpatient basis. Antibiotics for seven days were used in the postoperative periods according to culture and sensitivity reports.

RESULTS

Table 1: Comparison of preoperative and intraoperative parameters between the 2 groups

Variables	Dorsal group (Mean [SD])	Ventral group (Mean [SD])	P value
Age	42.5 (10.5)	49.1 (10.7)	.112
Length of Stricture	1.7 (1.1)	1.6 (0.6)	.590
Duration of Surgery	87.3 (25.4)	91.4 (21.9)	.580

The average age of patients in our study was 45 years (range 37-68). The demographic data of both the study groups were comparable. All patients presented with severe obstructive LUT symptoms with average AUA symptom severity score in patients preoperatively of 24. Eighty percent (16 out of 20) of patients had a history of undergoing multiple dilatations in the past, resulting in only temporary symptomatic relief. On preoperative uroflowmetry all patients had an obstructive flow with average Qmax of 9.0 mL/s (3.4-14 mL/s) and an average post void residual volume of 80 mL (range: 0-350 mL).

The mean duration of surgery was 89 minutes (range 75-105 min). The stricture extended up to the meatus in 15% cases, with the remaining patients having a normal meatus. The various preoperative and intraoperative parameters were comparable between the 2 groups.

Table 2: Follow up

Variables	Dorsal group (Mean [SD])	Ventral group (Mean [SD])	P value
Mean IPSS AUA			
Preoperative	24.10 ±7.06	23.90 ±7.42	0.90
At 3 months	4.95 ±3.89	4.80 ± 4.20	0.85
At 6 months	5.57 ±4.72	5.15 ±4.56	0.65
Mean Qmax			
Preoperative	5.57 ±2.92	5.68 ±2.96	0.86
At 3 months	18.21 ±3.17	18.09 ±3.38	0.87
At 6 months	17.32 ±4.04	17.31 ±4.00	0.99
AT 12 MONTHS	17.0±3.04	17.26±3.6	0.98

Table 2 summarizes the follow-up data. The mean IPSS and Qmax showed significant improvement at 3 and 12-month follow up compared with the preoperative value. At 12-month follow up, the mean IPSS showed 324.95% and 353.59% improvement, whereas the mean Qmax showed 208.43% and 201.93% improvement in group A and B, respectively. At 3- and 6-month follow up, the IPSS and Qmax data between the two groups did not show significant difference.

Table 3: Comparison of FSFI female sexual function index) preoperatively and postoperatively between the 2 study groups

	Pre-operative FSFI Mean (SD)	6 mo post-operative FSFI Mean (SD)
Dorsal onlay urethroplasty group (n = 10)	14(2)	16.3 (2.8)
Ventral onlay urethroplasty group(n = 10)	13.8 (2.3)	16.6 (2.9)
P value	0.96	0.79

Sexual function was studied with help of preoperative and post operatively measured female sexual function index (FSFI) among the patients who were sexually active. None of the patients presented with any postoperative dyspareunia or new onset sexual dysfunction. There was a universal improvement noticed in the sexual function score, a mean increase of about 3 points over baseline which was sustained throughout the follow up period of 6 months.

DISCUSSION

Management of female urethral stricture one of less understood urological disease process is challenging. The results of definitive urethral stricture surgery are still being defined. The usual etiological factors associated with female urethral strictures are not known the usual diagnosis is a history of poor stream along with cysto urethroscopy are diagnostic. Usual management involves dilatation but the results are not sustained with reinterventions required in most of the cases.

Substitution urethroplasty is the definitive option of FUS management. Several techniques for augmentation urethroplasty in female urethra have been described, encompassing the use of variety of different flaps and grafts, in either the dorsal and ventral locations.^{12,15} Due to paucity of large-scale prospective trials, the various techniques described are still under continuous evaluation and refinement to help define the optimal technique as per individual case.

Augmentation with buccal graft is an accepted technique for management of such cases. A vaginal graft provides a good source of tissue for augmentation mostly in pre- menopausal patients as it is present in ample amount and can be harvested easily with minimal donor site morbidity. However, the concerns regarding its use still persist as most patients suffering from the disease are of menopausal age group with atrophic vaginal mucosa. Buccal mucosa remains the graft of choice as urologists are versed in the art of harvesting and grafting buccal mucosa from their experience in male urethral surgery.

Both the techniques were equally efficacious (around 90% success rate) in managing FUS with statistically almost similar outcomes at the end of study and follow up period, both in terms of improvement in post-operative urine flow and patient reported symptom resolution. The dorsal approach seems easier in cases of urethral stricture involving the distal most urethra in and around external meatus, as adequate exposure could be easily achieved, and the newly reconstructed urethral meatus were more likely to reproduce normal voiding stream. While in strictures involving mid or proximal parts of urethra, difficult dissection, a narrow surgical field, higher bleeding (due to proximity to neuro vascular bundles) and poor visualization of proximal urethral mucosal margin increased the difficulty of repair, especially during the anastomosis of mucosal graft to proximal urethral margin. Meatal

sparing is not possible during dorsal approach as the intact meatus further limits the field hence making the proximal mucosal anastomosis almost impossible.

The ventral approach provided relatively better access to the mid and distal parts of urethra facilitating better dissection. Meatus preservation is also technically easier, however, when operating in cases of meatal involvement using the ventral approach, the newly formed meatus was patulous and significant splaying of urinary stream was reported by some patients post operatively.

A recently conducted systematic review and meta-analysis by Sarin et al¹⁶ of 28 well conducted studies all retrospective found an excellent success rates of 88% (95% confidence interval (CI) 0.79-0.95) for dorsal and 95% (95% CI 0.86-1.0) for ventral onlay graft urethroplasties like the outcome in this study.

Gomez et al¹⁷ in their study reviewed surgical management of FUS and provided their own technique and experience with dorsal onlay graft technique. They performed grafting of the urethra from just distal to bladder neck till the distal part of urethra just proximal to meatus, as they believed that accurate localization of strictures in female urethra is very difficult.

Sexual function as studied in this study by the female sexual function index (FSFI) showed an improvement of about 4 points above baseline. This improvement was sustained throughout the follow up period. The improvements noted in FSFI though very marginally greater in the ventral onlay group, was not statistically different between the 2 groups. The main factor leading to the improvement in sexual function may be related more to resolution of symptom of LUT and UTI with resultant improved quality of life and self confidence rather than due to a specific surgical approach. Female strictures are an uncommon entity so getting large sample sizes enough to randomize into groups and to obtain meaningful data is challenging. A randomized study with 80% power would need to enroll a total of at least 98 patients which is impractical in a prospective study setting. While the small sample size of patients is an impediment to draw wide conclusions, the single institutional nature of our study helped in reducing biases based on differing evaluation and management protocols as well as variations in level of surgical expertise among different surgeons.

CONCLUSION

Both the dorsal and ventral surgical approaches appear efficacious and provides good results in experienced hands. With further research into this domain, new insights will widen the repertoire and knowledge of reconstructive surgeons to provide the best available treatment strategy for this chronic surgical condition. Dorsal approach appears to be more favorable in cases of stricture involving the distal most parts of the urethra but may be associated with more blood loss. Meatal reconstruction using dorsal approach yields a more physiological stream. Ventral approach provides a more familiar plane and wider exposure and seems more suitable for cases of mid urethral strictures as well as ease of meatal preservation. Recurrences are mainly associated with difficult graft placement during surgery in cases with extremely narrow urethral plates.

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