International Journal of Medical and Health Research
ISSN: 2454-9142
www.medicalsciencejournal.com
Volume 4; Issue 5; May 2018; Page No. 51-55

Dorsal onlay vaginal mucosal graft urethroplasty for refractory female urethral stricture

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Abstract

Background: Female urethral stricture may account between 4-18% of all bladder outlet obstruction of females.
Urethral dilatation is a simple easily available office procedure which improves urethral flow in most of them initially. Literature shows only 50-60% patients cured by urethral dilatation alone in long term follow up. We hereby presenting our study results of dorsal onlay vaginal mucosa graft urethroplasty in female urethral stricture disease, who are refractory to conservative urethral dilatation.

Material & method: This is long term, hospital based, observational, follow up study. Patients were called for follow up from hospital data base, who have been operated by dorsal onlay female urethroplasty for female urethral stricture disease. Their preoperative urine flow, post void residual urine volume, urethral caliber, urinary incontinence, urgency, need of urethral dilatation Micturating Cystourethrogram records were compared with post-operative follow up records.

Result: We identified eight women who underwent dorsal onlay vaginal graft urethroplasty in our institute from January 2013 to June 2017. The Mean age of our cohort was 50.62 years & mean follow up was 22.4 months. Mean postoperative urinary flow rate (Qmax) increased to 19.03 ml/s from preoperative urine flow 5.4 ml/S (P=0.0003). Similarly Post void residual urine reduced to mean 32.12 ml (Median =13 ml) from pre-operative mean 165.12 ml (Median = 137.5 ml) (P=0.049). Two patients required post urethroplasty urethral dilatation; post dilatation one patient was cured while another was subjected to redo urethroplasty with buccal mucosa graft.

Conclusion: Dorsal onlay vaginal flap urethroplasty is a simple, feasible and effective surgical technique for female stricture urethra patients, refractory to repeated conservative urethral dilatations.

Keywords: urethral stricture, urethral caliber, urinary incontinence, urgency

Introduction

Female urethral stricture (FSU) may accounts between 4-18% of all bladder outlet obstruction (BOO) of females but its true prevalence is unknown due to under reporting [1,2]. Voiding dysfunction due to neuromuscular dysfunction of the pelvic floor and external sphincter would appear to be a relatively common cause of BOO in females [3]. Unlike male urethra, female urethral length is only 4 cm, so easily available office procedure urethral dilatation improves urethral flow in most of them however in many of them repeated urethral dilation is needed, while few become resistant to Urethral Dilation ultimately. This group of patients suffers from repeated Urinary tract infections, dysuria, obstructive symptoms, renal damage due to back pressure changes and other complications. Female urethroplasty currently is a topic of increasing attention with multiple surgical approaches described in literature including use of both grafts (vaginal wall, buccal mucosal membrane, lingual mucosa, and labia minora) and flaps (vaginal vestibule, anterior vagina, and lateral vagina).

In spite of high incidence rate, still female urethroplasty is a rarely performed procedure for FSU, due to a) an alternative easily available, simple and often overused office procedure; urethral dilatation, b) Diagnosis criteria of FSU is still not well defined and debatable c) lack of confidence among surgeons in doing female urethroplasty.

In the literature only few studies have been published on female urethral reconstruction with small series of patients and short follow-up. We hereby present our study results and efficacy of dorsal onlay vaginal mucosa graft female urethroplasty in treating FSU failed on conservative urethral dilatation management.

Material & Method

This is long term, hospital based, observational, follow up study. Hospital records of all female patients, who underwent female urethroplasty in department of urology and renal transplant at Institute of Kidney Disease and Research Center & Institute of Transplant Science Ahmadabad (IKDRC&ITS) from 1st Jan 2013 to 30th June 2017, were scrutinized. All patients were called for follow up data collection, after taking their informed consent. Demographic data points were identified in addition to pertinent clinical and Urodynamic parameter including pre and postoperative urine urinary flow; Post Void residual urine; Micturating Cystourethrogram (MCU); History of Urinary tract infections pre and postoperatively; any pertinent upper tract imaging was reviewed. Clinical follow-up included need of repeated urethral dilatation or therapy for urethral stricture disease in

the postoperative period; any incontinence; urgency. During Follow-up every patient's surgical success was assessed by Patient Global Impression of improvement (PGI-I) Questionnaire with score 1-5: 1 (very much improved), 2 (Much Better), 3 (a little better), 4 (no change), 5 (worse) [4].
There was no funding for this research and its publication.

Steps of Vaginal mucosal graft Onlay Urethroplasty

- An inverted semi-lunar incision was made peri-urethraly in modified dorsal Lithotomy position. [Fig 1a]
- Urethra Mobilized from 3-9 o'clock position till Bladder Neck. (pubic bone as guide of bladder neck). [Fig 1b]
- A full thickness Urethrotomy was made at 12' 0 clock position with extension to healthy area.
- Harvest vaginal mucosal free graft from anterior vaginal wall of size approximately 3.5 cm in length and 1.5 cm in width. [Fig 1c]
- Harvesting site closure by 2-0 absorbable suture.
- The vaginal graft was sutured at the dorsal surface of urethra (Urethrotomy site) as dorsal onlay graft with 4-0 PDS sutures in interrupted fashion over 18 Fr Foley catheter.
- Periurethral wound closer by PDS Suture.

Results

We identified 8 women who underwent dorsal onlay vaginal graft urethroplasty in our institute from January 2013 to June 2017. Pre operative patients characteristics were collected [table1]. The Mean age of our cohort was 50.62 years & mean follow up was 22.4 months. All eight patients had history of repeated multiple urethral dilatation without any Urethrotomy or urethral reconstructive surgery. All patients investigated by Ultasonograpy, Urodynamic study, Urine flow study, MCU, urethral calibration preoperatively. In all patients urethral caliber were less than 12F. Four patients had preoperative urinary incontinence (SUI). There was no uterine prolapse in any patient on clinical examination. After the procedure postoperative characteristics were noted [Table 2]. Four patients who were incontinent preoperatively become dry (Continent) Postoperatively. Urgency also resolved in three patients postoperatively out of five preoperatively. No postoperative Urodynamics was done in view of excellent symptomatic improvement and good urine flow. Post void residual urine also reduced to mean 32.12 ml (Median =13 ml) only from pre-op mean 165.12 ml (Median = 137.5 ml) (P=0.049). Similarly mean preoperative maximum urine flow (Qmax) was 5.4 ml/S ; however the postoperative Qmax value increased to 19.03 ml/s (P=0.0003). Two patients required post urethroplasty urethral dilatation; post dilatation one patient was cured while another subjected for redo urethroplasty with buccal mucosa graft. Post redo-urethroplasty she was better in short follow-up. Three patients had preoperative hydronephrosis in ultrasonogram, which was initially managed by catheterization & conservative urethral dilation however post urethroplasty follow-up ultra sonogram showed resolution of hydronephrosis in all patients.

Sixteen Fr Foleys catheter easily passed in all postoperative patients without any resistant. For UTIs all eight had recurrent UTIs preoperatively, while none have recurrent UTIs but four reported breakthrough UTIs, which managed conservatively with antibiotics by local practitioner.

Self reporting satisfaction score using PGI-I score showed four patient scored 1 (very much better), Three scored 2 (Much better), one scored 3 (little better), none has scored 4 (No change) or 5(a little worse).

Discussion

FSU disease is more common then thought [5]. The most common cause of FSU is Idiopathic, followed by prolonged labour, then iatrogenic causes like catheterization trauma, stone, urethral surgeries, infection, chronic irritation, prior dilatation, urethral trauma either obstetrical or blunt as well as vigorous coitus [6]. Rare causes are radiation and malignancy. Symptoms of FUS may be variable, but often include hesitancy, poor flow, frequency, urgency, dysuria, and may lead to recurrent urinary tract infection and overt urinary retention [7].

The diagnostic criteria of FSU remain undefined. Inability to pass a small size catheter (12/14 Fr) into distal urethra is suggestive. Defreitas *et al*. reported that a detrusor pressure at maximum flow (pdet.Qmax) of >25 cmH2O with Qmax of<12 mL/s is suggestive of obstruction [8]. In MCU an open bladder neck, a relaxed sphincter and a distal narrowed area in the urethra, suggested diagnosis of urethral stricture [9].

Line of Surgical management for FSU is not well established. Historically Urethral dilatation has been a mainstay in the treatment of FSU, though evidence for its effectiveness is limited. Santucci *et al.* has noted urethral dilatation is practiced rather frequently in the clinics; it is of no therapeutic value with patients plagued with strictly irritative voiding symptoms in the absence of confirmed urethral stricture disease [10]. Smith *et al*. reported a 57% success rate at a mean follow-up of 21 months in seven women after dilatation to 30 Fr [11]. In the largest published series on urethral dilatation of FSU, Romman *et al.* had a 51% success rate in 91 patients for dilatation for initial dilatation to 41 Fr at presentation. History of prior urethral dilatation was a statistically significant predictor of failure in this group [12]. Urethral Dilatation requires patient should be compliant & may do self calibration later. It is commonly done by serial Hegars metallic dilators up to 30-40 F.

Urethrotomy combined with urethral dilatation has reported to show short-term success in a study of Grivas *et al*. however this is associated with potential risk ro the sphincter mechanism and may lead to urinary incontinence [13, 14]. Many women not undergoing urethral reconstruction surgery but managed with chronic interval urethral dilatations and internal Urethrotomy will have high recurrence and may result in increased scaring and fibrosis [15, 16]. Another urethral surgery for FUS is Meatoplasty, which reserved for selected patients of only small segment distal urethral stricture.

FSU disease is now again came in to the focus after a long period of silence due to the high failure rate of conservative urethral dilatation procedure. New treatment modalities are evolving like various grafts from buccal mucosa, labia minora, vaginal mucosa to Pedicle flaps from vaginal vestibules, anterior vagina, and lateral vagina. Substitution graft or flap can be placed dorsally, ventrally, or laterally.

Advantage of vaginal mucosal graft is easily locally available, hairless elastic surface, no need of general anesthesia to

harvest buccal mucosa, good vascularity, early healing.

In 1989 Blavis *et al.* described vaginal flap urethral reconstruction technique, which endeavors a new era for FSU [17]. Montorsi *et al*. published the largest series of vaginal flap urethral reconstruction in 17 patients and noted 88% success with post operative calibration to 28 Fr [18]. The advantage of ventral vaginal flap urethroplasty is that it lends itself well to the concomitant placement of pubo-vaginal sling or Martius flap, should they be deemed necessary.

Several published case series have demonstrated excellent outcome of buccal or lingual mucosa in onlay urethroplasty either dorsal or ventral technique. Overall reconstruction with oral mucosa graft urethroplasty have cumulative success rate of 94%, but these series have very small numbers and lack of long term follow-up [19]. Tanello *et al.* reported the use of pedicle flap from the labia minora for the repair of FSU in two patients [20].

Vaginal graft urethroplasty was first described by Tsivian and Sidi in 2006 with advantage in that it does not require any oral graft harvest and completely rely on readily accessible local tissue [21]. Thus morbidity of buccal or lingual mucosa harvest is circumvented. It can be performed in either a dorsal or ventral approach. This technique is not suitable when the vaginal mucosa is atrophic, radiated or has been subjected to trauma or scaring from prior procedure. Dorsal approach minimizes diverticula formation & urethrovaginal fistula chances, while also offering strong mechanical support and vascular bed provided by clitoris. It is also a more physiological reconstruction that directs the urinary stream away from vagina and spares the ventral aspect of urethra for further anti-incontinence surgery [22].

In our study we had performed dorsal onlay vaginal mucosal free graft urethroplasty, which augmented the urethral caliber and give long term improvement in clinical symptoms which is reflected in improvement in urine flow rate & MCU imaging. We have noted success in seven out of eight operated patients with improvement in PVRU and Qmax, 165.12 ml & 5.4 ml/s preoperatively to 32.12 ml & 19.03 ml/s post-operatively respectively.

Petrou *et al*. had reported success in eight out of eleven patients with improvement of mean PVRU from 187.1 (14-400)ml to 75.8 (0-245)ml & mean Qmax from 7.3 (2.5-12.3)ml to 21.8 (13.1-41.3)ml after Dorsal vaginal graft female urethroplasty [23].

Singh *et al*. from India have showed 93.7% success rate with dorsal onlay vaginal graft urethroplasty in their 16 patient's series. Mean preoperative versus postoperative Qmax improved from 6.2 ml/s to 27.6 ml/s while mean PVRU was 160ml versus 20ml [24].

The presence of pre and post operatively urinary urgency had minimal impact to perceived success in FSU disease [25]. In our study preoperative urgency did not resolved in three out of five patients. Stress urinary incontinence was relieved completely in all four patients, which may be due to reduction in maximum voiding pressure ($pDat^{Max)}$ after female urethroplasty.

The result of this study is very promising which is not only limited to clinically but also reflected in their social and family life. Most of the patients reported very high self-satisfaction score which is also suggesting success of operative procedure. These women were on conservative repeated urethral dilatations from years and their motivation and compliance for surgery was very high which another factor was for high satisfaction score.

One of the limitations of our study is small number of participants and longitudinal follow up design of the study with short term follow-up. This may be overcome by multi centric prospective randomized control studies in future.

Table 1: Pre operative characteristics

S. No	Age	Urethral Calibration(Fr)	Incontinence		Uroflow	PVR	$pDat^{max}$
			Stress	Urge			
1	48	8	Y	Y	2.2	420	80.7
2	38	6	N	N	5.1	44	68.2
3	45	6	Y	Y	4	290	72
4	55	10	N	N	10.2	102	30.2
5	46	12	N	Y	6.2	121	66.4
6	64	12	Y	Y	5	50	56
7	70	10	Y	Y	6.9	240	92.8
8	39	8	N	N	3.8	154	78.3

Table 2: Post operative characteristics

S. No.	Follow-up (Months)	Urethral Calibration(Fr)	Incontinence		Uroflow	PVR	PGI-I Score	Post-op Dilatation
			Stress	Urge				
1	20	26	N	N	14.2	45	1	N
2	38	26	N	N	22	0	1	N
3	12	18	N	N	12	122	3	Y
4	6	24	N	N	20.4	22	2	Y
5	19	26	N	N	32.7	12	1	N
6	33	24	N	Y	18.2	14	2	N
7	27	26	N	Y	14.2	42	2	N
8	24	22	N	N	18.6	0	1	N

One Patient required re-urethroplasty with Buccal mucosa graft.

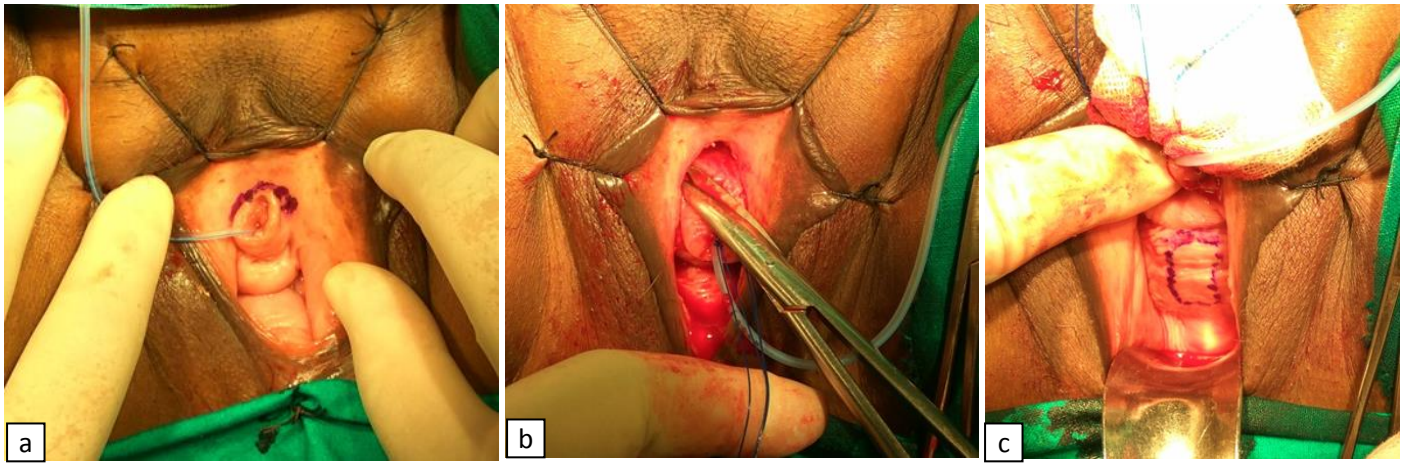

Fig 1: a) Peri-urethral semi-lunar incision, b) Urethra Mobilized from 3-9 o'clock position till Bladder Neck, c) Site of Vaginal graft harvest

Conclusion

Urethral dilatation is an appropriate initial step in the management of FSU. In those refractory to repeated conservative urethral dilatations, urethral reconstruction by dorsal onlay vaginal flap urethroplasty is a simple, feasible and effective surgical technique. Although long term data is lacking, short term results are promising.

Conflict of interest

The authors have no conflicts of interest in regards to this manuscript.

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