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Letter

Understanding female urinary continence—lessons from complications of female urethral surgery

Dear Editor,

We share our experience of two significant complications associated with female urethroplasty and their management in understanding the factors contributing to urinary continence. We have also tried to assess the different components of female urinary continence mechanism and the ways to combat the postoperative urinary continence while performing female urethral surgeries (Fig. 1). Informed consent was taken from each of the patients before their evaluation and management. They were explained properly and informed consents were taken from them before the publication of this article.

The first case was a scenario of total urinary incontinence after female urethroplasty in postradiation urethral stricture. A 55-year-old lady, known patient of carcinoma cervix (IIIb) after chemoradiotherapy underwent buccal mucosal graft dorsal onlay urethroplasty for radiation-induced urethral stricture. She had a successful relief from obstruction, though had mild stress urinary incontinence (SUI) on follow-up, which was managed with pelvic floor muscle training. However, her SUI progressed over 2 years to total urinary incontinence. On examination, there was a narrow, fibrosed vagina, and normal urethral meatus. Severe SUI was demonstrated on coughing and with a positive Q-tip test. Her Medical, Epidemiologic, and Social aspects of Aging (MESA) score was 26 (questions 1–9 of MESA score for SUI), and her Urogenital Distress Inventory score was 62.5. In the video-urodynamic study (VUDS), she developed stress leak and the abdominal leak point pressure was less than 50 cmH_2O (1 cmH_2O = 0.098kPa) at 40 mL filling of the bladder. Urethroscopy showed a normal patent urethra with a patulous bladder neck. She subsequently underwent autologous pubovaginal sling repair for incontinence. An 8 cm×2 cm rectus sheath sling was placed at the level of the bladder neck with adequate tensioning. She was continent and voided normally after catheter removal with a maximum urinary flow (Q_{max}) of 31.5 mL/s with negligible post-void residual urine (PVR). She has been dry with no significant voiding symptoms at 1 year of follow-up.

The second case was a female primary bladder neck obstruction (PBNO) misdiagnosed as female urethral stricture disease status after vaginal graft urethroplasty managed successfully with bladder neck resection. A 34-year-old female patient presented with a history of acute urinary retention during pregnancy and subsequently had straining to void, incomplete emptying, and poor flow postpartum. She was managed outside with regular urethral dilatation and clean intermittent catheterization for a year with mild improvement. She was referred to as a case of female urethral stricture disease at our center. Uroflowmetry showed plateau shaped curve with voided volume of 180 mL, Q_{max} of 7.8 mL/s and PVR of 200 mL. The VUDS was suggestive of bladder outlet obstruction. Bladder neck funnelling was poor with constriction seen at the level of the proximal urethra. A streak of contrast was seen coming to the proximal urethra. On urethroscopy, a dense fibrous whitish ring was encountered at the level proximal to the mid urethra. A diagnosis of female urethral stricture disease was made because of urethroscopy findings and history of dilation, and the patient was subjected to dorsal onlay vaginal graft urethroplasty. However, there was no improvement and she continued to have poor urinary flow after surgery (Q_{max} 9 mL/s). She continued voiding lower urinary tract symptoms with high PVR. She was subsequently managed with timed voiding and clean intermittent catheterization for 1 more year. A repeat VUDS at 1 year showed bladder outlet obstruction with no funneling of the bladder neck, and urethroscopy showed a patent urethra with normal mucosa. Finally, a diagnosis of PBNO was made, and she underwent bladder neck resection. Postoperatively trial without catheter was successful with Q_{max} of 22 mL/s, voided volume of 360 mL, and negligible PVR on uroflowmetry after 1 week of surgery. She is now voiding with a good flow with no incontinence after 6 months of follow-up.

Besides the Hammock and Integral theories in the early 1990's, new theories like the pressure transmission theory and the tent canvas hypothesis have emerged recently to unravel the female urinary continence mechanism [1,2].

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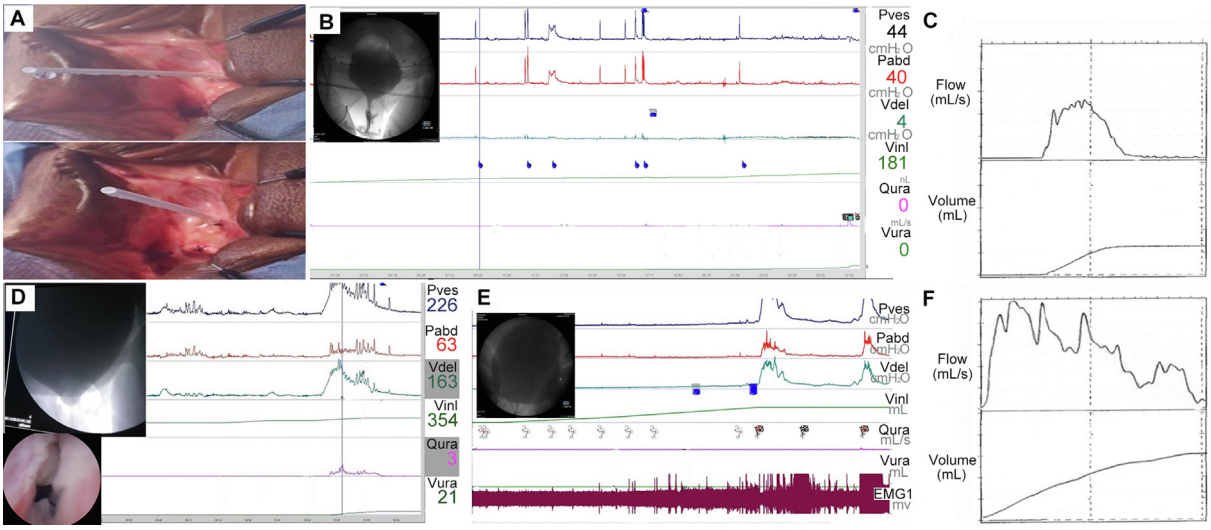

Figure 1 Uroflowmetry, video-urodynamic and operative images of the two cases. (A–C) First case scenario. (A) Q-tip test; (B) The VUDS showing multiple stress leak with abdominal leak point pressure of 40 cmH_2O (1 $cmH_2O = 0.098kPa$); (C) Postoperative uroflowmetry showing a bell-shaped curve with voided volume 170 mL, Q_{max} 31.5 mL/s, and negligible PVR; (D–F) Second case scenario. (D) The VUDS showing high pressure poor flow voiding with Q_{max} 3 mL/s, $P_{det}@Q_{max}$ 63 cmH_2O, and PVR 200 mL (though bladder neck funnelling is poor, a streak of contrast reached till proximal urethra); urethroscopy showing dense fibrous whitish ring at the level of proximal to mid urethra; (E) The post urethroplasty VUDS showing no urinary flow at the voiding phase with maximum detrusor pressure of 106 cmH_2O and no bladder neck funnelling suggestive of primary bladder neck obstruction; (F) Postoperative uroflowmetry showing a bell-shaped curve with voided volume 170 mL, Q_{max} 22 mL/s, and negligible PVR. VUDS, video-urodynamic study; Q_{max}, maximum urinary flow; $P_{det}@Q_{max}$, detrusor pressure at maximum urinary flow; PVR, post-void residual urine.

There are both extrinsic and intrinsic factors like contraction of the periurethral striated pelvic muscles, the smooth muscle tone at the bladder neck, the length of the female urethra, the centripetal force by both rhabdosphincter and lissosphincter, the hormone-sensitive cushioning vascular channel in the submucosa, the connective tissue of urethra, and the transference of intra-abdominal pressure, especially in moments of stress [3,4].

After graft urethroplasty, the incontinence rates were reported as 3.6%–5.8% in the literature [5]. In the first case, the possible reasons behind the incontinence are the proximal location of the stricture with long urethrotomy during urethroplasty along with post-radiation changes in carcinoma cervix, which led to the poor periurethral supporting tissue and poor vascularity due to fibrosis. Uroflowmetry can be used effectively in the follow-up after such complex urethral surgeries to evaluate the postoperative continence and voiding [6]. We followed up our patient with non-invasive methods like clinical assessment, symptom severity scoring system like Urogenital Distress Inventory and MESA scores, uroflowmetry and PVR on ultrasonography. When her incontinence progressed and the conservative management failed, a VUDS was done and a shared decision was made to plan for surgical intervention. Many treatment modalities like the urethral bulking agent, pubovaginal sling, artificial urinary sphincter, colposuspension even urinary diversion have been tried for bothersome urinary incontinence in post-radiotherapy female patients. Nevertheless, all the results are inconsistent [7,8]. Poor quality of tissue bed due to prior surgery and history of radiation led us to take autologous fascia as pubovaginal sling as the rescue measure as the tension-free vaginal tape was not ideal in this situation. The patient ultimately had a satisfactory outcome with a good urinary flow without any leaks.

Clinical findings, uroflowmetry, urethra-cystoscopy, calibration, VUDS, and MRI are the various modalities used to diagnose female urethral stricture disease [9,10]. In the second case, initial VUDS findings and a high PVR were suggestive of the possibility of PBNO. The history of regular dilation and urethroscopy led us in the wrong direction of urethral stricture disease. The unrestored urinary flow post-urethroplasty with high PVR questioned the diagnosis. However, bladder neck resection came to the rescue without any further complications like incontinence. Contrary to the first case, young age, healthy periurethral supporting tissue, good urethral length, and adequate waiting time for sphincter healing might have provided the continence mechanism. Therefore, a history of prior female urethral surgery should not rule out the possibility of another diagnosis when the symptoms are far from resolved; an appropriate management should be considered.

Female urinary continence is still undeciphered in many ways. The fear of incontinence should not preclude the reconstructing surgeon from correcting voiding dysfunction, and an anti-incontinence measure can be taken afterward to achieve a successful outcome.

Author contributions

Study concept and design: Sidhartha Kalra.
Data acquisition: Atanu Kumar Pal.
Data analysis: Sidhartha Kalra, Atanu Kumar Pal.

Drafting of manuscript: Sidhartha Kalra, Atanu Kumar Pal. *Critical revision of the manuscript*: Sidhartha Kalra, Lalgudi Narayanan Dorairajan.

Conflicts of interest

The authors declare no conflict of interest.

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