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Introduction

There is increasing use of trans-obturator slings in the treatment of post-prostatectomy stress urinary incontinence (PPI) but the mechanism of action of these slings remain unclear. Our previous ultrasound studies have demonstrated the phenomenon of 'dynamic compression' of the urethra during Valsalva and cough in patients with AdVance slings (Fig 1). The aim of this study was to evaluate changes in sling position and the concept of dynamic versus passive compression of the urethra as potential mechanisms of action of the male sling in a cohort of patients followed over 4 years.

Materials and Methods

Transperineal ultrasound was performed on 25 patients who underwent AdVance transobturator sling for PPI, preoperatively and postoperatively at 1, 12, 24 and 48 months. 2D Ultrasound examinations were conducted using a SonoSite M-Turbo ultrasound machine and 2D/3D imaging using Philips IU22/ EPIQ ultrasound machines and matrix transducer. Transperineal pelvic floor ultrasound images were obtained in the mid-sagittal plane at bladder volumes of over 150mls at rest and on Valsalva. 3D volume datasets were acquired and analysed using QLAB software.



Figure 1. Sagittal transperineal ultrasound image of AdVance male sling (arrow) at rest (left) and on Valsalva (right) demonstrating dynamic compression of bulbar urethra (see calipers)

Results

All 25 AdVance slings were well visualized on 2D transperineal ultrasound in the mid-sagittal plane. The sub-urethral portion of the AdVance slings were located at or above the inferior border of the pubic symphysis in patients with successful slings but slings were located more distally in the perineum in 3 patients with early sling failure, 2 of these had paradoxical distraction/opening of the urethra on Valsalva. Dynamic compression of the urethra by the AdVance sling was demonstrated with Valsalva and coughing in patients with successful slings at 4 weeks and this was unchanged on serial imaging over 4 years (Fig 2 & 3). All 4 patients who had previous radiotherapy had worsening incontinence over the follow-up period despite dynamic compression demonstrated on imaging. Multiplanar analysis of 3D datasets of male slings confirmed stability of sling positioning over time and more acute angulation of male sling versus female transobturator slings (Fig 4).



Figure 2. Sagittal transperineal ultrasound image of AdVance male sling (white arrow) around bulbar urethra at rest. bulbar urethra (u), bladder (b), pubic symphysis (ps).



Figure 3. Transperineal ultrasound image of AdVance sling at 4 years (same patient as Fig 1 imaged using the same ultrasound machine). During coughing there is dynamic compression of urethra by sling (arrow).

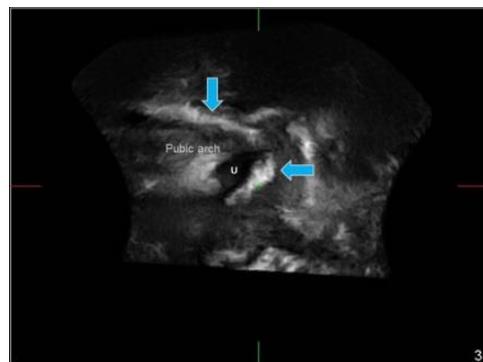


Figure 4. Axial reconstruction of 3D volume dataset obtained by transperineal ultrasound in patient with AdVance sling demonstrating the 'U' configuration of the sling (arrows) around urethra (U)



Figure 5. Sagittal transperineal ultrasound image during Valsalva in patient with early failure post AdVance sling showing malposition and lack of compression (arrow).

Discussion

This is the first functional imaging study demonstrating the AdVance sling remains in a stable position with mid-term followup in patients who had a successful initial outcome and documented satisfactory sling position. Dynamic compression of the urethra by transobturator sling was consistently observed in patients with satisfactory sling position. Transperineal ultrasound may have a role in assessment of early sling failure due to technical factors such as mal-position of the sling (Fig 5).

Conclusion

Longitudinal functional ultrasound studies demonstrated that the AdVance sling remains in a stable position over time. Dynamic compression of the urethra by transobturator sling was consistently observed on serial imaging suggesting that this may be a mechanism of action of the male trans-obturator sling in addition to passive compression.