558

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THE URETHRAL MOTION PROFILE BEFORE AND AFTER MONARC SUBURETHRAL SLING PLACEMENT

Hypothesis / aims of study

Suburethral slings are widely used in the surgical treatment of urodynamic stress incontinence (USI). These procedures are thought to exert their effect by providing for dynamic compression of the urethra at times of raised intraabdominal pressure (1). This would likely require restriction of urethral mobility, but to date there is limited data in the literature on the effect of suburethral slings on urethral mobility. We have recently developed a highly reproducible methodology to quantify segmental urethral mobility, obtaining a 'urethral motion profile' (UMP) (2). The aim of this study was to evaluate the UMP before and after Monarc suburethral sling placement.

Study design, materials and methods

In this retrospective study we included 91 women who had undergone a Monarc procedure between July 2005 and November 2008 in a tertiary urogynaecology unit. All patients had undergone a standardized interview, clinical examination and a 3D/4D transperineal ultrasound (GE Kretz Voluson 730 Expert) as previously described (3) both before the procedure and during follow up visits at a minimum of 4 weeks postoperatively. Stored ultrasound volume data were reviewed on a desktop PC using proprietary software.

Urethral mobility was described by the vectors of movement from rest to maximum Valsalva of 6 equidistant points along the length of the urethra as previously described (2), with Point 1 marking the bladder neck and Point 6 the external urethral meatus. A semi-automated programme was developed utilizing an Excel macro allowing automatic determination of x and y coordinates of the 6 points relative to the inferoposterior margin of the symphysis pubis on a bitmap. Mobility vectors of the 6 points were calculated using the formula $\sqrt{((x_{val} - x_{rest})^2 + (y_{val} - y_{rest})^2)}$. The semi-automated programme was tested against manual measurement and interobserver variation was determined on 20 UMPs (120 mobility vectors) in a test- retest series. Changes in urethral mobility after Monarc suburethral sling was determined by comparing the mobility vectors of these 6 equidistant points before and after sling placement.

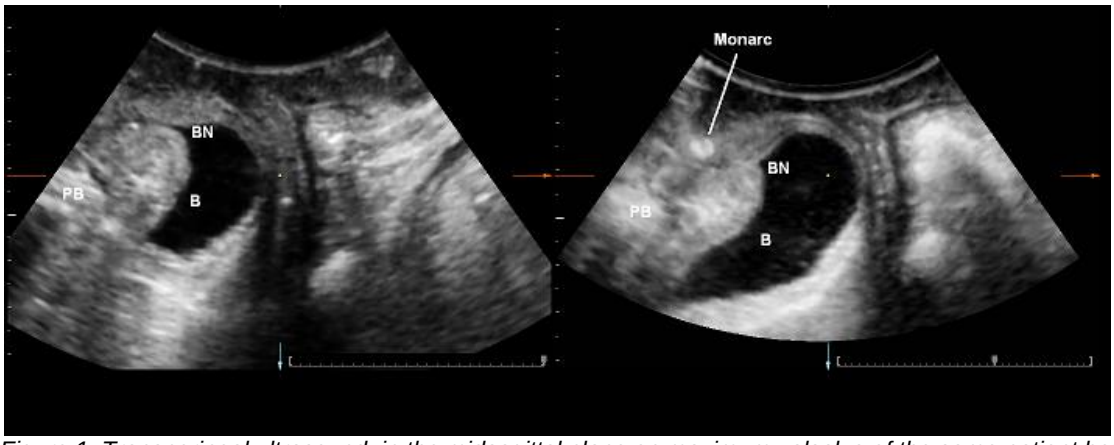

Figure 1: Transperineal ultrasound in the midsagittal plane on maximum valsalva of the same patient before (left) and after Monarc (right) suburethral sling. PB=pubic bone; B=bladder; BN=bladder neck.

Results

Of 91 patients operated on during the inclusion period, 31 were excluded because of previous surgery such as Burch colposuspension or slings, or because of concomitant Perigee mesh implantation. In six patients volumes could not be assessed both pre- and postoperatively due to file corruption or incomplete data acquisition. All subsequent data refers to the remaining 54 datasets. Mean age was 55 years (range 33 to 87), mean parity was 2.8 (range 1-8), median follow-up interval was 0.7 years (range 0.1 to 2.9). Fifty-two patients (96%) complained of stress incontinence, 45 (83%) of urge incontinence and 13 (24%) of symptoms of prolapse. Significant prolapse (≥ ICS POP=Q stage 2) was found in 31 patients, and in 16 patients this was a cystocele (>= stage 2). All 54 patients had been shown to suffer from urodynamic stress incontinence preoperatively, and 11 (20%) were found to have detrusor overactivity as well. A concomitant prolapse repair was performed in 22 (41%). The subjective cure rate for stress incontinence was 81.5% (44/54).

	Before Monarc	After Monarc	P value
Mean mobility of Point 1/ cm(SD)	2.92 (1.00)	2.86 (1.03)	0.667
Mean mobility of Point 2/ cm(SD)	2.61 (0.87)	2.37 (0.75)	0.039
Mean mobility of Point 3/ cm(SD)	2.31(0.78)	1.99 (0.55)	0.002
Mean mobility of Point 4/ cm(SD)	2.06 (0.70)	1.82 (0.49)	0.018
Mean mobility of Point 5/ cm(SD)	1.88 (0.64)	1.80(0.50)	0.385
Mean mobility of Point 6/ cm(SD)	1.80(0.63)	1.81(0.52)	0.892

Table 1: Mean mobility of Points 1 - 6 on maximal Valsalva before and after Monarc (n=54).

The Interobserver variation in a blinded test- retest series showed excellent repeatability of the semi-automated methodology (Intraclass correlation, ICC, 0.93 (CI 0.90-0.96) and between manual and semi-automatic measurements (ICC 0.95, CI 0.92-0.96).

There was a statistically significant reduction in mobility at Points 2, 3 and 4 (see Table 1) after sling placement. No change in mobility was observed at bladder neck and distal urethra. Figure 2 illustrates mean urethral motion profiles before and after Monarc.

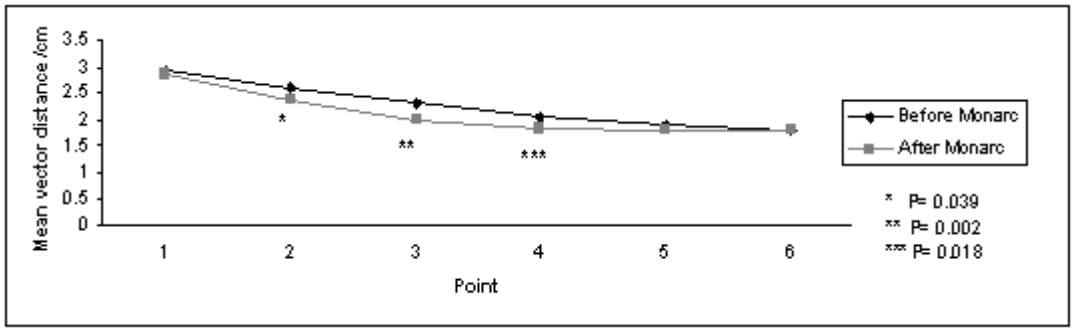

Figure 2: Urethral motion profile before and after Monarc suburethral sling (n= 54)

Interpretation of results

Urethral hypermobility is considered an important factor in the pathophysiology of USI. Burch colposuspension, the previous gold standard in the surgical treatment of USI, is thought to be effective by limiting bladder neck mobility. This does not seem to be the case for the Monarc suburethral sling. The procedure limits mobility of the mid-urethra rather than of the internal meatus, likely leading to midurethral compression. It is probably central urethral mobility that is most affected in USI (own unpublished data), suggesting possible impairment of urethral support /fixation of this part of the urethra. Suburethral slings may be more physiological in their action than colposuspension procedures.

Concluding message

Monarc suburethral slings restrict urethral mobility at the mid-urethra without significant effect on bladder neck mobility.

References

References

1. Ultrasound Obstet Gynecol 2004; 23: 267-271
2. Aust NZ J Obstet Gynaecol 2008; 48:337-342
3. Ultrasound Obstet Gynecol 2004; 23:615-625

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Was this study approved by an ethics committee?	**Yes**
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Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**