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ASSESSING URETHRAL LENGTH MEASUREMENT: COMPARISON BETWEEN SIMPLE CATHETER METHOD AND 3D TRANSPERINEAL ULTRASOUND

Hypothesis / aims of study

Optimal placement of the material is reported to play an important role in bulking agent efficacy for treating women with stress urinary incontinence (UI) [1]. Considering individual variations, the assessment of urethral length prior injection may help guide cystoscope insertion in order to determine the adequate site of injection such as the mid-urethral zone for instance. Three-dimensional (3D) ultrasound imaging has been suggested to be useful in assessing urethral morphology and identifying site of injection [2]. Because such technology may not be readily available, most of the physicians assess the urethral length using a Foley catheter. However, the validity of this method has never been reported. The aim of this study was to investigate the agreement between urethral length measured with a catheter compared to 3D transperineal ultrasound.

Study design, materials and methods

Fifty-seven women with stress or mixed UI with stress predominant symptoms were recruited. This study is part of a larger trial investigating the effectiveness of transurethral injection of autologous muscle derived cells. Women were recruited from local newspaper ads and referrals from urology clinics. To be included in the study, women had to be aged 18 years and older, reported at least 3 episodes of stress UI during a 3-day bladder diary and had an ambulatory 24 hour pad test with a pad weight over 3 g. Women were excluded if they had: 1- BMI ≥35; 2- Pelvic organ prolapse (POP-Q >grade 2); 3- Ongoing treatment for UI.

After signing the consent form, women underwent a standardised assessment including a structured interview, a 3D transperineal ultrasound assessment and a catheter measurement of the urethral length by three different trained assessors blinded to each other's data. The nurse continence advisor carried out the structured interview for collecting baseline characteristics and 24h pad test results. Thereafter, women were asked to empty their bladder and adopted a supine lying position. Urethral length was assessed with 3D transperineal ultrasound (GE Voluson e8 expert ultrasound system with 4–8 MHz curved array 3D/4D ultrasound transducer). The urethral length was calculated from the postero-inferior margin of the pubic symphysis to the bladder neck in both sagittal and axial planes [2]. The mean of the two planes was considered for analysis. Women were then convened to the minor surgical unit in preparation for injection. A Foley catheter was introduced to empty the bladder and the balloon was inflated with 10 ml of sterile water. The bladder was then filled with 50 ml of sterile water. The catheter was gently pulled back until the balloon engaged the bladder neck. The physician pinched the catheter at the level of the meatus, removed the deflated catheter and hence, measured with a ruler the distance between her finger (meatus) and the balloon lightly re-inflated (bladder neck) in order to evaluate the urethral length. Following the recommendations of a recent systematic review for assessing agreement [3], the Bland and Altman analysis was used to compare the two methods for measuring urethral length. A range of agreement was defined as mean bias ± 2SD. Moreover, intraclass correlation coefficient (ICC) was also computed using SPSS v.18.

Results

Fifty-seven women with a mean age of 48 years old (SD 8, range 26 - 71) and a mean of BMI 27.4 kg/m^2 (SD 4.2; range 19 - 34) participated in the study. Thirty-three women (58%) had stress UI and 24 women (42%) had mixed UI with stress predominant symptoms with a mean 24h pad test weight of 71.2 g (SD 79.9 g; range 6.9 - 416.4 g). The mean number of parity was 2.6 (SD 1.6; range 0-9), 51 (89%) had vaginal deliveries and 11 vacuum/ forceps assisted vaginal deliveries (19%). Regarding previous treatment for UI, 2 (3%) had uretropexy, 4 (7%) TVT/TOT and 44 practiced (77%) pelvic floor muscle exercises.

The mean urethral length measured with the catheter was 3.02 cm (SD 0.41; range 2.20 - 3.90) while the mean urethral length evaluated with 3D transperineal ultrasound was 3.03 (SD 0.34; range 2.31 – 3.67). ICC for the two methods of assessment was 0.90 (CI 0.82-0.94, p≤0.001). As shown in Figure 1, limits of agreement (from Bland-Altman method) were +0.46 cm to -0.45, with a mean difference of -0.01 cm (SD 0.23). A student t test indicated that the difference between the two methods was not significantly different from 0 (p=0.857).

Interpretation of results

The high ICC coefficient supports the concordance of the two methods for evaluating urethral length. The Bland Altman method also demonstrates good agreement with a difference close to zero at -0.01 cm suggesting no systematic error. Some variability may be explained by bladder residual volume.

Concluding message

The results of this study provide highly relevant information for clinical practice to properly determine the site of injection for treating stress UI. It suggests that a simple method for measuring urethral length using a Foley catheter was in agreement with transperineal ultrasound assessment, with small mean bias and clinically acceptable limits of agreement.

References

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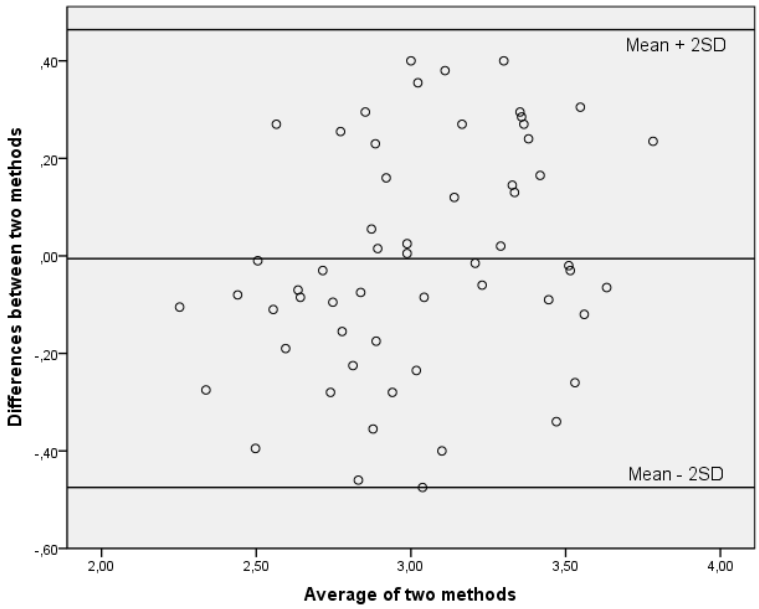
Figure 1. Bland-Altman plot



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