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Is there a link between preoperative fluoroscopic cough stress testing and synthetic midurethral tape outcome?

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ABSTRACT

Objectives: The primary aim of our study was to assess the utility of fluoroscopic cough stress testing as a predictor of synthetic midurethral tape (MUT) outcome. The secondary aim was to examine whether baseline demographics, clinical symptoms and urodynamic variables could predict MUT success.
Study design: We carried out a retrospective study including women with stress urinary incontinence (SUI) who underwent retropubic MUT in a tertiary referral urogynaecology unit. We excluded cases where concurrent pelvic organ prolapse surgery was performed. Patients were subdivided into groups based on the pre-operative fluoroscopic cough stress testing, using Blaivas and Versi classifications. Subjective outcome was evaluated at 6 weeks based on self-reported SUI in the symptom domain of the King's Health Questionnaire. Logistic regression models were used to identify predictors of treatment success.
Results: 143 patients were included in the study. Blaivas and Versi classifications were not useful in predicting subjective success ($p = 0.44$ and $p = 0.40$, respectively). Baseline demographics, clinical and other urodynamic variables failed to predict subjective outcome.
Conclusions: Fluoroscopic cough stress testing is not a useful predictor of MUT outcome. No preoperative variables have been found to predict MUT success.

Introduction

Synthetic midurethral tapes (MUTs) have gained popularity worldwide, due to their effectiveness, simplicity and low morbidity, in comparison to former techniques [1]. Nowadays, they represent the "gold standard" for the surgical treatment of female stress urinary incontinence (SUI) [2]. A recent analysis shows an increase in the use of MUTs in England between 2006 and 2012, with more than 10,000 procedures performed in 2012 [3].

However, although MUTs are offered to the vast majority of women with SUI after failed conservative management, there is scanty evidence regarding who is most likely to benefit. Demographic, clinical and urodynamic variables have been considered as potential predictors of surgical outcome [4,5].

Tests of the lower urinary tract function have traditionally played a key role in assessing women with SUI [6]. Cystometry has been combined with cystourethrography [videourodynamics (VUDS)] to obtain a more comprehensive evaluation of lower urinary tract events [7]. Fluoroscopic classifications have been introduced in order to categorise the type (Blaivas) [8] and severity (Versi) [9] of urodynamic stress incontinence (USI). The primary aim of the study was to assess the utility of Blaivas and Versi classifications as predictors of MUT outcome. The secondary aim was to examine whether baseline demographics, clinical symptoms and urodynamic variables could predict treatment success.

Materials and methods

This was a retrospective study including women who underwent retropubic MUT between January 2008 and December 2012 in a tertiary referral urogynaecology unit. Eligibility requirements excluded procedures where concurrent pelvic organ prolapse (POP) surgery was carried out and cases where preoperative VUDS were not performed. Data were collected from patient's records and our urodynamic database using a standardised proforma.

Preoperative evaluation included medical history, 3-day bladder diary, physical examination (using POP quantification (POPQ) scale [10]), urinalysis and VUDS (performed according to the ICS standards [11]). X-ray contrast medium (Ioxehol 140 ml per ml; Omnipaque™, GE Healthcare) was used during filling

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cystometrography. Bladder filling was stopped when the patient developed a strong desire to void or 500 ml of fluid had been infused into the bladder, whichever occurred first. A cough stress test was performed in the standing position while the bladder neck and urethra were radiologically imaged in a semi-oblique plane (lateral view, 45°). The woman was asked to cough once, three and finally five times in quick succession with maximal effort, to detect any incontinence of contrast medium.

Patients were subdivided based on fluoroscopic findings. According to Blaivas classification, the following groups were identified:

- Type 1: the bladder neck was closed at rest and situated at or above the inferior margin of the pubic symphysis. Following stress, bladder neck and proximal urethra opened and descended <2 cm.
- Type 2: the bladder neck was closed at rest and situated either above or below the inferior margin of the pubic symphysis. Following stress, the bladder neck and proximal urethra opened and descended >2 cm.
- Type 3: bladder neck and proximal urethra were open at rest, despite the absence of a detrusor contraction.

According to Versi classification, SUI was defined as:

- Severe: if leakage occurred on the first cough.
- Moderate: if leakage occurred on the second or third cough.
- Mild: if incontinence was demonstrated only after multiple coughs.

The tension-free vaginal tape (TVT) (Gynecare, Ethicon, Somerville, NJ, USA) was inserted as a day case procedure under general anaesthesia by the consultant urogynaecologists or under their direct supervision. Follow-up evaluation was scheduled at 6 weeks, where subjective surgical success was determined based on self-reported SUI in the symptom domain of the King's Health Questionnaire (KHQ) [12]. Patients with no postoperative episodes of SUI were considered to be a treatment success. If women were still reporting SUI (either "a little", "moderately" or "a lot"), they were considered as treatment failures.

The variables investigated were demographics and clinical characteristics [age, body mass index (BMI), parity, menopausal status, POPQ stage, previous hysterectomy, previous incontinence procedure]. The presence of concomitant lower urinary tract symptoms (urgency, urgency incontinence, frequency, nocturia), the use of antimuscarinics and the functional capacity of the bladder were also evaluated as potential predictors. Finally we took into account VUDS data [voided volume and maximum flow rate (Q_{max}) at uroflowmetry, cystometric capacity, bladder compliance, detrusor overactivity (DO), Blaivas and Versi classification].

Classification and outcome were compared using the Pearson chi-squared test. To identify predictors of treatment success, we performed univariate logistic regression analysis obtaining the probability of subjective success as a function of each covariate separately. Odds ratios (ORs) and 95% confidence intervals (CIs) described the associations between predictors and outcome. Variables with p-values ≤0.2 in the univariate analysis were used in the multivariate logistic regression model. Due to the nature of the study, power calculation was not performed. Statistical analysis was performed using SPSS (Version 22.0. Armonk, NY: IBM Corp).

Results

A total of 143 patients were included in the study, of which 70 (48.9%) reported pure SUI and 73 (51%) stress predominant mixed urinary incontinence. In total, DO was detected in 21 (14.7%) patients preoperatively. Baseline demographics and clinical characteristics are shown in Table 1.

Table 1
Baseline demographic and clinical characteristics.

Variable	Statistics
Age (mean ± SD, range)	52.3 ± 10.7 (28–77)
Parity (median, range)	2 (0–5)
BMI (mean ± SD, range)	27.4 ± 5.2 (20–43)
Postmenopausal, *n* (%)	77 (53.8%)
POPQ stage (median, range)	1 (0–1)
Previous hysterectomy, *n* (%)	43 (30%)
Previous incontinence surgery, *n* (%)	13 (9%)

Overall, treatment success was reported by 111 out of 143 (77.6%) women. Surgical outcomes related to the fluoroscopic classifications are summarised in Table 2. Blaivas and Versi classifications were not associated with subjective outcome ($p = 0.44$ and $p = 0.40$, respectively). A subanalysis comparing Blaivas III vs Blaivas I/II and Versi Slight vs Versi Moderate/Severe did not highlight any statistical significant difference either ($p = 0.175$ and $p = 0.118$, respectively).

Evaluation of potential predictors of subjective success is reported in Table 3. Age and previous incontinence surgery were associated with reduced odds of subjective success ($p = 0.02$ and $p = 0.03$ respectively) on the initial bivariate analysis, but were not statistically significant on the multivariate analysis.

Comments

MUTs are the most frequently performed procedures for SUI [13]. Despite their high cure rates, a proportion of patients experience surgical failure [14]. A better awareness of the factors involved could help clinicians to counsel patients better preoperatively. In our study neither the fluoroscopic cough stress testing nor demographics, clinical or urodynamic factors were valuable predictors of MUT outcome.

To our knowledge, this is the first study to evaluate the performance of fluoroscopic classifications for SUI as predictors of MUT outcome. The National Institute for Health and Care Excellence (NICE) guidelines acknowledge the lack of strong evidence regarding predictors of tape failure [15]. Unlike standard urodynamics, VUDS provides anatomic details and allows direct observation and a better understanding of bladder events [16]. In particular, imaging of the urinary tract at rest allows the assessment of bladder shape and outline while on coughing and straining the degree of bladder base descent and bladder neck competence can be obtained. Combining X-ray and urodynamic investigations, VUDS offers the most comprehensive means of assessment, combining anatomical details to physiological (urodynamic) data [17].

Our research question aimed to assess whether this additional information may be useful to predict MUT outcome. Concerns regarding the radiation exposure have led to the limited use of this

Table 2
Surgical outcome.

SUI type and group	Subjective success *N* (%)	*p*-Value
Blaivas		
I	33/41 (80.5)	0.44
II	63/79 (79.7)	
III	15/23 (65.2)	
Versi		
Slight	9/9 (100)	0.40
Moderate	43/56 (76.8)	
Severe	59/78 (75.6)	