

THE IMPACT OF THE TRANSOBTURATOR TAPE (TOT) ON URETHRAL PRESSURE PROFILOMETRY (UPP)

Hypothesis / aims of study

To maintain continence, the urethral pressure (UP) must exceed vesical pressure. UP and urethral closure pressure (UCP) are concepts which attempt to support this phenomenon. The UPP has been devised to attempt to measure these pressures. Theoretically, there should be decreased UPP values in patients with stress urinary incontinence(SUI) compared to continent patients. Based on this, the UPP values should also increase post-continenence surgery if the mechanism of action is to increase UP. However, various studies have conflicting results. The aim of this study therefore is to evaluate UPP parameters before and after placement of a transobturator tape (TOT).

Study design, materials and methods

Women with urodynamically-proven USI with no demonstrable detrusor overactivity or >grade 2 prolapse were recruited. They completed a 1-hr pad test and underwent UPP. With the patient in a sitting position, the bladder was first emptied using a urethral catheter and then refilled to 200ml. An 8F microtip catheter was then secured to a mechanical puller. The transducer on the catheter was directed to either the 9 o'clock or 3 o'clock positions. This was pulled at a speed of 1mm/sec and the resting UP recorded. The simultaneous recording of both the intraurethral(Pura) and intravesical(Pves) pressure enabled calculation of the UCP (Pura-Pves) as well as functional urethral length(FUL).

The catheter is then mechanically re-inserted into the bladder and another profile is done. A total of 3 profiles were obtained. The mean and maximum values of UCP and FUL were noted.

Placement of the TOT and cystoscopy were performed according to a standard technique. At 6 weeks follow-up, the UPP and 1-hr pad test were repeated. A vaginal examination was also performed to exclude tape erosion.

Results

80 were recruited. Median age was 55(IQR 51-62) years and BMI 28(IQR 25-32)kg.m⁻².

Post-operatively, there was a significant decrease in urinary loss on 1-hr pad testing. Pre-operatively, the median pad loss was 23(IQR 4-78)g and at follow-up visits median values were 0.4 to 0.6 g at 6 weeks, 6, 12, and 24 months.

UPP analysis shows that there was no significant change in FUL or maximum FUL, however, there was a significant decrease in MUCP and maximum MUCP values at 6 wks post-surgery (Table 1). UPP values did not show a correlation between age, parity, and BMI. Pad test values also did not correlate with MUP and MUCP pre- and post-surgery.

Table 1. UPP parameters pre-operatively and at 6 weeks follow up.

	Pre-operative	6 weeks
MUCP	38 (22-46)	31 (22-42)*
Mean MUCP	42 (26-52)	32 (23-44)**
FUL	28 (23-32)	25 (22-31)
Maximum FUL	30 (24-35)	28 (24-32)

MUCP=maximum urethral closure pressure; FUL=functional urethral length

All figures shown as median(IQR).

*p<0.01, tau b=0.24, **p<0.01, tau b=0.25

Interpretation of results

UPP is a graphic illustration of pressure within the urethra at different points throughout its length. However, measurement is subject to a degree of inter- and intra-individual variability. Variation can be accounted for by differences in technique of each operator and differences in equipment used. There are also intrinsic fluctuations in pressure within the urethra at any given point in time which can be secondary to muscle activity. In our study, the measurement was performed by the same operator pre- and post-operatively using the standard technique described. However, the introduction of the transducer into the urethra, patient anxiety, and reflex contraction of the pelvic floor because of the invasive nature of the investigation can produce variability and artifacts. To control for these factors, we performed the profilometry 3 times and the mean and maximum values were noted.

Because of variability, published reports show a wide range of normal values (50-80 cm H2O for MUP, 40-70 cm H2O for MUCP, and 3cm for FUL). In our study, both MUCP(42 cm H2O) and FUL(3 cm) fell within these ranges prior to surgery. However, post-operatively the MUCP values fell outside this range(31 cm H2O). The FUL did not significantly change. Despite this fall, however, our patients had improved continence as confirmed by the pad test which showed a significant decrease in urinary loss even at long-term follow-up. This only further confirms that UPP values that characterise continence is of a wide range.

Over the years many investigators have attempted to use UP studies to explain the pathogenesis of UI and to diagnose SUI. However, lack of consistent association with subtracted cystometry has limited its acceptance. In our study, we correlated the MUCP and maximum MUCP to the 1-hr pad test to establish the relationship between urinary loss and urethral function. There was no correlation found between these parameters pre- and post-operatively.

Several factors are thought to influence urethral function. With increasing age, it is postulated that vascular changes in the urethra causes changes in urethral function and, subsequently, a decrease in urethral function. Several studies show that MUP and MUCP decline as a function of age. In our study, we did not find any relationship between age and urethral function.

Studies indicate that there is a trend toward a shorter FUL in patients with USI compared to those who are continent. In our study, there was no significant change in FUL and maximum FL after placement of the TOT despite achieving continence.

UCPs are expected to increase after incontinence surgery. However, results are conflicting. Upto time of writing, we are unable to find articles studying UPP parameters in women post-TOT with no concomitant prolapse surgery. In our study, there was a significant decrease in MUCP and maximum MUCP after placement of the TOT. What this implies is that the mechanism of action of the TOT is different from the retropubic slings. The decreased UCP values can probably be explained by the more lateral dissection during placement of the tape. Compared to the retropubic approach, the urethra is not placed in a high retropubic

location and therefore the abdominal pressures do not influence its function. From our study, the TOT does not work seem to work by causing pseudo-obstruction or urethral compression. However, further studies are needed to explore the mechanism of action of this approach.

It has been suggested that MUCP and MUP are decreased in women with SUI. However there is a great overlap of values from continent and incontinent women and, as such, it has been impossible to define a cut-off level that allows differentiation between women with and without SUI. Standard static profile parameters correlate poorly with the severity of USI.

Pressure-transmission ratio (PTR) tests the response of the urethra to increases in abdominal pressures. Most published articles have shown that this correlates poorly with the severity of USI and that reproducibility of the test has not been established. Furthermore, the reliability and usefulness of cough profilometry using conventional microtip transducer catheters has been deemed dubious. Because of the questionable usefulness of this parameter, we deemed it not necessary to analyse this in our study.

Concluding message

UPP has a wide range of normal values. Low UPP values do not necessarily predict incontinence. It is therefore a poor predictor of good surgical outcome and a poor gauge of incontinence and therefore surgical success. There is very little evidence to show that this should be performed routinely in patients undergoing incontinence surgery.

The mechanism of action of the TOT does not seem to be by increasing urethral pressure. Further research is recommended to establish its mechanism of action.

<i>Specify source of funding or grant</i>	No external funding.
<i>Is this a clinical trial?</i>	No
<i>What were the subjects in the study?</i>	HUMAN
<i>Was this study approved by an ethics committee?</i>	Yes
<i>Specify Name of Ethics Committee</i>	Audit Committee of St. George's Hospital Medical School
<i>Was the Declaration of Helsinki followed?</i>	Yes
<i>Was informed consent obtained from the patients?</i>	Yes