

## CONTRIBUTION OF MODELING TO UNDERSTANDING OF THE MODE OF ACTION OF SUB-URETHRA TAPE PROCEDURE FOR CURE OF FEMALE STRESS INCONTINENCE.

### Aim of study

A recent study [1] has established the predictive value of the mobility of the proximal urethra for success after cure of stress urinary incontinence (SUI) by retro-pubic tape procedure (TVT). TVT does not modify the maximum urethral closure pressure; so, restoration of continence implies a compressive effect (dynamic) which add to the other suspected effects: constrictive (passive) obstruction [2] and abnormality of detrusor excitation.

Our purpose was to identify and quantify the changes induced by TVT in the mechanics of both detrusor and urethra using the VBN mathematical micturition model [3].

### Methods

Fifty three female patients (mean age: 54.0 years; range [33-85 years]) with SUI complaint underwent a TVT operation. They had urogynaecological examination and urodynamic tests before and after (1, 6, 12, 24 months) surgery. Preoperatively, a lateral urethrocytography was performed, the patient being asked first to restraint and second to strain; the angle between the lines joining the mid urethra and the bladder neck was measured on X-rays which evaluated the degree of mobility of the proximal urethra.

The modeled analysis of free uroflows has been performed using the VBN model [2-3]. Urethra is a dilatable pipe; obstruction can result from two processes: a constrictive mechanism characterized by a urethral parameter  $g$  that describe the passive change of the cross-section of the urethra ( $g = 1$  if normal), and a compressive mechanism characterized by a counter-pressure acting on the urethra. Detrusor function is characterized by 2 parameters: the time where detrusor excitation diverts from the standard curve and the ratio of recruited neurons ( $rr$ ) during the following part of micturition.

### Results

The modeled analysis has underscored 3 main effects of TVT. 1) Occurrence of a constrictive obstruction ( $g = 1.00 \pm 0.40$  before surgery and  $0.65 \pm 0.38$  at one month follow up ( $p < 0.0001$ ); this status remains unchanged after 6 months and more follow-up ( $0.71 \pm 0.36$ ;  $p = 0.006$ ). No correlation between urethral mobility and decrease of the urethral parameter  $g$  has been found. 2) A compressive obstruction disclosed during strain which has been evaluated equal to 10 cm H<sub>2</sub>O for cured patients. 3) An irritative effect leading to an impaired detrusor control is observed in the early stage and decrease at long-term: ratio of normal detrusor excitation = 43.4% before surgery, 16.3% one month after and 34.6% beyond 6 months;  $rr = 0.66 \pm 0.33$  before surgery,  $0.41 \pm 0.33$  after one month ( $p < 0.0001$ ) and  $0.58 \pm 0.33$  beyond 6 months (ns).

### Conclusions

Modeling allows by simulation of pathophysiological hypotheses to identify and to quantify the consequences of sub-urethra tape procedure for cure of SUI in women. Constrictive effect of the tape and induced modified detrusor control are confirmed, as their evolution at long follow up. More interesting, this study brings to the fore the occurrence of a compressive obstruction reinforced during strain to explain objective cure. Correlation between proximal urethra mobility and compressive effect will be the following step in order to understand how TVT achieves continence.

### References

1. Submitted to J Urol
2. F. Valentini et al. Neurourol Urodyn 2000; 19:153-176.
3. F. Valentini et al. Int Urogyn J 2000; 11(suppl 1): S30.