

## THE SIGNIFICANCE OF URETHRAL FUNNELING AND URINE FLOW (PF-ULTRASOUND) IN EVALUATING STRESS URINARY INCONTINENCE

### Hypothesis / aims of study

Nowadays we still need non-invasive objective test to confirm stress urinary incontinence (SUI). There are conflicting data in the literature on the clinical significance of urethral funnelling and urine flow assessed during ultrasound examination (1, 2). There are a lot of studies available nowadays which show that ultrasound is useful in assessing urogynecological patients, also before and after operations (3). The aim of the study was to evaluate the usefulness of urethral funnelling and urine flow, visualized during introital pelvic floor ultrasound, to confirm SUI and to evaluate cure effect of anti-incontinence procedure.

### Study design, materials and methods

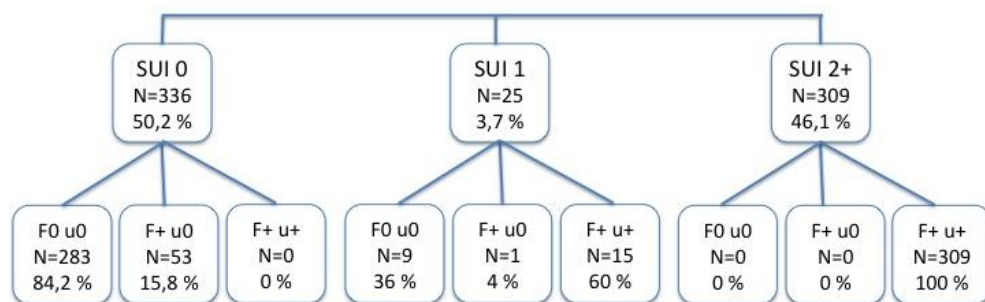
The analysis was performed on data obtained from 670 patients, who attended urogynecologic center for the diagnosis and treatment due to symptoms of pelvic floor dysfunction. All these patients had nonvalidated interview, a clinical examination including stress test, fulfilled 3-day micturition diary, had 2D introital pelvic floor ultrasound using transvaginal probe performed by specialist blind to the clinical exam results. Stress related leakage was defined according to the subjective 4-point scale: 0= no urine loss, 1 = loss with strenuous activity, 2 = loss with moderate activity, 3 = loss with minimal activity or gravitational incontinence. Studied groups were divided according to subjective scale, the result of cough test and information from patient diary. SUI 0 was defined when the patient had informed during interview and in diary about no urine loss, and cough test was negative. SUI 2+ was defined when subjective scale showed stage 2 or 3 from subjective scale and the cough test was positive. SUI 1 was diagnosed when subjective scale showed stage 1. In this group there were included also patients from subjective scale 0 with positive cough test and from the subjective scale group 2 or 3 with negative cough test. The probe (vaginal transducer, 3.6-8.3 MHz; beam angle, 160°) was placed in the area of the vaginal introitus at the level of the external urethral orifice (3). The standardized bladder filling volume was 200-300 ml. After rotating the probe to optimize bladder neck visualization, urethral funnelling and urine flow were observed during maximal Valsalva maneuver. Urethral length as well as the length and width of the funnelling were measured and urine flow visualization during ultrasound was noticed. In the study we analyzed relative length of funnelling which was calculated as percent of ultrasound urethral length in accordance with formula: length of funnelling/urethral length x 100%. Later 106 of those patients had TVT operation and 138 had Burch colposuspension performed. Outcome measurements included subjective and objective parameters were collected preoperatively and postoperatively. For the purposes of this analysis, patients were divided into two groups: cured and not cured.

Statistical analysis was performed with the use of Statistica 7.1 StatSoft.

### Results

Mean age of studied group was 51 years (range, 19-86). 50,2% had no SUI symptoms (group SUI 0, n= 336). 46,1% (n= 309) were included into group SUI 2+, 3,7% (n= 25) - into group SUI 1. The results are presented on the ryc. 1. Urethral funnelling visualized during pelvic floor ultrasound with urine flow was found in all of the patients SUI 2+. There was no urethral funnelling with visualized urine flow during ultrasound urethrocystography among women without SUI symptoms (SUI 0). Urethral funnelling without visualized during ultrasound urine flow, was observed among women without SUI symptoms (SUI 0), as well as among patients SUI 1. Most of the women without SUI symptoms had no urethral funnelling visible during pelvic floor ultrasound. The group of women SUI 1 was a heterogeneous one. There were women in whom funnelling was not observed, as well as those with funnelling observed without and with urine flow.

Ryc. 1. Funnelling and urine flow in studied group of patients

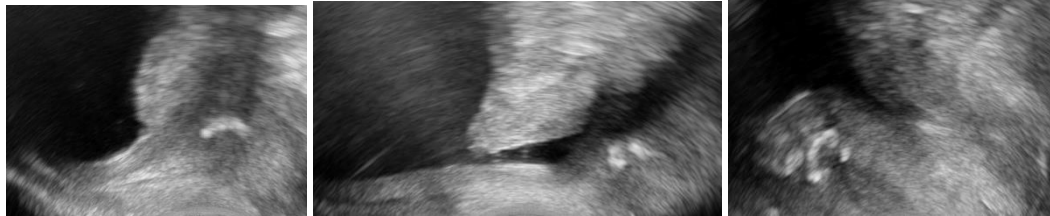


Legend: F+ - funnelling, F0 - no funnelling, u+ - urine flow observed, u0 - no urine flow

All the patients operated with anti-incontinence procedure were from SUI 2+ group. On the control visit after TVT (3-6 months after the procedure) 91 patients were cured, 15 were not cured. After TVT insertion in the group of cured women there was no patient with visualized urine flow. 70 women (76,9%) had no funnelling visualized. 21 patients had funnelling seen. In all 15 not-cured women there was funnelling with urine flow observed (ryc. 2). In the group of cured patients, in whom TVT tape implantation does not completely remove the urethral funnelling, the operation decreases the length of the funnelling on average 17,8% ( $p < 0,002$ ), but does not affect its width (differences on average 0,6 mm, NS). In patients who have failed to eliminate stress urinary incontinence after TVT operation, postoperative length and width of urethral funnelling did not change significantly. On the

control visit after Burch colposuspension (3-60 months after the procedure). Out of 138 patients, 109 patients were cured. Among the cured patients operation led to a complete liquidation of the urethral funnelling in 78%. In the remaining 22% of the cured patients, urethral funnelling was still visible, but without being visible on ultrasound urine flow. Of the remaining 29 not cured patients in the postoperative ultrasound urethrocytography in 26 women (89.7%), was observed persistence of the urethral funnelling with visible in ultrasound urine flow. In one patient (3.4%) urethral funnelling without the escape of urine was observed, in two (6.9%) neither urethral funnelling nor urine flow was noticed. All three patients were classified into subgroup with improvement. In all cases of patients with no improvement during the ultrasound examination there was urethral funnelling visible along with the concomitant urine flow.

Ryc. 2. Pelvic floor ultrasound after TVT



a. cured, no funneling,  
no urine flow

b. cured, funneling,  
no urine flow

c. not cured, funneling,  
urine flow

#### Interpretation of results

Urethral funnelling visualized during pelvic floor ultrasound with urine flow proved to be a typical symptom for the patients with SUI 2+. There was no urethral funnelling with visualized urine flow during ultrasound urethrocytography among women without SUI symptoms (SUI 0). The controversies from the literature concerning the significance of the funneling may be due to the technique of performing the ultrasound exam (for example the angle of the us beam) as well as the amount of urine in the bladder during the exam.

#### Concluding message

Ultrasound evaluation of urethral funneling and urine flow visualized during pelvic floor ultrasound performed with transvaginal probe in women with full bladder may be useful to confirm stress urinary incontinence. It seems to be useful to assess the results of SUI treatment after anti-incontinence procedures: TVT and Burch colposuspension.

#### References

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#### Disclosures

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