

# The Effects of Suburethral Tape on the Symptoms of Overactive Bladder

## Die Wirkung des suburethralen Bandes auf die Symptome der überaktiven Harnblase

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### Schlüsselwörter

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### Abstract

Suburethral tension-free vaginal tape is used for the treatment of stress urinary incontinence with a high success rate. Often patients report having stress incontinence, as well as co-existing micturition problems which are attributable to overactive bladder syndrome (OAB). The present study examines the effect of suburethral tape on the symptoms of OAB. In the study, we used the transobturator vaginal tape inside-out technique (TVT-O).

**Materials and Methods:** 53 patients were included in the study, all had proven urodynamic stress incontinence and symptoms of overactive bladder. The patients were examined preoperatively and 3 months after the TVT-O placement.

**Results:** The individual OAB symptoms improved significantly, with urinary frequency and urge incontinence improving more than nocturia. The frequency of micturition decreased on average from 16.1 to 10.1 episodes/24 hours, while nocturnal frequency of micturition decreased from 2.2 to 1.1. Not a single patient experienced the simultaneous worsening of all three measured variables, however 19% of patients did report their simultaneous disappearance. Their quality of life that had been affected by OAB was measured on the basis of validated questionnaires, and found to have improved significantly. Only 28% of patients reported a desire for drug treatment of OAB symptoms following tape placement.

**Conclusions:** TVT-O placement leads to a significant improvement of the symptoms of overactive bladder syndrome. Patient quality of life – which was affected by OAB – was also enhanced by the tape placement. This accounts for a substantial share of the overall success of the suburethral tape.

### Zusammenfassung

Das spannungsfreie suburethrale Vaginalband wird zur Behandlung der Belastungsinkontinenz mit hohen Erfolgsraten eingesetzt. Oft berichten Patientinnen mit Belastungsinkontinenz aber auch von gleichzeitig bestehenden Miktionsproblemen, die dem Syndrom der überaktiven Harnblase (engl. overactive bladder – OAB) zuzuordnen sind. Die vorliegende Studie prüft die Wirkung des suburethralen Bandes auf die Symptome der OAB. In der Studie verwendeten wir ein transobturatorisch geführtes Band in der Inside-out-Technik (TVT-O).

**Material und Methoden:** In die Studie wurden 53 Patientinnen eingebracht, die alle außer einer urodynamisch nachgewiesenen Belastungsinkontinenz Symptome der überaktiven Harnblase aufwiesen. Die Patientinnen wurden präoperativ und 3 Monate nach Implantation von TVT-O untersucht.

**Ergebnisse:** Die einzelnen OAB-Symptome verbesserten sich signifikant, Dranginkontinenz und Pollakisurie mehr als Nykturie. Die Miktionsfrequenz sank im Mittel von 16,1 auf 10,1 Miktionen/24 Stunden, die nächtliche Miktionsfrequenz von 2,2 auf 1,1. Bei keiner einzigen Patientin kam es zur gleichzeitigen Verschlechterung aller 3 gemessenen Parameter, dafür jedoch bei 19% der Patientinnen zu ihrem gleichzeitigen Verschwinden. Die durch die OAB beeinträchtigte Lebensqualität verbesserte sich signifikant, was anhand von validierten Fragebögen gemessen wurde. Nur 28% der Patientinnen gaben nach Bandeinlage noch den Wunsch nach medikamentöser Behandlung der OAB-Symptome an.

**Schlussfolgerungen:** Die Implantation von TVT-O führt zur signifikanten Verbesserung der Symptome der überaktiven Harnblase. Auch die durch die OAB beeinträchtigte Lebensqualität wird durch die Bandimplantation gesteigert, was einen we-

sentlichen Anteil am allgemeinen Erfolg des suburethralen Bandes ausmachen dürfte.

## Introduction

The placement of suburethral tape is taking place all over the world with great success in the treatment of stress urinary incontinence. In many cases, however, upon closer anamnestic investigation, stress incontinence is found not to be the patient's only micturition problem. Often, the patient also has symptoms of an overactive bladder, which include urgency, frequency, nocturia and possibly urge urinary incontinence. If the patient suffers from a combination of stress and urge incontinence, this is defined by the International Continence Society (ICS) as mixed incontinence [1], which has, according to Dooley et al. [2] a prevalence of 30% of all women with urinary incontinence and is more of a strain on the patient than pure stress incontinence [3].

Several studies have already dealt with the question of whether mixed incontinence can be an indicator for surgical treatment. This question has now been answered with yes [4–6], although a lower cure rate is to be expected than in the case of pure stress incontinence [4]. Abdel-fattah [7] quotes a subjective rate of satisfaction of 75% of all patients with mixed incontinence one year after tape placement. In a meta-analysis, Jain [8] reports the cure rate of the urge urinary incontinence component to be 30–85% after tape placement. Kissling [6] proves that tape placement is superior in the case of mixed incontinence with a predominantly urge incontinence component to drug therapy with an anticholinergic.

In addition to its effect on urge incontinence, how much influence does tape placement have on the other individual symptoms of overactive bladder mentioned above? Athanasiou [9] describes how these are also significantly improved by tape placement. Abdel-fattah [7] reports a cure rate of 52% with respect to urgency, while Palva and Nilsson [10] quote a 61% cure rate for urinary frequency. Only 16–26% of patients wanted further drug treatment with antimuscarinics following tape placement [11, 12].

The present study aims to improve clarity about the extent to which the individual, preoperative, existing symptoms of overactive bladder syndrome are alleviated or cured, and how the related quality of life is improved by the placement of a suburethral tape.

## Materials and Methods

The present study is a prospective clinical longitudinal study. Changes to micturition variables and questionnaire scores are measured with reference to the symptoms of an overactive bladder. As the study has the character of an observational study and the indication for treatment (tape placement) in all patients was on the basis of a proven stress incontinence component, an ethics commission vote was not needed.

### Patient group

The prospective observational study was conducted between June 2010 and June 2012 at the Department of Obstetrics and Gynaecology at Pardubice District Hospital (Pardubická krajská nemocnice, a.s.) in the Czech Republic. We studied 78 patients, to whom the inclusion criteria “proven urodynamic stress incon-

tinence” and “concurrent symptoms of an overactive bladder” applied. All 78 patients had urge sensation, frequency (> 8 episodes of micturition/day) and nocturia, with some also having the symptom of urge urinary incontinence. The patients agreed to surgical treatment and all received the transobturator vaginal tape inside-out technique (TVT-O). For the study, the following exclusion criteria applied: neurogenic bladder dysfunction (1 patient), phase following anti-incontinence surgery (2 patients), simultaneous carrying out of further surgery, such as a hysterectomy or vaginal repair (22 patients). Thus, 53 patients could ultimately be included in the study.

### Initial investigation

The preoperative investigation comprised taking patients' urogynaecological medical history, keeping a micturition diary for at least 2 × 24 hours, a pelvic examination, urinalysis, a urodynamic examination and an ultrasound, and required patients to complete both the ICIQ-OAB and ICIQ-OABqol questionnaires in the Czech language. ICIQ-OAB is a validated questionnaire that uses four questions to measure the severity of OAB symptoms (urinary frequency, nocturia, imperative urgency and urge urinary incontinence) and which determines the level of suffering caused by this on an analogue scale. ICIQ-OABqol uses 26 questions to measure the impact of OAB symptoms on quality of life. An overview of the ICIQ questionnaire can be found at [www.iciq.net](http://www.iciq.net). Both questionnaires used are expressly recommended for use in the context of scientific studies in a review article by V. Khullar [13].

### Tape insertion and check-up

All patients underwent the TVT-O tape procedure (transobturator tape inside-out technique, Ethicon). A check-up took place three months postoperatively: micturition diary for two days, questioning about urge incontinence, urinary tract ultrasound, completing both the ICIQ-OAB and ICIQ-OABqol questionnaires, as well as a consultation regarding the desire for drug treatment of OAB symptoms.

### Statistical analysis

When we speak of being cured with regard to a symptom, this refers to the symptom no longer occurring after tape placement, for example the disappearance of urinary urgency, a frequency of micturition of less than nine episodes per 24 hours, no need to visit the toilet during the night and no more episodes of urge incontinence. Accordingly, the reduced frequency of these symptoms is referred to as improvement. This cure and improvement are indicated in a purely descriptive manner, as is the presentation of the questionnaire scores before and after tape placement. The t-test for paired samples was used to compare the frequency of micturition, as well as the questionnaire total scores before and after tape placement. All analyses were performed using the statistical functions of the Microsoft Excel programme. P values < 0.05 were considered statistically significant.

## Results



### Parameters of the initial investigation

Table 1 shows the patient medical history data. In addition to age, body mass index, and duration of symptoms, this also includes previous medicative and surgical treatments, medical history of childbirth and risk factors.

Table 2 gives an overview of research findings following clinical exploration, a urodynamic examination and an ultrasound. These all refer to the patient's condition before tape placement.

### Evaluation of micturition diary

According to entries in 22 patients' (41.5%) micturition diaries, tape placement reduced micturition frequency to eight episodes or fewer per 24 hours. These patients can thus be described as being cured in relation to urinary frequency (Table 3). A further 23 patients (43.4%) experienced an improvement in urinary frequency. Nocturia disappeared completely in only 12 patients (22.6%), with a further 23 patients (43.4%) recording an improvement. The largest cure percentage was that recorded in relation to the symptom of urge incontinence, which 83.9% claimed not to suffer from following tape placement. If we look at all three

above-mentioned symptoms together, 10 patients (18.9%) reported the simultaneous disappearance of all symptoms, and the simultaneous worsening of all three symptoms did not occur in a single case.

**Table 1** Patient medical history data.

Anamnestic information	Number of patients	%
<b>Age</b>		
▶ 0–50	14	26.4
▶ 51–70	31	58.5
▶ >70	8	15.1
<b>BMI</b>		
▶ < 25.0	13	25.0
▶ 25.0–35.0	34	65.4
▶ > 35.0	5	9.6
▶ N/A	1	
<b>Duration of symptoms (in years)</b>		
▶ < 1	3	5.6
▶ 1–5	36	67.9
▶ > 5	14	26.4
▶ on average	4.92	
<b>Previous surgery</b>		
▶ hysterectomy	13	24.5
▶ anterior colporrhaphy	1	1.9
▶ none	39	73.6
<b>Anticholinergic drug history</b>		
▶ subjective without effect	8	15.1
▶ subjective with effect	2	3.8
▶ subjective with temporary effect	12	22.6
▶ none	31	58.5
<b>History of childbirth</b>		
▶ spontaneous vaginal	52	98.1
▶ operative vaginal (forceps)	1	1.9
<b>Parity</b>		
▶ 1	6	11.3
▶ 2	37	69.8
▶ 3	7	13.2
▶ 4	3	5.7
Taking anti-depressants	12	22.6
Diabetes mellitus	6	11.3
Bronchial asthma	10	18.9
Nicotine abuse	11	20.8
Constipation	13	24.5
Urinary tract infection > 2×/year	6	11.3

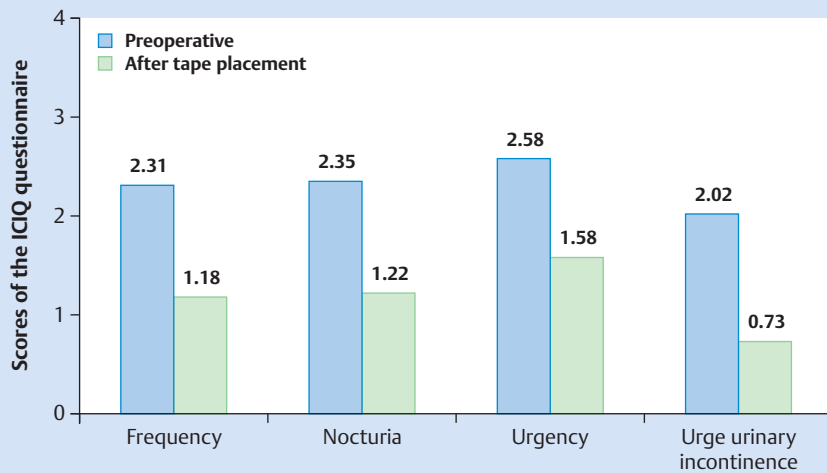
**Table 2** Patient data according to clinical examination, urodynamics, ultrasound.

Parameters	Number of patients	%
<b>Prolapse</b>		
▶ none	39	73.6
▶ small cystocele	9	17.0
▶ small rectocele	5	9.4
<b>First urgency</b>		
▶ < 150 ml	11	22.0
▶ > 150 ml	39	78.0
no data	3	
<b>Total bladder capacity</b>		
▶ < 350 ml	14	26.4
▶ > 350 ml	39	73.6
Proven detrusor contractions	2	3.8
Hypotonic urethra (ISD)	10	18.3
<b>Qmax</b>		
▶ < 15 ml/s	3	5.8
▶ > 15 ml/s	49	94.2
▶ no data	1	
<b>Residual urine</b>		
▶ 0–10 ml	33	62.3
▶ 11–20 ml	9	17.0
▶ 21–30 ml	6	11.3
▶ 31–40 ml	4	7.5
▶ > 40 ml	1	1.9
Urethral hypermobility	47	88.7

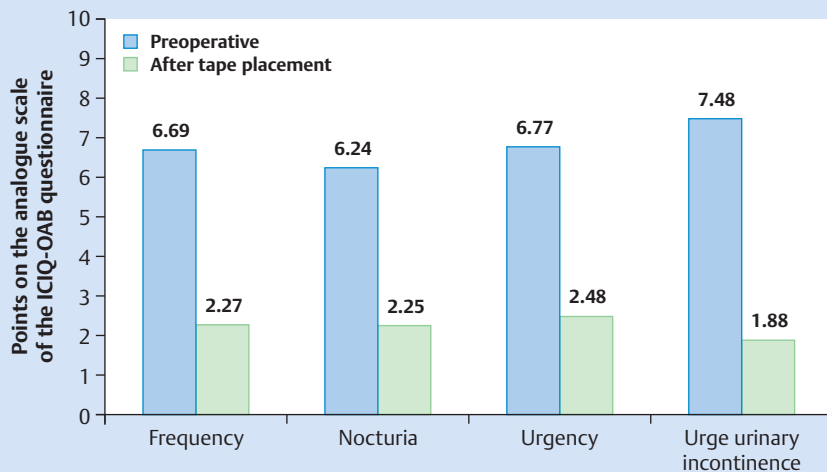
\* ISD = intrinsic sphincter deficiency as per international guidelines [14, 15]

**Table 3** Changes in individual symptoms 3 months after tape placement.

Symptom	Change	Number of patients	%
Urinary frequency	cured	22	41.5
	better	23	43.4
	the same	7	13.2
	worsened	1	1.9
Nocturia	cured	12	22.6
	better	23	43.4
	the same	12	22.6
Urge urinary incontinence	worsened	6	11.3
	cured	26	83.9
	better	0	0
	the same	2	6.5
	worsened	3	9.7
	(without urge urinary incontinence: 22)		
Patients without urinary frequency, nocturia or urge urinary incontinence		10	18.9
Patients with the simultaneous worsening of urinary frequency, nocturia and urge urinary incontinence		0	0



**Fig. 1** ICIQ-OAB questionnaire: Scores for each symptom before and after tape placement (score distribution for each symptom from 0–4).



**Fig. 2** ICIQ-OAB questionnaire: Level of suffering for each symptom before and after tape placement (analogue scale 0... 10).

The records in the micturition diary also allow, relative to the entire group of patients, the calculation of an average value of episodes of micturition per 24 hours and per night, and their comparison before and after tape placement (▶ **Table 4**). Prior to tape placement, the average micturition frequency was 16.09 episodes/24 h and 2.16 episodes/night. This was reduced 3 months after tape placement to 10.12 episodes/24 h and 1.07 episodes/night. The reduction of both values is statistically significant ( $p < 0.001$ ).

### Analysis of the questionnaires

In the ICIQ-OAB questionnaire, patients were required to provide information about the severity of the various symptoms of overactive bladder syndrome. The mean scores before and after tape placement are shown in ▶ **Fig. 1**. On average, the most pronounced symptom was urgency (average score before tape placement: 2.58, after tape placement: still 1.58). All of the symptoms improved on average, with the greatest improvement being recorded in relation to urge incontinence (score difference: 1.29).

▶ **Fig. 2** represents a further result of the ICIQ-OAB questionnaire. In relation to each symptom, patients were asked how much the symptom troubled them. The subjective distress had to be speci-

**Table 4** Changes to micturition variables.

Micturition variable	Before tape placement	After tape placement	p-value
Frequency of micturition/24 h	16.09 (SD 4.97)	10.12 (SD 4.15)	< 0.001
Nocturia	2.16 (SD 1.82)	1.07 (SD 0.96)	< 0.001

fied on a scale using numbers from 0 to 10. The highest level of distress was therefore caused by the symptom “urge incontinence” (average of 7.48 on the aforementioned scale), followed by “urgency” (average value: 6.77). The biggest difference in level of suffering values here, i.e. the greatest improvement, was observed for urge incontinence once again (point difference: 5.6).

A total score was calculated from the two ICIQ-OAB and ICIQ-OABqol questionnaires, and these were compared before and after treatment (▶ **Table 5**). The total score fell from an average of 9.25 before tape placement to 4.5 after tape placement for the ICIQ-OAB questionnaire. In the case of the ICIQ-OABqol questionnaire, these values were 77.4 before and 44.2 after tape

**Table 5** Total scores for the respective questionnaire (total score distribution for ICIQ-OAB of 0–12, for ICIQ-OABqol of 25.150).

Questionnaire	Before tape placement	After tape placement	p-value
ICIQ-OAB	9.25	4.5	<0.001
ICIQ-OABqol	77.4	44.2	<0.001

placement. In the case of both questionnaires, the total score decreased statistically significantly ( $p < 0.001$ ).

### Need for drug treatment of OAB after tape placement

Finally, all patients were asked at the check-up 3 months after tape placement if they still wished to have drug treatment for any continuing symptoms of overactive bladder syndrome. 15 patients (28.3%) indicated a desire for this kind of treatment.

### Discussion

It is well known that suburethral tape has been used for the improvement or cure of stress incontinence with much success [16]. The effect on sphincter weakness is well documented in many studies. Our study, however, does not address the variables of stress urinary incontinence, but the symptoms of overactive bladder syndrome, which were present in all patients involved in the study in addition to stress urinary incontinence. In many studies, these frequent accompanying symptoms are not sufficiently taken into account, if at all.

The existing preoperative symptoms of overactive bladder syndrome in all patients involved in the study were significantly alleviated in accordance with the results shown. The level of suffering caused by the micturition problems also decreased significantly after tape placement. In some cases, tape placement led to the worsening of a single symptom of overactive bladder symptom, but in no case did all measured variables worsen simultaneously.

When it comes to the individual components of overactive bladder syndrome, urinary frequency and urge incontinence were improved and cured in 85 and 84% of cases respectively, while the largest positive change was seen in urge incontinence, which has been reported consistently by Abdel-fattah et al. [7]. The improvement or cure of nocturia, however, was only possible in 67% of cases. This can certainly be explained by the influence of nocturnal polyuria [17, 18], i.e. by increased urine production during the night, which of course cannot be influenced by the manipulation of the lower urinary tract.

How can one explain the positive influence of the suburethral tape on the symptoms of overactive bladder syndrome? D. Perucchini and G. Schär attribute the triggering of the urge sensation to the entrance of urine into the proximal urethra via what is known as funnelling [5, 19, 20], eliminating the urethra funnel using tape placement could thus lead to the elimination of urinary urgency [21]. Another hypothesis of “urethro-genetic detrusor over-activity” states that, in certain cases, detrusor over-activity precedes urethral relaxation, and that patients with this disorder would respond better to surgical treatment and less to antimuscarinic drug treatment [22–25].

Which factors then can prevent an improvement of the symptoms of overactive bladder syndrome through tape placement? The main factors considered here are: hypotonic urethra (intrinsic

sphincter deficiency – ISD), proven urodynamic detrusor contractions, an elevated degree of preoperative symptom severity, and advanced age. The latter three unfavourable prognostic risk factors were already proven [26, 27]. In addition to these, Gamble [28] also found: two or more episodes of nocturia, a decreased total cystometric bladder capacity, higher detrusor pressure and lower bladder volumes in the occurrence of detrusor contractions, and lower flow rates ( $Q_{max}$ ). Katsumi and Rutman [27] conclude from their literature review that transobturator tape placement shows better results in terms of the effect on an overactive bladder than retropubic placement. Further studies are certainly needed for the unambiguous assessment of all of these factors.

### Conclusion for Clinical Practice

The implantation of a suburethral tape can statistically significantly improve not only stress incontinence, but also the often co-existing symptoms of overactive bladder syndrome. This statement applies more to urge incontinence and urinary frequency than to nocturia. The study compares the situation prior to, and three months afterTVT-O tape placement. Quality of life is significantly increased.

### Conflict of Interest

None.

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