Original article

Mid-urethral sling implantation effect on urge component in stress predominant mixed urinary incontinence.

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Abstract:

Objective: The aim of the study was to evaluate the influence of a suburethral sling implantation on the urge symptoms in patients suffering mixed urinary incontinence (MUI) with predominant stress component in case of.

Material and methods: The study group was 220 woman with stress urinary incontinence (SUI), among them 35 women with stress-predominant MUI, treated primary with suburethral sling implantation. In 85.7% (N=30) TOT and in 14.3% (N=5) TVT was performed. The clinical symptoms and QOL were assesed before and after treatment using bladder diary and QOL questionnaire. Other additional treatment was also evaluated.

Results: Subjective improvement of urge symptoms was observed in 97.1% of woman in the study group. 'Wet OAB' symptoms were reduced from 68.6% to 28.6% after sling procedure. Nocturia and pollakiuria were reduced from 45.7% to 11.4% and 8.6% respectively. Nocturia and pollakiuria de novo were observed in 2 (5.4%) and 1 (2.7%) patients respectively. After the sling procedure in 28.6 % (N=10) pharmacotherapy with solifenacin was administered for 2-4 months, in 8.6% (N=3) intravesical injection of botulinum toxin was performed due to persisting OAB symptoms.

Conclusion: suburethral sling implantation in woman with stress- predominant MUI, although dedicated to treat SUI symptoms, seems to improve also the urge component of MUI.

Keywords: stress urinary incontinence; mixed urinary incontinence; urge urinary incontinence; incontinence; midurethral sling; suburethral sling;

1. Introduction

Urinary incontinence affects approximately 25-45% of women [1]. These data allow to classify urinary incontinence as a social disease. WHO and ICS consider any uncontrolled leakage of urine from the bladder as the urinary incontinence [2].

The most common types of incontinence are the stress urinary incontinence (SUI), due to disorder of urethral closing mechanism and overactive bladder (OAB) connected to the hyperactivity of the detrusor muscle. About 10-20% of all patients who reported the urinary incontinence have simultaneously symptoms of both SUI and OAB, which are classified as mixed urinary incontinence [1,2].

Patients with SUI suffer from urine leakage during sneezing, coughing, exercise, or laughing. Overactive bladder is characterized by urinary urgency with (wet OAB) or without (dry OAB) urine leakage, nocturia and pollakiuria [2,3].

According to ICS guidelines, the number of urinations during the day, which is burdensome for the patient and adversely affects normal functioning, is classified as pollakiuria [3].

Nocturia is defined as urinating more than once a night. The form of an overactive bladder also differs, the dry form in which the patient often experiences urge competing them to urinate frequently, but there are no episodes of lackage of urine and the wet overactive bladder, where there is the incontinence during the urge to urinate [3].

Suburethral slings used in the treatment of SUI for over 20 years, are divided according to the technique of implantation into the tension-free vaginal tape (TVT) and tension-free implanted transobturator tape (TOT). The tape implantation is a minimally invasive procedure, the patient's recovery time is short, the hospitalization usually does not exceed two days. The suburethral sling implantation is characterized by a low risk of complications and high efficiency. TOT procedure is associated with a lower rate of intraoperative complications and shorter operation time due to the lack of need for cystoscopic control. Therefore this method is used more often [4].

Current study considered the effect of the suburethral tapes implantation on the urge symptoms in patients with a mixed form of the urinary incontinence

2.Materials and Methods

In the study we analyzed medical records of 220 women who underwent TOT or TVT procedure performed in 2015 till 2020 in Department of Gynaecology and Obstetrics, AFM Krakow University. According to anamnesis and urodynamics results 35 woman were preoperatively diagnosed with mixed urinary incontinence, SUI component at least grade II. The sociodemographic and medical data such as age, BMI, parity, previous operations comorbidities affecting urinary incontinence were analyzed.

Exclulusion criteria were:

I-st Grade of SUI qualified for conservative treatment, neurological diseases, comorbidites: decompensated diabetes mellitus. diuretics , UTIs, pelvic organ prolapse (POP)

The data was collected preoperatively, 2 and 6 weeks after surgery using a micturition diary , symptom severity questionnaire and the Stamey scale.

3. Results

1. Characteristics of the studied group

The study group consisted of 35 women with an average age of 66.97 (minimum 41-maximum 93 years old, SD = 10.71). 40% woman (N = 14) were 61 70 years old.

The average number of vaginal deliveries was 2.17 (SD = 0.79, min 1, max 4). 45.7% (N=16) underwent 2 vaginal deliveries Fig. 1.

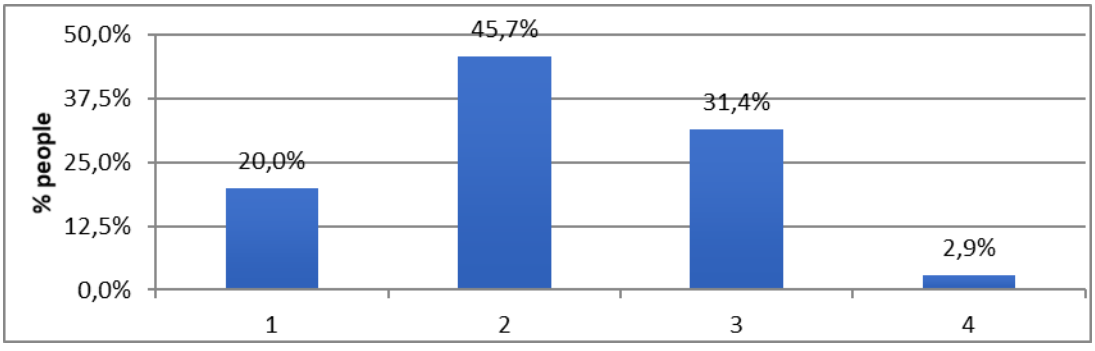

Fig. 1 The number of the vaginal deliveries

The average BMI was 26,3 (18,2-39,4).

In 45.7% of women (N = 16) has been diagnosed the stress urinary incontinence stage II while in 54.3% (N = 19) stage III .
In 68.6% of women (N = 24), wet urinary urgencies occurred before the procedure while 31.4% (N = 11) indicated dry urinary urgencies.
Before the surgery, nocturia and pollakiuria were found in 45.7% of women (N = 16). The TOT surgery was performed in 85.7% (N = 30), the TVT in 14.3% of women (N = 5). 14.3% of women (N = 5) have been operated in other centers because of the urinary incontinence. Coexisting diseases occurred in 17.1% of women (N = 6). 5.7% of women(N = 2) suffered from COPD or asthma fig. 2.

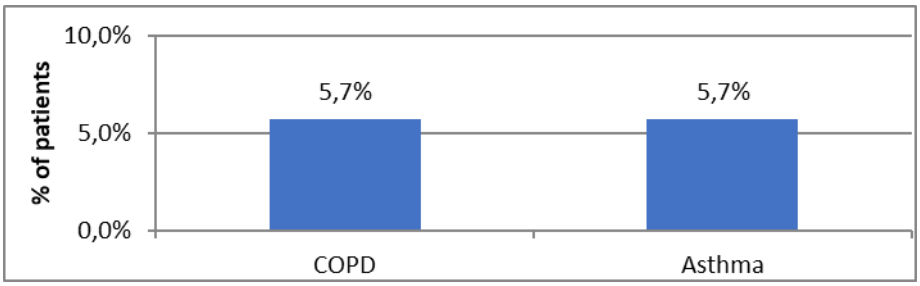

Fig. 2 comorbidities

Treatment results

Subjective improvement after surgery was observed in 97.1% of women (N = 34). Only one patient (i.e. 2.9%) did not report any improvement after the procedure.
48.6% of woman (N = 17) reported dry urgency after operation. In the majority of women (N = 25, i.e. 71.4%) there was no wet urinary urgency after the procedure. (table 1)

	Before operation	After operation
Dry urgency	31,4% (N=11)	48,6% (N=17)
Wet urgency	68,6% (N=24)	28,6% (N=10)

Table 1

Postoperative nocturia occurred in only 11.4% ~~o~~(N = 4) of women. 5.4% (N = 2) reported de novo nocturia.-(Table 2)

			Nocturia		All together
			Yes	No	
Nocturia after the surgery	Yes	N	2	2	4
		%	12,5%	10,5%	11,4%
	No	N	14	17	31

	%	87,5%	89,5%	88,6%
All together	N	16	19	35
	%	100,0%	100,0%	100,0%
	χ2=0; p=1			

Table 2 – prevalence of nocturia

Pollakiuria was recovered in 8,6% (N = 3) of the patients after the surgery and in one patients it was a new symptom.

For urinary urgency remained after surgery 28.6% of women (N = 10) obtained additional pharmacological treatment with 10 mg of solifenacin for 2-4 months. 8,6% patients (N=3) received botulin toxin injections in to the bladder. Fig- 3.

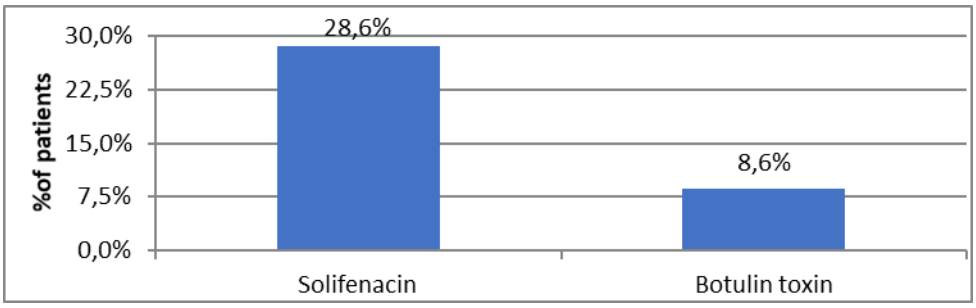

Fig. 3 The additional treatment administered after surgery.

97.1% of the women experienced a subjective improvement in OAB, described as a relief of the urinary urgency after the surgery. - fig. 9 In the case of 13 women, 54.2% of the wet urinary urgency before the surgery changed to the dry urinary urgency which was less burdensome in the opinion of the patients. In-case of 4 (36,4%)women, the dry urinary urgency was not eliminated - Table 3.

	Urinary urgencies	All together

			Wet	Dry	
Dry urinary urgencies	Yes	N	13	4	17
		%	54,2%	36,4%	48,6%
	No	N	11	7	18
		%	45,8%	63,6%	51,4%
All together		N	24	11	35
		%	100,0%	100,0%	100,0%

$\chi 2=0,377$; $p=0,5392$

Table 3 - The urinary urgency before the surgery and the presence of the dry urinary urgency after the surgery

The dry urinary urgency remained after surgery in 8 women (33,3%). Two women (18,2%) having dry urinary urgency preoperatively experienced the wet urinary urgency after the surgery - Table 4.

			Urinary urgencies		All together
			Wet	Dry	
Wet urinary urgencies	Yes	N	8	2	10
		%	33,3%	18,2%	28,6%
	No	N	16	9	25
		%	66,7%	81,8%	71,4%
All together		N	24	11	35
		%	100,0%	100,0%	100,0%

$\chi 2=0,268$; $p=0,6044$

Table 4 – Presence of the wet urinary urgencies

The average age of women who underwent anterior mesh was 10 years higher than the average age of women who did not undergo this procedure (76.33 years old vs. 66.09 years). There were also slight differences between the age and the degree of stress urinary incontinence (SUI III was present in older women). In older women, symptoms of OAB

were more common – wet urinary urgency, nocturia, wet urinary urgency after surgery, nocturia after surgery and comorbidities, including asthma, were more frequent - Table 5

		Age						P
		Average	SD	Me	Min.	Max	N	
Stress urinary incontinence	SUI II	64,81	7,97	65	55	86	16	0,0883
	SUI III	68,79	12,50	68	41	93	19	
Urinary urgencies	Wet	68,33	11,66	68	41	93	24	0,1234
	Dry	64,00	7,95	64	55	80	11	
Nocturia	Yes	70,31	10,79	68	55	93	16	0,1421
	No	64,16	10,08	65	41	80	19	
Pollakiuria	Yes	69,44	9,80	68	48	86	16	0,2432
	No	64,89	11,26	67	41	93	19	
TOT	No	72,50	7,78	73	67	78	2	0,4840
	Yes	66,64	10,87	67	41	93	33	
TVT	No	66,48	11,43	67	41	93	29	0,4279
	Yes	69,33	6,38	68	60	78	6	
Anteriol Mesh	No	66,09	10,77	67	41	93	32	0,0449
	Yes	76,33	3,21	75	74	80	3	
Subjective improvement	Yes	66,74	10,78	67	41	93	34	0,4000
	No	75,00	-	75	75	75	1	
Stress urinary urgency after the procedure	Yes	75,00	-	75	75	75	1	0,4000
	No	66,74	10,78	67	41	93	34	
Dry urinary urgencies after the procedure	Yes	69,41	11,62	67	48	93	17	0,4048
	No	64,67	9,53	68	41	80	18	
Wet urinary urgencies after the procedure	Yes	72,10	7,82	68	64	86	10	0,0592
	No	64,92	11,15	67	41	93	25	
Nocturia after the procedure	Yes	74,00	7,53	74	67	81	4	0,1297
	No	66,06	10,82	67	41	93	31	
Pollakiuria in one day after the procedure	Yes	67,00	5,00	67	62	72	3	0,9338
	No	66,97	11,15	68	41	93	32	

Botox	No	66,97	11,21	67	41	93	32	0,9338
	Yes	67,00	1,73	68	65	68	3	
Vesicare	No	66,00	11,57	68	41	93	25	0,6022
	Yes	69,40	8,21	67	59	81	10	
CODP	No	66,36	10,71	67	41	93	33	0,1210
	Yes	77,00	4,24	77	74	80	2	
Asthma	No	67,27	10,48	67	41	93	33	0,8067
	Yes	62,00	18,38	62	49	75	2	
Retention	No	66,79	11,00	67	41	93	33	0,4840
	Yes	70,00	2,83	70	68	72	2	
Comorbid conditions	No	66,41	10,79	67	41	93	29	0,2022
	Yes	69,67	10,86	73	49	80	6	

Table 5 – Age and the variables

No statistically significant correlation was found between the number of deliveries and the selected variables - Table 6.

		The number of vaginal deliveries						p
		Average	SD	Me	Min.	Max	N	
Stress urinary incontinence	SUI II	2,06	0,93	2	1	3	16	0,6353
	SUI III	2,26	0,65	2	1	4	19	
Urinary urgencies	Wet	2,21	0,72	2	1	4	24	0,8474
	Dry	2,09	0,94	2	1	3	11	
Nocturia	Yes	2,13	0,89	2	1	4	16	0,6827
	No	2,21	0,71	2	1	3	19	
Pollakiuria	Yes	2,31	0,60	2	1	3	16	0,3331
	No	2,05	0,91	2	1	4	19	
TOT	No	2,00	0,00	2	2	2	2	0,7563
	Yes	2,18	0,81	2	1	4	33	

TVT	No	2,14	0,83	2	1	4	29	0,6233
	Yes	2,33	0,52	2	2	3	6	
Anterior Mesh	No	2,19	0,78	2	1	4	32	0,7600
	Yes	2,00	1,00	2	1	3	3	
Subjective improvement	Yes	2,18	0,80	2	1	4	34	0,8571
	No	2,00	-	2	2	2	1	
Stress urinary urgencies after the procedure	Yes	2,00	-	2	2	2	1	0,8571
	No	2,18	0,80	2	1	4	34	
Dry urinary urgencies after the procedure	Yes	2,18	0,88	2	1	4	17	0,9610
	No	2,17	0,71	2	1	3	18	
Wet urinary urgencies after the proceedure	Yes	2,50	0,71	2	2	4	10	0,2115
	No	2,04	0,79	2	1	3	25	
Nocturia after the procedure	Yes	2,00	0,82	2	1	3	4	0,7078
	No	2,19	0,79	2	1	4	31	
Pollakiuria in one day after the procedure	Yes	2,00	1,00	2	1	3	3	0,7600
	No	2,19	0,78	2	1	4	32	
Botox	No	2,16	0,72	2	1	3	32	0,9778
	Yes	2,33	1,53	2	1	4	3	
Vesicare	No	2,16	0,80	2	1	4	25	0,8435
	Yes	2,20	0,79	2	1	3	10	
CODP	No	2,18	0,77	2	1	4	33	0,8605
	Yes	2,00	1,41	2	1	3	2	
Asthma	No	2,18	0,81	2	1	4	33	0,7563
	Yes	2,00	0,00	2	2	2	2	
Retention	No	2,15	0,80	2	1	4	33	0,5681
	Yes	2,50	0,71	3	2	3	2	
Comorbid conditions	No	2,17	0,80	2	1	4	29	0,9830
	Yes	2,17	0,75	2	1	3	6	

Table 6 – The number of deliveries and the selectioned variables

Before the surgery, the wet urinary urgency was more common (80.0%) in women who had previously undergone pelvic floor operations previously than in women who had not been previously operated on that purpose (66.7%). However, these differences were not statistically significant (p = 0.9408) - Table 7.

			Previous operations		All together
			no	yes	
Urinary urgencies	Wet	N	20	4	24
		%	66,7%	80,0%	68,6%
	Dry	N	10	1	11
		%	33,3%	20,0%	31,4%
All together		N	30	5	35
		%	100,0%	100,0%	100,0%

$\chi 2$=0,006; p=0,9408

Table 7 – The urinary urgencies and the previous operations

The occurrence of the wet urinary urgency after the UI surgery was slightly more frequent (40.0%) in women who had previously undergone a surgery (p = 0.9391) - Table 8.

			Previous operations		All together
			no	yes	
Wet urinary urgencies after the procedure	Yes	N	8	2	10
		%	26,7%	40,0%	28,6%
	No	N	22	3	25
		%	73,3%	60,0%	71,4%
All together		N	30	5	35
		%	100,0%	100,0%	100,0%

$\chi 2=0,006$; p=0,9391

Table 8 – The wet urinary urgencies after the surgery and the previous operations

4. Discussion

Based on the presented study, it was shown that performing the suburethral sling implantation procedure improves the overall clinical symptoms of the mixed urinary incontinence. Patients having wet urinary urgencies reported improvement not only in SUI but also in OAB symptoms. The frequency of wet urinary urgencies in patients with MUI was reduced. Persistent dry urinary urgencies, especially in patients who had wet urgency before sling implantation have a less negative impact on the quality of life of patients with MUI. [5]. The implantation of the suburethral sling has a positive effect on reducing stress connected to urgency and leakage of urine in patients with MUI, probably due to sealing of urethra –The dry urinary urgency is associated with a better acceptance due to the lower stress related to the possibility of leakage and the feeling of control over one's own body [6].

Less improvement after incontinence surgery was observed in patients who had previously undergone other urogynecological surgeries. These patients reported micturition disorders following previous surgery or de novo urinary urgency after these operations. According to Kobashi KC at al. and Shin JH at al. de novo OAB occurs in 6-9% of patients after the implantation of the suburethral tape [7,8]. 'In our study de novo symptoms, such as wet urgency or nocturia or dry urgency or pollakiuria were observed in 5 (14,3 % of patients). Risk factors for de novo OAB include previous surgical procedures in pelvic floor (e.g. hysterectomy). In patients with the mixed urinary incontinence the risk factors are: age and MUI with a dominant urgency component [8], and detrusor overactivity in preoperative urodynamic examination [9]. In this form of MUI, treatment results may be less satisfactory in comparison to pure form of SUI [9]. According to Pergialiotis V et al. patients from this group should be carefully qualified for surgery. The technique of tape implantation seems to be irrelevant (TOT vs TVT) [10]. Incorrect placement of the suburethral implant (too close to the bladder neck, too close to the urethral wall) is also a risk factor for SUI treatment failure and the occurrence of OAB symptoms [11].

Among the causes of the postoperative symptoms of OAB, erosion of the bladder or the urethral tape, iatrogenic obstruction in urine outflow, and incorrect position of the tape should be excluded [9]. The suburethral tape implantation is regarded as the surgical treatment of choice in patients with SUI, which affects the frequency of these procedures and an increasing number of centers offering this method of treatment to their patients. The learning curve seems to be short due to the simplicity of the procedure, but the treatment requires quite high precision, and the number of treatments performed by a certain operator has a direct proportional effect on their effectiveness [12]. Recent data show that the learning curve of the technique of suburethral sling implantation appears to be longer than previously thought [13] and requires a minimum of 30 [14] to 80 [13] procedures performed. Despite the low invasiveness of the TOT and TVT procedures, there are complications that, when detected late, affect the occurrence of de novo urinary urgency and the severity of SUI [15]. It can be concluded that the treatment results can be influenced negatively by suboptimal surgical technique.

5. Conclusions

The patients with MUI benefit from the surgical treatment with the use of suburethral tapes also in experiencing the symptoms of the urinary urgencies. The improvement after the surgery, originally dedicated to SUI, also gives benefits in terms of UUI symptoms. Therefore, the surgery can be considered in patients with MUI and dominant SUI

as the first choice treatment. Precise implantation of the tape is the most important factor to the effectiveness of the treatment. A large number of the procedures performed allows to obtain a standardized and good surgical technique. Specialized centers for pelvic organ surgery scan significantly reduce the complications, improve the treatment's results as well as reduce the often unnecessary use of pharmacological treatment.

Patients with mixed urinary incontinence have the significant improvement in both components - stress urinary incontinence and urgency after implantation of suburethral tapes.

Abbreviations list:

POP- pelvic organ prolapse

TOT- transobturator tape

TVT- tension-free vaginal tape

SUI- stress urinary incontinence

MUI- mixed urinary incontience

OAB-overactive bladder

Conflicts of Interest: "The authors declare no conflict of interest."

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