

# Comparison of one-year results of transobturator tape method in the stress incontinence treatment according to body mass index

## *Stres inkontinans nedeniyle transobturator teyp uygulanan hastalarda bir yıllık sonuçların vücut kitle indeksi değerlerine göre karşılaştırması*

Şükrü Kumsar<sup>1</sup>, Hüseyin Aydemir<sup>1</sup>, Osman Köse<sup>1</sup>, Salih Budak<sup>2</sup>, Hasan Salih Sağlam<sup>1</sup>, Öztuğ Adsan<sup>1</sup>

### ABSTRACT

**Objective:** The purpose of this study was to compare the 1-year results of patients on whom we used the transobturator tape method for the stress incontinence treatment according to body mass index (BMI).

**Material and methods:** Patients diagnosed with stress incontinence and treated with the transobturator tape method were divided into three groups according to BMI. We recorded the results of preoperative urodynamic studies; durations of operation, catheterization, and hospitalization; and complications of patients. Patients were evaluated 1 year after the operation with respect to the objective/subjective success rates of the operation, patient satisfaction rates, and possible late complications.

**Results:** The obese group was observed to have a significantly higher duration of operation than the normal and overweight groups ( $p<0.001$ ). The objective and subjective success rates were not significantly different between the groups ( $p=0.567$  and  $p=0.245$ , respectively). There was no statistical difference between the groups with respect to the satisfaction rates ( $p=0.245$ ). There was no significant difference between all three groups with respect to both preoperative and postoperative complication rates ( $p=0.096$ ).

**Conclusion:** The transobturator tape method for stress incontinence treatment has similar objective and subjective success rates, independent of BMI. In the obese patients, the operation time is longer than the others, but there is no difference with respect to the complication rates.

**Keywords:** Complication; obesity; stress incontinence; success rate; transobturator tape.

### ÖZ

**Amaç:** Çalışmamızın amacı, stres inkontinans tedavisi için transobturator teyp yöntemini kullandığımız hastaların bir yıllık sonuçlarını vücut kitle indeksi (VKİ) değerlerine göre karşılaştırmaktır.

**Gereç ve yöntemler:** Stres inkontinans tanısıyla transobturator teyp yöntemi kullanılarak tedavi edilen hastalar Vücut Kitle indeksi (VKİ) değerlerine göre 3 gruba ayrıldı.

Hastaların preoperatif ürodinami sonuçları, operasyon süreleri, kateterizasyon ve hastanede kalış süreleri ve komplikasyonlar kaydedildi. Ameliyattan 1 yıl sonra ameliyatın objektif/subjektif başarı oranları, hasta memnuniyet oranları ve olası geç komplikasyonlar açısından hastalar değerlendirildi.

**Bulgular:** Gruplar operasyon süresi bakımından değerlendirildiğinde obez grubun operasyon süresi normal ve aşırı kilolu gruba göre anlamlı olarak yüksek bulundu ( $p<0.001$ ). Grupların objektif ve subjektif başarı oranları arasında anlamlı fark yoktu ( $p=0.567$ ), ( $p=0.245$ ). Gruplar arasında memnuniyet açısından istatistiksel anlamlı fark yoktu ( $p=0.245$ ).

Her üç grup, perioeratif ve postoperatif komplikasyonlar açısından karşılaştırıldığında anlamlı fark saptanmadı ( $p=0.096$ ).

**Sonuç:** Stres inkontinans nedeniyle gerçekleştirilen transobturator teyp yöntemi, VKİ değerlerinden bağımsız olarak benzer objektif ve subjektif başarı oranlarına sahiptir.

Obez hastalarda operasyon diğerlerinden daha uzun sürmektedir ancak komplikasyon oranları açısından fark yoktur.

**Anahtar kelimeler:** Komplikasyon; obezite; stres inkontinans; başarı oranı; transobturator teyp.

<sup>1</sup>Department of Urology, Sakarya University Training and Research Hospital, Sakarya, Turkey

<sup>2</sup>Department of Urology, Tepecik Training and Research Hospital, İzmir, Turkey

**Submitted:**  
22.10.2014

**Accepted:**  
18.03.2015

**Correspondence:**  
Şükrü Kumsar,  
E-mail: drkumsar@yahoo.com

©Copyright 2015 by Turkish Association of Urology

Available online at  
www.turkishjournalofurology.com

## Introduction

Stress urinary incontinence (SUI) is a symptom of involuntary urinary loss that occurs as a result of activities that cause an increase in abdominal pressure. These activities include coughing, laughing, sneezing, and walking. In addition, in some cases, light activities such as rising to stand or bending over may result in leakage.<sup>[1]</sup>

The minimally invasive midurethral sling procedure is still the gold standard as the initial surgical treatment of SUI in women.<sup>[2]</sup>

Modifications made regarding the pubovaginal sling since the guideline of 1997 have included the development of two minimally invasive procedures for the surgical treatment of SUI: the tension-free vaginal tape procedure introduced in 1996 and the transobturator technique introduced in 2001.<sup>[3-5]</sup>

For SUI, mesh midurethral slings have at least provided short-term and long-term outcomes equivalent to many types of current SUI repairs with shorter operation times and quicker convalescence, among other potential advantages.<sup>[6,7]</sup>

The potential intraoperative complications of midurethral slings are bleeding, urethral injury, and bladder injury. Significant bleeding is a potential intraoperative complication of midurethral sling insertion, occurring in <1% of the procedures. Early postoperative complications include lower urinary tract symptoms (LUTS), voiding dysfunction, infection, extrusion, and pain. Initial urgency and urgency incontinence are observed in almost 20% of patients after the insertion of a midurethral sling.

Late postoperative complications are often the most challenging to treat and include extrusion (vaginal exposure), erosion (mesh inside lower urinary tract or gastrointestinal tract), obstruction/voiding dysfunction, and recurrent urinary tract infections.<sup>[8]</sup>

In addition to vaginal delivery, history of gynecological surgery, body mass index (BMI), menopausal status, smoking, and coffee and alcohol consumption, obesity is one of the important risk factors for the development of urinary incontinence in old age.<sup>[9-12]</sup>

Some authors have described an increase in intra-abdominal pressure in obese patients, and this phenomenon may induce a pelvic floor stress, possibly causing nerve and muscular injury that may lead to a higher prevalence of SUI.<sup>[13]</sup> In addition, it is known that increased BMI is associated with urge and mixed urinary incontinence.<sup>[14]</sup> However, not all SUI cases are associated with obesity; therefore, the clinical characteristics and urodynamic parameters may differ between obese and non-obese SUI patients. The effect of obesity on surgical outcomes in SUI patients has still been debated.

There are few large prospective series, and few studies have assessed the outcome of these procedures in obese women. The purpose of this study was to assess the potential effect of obesity on the success rate of the procedure, patient satisfaction, and complications in the first year after surgery.

## Material and methods

Women presenting with predominantly SUI (defined as involuntary leakage during physical activity, coughing, or sneezing) underwent a review of their medical history, physical examinations, urinalysis, urine culture, and urodynamic studies, including the measurement of Valsalva leak point pressure (VLPP). Women with a history of symptoms of uncomplicated SUI for at least 3 months, a failure to respond to standard medical treatment and pelvic floor exercises, a negative urine culture to exclude urinary tract infection, a desire to undergo surgery of SUI, and a positive provocative stress test (defined as an observed transurethral loss of urine that was simultaneous with a cough or Valsalva maneuver) were eligible for the study. Patients with previous failed anti-incontinence surgeries or treatments with a bulking agent were excluded from the study. Patients with mixed urinary incontinence were not excluded if their cystometrogram showed normal capacity, compliance, and no uninhibited contractions. Patients with obstructive, unstable bladder functions or neurogenic bladders were excluded from the study.

Patients who were diagnosed with stress incontinence and who were treated with the transobturator tape method at the Urology Clinic of Sakarya University Training and Research Hospital between January 2011 and June 2012 were divided into three groups according to the BMI determined by the World Health Organization (normal, 18.5–24.9 kg/m<sup>2</sup>; overweight, 25–29.9 kg/m<sup>2</sup>; and obese, ≥30 kg/m<sup>2</sup>).

As described by Delorme in 2001, the transobturator approach was performed by using a helical tunneler from the outside entrance point to adjust the tape without any tension. A polypropylene mesh of 35x2 cm in size (PROLENE®, Ethicon Inc., Somerville, New Jersey, USA) handmade tape was attached to the helical needles and it was pulled out through the transobturator tunnel.

Immediately before surgery, all patients received one 1000 mg dose of sefazolin intravenously for antibiotic prophylaxis. The cystoscopy was performed during the procedures in all patients to examine if there was any injury in the bladder or the urethra, and the catheter was removed in the recovery room before the patients were discharged.

The preoperative urodynamic results and complications of patients as well as the durations of operation, catheterization,

and hospitalization were recorded. Patients were contacted via the phone and were called for a follow-up 4 weeks after surgery and then in the 3<sup>rd</sup>, 6<sup>th</sup>, and 12<sup>th</sup> month after surgery.

Patients were assessed for 1 year after the operation with respect to the objective/subjective success rates of the operation, patient satisfaction rates, and possible late complications.

The negative provocative stress test and 24-h negative purified protein derivative (PPD) test were used as the objective success criterion.

On the other hand, having the absence of the stress-type incontinence symptom obtained through the International Consultation on Incontinence Questionnaire Short Form (ICIQ-SF), no urinary leakage in the 3-day micturition diary, and lack of an additional treatment regarding the stress incontinence was used as the subjective success criterion.

Patient satisfaction was evaluated on the basis of answers to the question “How satisfied are you with the outcome of the bladder operation you underwent due to the urinary leakage,” which was asked in the postoperative 12<sup>th</sup> month. The answers included “strongly satisfied,” “mostly satisfied,” “undecided,” “mostly unsatisfied,” and “strongly unsatisfied.” While the answers “strongly satisfied” and “mostly satisfied” were classified as satisfied, the answers “undecided,” “mostly unsatisfied,” and “strongly unsatisfied” were classified as unsatisfied. The data

of 81 out of 88 patients who completed the 1-year follow-up were evaluated.

### Statistical analysis

Data were evaluated using the Statistical Package for the Social Sciences software (SPSS; Version 15.0, SPSS Inc., Chicago, IL, USA). Kruskal–Wallis and chi-square tests were used to compare categorical variables. Significance level was accepted as  $p < 0.05$ .

### Results

In the normal weight group, 26 patients had an objective success rate of 96.1% and a subjective success rate of 92.3%; 36 patients in the overweight group had an objective success rate of 94.4% and a subjective success rate of 94.4%; and 19 patients in the obese group had an objective success rate of 94.7% and a subjective success rate of 94.7%.

When groups were evaluated with respect to the duration of operation, it was observed that the obese group had a significantly higher operation time than the normal and overweight groups ( $p < 0.001$ ) (Table 1).

There was no significant difference between the groups with respect to the objective and subjective success rates ( $p = 0.567$  and  $p = 0.245$ , respectively) (Table 2).

**Table 1. Comparison of clinical characteristics and parameters with body mass index**

	Normal (n=26)	Overweight (n=36)	Obese (n=19)	p value
Age (mean)	48.23±8.41	51.81±6.57	50.61±5.35	0.139
Chronic Disease				
DM	2 (10%)	6 (18%)	3 (30%)	<0.05*
HT	4 (21%)	9 (28%)	4 (40%)	<0.05*
VLPP (mean)	81.90±37.41	78.85±21.44	82.90±42.23	0.425
Mean duration of operation (min)	20.4±6.2	23.4±4.7	32.5±6.6	<0.001#
Mean duration of catheterization (day)	1.4±0.28	1.7±0.58	1.6±0.38	0.457
Mean duration of hospitalization (day)	1.9±0.47	2.1±0.36	2.2±0.59	0.348

(\*) Statistical evaluation of chronic diseases between normal, overweight, and obese groups

(#) Statistical evaluation of normal, overweight, and obese groups with respect to the duration of operations

DM: diabetes mellitus; HT: hypertension; VLPP: valsalva leak point pressure

**Table 2. Objective and subjective success rates after the sling operation in the groups classified according to BMI**

Success		Normal (n=26)	Overweight (n=36)	Obese (n=19)	p value
Objective Success	Successful	25 (96.1%)	34 (94.4%)	18 (94.7%)	0.567
	Unsuccessful	1 (3.9%)	2 (5.6%)	1 (5.3%)	0.421
Subjective Success	Successful	24 (92.3%)	34 (94.4%)	18 (94.7%)	0.245
	Unsuccessful	2 (7.7%)	2 (5.6%)	1 (5.3%)	0.198

The patient satisfaction rate evaluated in the postoperative 12<sup>th</sup> month was determined to be 92.3% in the normal group, 94.4% in the overweight group, and 94.7% in the obese group.

There was no statistical difference between the groups with respect to the satisfaction rates ( $p=0.245$ ) (Table 3).

There was no significant difference between all three groups with respect to both preoperative and postoperative complication rates ( $p=0.096$ ) (Table 4).

## Discussion

A number of epidemiological studies show that obesity is a strong risk factor for incontinence.<sup>[11, 12, 15]</sup>

The increased intra-abdominal pressure increases the pressure at the maximum cystometric capacity and decreases the transmission of the pressure, which is induced by Valsalva, from the bladder to the urethra. Consequently, the decreased VLPP contributes to the development of SUI in obese patients. On the other hand, the neurogenic effects on the pelvic floor associated with obesity cause the development of urgency and urge incontinence.<sup>[16]</sup>

However, the results of studies examining the relationship between the surgical outcomes of SUI and obesity are contradictory. In some studies, it was observed that women with a BMI of  $\geq 25$  had a lower surgical success than the others.<sup>[17-19]</sup>

In their study, Heinonen et al.<sup>[20]</sup> compared patients having a BMI  $>30$  and those having a BMI  $\leq 30$  and determined the simi-

lar rates of subjective satisfaction and objective cure between the groups.

Similarly, in their study comparing the outcomes of the midurethral sling procedure according to BMI in women with stress incontinence, Ku et al.<sup>[21]</sup> found no difference between the satisfaction and cure rates.

Rechberger et al.<sup>[22]</sup> revealed that the clinical effectivity of the SUI treatment was not affected by BMI in 269 retropubic and 268 transobturator sling patients.

In our study, the patients undergoing the transobturator tape procedure because of stress incontinence were divided into three groups as normal, overweight, and obese according to their BMI and no difference was determined between the groups with respect to their 1-year subjective satisfaction and objective cure rates.

Higher rates of complication are generally asserted for incisions performed in the pelvic area of the abdomen in obese patients.<sup>[23]</sup>

No precise consensus is found among studies examining the relationship between obesity and the frequency of complications following the SUI surgery.

In the study conducted by Rafi et al.<sup>[24]</sup> to evaluate the outcomes of 147 normal and overweight patients and 38 obese patients undergoing the tension-free vaginal tape procedure, they did not find a significant difference between the cure rates; however, they observed that the development of **de novo** urgency was more frequent in the obese group than the normal and overweight groups. In our study, no significant relationship was determined between the development of **de novo** urgency and obesity.

In the prospective study conducted by Mukherjee et al.<sup>[25]</sup> with 242 women who underwent SUI surgery, they divided these women into three groups according to their BMI and determined no difference between the rates of wound site infection and retropubic hematoma in the obese group.

In two different studies, Lovatsis<sup>[24]</sup> and Rafii<sup>[26]</sup> found no relationship between obesity and bladder injury following SUI surgery.

Skriapas et al.<sup>[27]</sup> followed up 31 female patients having a BMI  $>40$  and 52 patients having a BMI  $<30$  for 18.5 months after the tension-free vaginal tape procedure. Early postoperative complication rates were significantly higher in morbid obese patients.

Although Connolly et al.<sup>[28]</sup> obtained similar success rates in their study, they observed the infection of a postoperative necrotizing surgical wound site in a 53-year-old patient.

**Table 3. Patient satisfaction rates after the sling operation in the groups classified according to BMI**

Satisfaction	Normal (n=26)	Overweight (n=36)	Obese (n=19)	p value
Satisfied	24 (92.3%)	34 (94.4%)	18 (94.7%)	0.245
Unsatisfied	2 (7.7%)	2 (5.6%)	1 (5.3%)	0.198

**Table 4. Postoperative complications in the groups classified according to BMI**

Complication	Normal (n=26)	Overweight (n=36)	Obese (n=19)	p value
Bleeding	0	1	0	
Perforation	0	0	0	
Retention	0	0	0	
Infection	0	1	0	
<b>De novo</b> urgency	1	0	1	
Vaginal erosion	0	0	0	
Total (%)	1 (3.8%)	2 (5.6%)	1 (5.3%)	0.096

Killingsworth et al.<sup>[29]</sup> found no difference between the success rates, patient satisfaction rates, and complication rates of 127 overweight and obese patients who underwent the tension-free vaginal tape procedure according to the BMI.

In this study, we compared the 1-year outcomes and complication rates of 81 patients undergoing the transobturator tape method according to their BMI and found no statistically significant difference between the objective and subjective success rates and perioperative and postoperative complication rates.

The transobturator tape method for the stress incontinence treatment has similar objective and subjective success rates, independent from the BMI.

Although the operation takes a longer time in obese patients, there is no difference with respect to the complication rates.

**Ethics Committee Approval:** Due to the retrospective nature of this study, ethics committee approval was not received.

**Informed Consent:** Due to the retrospective nature of this study, informed consent was waived.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept - Ş.K., H.A.; Design - Ş.K., O.K.; Supervision - H.S.S., Ö.A.; Materials - Ş.K., S.B.; Data Collection and/or Processing - Ş.K., O.K.; Analysis and/or Interpretation - Ş.K., H.A.; Literature Review - Ş.K., O.K.; Writer - Ş.K., H.A.; Critical Review - H.S.S., Ö.A.

**Conflict of Interest:** The authors declared no conflict of interest.

**Financial Disclosure:** The authors declared that this study has received no financial support.

**Etik Komite Onayı:** Retrospektif inceleme olduğundan etik onay alınmamıştır.

**Hasta Onamı:** Retrospektif inceleme olduğundan hasta onamı alınmamıştır.

**Hakem Değerlendirmesi:** Dış bağımsız.

**Yazar Katkıları:** Fikir - Ş.K., H.A.; Tasarım - Ş.K., O.K.; Denetleme - H.S.S., Ö.A.; Kaynaklar - Ş.K., S.B.; Malzemeler - Ş.K., S.B.; Veri toplanması ve/veya işlemesi - Ş.K., O.K.; Analiz ve/veya yorum - Ş.K., H.A.; Literatür taraması - Ş.K., O.K.; Yazıyı yazan - Ş.K., H.A.; Eleştirel İnceleme - H.S.S., Ö.A.

**Çıkar Çatışması:** Yazarlar çıkar çatışması bildirmemişlerdir.

**Finansal Destek:** Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

## References

- Haylen BT, de Ridder D, Freeman RM, Swift SE, Berghmans B, Lee J, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Int Urogynecol J* 2010;21:5-26. [\[Crossref\]](#)
- Stav K, Dwyer PL, Rosamilia A, Schierlitz L, Lim YN, Chao F, et al. Repeat synthetic mid urethral sling procedure for women with recurrent stress urinary incontinence. *J Urol* 2010;183:241-6. [\[Crossref\]](#)
- Delorme E. Transobturator urethral suspension: mini-invasive procedure in the treatment of stress urinary incontinence in women. *Prog Urol* 2001;11:1306-13.
- Delorme E, Droupy S, de Tayrac Ret, Delmas V. Transobturator tape (Uratape). A new minimally invasive method in the treatment of urinary incontinence in women. *Prog Urol* 2003;13:656-9.
- Delorme E, Droupy S, de Tayrac Ret, Delmas V. Transobturator tape (Uratape): a new minimally-invasive procedure to treat female urinary incontinence. *Eur Urol* 2004;45:203-7. [\[Crossref\]](#)
- Dmochowski RR, Blaivas JM, Gormley EA, Juma S, Karram MM, Lightner DJ, et al. Update of the AUA guideline on the surgical management of female stress urinary incontinence. *J Urol* 2010;183:1906-14. [\[Crossref\]](#)
- Taweel WA, Rabah DM. Transobturator tape for female stress incontinence: follow-up after 24 months. *Can Urol Assoc J* 2010;4:33-6. [\[Crossref\]](#)
- Nitti WV. Complications of midurethral slings and their management. *Can Urol Assoc J* 2012;6(5 Suppl 2):S120-2.
- Parazzini F, Colli E, Origgi G, Surace M, Bianchi M, Benzi G, et al. Risk factors for urinary incontinence in women. *Eur Urol* 2000;37:637-43. [\[Crossref\]](#)
- Waetjen LE, Liao S, Johnson WO, Sampsel CM, Sternfield B, Harlow SD, et al. Factors associated with prevalent and incident urinary incontinence in a cohort of midlife women: a longitudinal analysis of data: study of women's health across the nation. *Am J Epidemiol* 2007;165:309-18. [\[Crossref\]](#)
- Melville JL, Katon W, Delaney K, Newton K. Urinary incontinence in US women: a population-based study. *Arch Intern Med* 2005;165:537-42. [\[Crossref\]](#)
- Danforth KN, Townsend MK, Lifford K, Curhan GC, Resnick NM, Grodstein F. Risk factors for urinary incontinence among middle-aged women. *Am J Obstet Gynecol* 2006;194:339-45. [\[Crossref\]](#)
- Noblett KL, Jensen JK, Ostergard DR. The relationship of body mass index to intra-abdominal pressure as measured by multichannel cystometry. *Int Urogynecol J Pelvic Floor Dysfunct* 1997;8:323-6. [\[Crossref\]](#)
- Townsend MK, Curhan GC, Resnick NM, Grodstein F. BMI, waist circumference, and incident urinary incontinence in older women. *Obesity (Silver Spring)* 2008;6:881-6. [\[Crossref\]](#)
- Hannestad YS, Rortveit G, Daltveit AK, Hunskaar S. Are smoking and other lifestyle factors associated with female urinary incontinence? The Norwegian EPINCONT Study. *BJOG* 2003;110:247-54. [\[Crossref\]](#)
- Richter HE, Creasman JM, Myers DL, Wheeler TL, Burgio KL, Subak LL. Urodynamic characterization of obese women with urinary incontinence undergoing a weight loss program: the program to reduce incontinence by diet and exercise (PRIDE) trial. *Int Urogynecol J Pelvic Floor Dysfunct* 2008;19:1653-8. [\[Crossref\]](#)

17. Lee KS, Choo MS, Doo CK, Han DH, Lee YS, Kim JY, et al. The long term (5-years) objective TVT success rate does not depend on predictive factors at multivariate analysis: a multicentre retrospective study. *Eur Urol* 2008;53:176-82. [\[Crossref\]](#)
18. Hellberg D, Holmgren C, Lanner L, Nilsson S. The very obese woman and the very old woman: tension-free vaginal tape for the treatment of stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct* 2007;18:423-9. [\[Crossref\]](#)
19. Stav K, Dwyer PL, Rosamilia A, Schierlitz L, Lim YN, Lee J. Risk factors of treatment failure of midurethral sling procedures for women with urinary stress incontinence. *Int Urogynecol J* 2010;21:149-55. [\[Crossref\]](#)
20. Heinonen P, Ala-Nissilä S, Rätty R, Laurikainen E, Kiilholma P. Objective cure rates and patient satisfaction after the transobturator tape procedure during 6.5-year follow-up. *J Minim Invasive Gynecol* 2013;20:73-8. [\[Crossref\]](#)
21. Ku JH, Oh JG, Shin JW, Kim SW, Paick JS. Outcome of mid-urethral sling procedures in Korean women with stress urinary incontinence according to body mass index. *Int J Urol* 2006;13:379-84. [\[Crossref\]](#)
22. Rechberger T, Futyma K, Jankiewicz K, Adamiak A, Bogusiewicz M, Skorupski P. Body mass index does not influence the outcome of anti-incontinence surgery among women whereas menopausal status and ageing do: a randomised trial. *Int Urogynecol J* 2010;21:801-6. [\[Crossref\]](#)
23. Parnell JP 2nd, Marshall VF, Vaughan ED Jr. Primary management of urinary stress incontinence by the Marshall-Marchetti-Krantz vesicourethropexy. *J Urol* 1982;127:679-82.
24. Rafii A, Daraï E, Haab F, Samain E, Levardon M, Deval B. Body mass index and outcome of tension-free vaginal tape. *Eur Urol* 2003;43:288-92. [\[Crossref\]](#)
25. Mukherjee K, Constantine G. Urinary stress incontinence in obese women: tension-free vaginal tape is the answer. *BJU Int* 2001;88:881-3. [\[Crossref\]](#)
26. Lovatsis D, Gupta C, Dean E, Lee F. Tension-free vaginal tape procedure is an ideal treatment for obese patients. *Am J Obstet Gynecol* 2003;189:1601-5. [\[Crossref\]](#)
27. Skriapas K, Poulakis V, Dillenburger W, de Vries R, Witzsch U, Melekos M, et al. Tension-free vaginal tape (TVT) in morbidly obese patients with severe urodynamic stress incontinence as last option treatment. *Eur Urol* 2006;49:544-50. [\[Crossref\]](#)
28. Connolly TP. Necrotizing surgical site infection after tension-free vaginal tape. *Obstet Gynecol* 2004;104:1275-6. [\[Crossref\]](#)
29. Killingsworth LB, Wheeler TL, Burgio KL, Martirosian TE, Redden DT, Richter HE. One-year outcomes of tension-free vaginal tape (TVT) mid-urethral slings in overweight and obese women. *Int Urogynecol J Pelvic Floor Dysfunct* 2009;20:1103-8. [\[Crossref\]](#)