



Midurethral Slings; Which One in What Patient?

Workshop 2

Monday 23 August 2010, 09:00 – 12:00

Time	Time	Topic	Speaker
09:00	09:05	Opening	Harry Vervest
09:05	09:15	Global changes in the surgical treatment of stress incontinence	Peter Dwyer
09:15	09:30	The value of pre-operative urogynecological history, physical and urodynamic investigation	Harry Vervest
09:30	09:55	Risk factors for failure of Stress Incontinence Surgery: Intrinsic Sphincter Deficiency and Previous Incontinence Surgery	Peter Sand
09:55	10:20	Risk factors for failure of Stress Incontinence Surgery: Detrusor Overactivity and the presence of Mixed Urinary Incontinence	Sigurd Kulseng-Hanssen
10:20	10:50	Break	
10:50	11:15	Performing Stress Incontinence Surgery with concomitant prolapse surgery	Peter Dwyer
11:15	11:45	Individualised treatment: Choosing the best mid-urethral sling procedure, a proposal	Harry Vervest
		Comment by and selection criteria in the USA	Peter Sand
		Comment by and selection criteria in Australia	Peter Dwyer
		Comment by and selection criteria in Norway	Sigurd Kulseng-Hanssen
11:45	12:00	Discussion with the audience	

Aims of course/workshop

Retropubic and transobturator mid-urethral slings seem to perform differently with regard to failure in women with specific underlying pathology like ISD, detrusor overactivity, mixed urinary incontinence or a history of previous incontinence surgery. Also controversy exists whether stress incontinence and prolapse surgery should be carried out simultaneously or done in separate sessions.

In this workshop the following will be discussed: the predictive value of the diagnostic work-up for the success or failure of mid-urethral slings, which parameters predict failure and why, combine or not prolapse and incontinence surgery and how to decide on the best mid-urethral sling in women with and without risk factors for failure.

Educational Objectives

Traditionally prior to embarking on stress incontinence surgery a diagnosis is made on analysing data from urogynecological history, physical and urodynamic investigation. However, a comparison of these data with the outcome of mid-urethral slings (MUS) shows that the predictive value of the diagnostic process to a successful outcome is limited. Nevertheless, certain risk factors for failure do exist and they are different for retropubic and transobturator approaches.



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Also controversy exists as whether in case of co-existing prolapse, MUS should be combined with prolapse surgery or done in separate procedures.

In this workshop scientific data will be presented about which pre-operative parameters are important in selecting the proper MUS and whether MUS should be performed simultaneously with prolapse surgery or not. Aids in deciding and a model for this decision process will be presented.

The value of pre-operative urogynecological history, physical and urodynamic investigation

Harry A.M. Vervest M.D., Ph.D.

R. Marijn Houwert M.D., Ph.D.

Department of Obstetrics and Gynecology

St. Elisabeth Hospital

Tilburg, The Netherlands

Despite that the treatment of Stress Urinary incontinence (SUI) made a lot of progress in the last two decade due to the introduction of mid-urethral slings, the diagnostic process of SUI remained largely unchanged. Urogynecologic history, physical examination and often also urodynamic investigation are performed to confirm the diagnosis or to find contra-indications for a surgical treatment. Nevertheless, a Cochrane review concluded that there was not enough evidence to show whether women with pre-operative performed urodynamics were less likely to be incontinent after treatment than women in whom no urodynamic before treatment was carried out [1]. So the diagnostic gold standards (history, physical and urodynamic investigation) are under debate especially with respect in predicting a successful outcome of surgery and predicting complications.

Houwert et al. studied 29 pre-operative collected variables from anamnesis, physical examination and urodynamic investigation in relation to the outcome of 437 Tension-free Vaginal Tape (TVT) and Transobturator Tape (TVT-O / Monarc) procedures [2]. Only a history of mixed incontinence or previous incontinence surgery, or detrusor overactivity on the urodynamic investigation was statistically significant related to a lower success rate (as independent risk factors).

Comparing TVT and TOT it was found that these risk factors for failure have a different influence between retropubic and transobturator performed procedures. Women with mixed urinary incontinence or detrusor overactivity had a lower failure rate after a TOT procedure, while women with a history of previous incontinence surgery or with an intrinsic sphincter deficiency did significantly better after TVT [3] (figure 1).

Previous incontinence surgery was also found to be associated with lower success rate by Meschia et al (4) and Chen et al (5). A maximum urethral closure pressure below 20

cm H₂O was observed as risk factor for failure by Miller et al (6) and Schierlitz et al (7). The presence of mixed urinary incontinence was not found in other comparing trials to be a risk factor (Poreno et al, 8). Nevertheless, Kulseng Hanssen et al. found in a larger series of 1113 patients with mixed urinary incontinence much lower success rates after 3 years (compared to the overall success rate of TVT, 9). Although detrusor overactivity is a known risk factor for failure of SUI surgery, Botros et al (10) could not confirm the finding of Houwert et al (figure 2).

It is surprising that just a few parameters from the many that we routinely collect, are independently related to success or failure of a mid-urethral sling. Perhaps it is also surprising that there are apparently differences in risk factors for retropubic and transobturator slings.

An explanation could be that in comparison with the TOT procedures, the sling axis of the TVT is more perpendicular to the urethral axis, creating more circumferential compression of the urethra. More compression of the urethra, and hence obstruction, is related to the development of detrusor overactivity. Therefore TOT, being theoretically less obstructive, is less likely to exacerbate urinary leakage in and might perform better in women with mixed urinary incontinence and detrusor overactivity.

Previous incontinence surgery is a known risk factor for failure of both TVT and TOT procedures [11,12]. Nevertheless after multivariate analysis, previous incontinence surgery appeared to be an independent risk factor only in the TOT group. The explanation might be that patients with previous incontinence surgery benefit from restoring pubo-urethral ligament support and increased urethral resistance as provided by the TVT. Results indicate that this increased urethral resistance is also of advantage in women with an intrinsic sphincter deficiency.

Therefore women with previous incontinence surgery or low urethral closure pressure might benefit from a Tension-free Vaginal Tape procedure whereas patients with mixed urinary incontinence or detrusor overactivity are better off with a Transobturator Tape procedure.

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Figure 1

Risk factors for <i>failure</i> of retropubic and transobturator mid-urethral slings					
		TVT (n = 214)		TOT (n = 173)	
		success rate	P value	success rate	P value
Type of incontinence	SUI	88 %	0.004	74 %	ns
	MUI	58 %		79 %	
Detrusor overactivity	absent	84 %	0.006	76 %	ns
	present	45 %		67 %	
Previous incontinence surgery	absent	84 %	ns	78 %	0.015
	present	63 %		50 %	
MUCP < 20 cm H ₂ O	absent	82 %	ns	76 %	0.002
	present	85 %		20 %	

RM Houwert, PL Venema, AE Aquarius, HW Bruinse, JP Roovers, HAM Vervest; AJOG 2009




Figure 2

Risk factors for <u>failure</u> of MUS comparison of several studies												
percentages are success rates; red boxes denote statistically significant differences	Previous incontinence surgery				MUCP < 20 cm H ₂ O				Mixed Urinary Incontinence			
	TVT		TOT		TVT		TOT		TVT		TOT	
	present +	absent -	+	-	+	-	+	-	+	-	+	-
Houwert N=384 1 yr; subjective	63%	84%	50%	78%	85%	82%	20%	76%	58%	88%	79%	74%
Meschia N=301 1 yr; subjective	72%	89%										
Chen N=54 9 m; subjective			57%	93%								
Miller N=145 3 m; Cough Stress T					97%	96%	84%	98%				
Schierlitz N=164 6 m; urodynamic SUI					79%		55%					
Porena N=148 2 yr; subjective									51%	83%	70%	82%
Botros N=224 3 m; UDI											de novo: 32% resolution: 40%	de novo: 22% resolution: 48%

Houwert et al. AJOG 2009; Meschia et al. IJU 2007; Chen et al. IJU 2007; Miller et al. AJOG 2006; Schierlitz et al. Obstet Gynecol 2008;
Porena et al. Eur Urol 2007; Botros et al. NeuroUrol Urodyn 2007

Risk Factors For Failure of Midurethral Slings: The Effect of Intrinsic Urethral Function, Urethral Hypomobility & Previous Failed Surgery

Peter K. Sand, M.D.

Professor of Obstetrics & Gynecology

Director, Evanston Continence Center

University of Chicago, Pritzker School of Medicine

Intrinsic Sphincteric Deficiency as a Risk Factor for Failed Transobturator Midurethral Slings:

Guerette et al, Int J Urogynecol 19: 97-102, 2008

12/31 Women (39%) with Low Urethral Closure Pressure (LPU) Failed Transobturator Midurethral Slings

2/39 Women (5%) with Higher Closure Pressures Failed Transobturator Midurethral Slings

Miller, et al. Am J Ob Gynecol 2006

Retrospective Analysis with ROC Curves Determined a Cut-Point of 43 cm H2O for MUCP was best for Segregating Failures with Transobturator Midurethral Slings

7/44 with Urethral Closure Pressure < 44 cm H2O Failed Transobturator Midurethral Slings

1/37 with Urethral Closure Pressure < 44 cm H2O Failed Retropubic Midurethral Slings

TOT 6 times more likely to fail than TVT in women with MUCP \leq 42 cm H2O

Schierlitz et al, Obstet Gynecol 112: 1253-61, 2008

RCT of TVT vs. TOT in Women with USI and ISD

32/71 (45%) of Women with ISD Failed on Urodynamics 6 Months After TOT

O'Connor, et al Neurourol Urodynam, 25(7):685-8, 2006

Overall Cure 65% With TVT-O (N=43)

25% Cure Rate if VLPP < 60 cm H2O

77% Cure Rate if VLPP > 60 cm H2O

TOT was 12 times more likely to result in SUI recurrence if the LPP was less than 60 cm H2O

Paick et al, J Urol 172: 1370-3, 2004

Effect of Low VLPP in 225 Women Having TVT Procedures

82% Cure with Low VLPP

93% Cure with Normal VLPP (P= 0.013)

Anast et al, Can J Urol 15: 4153-7, 2008

Low VLPP (\leq 60 cm H2O) was not a Risk Factor for Failed TOT

Juma and Brito Neurourol Urodynam, 2006

No difference in outcomes based on Valsalva LPP < 60 cm H2O

Urethral Hypomobility & Prior Failed Incontinence Surgery as Risk Factors

Meschia et al Int Urogynecol J 18(4):419-22, 2007

Retrospective Analysis (N=301)

Mean F/U: 32 months

Only Urethral Hypomobility & Prior Continence Surgery were Significantly Associated with Failure of TVT

Cure rate dropped from 89 % to 70 %.

Stav et al, Int Urogynecol J 21: 149-155, 2010
Logistic Regression Analysis of 1112 Women with Midurethral Slings at Mean F/U of 50 Months
Identified Low Urethral Closure Pressure (≤ 20 cm H₂O) as Independent Risk Factor for Failure of Midurethral Slings (OR 1.9)
Prior Failed Incontinence Surgery was also an Independent Risk Factor (OR 2.2)

Urethral Hypomobility as a Risk Factor

Karateke et al, Aust N Z J Obstet Gynecol 49: 99-105, 2009
Prospective RCT of TVT vs. TVT-O
TVT & TVT-O Cured USI in 94% of Women with Hypermobility but only 61.5% and 50% of Women Without Hypermobility

Paick et al, Urology 70: 246-50, 2007
Did Not Find Hypomobility to be a Risk Factor for the Failure of Transobturator Midurethral Slings

Urethral Hypomobility and Intrinsic Sphincteric Deficiency as Risk Factors

Clemons and Lasala, Int Urogynecol J, 2007
N = 36 with 21 month mean f/u
Risk Factors for Failure of Midurethral Slings
MUCP < 25 cm H₂O
Straining Urethral Angle < 35 degrees
Success rate with 1 risk factor: 50%
Success rate with 2 risk factors 17%

Haliloglu et al, Int Urogynecol J 21: 173-8, 2010
Prospective 2-Year Trial of Effect of ISD and Urethral Hypomobility on Transobturator Midurethral Slings
N= 65
ISD with Hypermobility (N=18): 75% Cure Rate
ISD with Hypomobility (N= 16): 53% Cure Rate (p= 0.04)
Normal LPP with Hypermobility (N=31): 86% Cure Rate
Hypomobility was the Greatest Risk for Failure of Transobturator Midurethral Slings

The data are often contradictory, but the most prominent risk factor for failure of midurethral slings is hypomobility. While many feel that ISD is a significant risk factor for those women having transobturator midurethral slings, the data are not as clear. Previous Failed Surgery Those with ISD and hypomobility are likely at the highest risk of failing both transobturator and retropubic midurethral slings and these women may be best treated with periurethral bulking injections.

Risk factors for failure of stress incontinence surgery. Mixed urinary incontinence and detrusor over activity.

451 women with subjectively defined mixed incontinence were divided into those who were most bothered with stress incontinence (69%), those who were most bothered by urge incontinence (7%) and those who were equally bothered by stress and urge incontinence (24%). All women had a TVT operation performed. Mean 9 months postoperatively 42% were cured, 40% improved, 10% had unchanged and 8% had increased urge incontinence. Satisfaction with the operation decreased significantly with increasing preoperative urge incontinence. Gram postoperative leakage during 24 hours pad test increased significantly with increasing preoperative urge incontinence. Kulseng-Hanssen S et al.

Percent women dry 5 year after TVT operation was found to be 81.0% in stress incontinent (n = 189) and 54.9% in mixed incontinent women (n = 82). Ankardal M et al.

Women with stress incontinence (n = 580) had a persistent cure rate of 85% from 2 to 8 years after the TVT operation, while mixed incontinent women (n = 112) had a persistent cure rate of 60% up to 4 years postoperatively. The cure rate declined steadily to 30% from 4 to 8 years after surgery. Holmgren C et al.

1113 women with subjectively defined mixed incontinence had follow up at mean 7 and 38 months. They were divided into those who were most bothered with stress incontinence (66%), those who were most bothered by urge incontinence (7%) and those who were equally bothered by stress and urge incontinence (27%). In women most bothered by stress incontinence and those equally bothered by stress and urge incontinence, urge incontinence was significantly more bothersome after 38 than 7 months. There was no significant difference in urge incontinence in women most bothered by urge incontinence after 7 and 38 months. Kulseng-Hanssen S et al.

Performing multiple logistic regression on 1113 women with subjectively defined mixed incontinence subjective cure was found to be poorer with increasing preoperative urge incontinence (OR 0.78; 95%CI 0.73, 0.85 P = 0.001) in women older than 56 years (OR 0.69; 95%CI 0.53, 0.91 P = 0.008) and in women leaking when rising from bed (OR 0.70; 95%CI 0.53, 0.93 P = 0.014). Kulseng-Hanssen S et al.

305 women with preoperative detrusor over-activity (DO) had also postoperative urodynamic testing. Participants with persisting DO were older than those with resolved DO. The overall objective cure for DO was 31.5%. Sling type was strongly related to persistence of DO which persisted in 53% after TOT, 64% after TVT, 66% after SPARC and 86% after the bladder neck sling procedure. In the multiple logistic regression model only sling type P < 0.001 and maximum cystometric capacity P < 0.001 remained statistically significant predictors of persistent postoperative DO. Gamble TL et al

On multivariate analysis maximal urethral closure pressure was associated with a 0.9 - fold risk of persistent urge incontinence after the procedure in 73 women with mixed urinary incontinence (OR 0.94; 95% CI 0.88 to 0.99, p = 0.030). Low maximal urethral closure pressure may thus be associated with persistent urge incontinence after the tension-free vaginal tape procedure in women with mixed urinary incontinence. Paick JS et al.

35 consecutive women with DO and urodynamic stress incontinence (USI) undergoing a TVT had pressure-flow studies pre and postoperatively. There was resolution of OAB symptoms in 51%; the persistence of OAB symptoms was predicted by a significant decrease (20.0 to 14.0 mL/s) in the maximum flow rate after the TVT (P = 0.027) and a significant increase in the detrusor pressure at maximum flow after the TVT (P = 0.04). Women with persistent DO

on cystometry had a significantly lower ($P = 0.02$) maximum flow rate before the TVT (mean 19.3 ml/sec) than those with no persistent DO (mean 26.9ml/sec). Duckett JR and Basu M

In a multi centre randomized trial Palva K et al compared 130 TVT women with 125 TVT-O patients. They did not find significant difference in postoperative de novo urgency or number of women who needed anti cholinergic medication at 36 months between the 2 groups.

In a meta-analysis Latthe PM et al found de novo urgency symptoms equivalent in TOT and TVT-O women (OR 0.89; 95% CI 0.54 – 1.86).

The meta-analysis of Sung VW et al. found 5 randomized trials where de novo irritating voiding symptoms were equivalent after TOT and TVT operations (OR 0.54 ;95% CI 0.26 – 1.1). In 8 cohort studies they found less de novo irritating voiding symptoms after TOT than after TVT operations Pooled OR for novo irritating voiding symptoms was 0.44 (95% CI 0.24 – 0.80). When only studies with more than 1 year follow-up were included the difference disappeared. Pooled (OR 0.48; 95% CI 0.232 – 1.00)

72, 22 and 50 mixed incontinent women had respectively the following operations performed TVT, SPARC and TOT. No significant difference was found in postoperative cure of subjective urge urinary incontinence (UUI). (Respectively 81.9%, 86.4% and 82%). Studying women from all operations a decrease in maximum urethral closure pressure was associated with an increased likelihood of treatment failure OR 0.974 95% CI 0.950 – 0.998, $P = 0.034$ and uninhibited detrusor contractions were associated with a 3.4 fold risk of treatment failure of UUI (OR 3.351; 95% CI 1.031 – 10.887, $P = 0.044$) Paick JS et al

In a case control study Duckett JR and Basu M compared 34 mixed incontinent TOT women with 34 mixed incontinent TVT women. The women were matched for age. 29.4% of the women in the TOT group needed a repeat continence procedure due to stress incontinence compared with none in the TVT group. There was no significant difference in the need for antimuscarinic medications between the 2 groups (OR 1.61; 95% CI 0.62 – 4.23)

Meschia M et al found 10%, while Krofta L et al found 24% de novo urge incontinence in respectively 91 and 82 stress incontinent women who had TVT-Secur operations performed.

De novo urgency was found in 9% (n 75) and 20% (n 56) in women who had MiniArc and Monarc procedures respectively performed. The difference was not statistically significant. De Ridder D et al.

De novo subjective UUI was found significantly more in the TVT (33%, n=99) and SPARC (17%, n=52) than in the Monarc group (8%, n=125) $P = 0.04$. 14 and 16% of women with preoperative UUI who underwent respectively TVT and SPARC had worsening of their postoperative UUI, while only 6% of the Monarc group did $P = 0.02$. Resolution of subjective UUI did not differ between the groups, $P = 0.081$. Botros SM et al.

In 23 women with low pressure motor urge defined as detrusor pressure ≤ 15 cm H₂O were significantly more likely than in the 18 women with higher pressure motor urge to resolve urinary urge symptoms after placement of pubovaginal slings and cystourethropexy. Schrepferman CG et al.

In the latest Cochrane Database Syst Review from 2009, dealing with Minimally invasive synthetic suburethral sling operations for stress urinary incontinence in women, no difference in de novo urge incontinence or urge incontinence and detrusor over-activity were found

postoperatively between women who had TVT and SPARC operations, TOT and TVT-O operations, obturator and retropubic operations. Ogah J et al.

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Prof Peter Dwyer

Department of Urogynaecology

Mercy Hospital for Women and Melbourne University

Melbourne

Stress incontinence in women with Pelvic Organ Prolapse (POP)

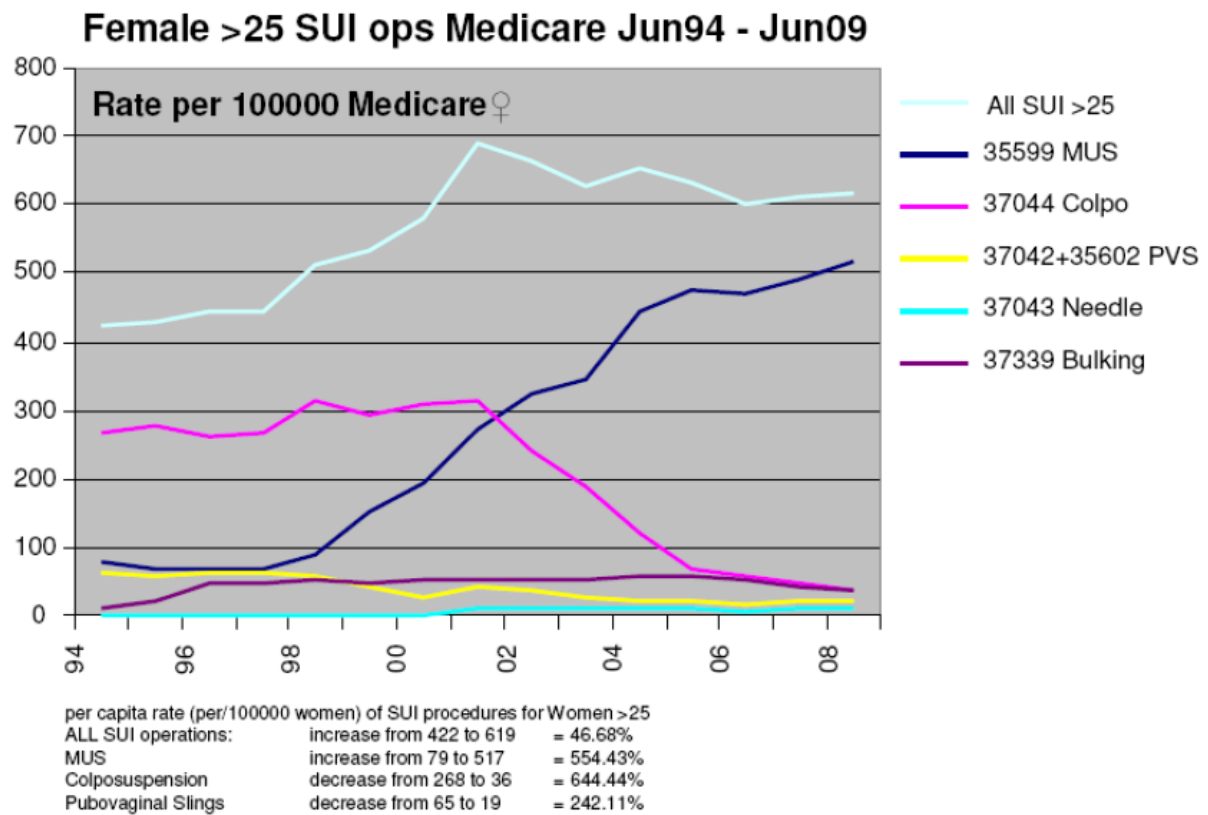
Aim of session is to discuss

- What type of SI procedure can be performed with POP surgery
- Mid-urethral slings have established predominance but what type of MUS (PPL?)
(retropubic, TOT, or mini-sling)
- Should SI surgery be performed concomitantly or separately from POP surgery; or before or after
- Occult stress incontinence
What is it; and what should we do about it?

Potential effect of prolapse surgery on urinary function

- straightening of urethrovesical angle
- denervation resulting in urinary tract dysfunction
- urethral fibrosis and narrowing
- change pressure transmission to urethra.
- loss of compression of urethra by cystocele, enterocele or rectocele.

SUI Surgery Trends Medicare Australia Jan 94 – Dec 08



Current sales of MUS devices in the US (2009)

- Retropubic slings 30%
- Obturator slings 50%
- Single incision mini-slings 20%

Place of urodynamics in women with POP

- women with urinary symptoms
- women w/o urinary symptoms

possible findings -occult SI; voiding dysfunction; abnormal bladder or urethral function (low MUCP or bladder overactivity)

Comparison of urinary symptoms preoperatively in the abdominal (n=47 women) & vaginal (n=48 women) treatment groups (Maher, Dwyer et al *Am J Obstet Gynecol* 2004)

Urodynamic diagnosis	Abdominal	Vaginal	P value *
Stress urinary incontinence	14 (30%)	15 (31%)	1.00
Overactive bladder	13 (28%)	14 (29%)	1.00
Voiding dysfunction	13 (28%)	9 (19%)	.34
Occult SI	5 (11%)	6 (13%)	.19

Concomitant sling and POP surgery? Our results - YES

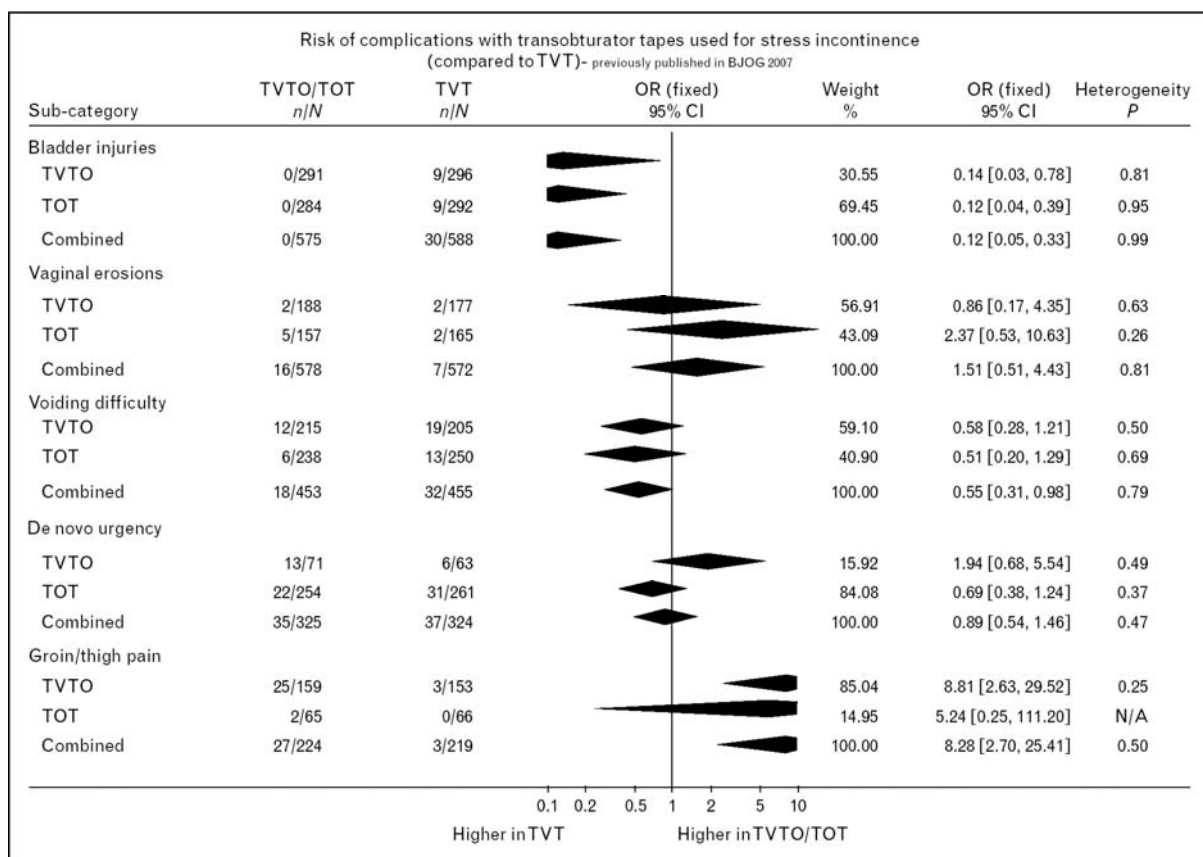
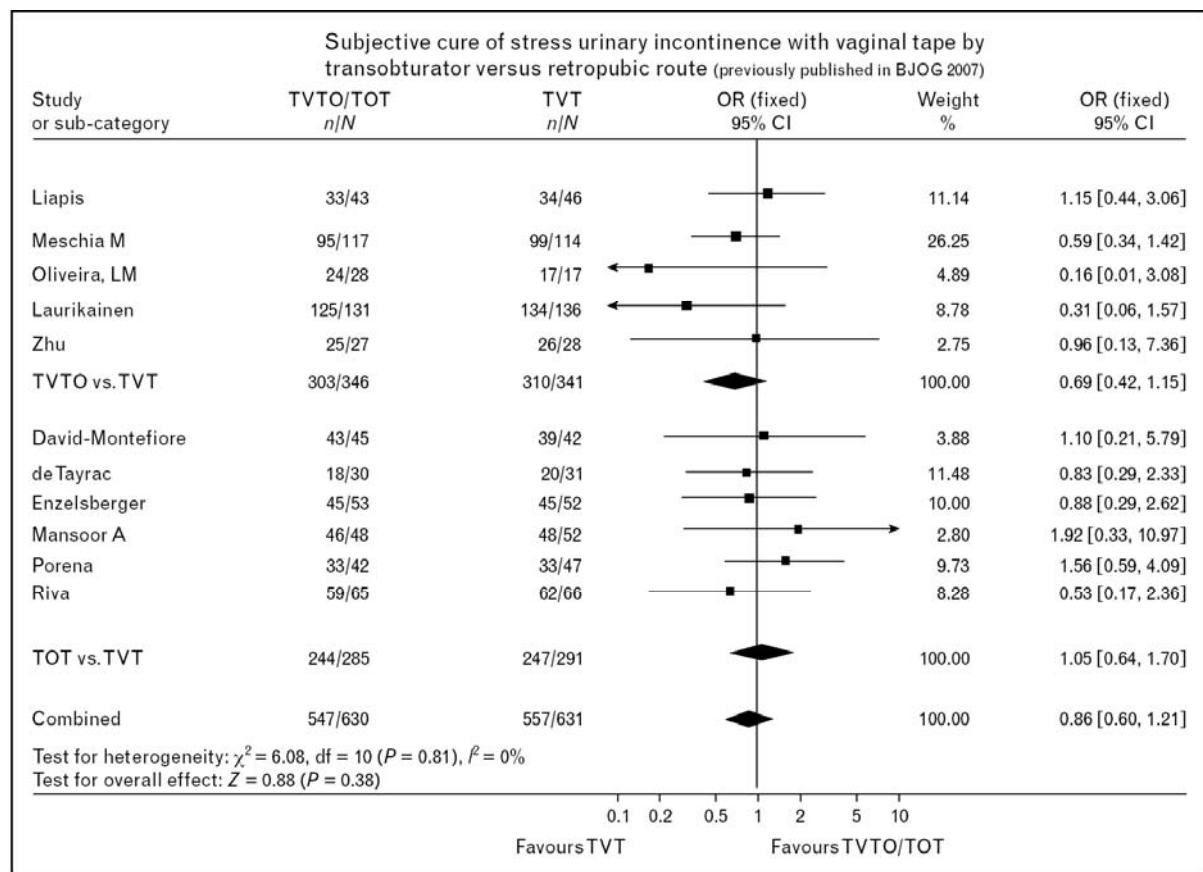
- 1225 consecutive women with urodynamic USI had a synthetic MUS (955 retropubic, 270 transobturator) at our institution between 1999 and 2007.
- At a mean follow-up of 50±24 months (range 12-114) the subjective cure rate was 84.7%.
- Concomitant prolapse surgery decreased the likelihood of surgical failure after MUS (OR 0.6). (38% vs 27%) **<0.01**

BMI>25, mixed urinary incontinence, previous continence surgery, intrinsic sphincter deficiency, and diabetes mellitus are independent risk factors for midurethral sling failure (Stav et al *J Urol* 2009)

	OR	Significance	95% CI
BMI >25	2.9	$p<0.001$	1.8–4.5
Urodynamic mixed urinary incontinence	2.4	$p<0.001$	1.6–3.6
Previous anti-incontinence surgery	2.2	$p<0.001$	1.5–3.2
Intrinsic sphincter deficiency	1.9	$p<0.01$	1.2–2.9
Diabetes mellitus	1.8	$p<0.05$	1.2–2.7
Concomitant prolapse surgery	0.6	$p<0.05$	0.4–0.8

Which MUS?

Comparative studies retropubic versus transobturator slings (effectiveness and safety)



A randomized controlled study to compare tension free vaginal tape (TVT) and Monarc trans-obturator tape in the treatment of women with urodynamic stress incontinence (USI) and intrinsic sphincter deficiency (ISD) (*Schierlitz et al. 2010 IUGA/ICS*)

Results (TVT (retropubic)	Monarc (transobturator)
N=162	80	82
USI at 6/12 postop	13 (16.3%)	23 (28%)
Repeat sling procedure after 6/12	0	7 (7xTVT)
Repeat sling at 2-4 yrs (mean 37 months)	1 (1.2%)	15 (18%)

Occult stress incontinence

presence of stress incontinence on examination or urodynamic stress incontinence in women without symptoms of stress incontinence

In a woman with grade 3-4 post-hysterectomy vaginal vault prolapse with no incontinence, would you perform urodynamics or place a MUS (RECENT SURVEYS) YES

	UK	ANZ
Pre-operative urodynamics:	36 %	47 %
MUS procedure for occult USI:	54 %	46 %

(UK. Jha et al; ANZ. Vanspauwen et al)

A prospective randomised controlled study comparing vaginal prolapse repair with and without Tension free Vaginal Tape (TVT) in women with symptomatic pelvic organ prolapse and occult stress incontinence (OSI). (*Schierlitz et al. 2010 IUGA/ICS*)

	Sling	No sling	P value
N=80	37	43	
USI 6/12 postop	3 (8%)	21(48%)	P = 0.0001
Insertion of sling as secondary procedure during 2-4 yrs FU	1	4 (9%)	
VAS > 80 (= cure)	90 median	95 median	NS
QOL questionnaires			NS

These results indicate that in women with occult SI and prolapse a clinician would have to insert 12 TVT slings to prevent one woman needing a sling 2-4 years postoperatively.

Conclusions

- Since 1999 midurethral sling procedures have replaced the Burch colposuspension as the stress incontinence procedure of choice.
- No difference in short-medium term subjective results between retropubic and TOT slings except in ISD SI
- Concomitant prolapse and MUS surgery has a high success rate
- Place of urodynamics in women with POP needs clarification
- occult SI –placement of routine MUS not indicated
- No evidence to support routine use of MUS in POP surgery

Individualized treatment: Choosing the best mid-urethral sling procedure.

TVT is better than TVT-O and TOT in a Norwegian national database.

A multicenter prospective cohort study including 27 gynaecological departments in Norway was undertaken. Patients that underwent stress incontinence surgery with TVT, TVT-O or TOT from January 2004 till January 2008 and completed a postoperative follow up were included. Patients that underwent concurrent vaginal prolapse surgery were excluded. All patients were subject to a preoperative evaluation including a validated Stress and Urge Incontinence Questionnaire, a 24-h pad test and a standardized stress test. A stress index and an urge incontinence index were estimated from the questionnaire. The stress incontinence index is derived from three questions regarding what kind of situations, how often and to what extent stress incontinence is experienced. In the same way, the urge incontinence index is derived from two questions regarding how often and to what extent urge incontinence is experienced. The indices are ranged from 0 to 12 and from 0 to 8 respectively. A high score is associated with severe leakage and bother. The choice of surgical approach was left to the performing surgeon. Postoperatively the women repeated the questionnaire, the 24-h pad test and the stress test. Perioperative complications were recorded by the surgeons.

5942 patients were recruited. 4692 women had a TVT, 843 women had a TVT-O and 407 women a TOT performed. Respectively 91,3%, 86,8% and 90,0% of these women completed a postoperative follow-up at mean 9 months. No significant difference in mean age was found. Small significant differences were found in BMI and numbers of months to follow-up when comparing TVT with TVT-O and TOT, we estimated this to be of no clinical importance. The preoperative urodynamic variables between the three groups were similar, with exception of a significant higher urge incontinence score in the TVT-O group compared to the TVT group. At follow up, there were significant differences in all outcome values between the TVT and TVT-O groups. This was consistent after adjusting for preoperative difference in urge incontinence score. When comparing the TVT group with the TOT group, there were statistically differences in all outcome values except leakage during 24-h test and urge incontinence index. Perforation of the bladder occurred more often in TVT operation, than in TVT-O and TOT operations. Urinary retention was less often experienced after the TVT-O operations and haematoma occurred less often after TOT operations.

In the hands of surgeons from 27 different hospitals, a significant better subjective and objective outcome is obtained with the TVT than with the TVT-O operation. Subjective stress incontinence, bother and leakage during stress test were larger and satisfaction with the operation was poorer in women who had a TOT than in women who had a TVT operation. Patients who had TVT-O and TOT operations performed were less likely to suffer from peri-operative complications.

Our national incontinence registry demonstrated better objective and subjective outcomes obtained after TVT operations for urinary stress incontinence than after the TVT-O and TOT operations. However, the TVT operation seems to be associated with a higher risk of perioperative complications. Departments who have poorer outcome with the TVT-O or TOT operations than with the TVT operations should consider improving their technique, or reintroducing the TVT operation.