

## SONOGRAPHIC APPEARANCE OF TRANSOBTURATOR SLINGS: IMPLICATIONS FOR FUNCTION AND DYSFUNCTION

### Hypothesis / aims of study

Suburethral transobturators slings have become very popular as anti-incontinence procedures and are accepted as first line procedures, largely equivalent to the TVT. However, recurrent stress incontinence (SI), de novo urge incontinence (UI), and voiding dysfunction (VD) remain a problem in some patients. Wide-weave polypropylene slings are highly echogenic and easily identified using translabial ultrasound (US). The aim of this study was to determine whether postoperative SI, UI and VD are associated with distinct sonographic findings.

### Study design, materials and methods

We conducted a prospective clinical audit of patients after Monarc suburethral sling with or without concomitant prolapse surgery between June 2005 and December 2008. The preoperative work-up included a standardised interview, a clinical examination including ICS POP-Q assessment, uroflowmetry, multichannel Urodynamic testing and 4D Pelvic Floor ultrasound, supine and after voiding, using Voluson 730 expert systems. The postoperative assessment was identical apart from the fact that we did not repeat urodynamic testing. Every patient was seen at least once postoperatively, with the most recent assessment used for analysis. At least two volume datasets (at rest and on Valsalva) were archived per patient and analysed offline, with the help of proprietary software, at a later date and blinded against all clinical data. The following sonographic parameters of tape location and configuration were assessed in the midsagittal plane (see Figure 1):

- 1.) minimal gap between symphysis pubis and Monarc sling on maximal Valsalva(1),
- 2.) the angle formed by cranial and caudal aspects of the tape at rest and on Valsalva,
- 3.) location of sling along the urethra at rest, described as percentile of urethral length,
- 4.) width and height of bladder neck funnelling on maximal Valsalva.

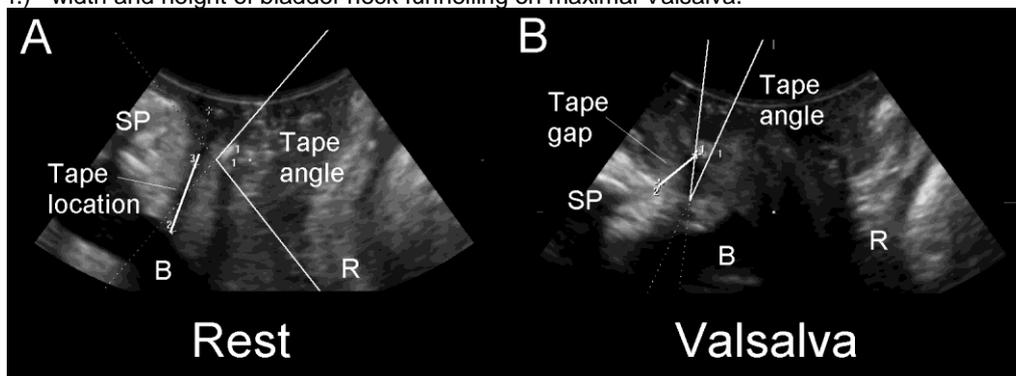


Fig. 1: Parameters of tape location and configuration. Fig. 1A shows tape location along the urethra and tape angle at rest, Fig. 1B the tape angle on Valsalva and the gap between symphysis pubis and tape on Valsalva. SP= symphysis pubis, B= bladder, R= rectal ampulla.

Table 1 shows repeatability figures in a test-retest series (n=20), giving intraclass correlation coefficient (ICC), limits of agreement and bias according to Bland/ Altman. All parameters demonstrated acceptable repeatability except funnelling (excluded from further analysis).

Parameter	ICC (CI) or Kappa	Limits of Agreement	Bias
Gap betw. tape and symphysis pubis	0.85 (0.46-0.95)	-1.4 to 3.4	1
Tape angle at rest	0.9 (0.77-0.96)	-34.9 to 47.2	6.2
Tape angle on Valsalva	0.9 (0.78-0.96)	-42.6 to 33.2	-4.7
Funnelling of urethra	0.24 (-0.13 – 0.5)	n/a	n/a
Location of tape along urethra (centile)	0.81 (0.61- 0.92)	-8.9 to 11.3	1.2
Urethral length	0.66 (0.33-0.84)	-0.8 to 0.5	-0.2

Table 1: Repeatability of US parameters . ICC= Intraclass correlation, CI= confidence Interval.

### Results

Of 98 patients operated on between June 2005 and December 2008, 6 had had a previous sling and were excluded, leaving 92 datasets. Mean age at first assessment was 55.5 (range, 27.2–86.8); all but one patient had delivered vaginally. Median parity was 3. Thirty-eight (41%) had had a previous hysterectomy and 11(12%) a previous anti-incontinence procedure. All but 5 patients (95%) were symptomatic for SI. Eighty (87%) complained of UI, 28 (30%) of symptoms of VD. Mean body mass index (BMI) was 29 (range, 19.8-45.9).

All patients were diagnosed with Urodynamic SI; 18 (20%) had detrusor overactivity and 24 (26%) urodynamic VD. Forty-five underwent concomitant prolapse surgery. The mean follow up interval was 0.96 years (range, 0.04-2.88). Eighty women (87%) were satisfied with the operative result and 86 (93%) reported subjective cure or improvement. Of 87 patients with preoperative SI, 69 (79%) reported subjective cure while 18 (21%) still experienced SI. Of those, 13 (15%) reported improvement and 4(5%) considered themselves the same. One patient felt worse than before. Eighty women (87%) reported UI symptoms preoperatively. Forty-one (51%) felt cured, 30 (38%) improved, and 7(9%) no different. Two had worsened UI symptoms postoperatively, and two patients developed de novo UI. Of 28 patients with preoperative symptoms of VD, 8 (29%) had persistent symptoms while 14 others reported de novo VD symptoms. There was no erosion. One patient with a preoperatively diagnosed atonic detrusor was self-catheterizing at follow-up.

The mean gap between symphysis pubis and the tape was 11.1 (range, 5.9-16.9) mm. The tape angle at rest varied from 10 to 180 degrees with a median of 113.5. Respective figures on Valsalva are 6 to 180 degrees (median 48.5), and the difference is highly significant ( $P < 0.0001$ ). Mean urethral length was 3.14 cm, mean tape location was at the 62<sup>nd</sup> centile (range, 40<sup>th</sup> to 87<sup>th</sup> centile). Patients who reported failure to cure SI had a significantly wider gap between symphysis pubis and sling ( $P=0.032$ ). We also found a significant association between persistent or worsening UI postoperatively and a wider gap ( $P=0.006$ ). Patients with de novo symptoms of voiding dysfunction had significantly smaller gap ( $P=0.014$ ). Neither tape angle at rest and on Valsalva nor tape location was associated with symptoms of SI, UI or voiding dysfunction postoperatively. When we repeated this analysis in a subgroup of women without concomitant prolapse surgery, a lower tape angle was also associated with SI and UI cure (see Table 2).

Parameter	All Monarcs (n=92)			Monarcs only (n=47)		
	SI postop	UI postop	VD postop	SI postop	UI postop	VD postop
Gap (mm)	<b>12.3 vs. 10.8*</b>	<b>11.9 vs 10.5**</b>	<b>9.9 vs 11.3*</b>	<b>13.3 vs. 11.2*</b>	12.2 vs 10.9	10.4 vs 11.8
Angle at rest (°)	121 vs 104	114 vs 113	114 vs 114	<b>180 vs 94*</b>	134 vs 87	102 vs 128
Angle on Valsalva (°)	56 vs 47	60 vs 46	48 vs 49	<b>152 vs 44**</b>	<b>76 vs 32*</b>	44 vs 55
Tape location (centile)	63 vs 62	62 vs 63	61 vs 63	59 vs 61	59 vs 63	60 vs 61

Table 2 : Association between US parameters and postoperative symptoms.

\* $P < 0.05$ , \*\*  $P < 0.01$ .

#### Interpretation of results

This prospective audit has shown the Monarc to be highly effective in improving or curing symptoms of SI (94%) and UI (89%) at a mean follow-up of one year. US parameters of tape location and function are highly repeatable. The gap between tape and symphysis pubis on Valsalva, as well as tape angle, are associated with SI and UI cure. The tighter a sling, the more likely was cure of both SI and UI. It appears that the association between overcorrection and irritative symptoms known from colposuspensions (2) and transretzius slings may not apply in transobturator slings. This accords with the observation that overcorrection is highly unlikely on mathematical modeling (3). As regards tape location, we have again confirmed that it seems to play no significant role in our population.

#### Concluding message

Ultrasound parameters of tape 'tightness' are highly reproducible and associated with both SI and UI cure. Tighter sling placement seems to be advantageous for the cure of both SI and UI, implying that overcorrection is unlikely when using a Monarc sling.

#### References

#### References

1. Int Urogynecol J 2006; 17: 566-569
2. Br J Obstet Gynaecol 2002, 109: 402- 412
3. Gynäkol-Geburtsh. Rundschau 2005, 45: 257-261

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Was informed consent obtained from the patients?	No