

# SONOGRAPHIC ASSESSMENT OF READJUSTABLE SLINGS. DIFFERENCES FROM MID-URETHRAL SLINGS.

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## Introduction

The mid-urethral slings (MUS) are the most common surgical treatment for women with stress urinary incontinence (SUI). The sonographic pattern of the MUS is well established in the literature and correlates with symptoms and complications. The dynamic interaction of the urethra with MUS during the Valsalva is a determinant factor of surgical success, requiring bladder neck mobility with MUS to perform the concordant movement (urethral kinking) which could be assessed by pelvic floor ultrasound (PF-US). However, different alternatives exist for women with SUI and hypomobile urethra, such as **readjustable slings** (RAS). RAS is a closed system with a suburethral sling fixed to a device located in the suprapubic region, which allows sling tension regulation after placement and which achieves urethral closure extrinsically compressing it during Valsalva. Due to its special characteristics, making it capable of coapting the lumen of hypomobile urethras, RAS is usually **reserved for patients with complex SUI and hypomobile urethra**. There is a lack of information related to the RAS sonographic pattern in the literature.

We hypothesize that postoperative sonographic parameters of MUS and RAS differ due to different mechanisms of action. The aim of this study was to define the postsurgical sonographic parameters of the RAS compared with those previously described in the literature for transobturator and retropubic MUS approaches, as well as the correlation with symptoms.

## Methods and Materials

We carried out an observational, prospective multicenter study of women undergoing SUI surgery with transobturator-MUS (TOT-MUS), retropubic-MUS (RT-MUS) and RAS between January 2012 and June 2020 in two university hospitals.

The preoperative evaluation included a symptom evaluation with the Incontinence Questionnaire-Short Form (ICIQ-UI-SF), a 3-day bladder diary, a 24 hour-pad weight, a pelvic examination, a cough stress test and an ICS standard urodynamic test (ICS-SUT). At the postoperative follow up, one-year post-surgery, patients were assessed using ICIQ-UI-SF, 24 hour-pad weight test, an ICS-UCST and an optional ICS-SUT.

A PF-US was performed to all patients at one-year follow-up visit. A concordant movement was considered when the RAS achieved extrinsic compression of the urethra during Valsalva, compressing the posterior urethral wall, coapting the lumen, and displacing the urethra anteriorly. The movement was considered discordant if extrinsic compression was not observed.

The **primary outcome** was the association between the sonographic parameters of RAS and patients' symptoms and functional tests.

The **secondary outcome** was the comparison of the postsurgical sonographic parameters of RAS with those previously described in the literature for MUS.

## Results

We included 165 patients (55 RAS, 55 TOT-MUS, 55 RT-MUS). The demographic data and presurgical symptoms of the three groups of patients included in the study are shown in **Table 1**.

Postsurgical incontinence Questionnaire-Short Form scores were significantly higher in patients with **persisting bladder neck funneling** [15.0 (3.9) vs 10.6 (6.7);  $p=0.020$ ] and in those with **discordant movement of RAS on Valsalva** [14.6 (5.7) vs 10.3 (6.7);  $p=0.045$ ].

We observed that RAS was more often located in the proximal urethra and farther from the lumen than MUS (**Table 2, Figure 1**).

**Table 2.** Postsurgical sonographic parameters of the suburethral slings in the three groups of patients included in the study.

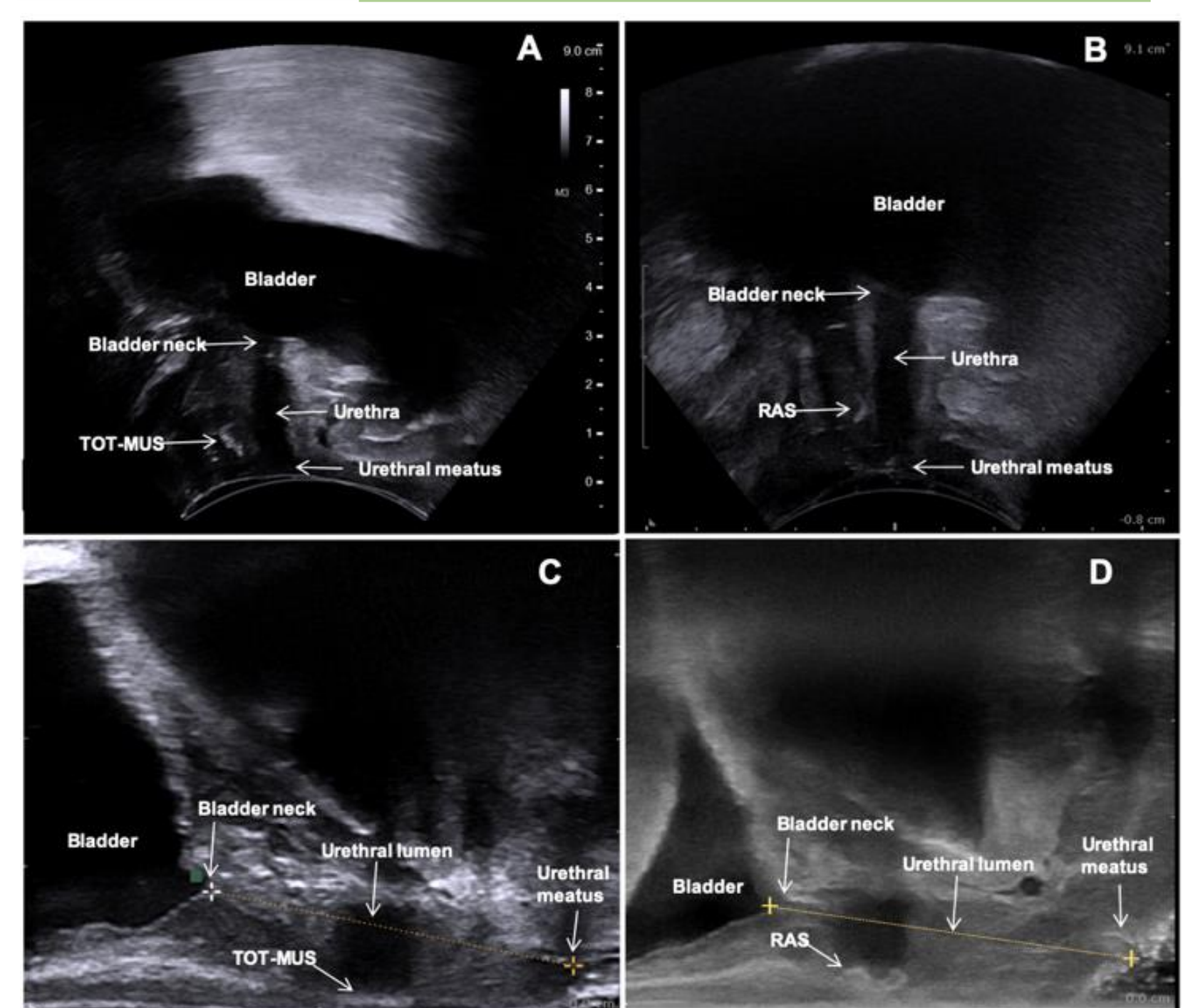
	TOT-MUS (n=55)	RT-MUS (n=55)	Remeex®- RAS (n=55)	p-value
- Sling position (urethral percentile), mean (SD)	49.8 (8.6)	50.4 (7.1)	39.9 (12.2)	< 0.001
- Distance of the sling to the urethral lumen (mm), mean (SD)	3.7 (1.0)	4.2 (0.9)	4.7 (1.6)	< 0.001
- Symmetrical sling, N (%)	54 (98.2%)	54 (98.2%)	52 (94.5)	1.000
- Movement on Valsalva, N (%)				
- Concordant	53 (96.4%)	52 (94.5%)	39 (70.9%)	< 0.001
- Discordant	2 (3.6%)	3 (5.5%)	16 (29.1%)	

**Table 1.** Demographic data, presurgical symptoms, presurgical urodynamic data and presurgical sonographic data of the three groups of patients included in the study.

	TOT-MUS (n=55)	RT-MUS (n=55)	Remeex®- RAS (n=55)	p-value
<b>Demographic</b>				
Age, mean (SD)	57.9 (8.5)	61.0 (10.21)	69.4 (8.9)	< 0.001
BMI (Kg/m <sup>2</sup> ), mean (SD)	27.0 (4.1)	26.8 (4.4)	29.0 (4.1)	0.011
Menopause, N (%)	40 (72.7%)	48 (87.3%)	53 (96.4%)	0.002
Previous anti-incontinence surgery, N (%)				
-None	54 (98.2%)	52 (94.5%)	13 (23.6%)	< 0.001
-Yes (>1 surgery)	1 (1.8%)	3 (5.5%)	42 (76.4%)	
<b>Symptoms</b>				
ICIQ-UI-SF, mean (SD)	15.4 (2.4)	16.3 (2.8)	18.4 (2.1)	< 0.001
Severity of UI according to ICIQ-UI-SF, N (%)				
-Moderate (6-12)	0	1 (1.8%)	0	
-Severe (13-18)	45 (81.8%)	40 (72.7%)	24 (43.6%)	< 0.001
-Very severe (19-21)	10 (18.2%)	14 (25.5%)	31 (56.4%)	
Urgency incontinence symptoms, N (%)	28 (50.9%)	35 (63.6%)	45 (81.8%)	0.002
24-hour-pad weight test, mean (SD)	31.8 (46.7)	35.9 (40.6)	274.6 (303.9)	< 0.001
<b>Urodynamic</b>				
MUCP, mean (SD)	65.7 (22.4)	39.33 (20.4)	35.1 (16.7)	< 0.001
Detrusor overactivity, N (%)	8 (14.5%)	4 (7.3%)	6 (10.9%)	0.475
<b>Ultrasound</b>				
Urethral mobility, N (%)				
-Hypermobile	48 (87.3%)	44 (80%)	0	
-Normomobile	7 (12.7%)	11 (20%)	0	< 0.001
-Hypomobile	0	0	55 (100%)	
Bladder neck funneling, N (%)	0	6 (10.9%)	10 (18.2%)	0.513

TOT-MUS: transobturator mid-urethral sling, RT-MUS: retropubic mid-urethral sling, RAS: readjustable mid-urethral sling, SD: standard deviation.

2D-TPUS: 2 dimensional-transperineal ultrasound; EVUS: endovaginal ultrasound.



**Figure 1.** Static sonographic parameters of MUS (A) and RAS (B) evaluated by 2D-TPUS (probe 8802, FleshFocus 400, BK Medical) in the mid-sagittal plane; and by high-frequency EVUS (probe 8838) of MUS (C) and RAS (D).

## Conclusions

The results of postsurgical PF-US suggest that the presence of discordant movement on Valsalva or persistence of bladder neck funneling in women with complex SUI and hypomobile urethra who underwent RAS (Remeex®) surgery are two parameters that correlate with the persistence of SUI after surgery. In these women, RAS is more frequently located in the proximal urethra and farther from the urethral lumen at rest in comparison with MUS. Future investigations are needed to demonstrate the role of these parameters as sonographic markers of RAS failure.