

## ANAL SPHINCTER AND LEVATOR FINDINGS ON 4D TRANSPERINEAL ULTRASOUND IN PATIENTS PRESENTING WITH SEVERE PELVIC FLOOR PROBLEMS

### Hypothesis / aims of study

The anal sphincter can be visualized by 4D transperineal ultrasound when assessing women with previous injury, such as in obstetric anal sphincter tears (1). Furthermore, it is not uncommon to observe previously unknown anal sphincter damage in women with other pelvic floor problems, such as prolapse or urinary incontinence. It is quite plausible that the two are interconnected and are caused by a common factor, namely labor trauma. Levator avulsion injury is a recognized form of labor trauma and has been described in women with urogynecological problems (2). We undertook a retrospective observational study to evaluate anal sphincter sonographic parameters and levator morphology in women with pelvic floor problems attending a tertiary referral clinic.

### Study design, materials and methods

We reviewed 269 datasets of women with pelvic floor problems who underwent 4D transperineal ultrasound in addition to the standard urogynecological evaluation at a tertiary referral centre. Ultrasound volume and raw datasets obtained with a GE Kretz Voluson 730 system were reviewed for sphincter characteristics and levator morphology, and analysed offline with 4D View software (GE Kretz). The following parameters were assessed: the external (EAS) and internal (IAS) anal sphincters were measured at the 12, 3, 6, and 9 o'clock positions in transverse section at a distance of 10 mm proximal to the anal portal; the lengths of the EAS at the 12 o'clock position and the IAS at the 6 o'clock position in the longitudinal section; the anorectal angle; signs of sphincter damage were noted and classified by type and location; hiatal dimensions were assessed at rest, maximal Valsalva and maximal pelvic floor contraction (PFMC); levator avulsion trauma was assessed qualitatively and quantified using tomographic ultrasound imaging (TUI) (3). Statistical analysis was performed with SPSS software. A p-value<0.05 was considered statistically significant.

### Results

There were 269 complete datasets for analysis. The mean age was 54 (range 21-88) and mean BMI 26.1 (range 17.3-39). The median parity was 3 (range 0-12), and 26% had previously undergone a hysterectomy. Women presented with symptoms of prolapse (60.7%), stress urinary incontinence (24%), urge urinary incontinence (13.5%) and other varied complaints (12.5%). Fecal and flatus incontinence were reported in 18.3% and 42.5% of women, respectively.

Anal sphincter parameters at transverse section are given in Table 1. In longitudinal section, the mean EAS length at the 12 o'clock position was 16.8±3.4 mm, and the mean IAS length was 34±5.8 mm in the posterior aspect. The mean anorectal angle was 129±17 degrees.

**Table 1:** Anal sphincter parameters at transverse section in means and standard deviations in mm. EAS- External anal sphincter, IAS- Internal anal sphincter.

	3 o'clock	6 o'clock	9 o'clock	12 o'clock
EAS	4.8±1	4.7±1.3	4.9±1.2	6.2±2
IAS	3.3±0.9	2.7±0.9	3.2±0.9	2.9±0.8

Signs of sphincter damage were the "half moon sign" (3%), absent mucosal star (10.4%), EAS discontinuity at the 12 o'clock position (8.9%), interrupted IAS (6.7%), longitudinal and transverse sphincter defects (4.4% and 6.3%, respectively). Defects were predominately seen in the right upper quadrant.

The incidence of levator avulsion injury was 60% (right avulsion – 14%, left avulsion – 7% bilateral avulsion – 39%) with a median TUI score of 6. A complete bilateral avulsion (a score of 16) was found in 23.6%. The association between sphincter parameters and levator hiatal dimensions with avulsion injury is depicted in Table 2.

**Table 2:** Sphincter parameters (in mm) and levator characteristics (in cm) in patients with and without levator avulsion defects in means and standard deviations (independent sample t-tests). PFMC=pelvic floor muscle contraction, EAS-External anal sphincter, IAS-Internal anal sphincter.

Measure	No avulsion	Avulsion	P value
Hiatal area at rest	19.2±5.3	22.2±6	<0.001
Hiatal area at Valsalva	26.5±8.4	32.1±9.2	<0.001
Hiatal area at PFMC	16.4±5	19.3±5.5	<0.001
EAS longitudinal length	16.9±3.1	15.5±3.8	0.015
IAS longitudinal length	32.8±4.8	32.5±5.6	0.768
Anorectal angle	125±17	133.2±15.7	0.003

<b>EAS width 12 o'clock</b>	6.47±2.1	6.1±2	0.15
<b>IAS width 12 o'clock</b>	2.67±0.6	2.71±0.9	0.723
<b>IAS width 3 o'clock</b>	3.2±0.8	3±0.8	0.251
<b>IAS width 6 o'clock</b>	2.6±0.8	2.3±0.78	<b>0.066</b>
<b>IAS width 9 o'clock</b>	3.1±0.8	2.8±0.87	<b>0.041</b>

A larger hiatal area at Valsalva (but not at rest or PFMC) was associated with a larger anorectal angle ( $p=0.035$ ), but this was not found to affect anorectal symptoms. Other sphincter measurements, in both longitudinal and transverse section seem to be shorter in women with avulsion injury. A shorter EAS length at the 12 o'clock position was found to be associated significantly with fecal and flatus incontinence,  $p=0.006$  and  $p=0.017$  respectively, while a shorter IAS in the posterior aspect was associated with flatus incontinence ( $p=0.007$ ). None of the other parameters were significantly associated with symptoms of fecal or flatus incontinence.

#### Interpretation of results

Anal sphincter damage is not uncommon in women attending a tertiary referral urogynecological centre. This study showed that several of these sphincter findings co-exist with levator avulsion injury. This finding is not surprising when considering that anal sphincter injury and levator trauma share a common etiology, i.e. labor. There seems to be a longitudinal shortening and a transverse constriction of the anal sphincter, along with a wider anorectal angle, in women with levator avulsion injury, which may partly explain anorectal symptoms.

#### Concluding message

A wide anorectal angle and a shorter and constricted anal sphincter are more common in women with pelvic floor problems and levator avulsion injury.

#### References

1. Ultrasound Obstet Gynecol 2006; 27:119-23
2. BJOG 2006; 113: 225-30
3. Ultrasound Obstet Gynecol 2007; 29:329-334

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<b><i>What were the subjects in the study?</i></b>	<b>HUMAN</b>
<b><i>Was this study approved by an ethics committee?</i></b>	<b>Yes</b>
<b><i>Specify Name of Ethics Committee</i></b>	<b>Sheba Medical Centre Institutional Review Board</b>
<b><i>Was the Declaration of Helsinki followed?</i></b>	<b>Yes</b>
<b><i>Was informed consent obtained from the patients?</i></b>	<b>Yes</b>