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## IN VIVO ASSESSMENT OF LEVATOR ANI MUSCLE ELASTIC PROPERTIES.PRELIMINARY RESULTS.

### Hypothesis / aims of study

The pathophysiology of pelvic floor disorders remains poorly understood, in particular the impact of intrinsic women's characteristics and the role of pregnancy. Elastic properties of pelvic floor muscles may be related with the risk of pelvic floor disorders but there was no non invasive technique described in the literature to measure these properties *in vivo* (1,2).

The aim of the study was to evaluate the feasibility of *in vivo* assessment of elastic properties of *levator ani* muscle using shear wave elastography in women in various conditions.

### Study design, materials and methods

Non-pregnant women were evaluated in lithotomy position using shear wave elastography technology with an Aixplorer device © (Supersonic Imagine). The proximal part of levator ani muscle (pubic insertion) was identified in 2D classical ultrasound mode using a translabial linear 8MHz probe (3). A region of interest containing the *levator ani* muscle was identified, corresponding to the region in which shear wave elastography analysis were performed. In this region of interest, the contours of the *levator ani* muscle were drawn in order to perform an exclusive assessment of *levator ani* muscle and not the adjacent tissues (Figure 1).

Figure 1: Right levator ani muscle's assesment in Valsalva maneuver.



Measurements of the shear modulus were performed at rest and Valsalva maneuver for both right and left sides. We obtained a Young's modulus measure (representing the relationship between stress and strain in a material) in kPa, which was to be divided

by 3 to calculate the shear modulus (in kPa), more appropriate for anisotropic tissues such as muscles. Greater is the shear modulus, stiffer is the tissue. We recorded dynamic continuous acquisition from rest to maximal Valsalva. The highest shear modulus value during the acquisition was considered for the analysis.

We reported the number of complete successful assessments, mean shear modulus values and a comparison of shear modulus during each times of the acquisition (Wilcoxon test). An ethical committee approved the study protocol.

Table 1: Changes in levator ani muscle's shear modulus from rest to maximal Valsalva.

	Mean shear modulus at rest, in Kpa (SD)	Mean shear modulus at Valsalva, in Kpa (SD)	Comparison rest versus Valsalva p <sup>a</sup>
Right levator ani	16 (6.9)	35.4 (13.9)	< 0.005
Left levator ani	17.1 (7.6)	37.6 (15.1)	< 0.005

<sup>a</sup> Wilcoxon test

### Results

12 women were included. Their mean age was 31±2.6 years, mean body mass index was 28±7.4kg.m<sup>-2</sup>. They were all parous women with a mean delay since the last delivery of 14±1.6 months. All examinations were successfully completed for assessments at rest. We reported 2 failures for Valsalva assessments with a lost of visibility of *levator ani* muscle during the maneuver. These two failures occurred in women with the highest mean body mass index (37.7 and 42.2 kg.m<sup>-2</sup>). Mean shear modulus for each sequence and comparison between rest and Valsalva were reported in Table 1.

### Interpretation of results

The present study is the first that demonstrates the feasibility to measure *in vivo* the elastic properties of women's *levator ani* muscle using the shear wave elastography. We reported an increase of muscle stiffness during the transition from rest to Valsalva maneuver. To investigate the role of pelvic floor elastic properties in pelvic floor disorders genesis, these data needs to be confirmed on larger populations of women with and without pelvic floor disorders.

### Concluding message

This technique could be very relevant to describe changes that occur in pelvic floor elasticity during pregnancy and the impact of these changes on the mode of delivery and the risk of pelvic floor disorders.

### References

1. Int Urogynecol J.2017.DOI: 10.1007/s00192-016-3252-9
2. Prog Urol.2016;26;385-94
3. Int Urogynecol J.2009;20;807-811

### Disclosures

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