

## EFFECT OF PELVIC FLOOR AND TRANSVERSE ABDOMINAL MUSCLE MAXIMAL VOLUNTARY CONTRACTIONS ON PELVIC FLOOR'S ULTRASOUND BIOMETRIC PARAMETERS IN WOMEN WITH STRESS URINARY INCONTINENCE: PRELIMINARY RESULTS.

### Hypothesis / aims of study

Previous studies (1) describe a coordinated and simultaneous activity between pelvic floor and abdominal muscles, especially transverse abdominal muscle (TA), which seems to favor urinary continence mechanisms.

Thereby, we hypothesized that TA maximal voluntary contraction presents effect on pelvic floor ultrasound biometric parameters similarly when performed pelvic floor muscles (PFM) maximal voluntary contraction. The aim of this study was to determine whether bladder neck position, genital hiatus area and pubo-rectal muscle thickness change during PFM and TA maximal voluntary contraction when compared at rest, in women with predominant stress urinary incontinence (SUI) symptoms.

### Study design, materials and methods

A clinical, transversal and controlled study was carried out after approval of the Research Ethics Committee. Initially, it was recruited 39 women and investigated if they fulfilled the study eligibility criteria, as well as if they had predominant SUI. SUI symptoms were checked using the International Consultation on Incontinence Questionnaire Urinary Incontinence - Short Form (ICIQ UI-SF). Eight of these women did not fulfill the inclusion criteria due to PFM strength grade 0 or 1 (n=3), presence of predominant urgency urinary incontinence (n=1), previous surgery for SUI and pelvic organ prolapse grade III or greater (n=4).

Thus, 31 women participated in the study. At first, the participants were taught how to correct contract PFM and TA. Then, they were evaluated by 3D transperineal ultrasound using the *GE Voluson E8 Expert*<sup>®</sup> equipment and *RAB4-8L* transducer. The ultrasound images were collected during rest, PFM maximal voluntary contraction and TA maximal voluntary contraction. In each situation three biometric parameters were analyzed: bladder neck position, genital hiatus area and pubo-rectal muscle thickness (calculated from an average of right and left muscle thickness), which were compared among the proposed situations.

Statistical analysis was performed using Kolmogorov-Smirnov, ANOVA for repeated measures and Tukey-Kramer post-test, adopting a significance level of 5%.

### Results

Most participants were white, married and had completed college degree. Participants' mean age was 51.6 ( $\pm 8.2$ ) years old and body mass index was 24.6 ( $\pm 5.5$ ) kg/m<sup>2</sup>. ICIQ-UI SF average score was 15 ( $\pm 3.6$ ).

All biometric parameters were significantly different between rest and PFM maximal voluntary contraction (p<0.05). Only pubo-rectal muscle thickness showed a significant statistical difference between the measurements obtained during rest and TA maximal voluntary contraction (Table 1).

**Table 1** – PFM' ultrasound biometric parameters during rest, PFM maximal voluntary contraction and TA maximal voluntary contraction.

	Rest M (SD)	PFM MVC M (SD)	TA MVC M (DP)	Difference among all situations <sup>1</sup>	Difference among each situation <sup>2</sup>
<b>Bladder neck position (cm)</b>	2.7 (0.3)	3.0 (0.4)	2.8 (0.3)	<b>p=0.0001*</b>	Rest x PFM MVC <b>p&lt;0.001*</b> Rest x TA MVC p>0.05
<b>Genital hiatus area (cm<sup>2</sup>)</b>	13.8 (3.2)	10.5 (2.5)	12.7 (3.4)	<b>p&lt;0.0001*</b>	Rest x PFM MVC <b>p&lt;0.001*</b> Rest x TA MVC p>0.05
<b>Pubo-rectal muscle thickness (cm)</b>	0.7 (0.2)	0.9 (0.1)	0.8 (0.2)	<b>p&lt;0.0001*</b>	Rest x PFM MVC <b>p&lt;0.001*</b> Rest x TA MVC <b>p&lt;0.05**</b>

Data presented in mean (M) and standard deviation (SD). PFM MVC = Pelvic floor muscles maximal voluntary contraction; TA MVC = Transverse abdominal muscle maximal voluntary contraction; PFM = Pelvic Floor Muscles; TA = Transverse abdominal muscle; cm = centimeter; cm<sup>2</sup> = square centimeter. <sup>1</sup>ANOVA for repeated measures. <sup>2</sup>Tukey-Kramer post test. \*p<0.001. \*\*p<0.05.

### Interpretation of results

Several authors discuss the relationship between PFM and TA. There are indications that TA thickness correlates directly with PFM electromyography activity (2), as well as TA isolated contraction promotes bladder neck elevation in women without pelvic floor disorders (1). However, other authors (3) argue that PFM contraction obtained from TA contraction is significantly lower and does not generate significant changes in genital hiatus area when compared to direct PFM contraction.

These preliminary results demonstrated a significant difference for bladder neck position, genital hiatus area and pubo-rectal muscle thickness between rest and PFM maximal voluntary contraction. Only pubo-rectal muscle thickness showed a significant difference between rest and TA maximal voluntary contraction. However, is still necessary to continue this study for elucidate the effects of TA maximal voluntary contraction on pelvic floor anatomical structures that involves urinary continence mechanisms, allowing a clinical practice based on evidence.

#### Concluding message

In conclusion, pelvic floor muscles' maximal voluntary contraction caused a significant difference in all analyzed ultrasound biometric parameters when compared with their measurements during rest. In contrast, during transverse abdominal maximal voluntary contraction only pubo-rectal muscle thickness increased significantly when compared with its measurement at rest, without presenting significant effect on bladder neck position and genital hiatus area measurements.

#### References

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