



# IS THERE A DIFFERENCE IN THE CO-ACTIVATION OF MUSCLES TRANSVERSUS ABDOMINIS / INTERNAL OBLIQUE AND PELVIC FLOOR DURING PREGNANCY?



Pereira L<sup>1</sup>, Botelho S<sup>1,2</sup>, Marques J<sup>1</sup>, Lanza AH<sup>1</sup>, Herrmann V<sup>1</sup>, Palma P<sup>1</sup>, Riccetto C<sup>1</sup>.

<sup>1</sup> UNICAMP, <sup>2</sup> UNICAMP, UNIFAL.

Departamento Uroginecologia e Obstetrícia

Faculdade de Ciências Médicas - Universidade Estadual de Campinas - UNICAMP, CEP 13083-887, Campinas, SP, Brasil.

**Hypothesis / aims of study:** Sapsford et al. (2001)<sup>1</sup>, Neumann & Gill (2002)<sup>2</sup> and Bø (2004)<sup>3</sup> have demonstrated the recruitment of the transverse abdominus muscles / internal oblique (Tra / IO) during contractions of the pelvic floor muscles (PFM) in young individuals. This study aims at evaluating, through surface electromyography, the co-activation during abdominopelvic exercises of maximal voluntary contraction of Tra / IO and PFM in primiparous pregnant women compared to nulliparous women.

**Study design, materials and methods:** Clinical, prospective, observational and controlled study.

**Subjects:** 45 women, mean age of 24.52 (± 4.6) years and mean body mass index of 24.62 (± 2.45) divided into two homogeneous groups: (G1) 20 nulliparous women without symptoms of dysfunction of the PFM; (G2) 25 primiparous pregnant women with mean gestational age of 30.49 weeks. (Hartley test Hc = 3.47 for age and Hc = 2, 14 for BMI).

**Exclusion criteria:** Prior abdominal or pelvic surgery, pelvic organ prolapse, diabetes, hypertension, neurological abnormalities, myopathy, chronic lung diseases, presence of urinary tract infection; physically active, high impact training of the pelvic floor and / or training of the abdominal muscles, body mass index (BMI) ≥ 30 kg/m<sup>2</sup>.

**Evaluation methodology:** Patient standing: sanitation of the abdominal region and surface electrodes (disposable, 3M<sup>®</sup>) were placed on the Tra/IO muscle region at two centimetres of the iliac crest, towards the pubic region.

Patient in supine position with knees and hips flexed and feet flat on the table: The probe (Physio-Med Services<sup>®</sup>) was inserted manually by the researcher, with the aid of hypoallergenic KY gel (Johnson's & Johnson's<sup>®</sup> - Brazil), and metal parts in contact with the side walls of the vagina.

Both sensors (abdominal and perineal) were connected to the electromyographer (EMG<sup>®</sup> System, Brazil, model 400C) that transmitted their electrical signals in microvolts to a notebook, where the data was stored and a software provided by the manufacturer was used for analysis.

**Electromyographic evaluation protocol (EMG):** Three requested isometric, voluntary and maximal pelvic floor contractions, recorded by the endovaginal probe (channel 1). Three voluntary maximal contractions of the Tra / IO muscles were also recorded (channel 2). For each requested contraction there was a rest period. The electrical activity from both muscles (PFM and Tra / IO), was simultaneously recorded.

During the electromyographic data analysis, five seconds of each registered contraction were selected together with the average of three RMS (*Root Mean Square*). The statistical test used for the electromyographic data analysis was ANOVA (Variance Analysis) with Orthogonal Contrast Test with significance level of 1 %.

## Results

Exercises	p
Tra / IO response during maximal PFM	0,0007***
PFM response during isometric exercise abdominal (Tra / IO)	0,00001***

\* Orthogonal Contrast Test

\*\*\*Significant value considering p≤0,001

**Interpretation of results:** The importance of the co activation between Tra/IO and PFM muscles in physiological conditions was already reported by many authors<sup>1,2,3</sup>.

There is no other study for which the aim was clarifying the behavior of Tra/IO and PFM muscles in pregnancy as well as the adaptations posed by that. It was found through our electromyography study that there is simultaneous motor response, arising from the co-activation of Tra / IO and pelvic floor muscles when voluntary contractions are requested.

The nulliparous group has shown homogeneous whereas the pregnant women group showed no co activation of those muscles. These findings allow us to infer that pregnancy itself can influence the physiology of the muscle, preventing the abdominopelvic synergy.

**Concluding message:** Co-activation between the muscles transversus abdominis / internal oblique pelvic in nulliparous women without complaints of pelvic floor dysfunction. Or pregnancy did not show co-activation between the muscles transversus abdominis / internal oblique and pelvic floor.

## REFERENCES

1. Sapsford RR et al. Co-activation of the abdominal and pelvic floor muscles during voluntary exercises. *NeuroUrol and Urodyn* 2001; 20: 31-42.
2. Neumann P, Gill V. Pelvic floor and abdominal muscle interaction: EMG activity and Intra-abdominal pressure. *International Urogynecology Journal* 2002; 13: 125-32.
3. BØ K. Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work? *Int Urogynecol Journal* 2004; 15: 76-84.

