739

Da Roza T[1], Duarte S[2], Mascarenhas T[2], de Araujo M[3], Natal Jorge R[1]
1. *IDMEC - Faculty of Engineering, University of Porto, Porto, Portugal,* ***2.*** *Faculty of Medicine, São João Hospital - University of Porto, Portugal,* ***3.*** *Federal University of São Paulo, São Paulo, Brazil*

STUDY OF THE ALTERATIONS IN THE LEVATOR HIATUS BY PELVIC FLOOR ULTRASOUND IN YOUNG SPORT STUDENTS: A PRELIMINAR STUDY

<u>Hypothesis / aims of study</u>

Urinary incontinence is traditionally regarded as a problem affecting older multiparous women and related to pregnancy and vaginal delivery. However, recent studies have suggested that there is a surprisingly high incidence of urinary incontinence in young, nulliparous women who have participated in high impact sport [1].

Some authors suggest that this dysfunction is caused by a change in function or in the morphology of the pelvic floor muscles. Based in the theory that the abdominal muscles and pelvic floor muscles have a synergistic relationship, it is highly probable that the pelvic floor would be activated during sports and the muscles would be trained, leading to a muscle hypertrophy. Therefore if changes in pelvic floor morphology occur, it is probably that they happen in women who practices high impact sport. The aim of the present study was to define the difference in levator ani hiatus morphology and levator anatomy by ultrasound in women who practice high impact sport when compared to low impact sport.

<u>Study design, materials and methods</u>

Seven nulliparous sport students participated in this study. The sport students were divided into two groups: 03 practiced gymnastics (high impact) and 04 practiced swimming (low impact). All participants perform high levels of physical activity - classified according to the International Physical Activity Questionnaire - Short Form (IPAQ-SF) questionnaire [2] - and were asymptomatic for pelvic floor dysfunction.

Translabial 3D/4D ultrasound images of the pelvic floor were obtained with women in dorsal lithotomy position, using a GE Kretz Voluson 730 EXPRT with 7- 4MHz transducer. The acquisition angle was set at the transducer maximum of 70º. Volumes were acquired at rest and during Valsalva with images in sagittal and axial plane.

Biometry of the levator hiatus was measured in the axial plane after the plane of minimal hiatus dimensions was set in the mid-saggital plane. This plane is defined as the minimal distance between the hyperechogenic inferoposterior margin of the symphysis pubis and the hyperechogenic anterior border of the puborectalis muscle just posterior to the anorectal angle, forming a sling around the rectum (Figure 1a) [3]. This minimal diameters was then utilized to determine the minimum anteroposterior (AP) and lateral diameters of the hiatus as well as the hiatal area (Figure 1b).In the axial view, we measured the maximum diameters of the pubovisceral muscle in two bilaterally localizations at the level of maximal muscle thickness (Figure 1c) [3].

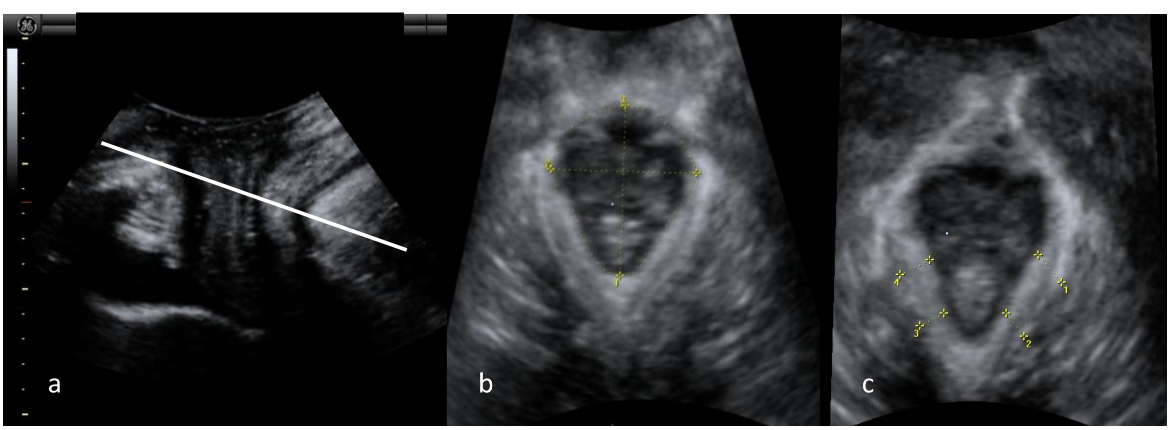

Figure 1: Translabial pelvic floor ultrasound, in mid-sagittal showing the location used for determining the minimal hiatal dimensions (a); levator hiatus area, AP and lateral diameter at rest and Valsalva (b): measurement of pubovisceral muscle thickness at rest (c).

SPSS Version 18 was used for statistical analysis. Student's t-test and Non- parametric Mann-Whitey *U* test were applied. Differences were considered significant for *P* values ≤ 0.05.

<u>Results</u>

All the participants in this study were nulliparous. Subjects in both groups did not differ by age; low impact sport students had a mean age 19.2±0.5 versus 20.3±0.3 for high impact women (p=0.11). The mean age of menarche was 12.0±0.0 vs. 12.0±0.6, in low and high impact, respectively (p=0.62). Also no difference was found in BMI 21.3±0.6 vs. 22.2±1.9 for low and high impact group (p=0.72).

In two participants, datasets on Valsalva maneuver were excluded due the volumes were technically inadequate. Consequently, hiatal area and diameters on Valsalva maneuver was available for 03 (low impact) and 02 (high impact) sport students. Table 1 displays the results of measurements in the axial plane.

Parameter	Low Impact	High Impact	P-Value
Pubovisceral muscle diameter (axial)	0.9±0.1	0.8±0.1	0.434
Levator hiatus at rest (AP diameter) (cm)	5.4±0.2	5.0±0.6	0.444
Levator hiatus at rest (LR diameter) (cm)	3.8±0.4	4.3±0.8	0.328
Hiatal area at rest (cm^2)	13.6±1.9	15.2±3.0	0.289
Levator hiatus at Valsalva (AP diameter) (cm)	5.6±1.0	5.6±1.6	0.956
Levator hiatus at Valsalva (LR diameter) (cm)	4.1±0.3	5.2±0.4	0.05*
Hiatal area at Valsalva (cm^2)	17.8±2.6	24.4±0.1	0.05*

AP (anteroposterior); LR (lateral diameter).

Interpretation of results

Measurements of muscle diameter showed no differences between the two groups. However, due to constantly increased intra-abdominal pressure this could lead to a functional adaptation in the form of hypertrophy. Thus, one would anticipate that the pelvic floor of sport students' needs to be much stronger than in the normal population to counteract these increases. Therefore, it is necessary more studies with a control group. Both groups showed similar biometric values at rest, with no statistically significant values (p>0.05). In contrast with the hiatal area and lateral diameter on Valsalva, the high impact group showed results statistically significant higher. This might be attributed to their participation in high-impact exercise. This study demonstrated in this group of young nulliparous sport students a Hiatal area the 14.3±2.3 cm^2 at rest and 20.5±4.8 cm^2 on Valsalva maneuver. This data shows higher values when compared with young nulliparous women in other studies.

Concluding message

Our preliminary study showed differences on the biometry measurements between high-impact and low impact sport students during Valsalva maneuver. It appears likely that high-impact exercise can influence in the biomechanics of the pelvic floor muscles. Further anatomical, functional, and biomechanical investigations in different levels of the exercises are needed in order to identify the impact of physical exercise in athlete's pelvic floor.

References

1. Eliasson K, Edner A, Mattsson E (2008) Urinary incontinence in very young and mostly nulliparous women with a history of regular organised high-impact trampoline training: occurrence and risk factors. Int Urogynecol J Pelvic Floor Dysfunct 19 (5):687-696.
2. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, Pratt M, Ekelund U, Yngve A, Sallis JF, Oja P (2003) International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 35 (8):1381-1395.
3. Dietz HP, Shek C, Clarke B (2005) Biometry of the pubovisceral muscle and levator hiatus by three-dimensional pelvic floor ultrasound. Ultrasound in Obstetrics and Gynecology 25 (6):580-585.

Disclosures

Funding: None **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** Ethics commitee of São João Hospital. **Helsinki:** Yes **Informed Consent:** Yes