ANALYSIS OF URETHRAL PRESSURE DURING INCREASED INTRA-ABDOMINAL PRESSURE: BIOMECHANICAL STUDY USING A NUMERICAL MODEL

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In the last decade, has been increasing interest in study the increase in intra-abdominal pressure (IAP), in order to better understand the female pelvic floor disorders, e.g. urinary incontinence and pelvic organ prolapse [1, 2]. It is recognized that during a physical effort a high IAP can be generated within the pelvic cavity, which can result in stress urinary incontinence (SUI) if the urethral closure pressure exceeds urethral pressure [3, 4]. Currently, few numerical models have studied the effect of increased IAP on urethral pressure. Therefore, the aim of this study was to investigate the urethral pressure response during different IAP conditions using computational model.

A young healthy female volunteer participated in the study. Pelvic multiplanar T2-w high-resolution continuous 3-mm slice MR images were acquired using a 3 Tesla scanner. The images were used to draw and build the 3D model including the pubic bone, pelvic organs (bladder, uterus and rectum) and support structures, e.g., the LA muscle, the pubourethral, uterosacral, cardinal and lateral rectal ligaments, the pubocervical fascia and the arcus tendineus fascia pelvis. Abaqus® software was used to generate the mesh and to describe the rectum, uterus and bladder as fluid cavities; the fluid was assumed to be incompressible, allowing for isovolume transformations. After that, numerical simulation was performed, including IAP values of 1.44 kPa, of 3.44kPa and 3.75kPa, applied to the superior surface of the organs, assuming the pressure from organ load in the resting supine position, walking at 2km/h and walking at 6km/h [1]. As expected, the descent of the pelvic organs and muscles increased as IAP increased. The urethra and bladder neck evidenced a downward and backward movement, as described by imaging studies [5]. The results also demonstrated an urethral pressure increase as increasing IAP, which is concurrent to what is described in the urodynamic assessment [6]. Further studies are necessary to confirm these data.
Da Roza T, Brandão S, Parente M, Duarte JA, Mascarenhas T and Natal Jorge R

REFERENCES


