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BIOMECHANICAL SIMULATION OF LIGAMENT DAMAGE: ITS CLINICAL RELEVANCE.

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Computational models of the pelvis provide additional grasp on some physiological and mechanical aspects of the pelvic floor muscles function (1-3). Previous studies considering the impairment on the pelvic ligaments are scarce. Therefore, the purpose of this work was to perform biomechanical simulation of ligament impairment, and to compare the results of pelvic floor organs and muscles displacement with healthy ligaments. We built a 3D model from multiplanar T2-w Magnetic Resonance images of a young healthy female. The model of the pelvic cavity included the organs and supportive structures, such as muscles, ligaments and connective tissue, to which different material properties and constitutive models were attributed. The Finite Element Method was applied. The impairment of the ligaments was simulated by reducing their stiffness, and simulation of Valsalva Maneuver was performed to assess the displacement of the pelvic floor and muscles. Results were compared with simulation with healthy ligaments. Our results showed that the impairment of the pubourethral ligaments lead to an increased bladder neck dislocation when simulating Valsalva Maneuver, which is often seen by ultrasound imaging in women with urinary incontinence. Also, when the uterine apical supporters (the cardinal and uterosacral ligaments) are damaged, the uterus suffered a higher descend, as seen in the clinical setting with the

pelvic organ prolapse quantification (POP-Q), a clinical scoring system of prolapse (4). When simulation weaker ligaments, the pelvic floor muscles are pulled downward, and thus do not prevent pelvic organs descent. The displacement obtained in these simulations are in the range of what was seen in patients with urinary incontinence and pelvic organ prolapse whose ligaments were damaged.

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