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EVALUATION OF THE INFLUENCE OF PELVIC MUSCLE ACTIVATION DURING VAGINAL DELIVERY IN OCCIPITO-POSTERIOR PRESENTATION

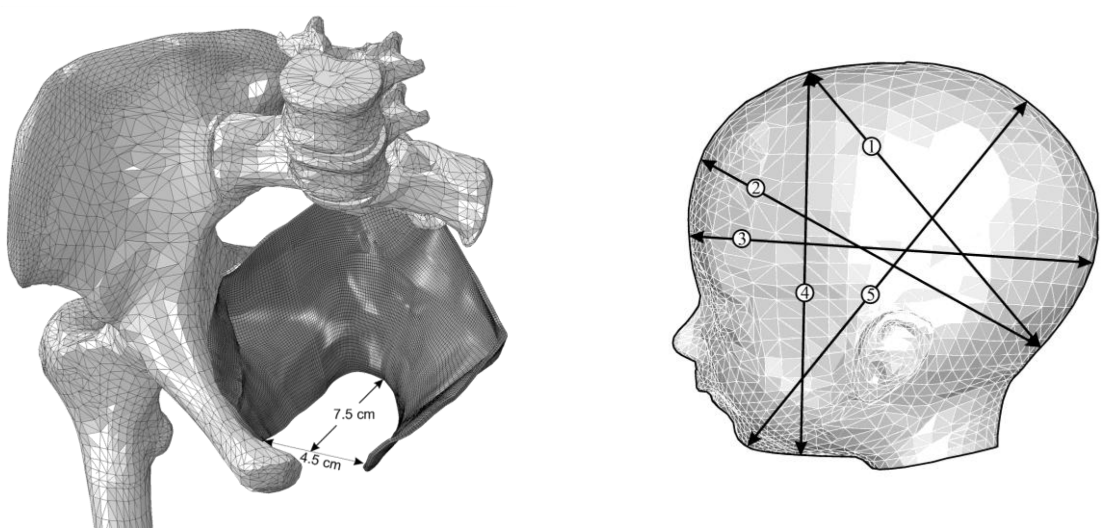
Hypothesis / aims of study

Several studies have shown that pelvic floor injuries during a vaginal delivery can be considered a significant factor in the development of urinary incontinence, fecal incontinence and pelvic organ prolapse (1). However, a full comprehension of the mechanisms of damage to the pelvic floor components (muscles, nervous, fascia) is still distant, as recognized by many.

Concerning the benefits of relaxation or other complementary therapies in labor, there is insufficient evidence related with the influence of pelvic floor muscle contraction during vaginal delivery. Pelvic floor muscle training might produce a strong pelvic floor. However, an opposite assumption is that pelvic floor muscle training may improve muscle strength. The interaction between fetus presentation and the birth canal can be considered as a biomechanical system. In this work, the Finite Element Method (FEM) is used to conduct a biomechanical study of the pelvic floor muscles. Using a 3D computational model which simulates the pelvic bones, pelvic floor muscles and fetus, the deformations and stresses on the pelvic floor induced by the passage of the fetus, during a vaginal delivery, with the fetus presenting in an occipito-anterior and occipito-posterior malposition, are estimated. Based on a numerical simulation technique the aim of this study is to evaluate the influence of pelvic floor muscle activation (3) during vaginal delivery, with the fetus in an occipito-posterior presentation.

Study design, materials and methods

For the numerical simulation conducted, the computational model of the pelvic floor was connected to a model of the pelvic skeletal structure (Figure 1.a). Also for computations conducted, a finite element mesh of the fetus is needed (Figure 1.b). The principal obstetric dimensions for the fetus head are the following: 1-suboccipito-bregmatic diameter, 10 cm, 2-suboccipito-frontal diameter, 10.5 cm, 3-occipito-frontal diameter, 12.0 cm, 4-mento-vertical diameter, 13.0 cm and 5-submento-bregmatic diameter, 11.5 cm (2).



a) b)

Figure 1: Computational model. a) bones structure and pelvic musculature; b) fetus head model.

Results

Results for the pelvic floor stress values, obtained during the passage of the fetus head are presented in Figure 2. The results were obtained along a path defined on the inferior area of the pelvic musculature model, for a vertical displacement of the fetal head of 60 mm. For both presentations it was imposed on the computational model a contractions of the pelvic floor. These contractions represent 5%, 10% and 15% of the supposed maximum force that could be produced by the muscle. The maximum values obtained for the stress were approximately 2.7 MPa for the occipito-posterior presentation and 1.3 MPa for the occipito-anterior presentation, respectively.

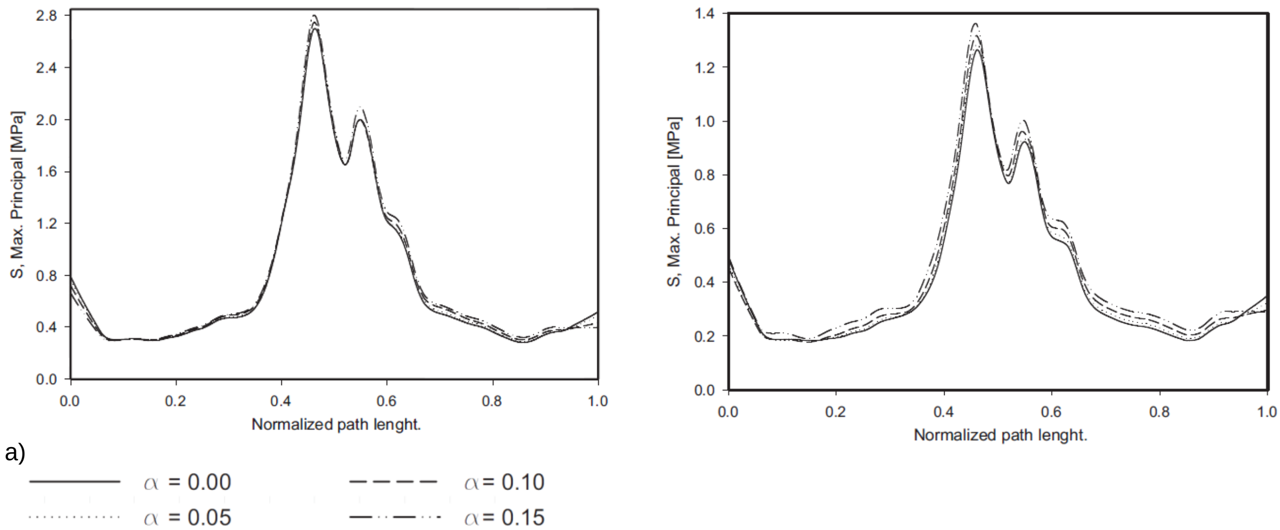


Figure 2: Maximum principal stresses for a fetus descent of 60 mm a) for a fetus in occipito-posterior presentation; b) for a fetus in occipito-anterior presentation.

Interpretation of results

The present numerical simulation shows that a malposition of the fetus during delivery as the occipito-posterior malposition, leads to higher stresses of the muscles of the pelvic floor, when compared with a delivery where the fetus presents in the normal occipito-anterior position, increasing the risk for a stress related injury. The activation of the pelvic floor muscles during vaginal delivery induces higher values of stresses in the pelvic floor. The differences between passive and activation situations are higher for a fetus in an occipito-anterior presentation. The present work constitutes a non-invasive procedure which can be used in the future to estimate the damage that a vaginal delivery can induce on a specific pelvic floor.

Concluding message

The computer model presented in this work contributes to a better understanding how obstetrical factors and interventions might influence levator ani injury risk. This work shows that the computer model can be used to study the effect of a malposition, such as the occipito-posterior position, on the degree of muscle stretch during delivery. The present study also demonstrates that the pelvic floor muscle activation during vaginal delivery may increase the risk for pelvic floor injuries. With future developments, the presented model could also be used to study the effect of assisted delivery, which will constitute future research work.

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Is this a clinical trial?	**No**
What were the subjects in the study?	**NONE**