IMPROVING CHILDBIRTH BIOMECHANICS

Dulce Oliveira[1] and Teresa Mascarenhas[2]

[1] INEGI, LAETA, Porto, Portugal, doliveira@inegi.up.pt
[2] CHUSJ, FMUP, Porto, Portugal, tqc@sapo.pt

Key Words: *Occiputanterior position, Occiputposterior position, Childbirth-related injuries, Numerical simulations*

Despite being a natural physiological event, childbirth is a very complex process that can have a negative impact on women. Childbirth-related trauma impacts millions of women and babies worldwide [1]. Pelvic floor muscle injury, both microtrauma and macrotrauma, has an incidence of 10-36%, and anal sphincter injury of 4-6.6% [2]. Pelvic floor injuries are exacerbated by foetal malposition, such as persistent occiputposterior (OP) position, which is estimated to affect 1.8-12.9% of pregnancies [3]. Childbirth-related trauma plays an important role in the development of pelvic floor dysfunction, and diagnosis rates at the time of injury are still poor [4].

The biomechanical aspects of childbirth are still not entirely understood; as such, computer models aim to improve current knowledge by evaluating mechanical aspects during vaginal delivery, such as stress, strain, forces, and contact pressures. A 3D biocomputational model previously developed to simulate vaginal deliveries was used in our studies, including the mother and the foetus [5]. The birthing process is a complex physiological phenomenon, so it is important to have a representative anatomical model to perform accurate biomechanical simulations. From our studies, we realized that the OP position induces a greater increase of the anteroposterior diameter. Furthermore, the maximum value occurs at a higher location in the birth canal compared to the normal position (occiputanterior, OA). This need for longer stretches at an earlier time of foetal descent can be a reason for prolonged second stage of labour in case of foetal malposition. The OP position is more demanding for the pelvic floor muscles than the OA position, corroborated by clinical studies [5]. On the other hand, the OP position was considered biomechanically favourable to the foetus since it suffers less head deformations. The moulding index, which evaluates the variation of predefined diameters of the foetal head, shows significantly lower values for the OP position compared to the OA position.

REFERENCES

[1] Feltovich, H. Labour and delivery: a clinician's perspective on a biomechanics problem. *Interface Focus*. (2019) **9(5)**: 20190032.
[2] Caudwell-Hall, J., Atan, I., Brown, C. et al. Can pelvic floor trauma be predicted antenatally?. *Acta Obstet Gynecol Scand*. (2018) **97**: 751–757.
[3] Gimovsky, A. Intrapartum Ultrasound for the Diagnosis of Cephalic Malpositions and Malpresentations. *Am J Obstet Gynecol MFM*. (2021) 100438.
[4] Lin, S., Atan, I., Diet, H., et al. Delivery mode, levator avulsion and obstetric anal sphincter injury: A cross-sectional study 20 years after childbirth. *Aust New Zeal J Obstet Gynaecol*. (2019) **26**: S64–S65.
[5] Parente, M., Natal, R., Mascarenhas, T. et al. Deformation of the pelvic floor muscles during a vaginal delivery. Int Urogynecol J. (2008) **19**: 65–71.
[6] Eskandar, O., Shet, D. Risk factors for 3rd and 4th degree perineal tear. *J Obstet Gynaecol*, (2009) **29**: 119–122.