

MUSCULOSKELETAL LOWER BACK LOAD OF ACCOUCHEURS DURING DELIVERY

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Introduction

With the progress in modern medicine, it was possible to significantly reduce the risks of birth for mother and child. One aspect that has received less attention so far is the risk of injury to the accoucheurs (obstetricians and midwives) during the birth process. Indeed, studies indicate that 92% of midwives suffer from musculoskeletal disorders, with the lower back being the main cause of complaints (72%) [1]. The aim of this study was to investigate two commonly used postural techniques used by accoucheurs during childbirth and to analyze the resulting load on the lower back using the AnyBody™ [2] musculoskeletal simulation software.

Material and Methods

To create a kinematic data set for musculoskeletal analysis, we recorded two male obstetricians performing a simulated deliveries using a birthing simulator (Sophie and Sophie's Mum Birth Simulator, MODEL-med, Melbourne, Australia) placed on a table. For each obstetrician, three different birthing trials were conducted. Obstetrician 1 was kneeling on his right knee, whereas obstetrician 2 was in an upright position pivoting his right elbow on his right thigh.

To determine the obstetricians' movement, an Xsens IMC System (Xsens Link, Xsens Technologies BV, Enschede, Netherlands) was applied to the test subjects. Two gloves, on top of each other, were placed on the accoucheur's hand - one glove to obtain the kinematics of all fingers of each hand (Prime I Xsens, Manus VR, Geldrop, Netherlands) and one glove, measuring the forces acting on the right thumb, index, and middle finger [3].

For the analysis of the loads acting on the accoucheur's musculoskeletal system, only the time interval of the final contraction of the delivery was considered. The musculoskeletal simulation software AnyBody™ (AnyBody Technology A/S, Aalborg, Denmark, V.7.3.1) was used as a modelling environment.

Results

Figure 1 shows the force acting on the lumbar spine of one exemplary trial of obstetrician 1 (Figure 1a) and obstetrician 2 (Figure 1b). The tendency of increased

force between the lumbar spine segments was seen in all three trials. The average maximum total load between the segments of the lower back decreased by 677 N (mean force 638 N) from obstetrician 1 to 2. Also, the shear forces showed a mean reduction of the maximum force of 295 N (276 N) for the anteroposterior direction and 92 N (66 N) for the mediolateral direction.

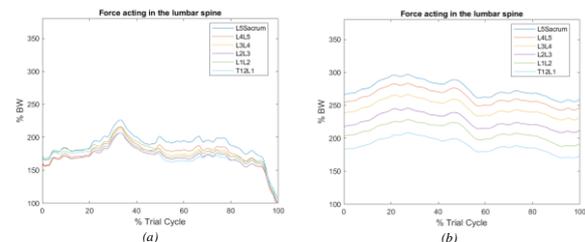


Figure 1: Force (normalized to the body weight - BW) acting between the segments of the lumbar spine for subject 1 (a) and subject 2 (b) during a delivery.

Discussion

The results of musculoskeletal simulations indicate that the kneeling position of the accoucheur does not stress the low back as much as standing posture. One limitation, however, is that the force transmission between the elbow and thigh was not included in the simulations of subject 2 as this force could not be measured. We appreciate that the measurements were only test measurements on a simulator, nonetheless have potential significant practical implications. In the next step of our work, we intend to apply an identical test setup to real deliveries.

References

1. Okuyucu, Kubra, et al. (2019), Midwifery, 79: 102546.
2. AnyBody Technology A/S. anybodytech.com
3. V. Kališ et al. (2020), BMC Pregnancy Childbirth 20 (1), pp. 1–6

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