The effect of maternal posture on pelvic outlet MR measurements

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Introduction
For centuries, there has been controversy around whether being upright or lying down has advantage for women delivering their babies. Different labor positions e.g. squatting, hand-to-knee position, sitting in birthing stools, are offered for parturition according to the cultural background and in the recent past even as “fashion” [1,2]. Changes in the pelvis under these conditions are anatomically not exactly known. Using conventional outlet views, it was shown that there was a significant increase in interspinous diameter in pregnant women in the last trimester on alteration of position from supine to sitting [3].

MR pelvimetry is widely accepted as the imaging modality of choice to assess the maternal bony pelvis in obstetrics [4,5].

With the advent of vertically open configuration magnet systems, patient’s examination is not limited anymore to the supine position and examinations in the upright position were for example shown to be of value for assessment of the female pelvic floor as well as for MR defecography [6].

The aim of our study was to investigate if measurements of the pelvic outlet based on MR examinations performed in an open 0.5 T system are influenced by different labor positions.

Methods
MR pelvimetry was performed in 25 female non-pregnant volunteers (mean age 27 ± 4 y, mean weight 59 ± 7 kg, mean height 166 ± 5 cm) in an open 0.5 T MR system (Signa SP, GE, Milwaukee, WI) in supine, hand-to-knee (Figure 1: a) and squatting (Figure 1: b) positions using a T1-weighted GRE sequence (FSPGR, TR 150, TE 8.6, matrix 256x192, flip 60°, slice thick. 5/0, 2 NEX) in the axial and midline-sagittal plane. Obstetric conjugate, transverse diameter, outlet sagittal diameter, transverse interspinous and intertuberous diameters were measured and results of the different positions were correlated.

Results
In the hand-to-knee position a significant increase of the sagittal outlet (11.6 ± 1.1 cm, mean diff. 3.0 mm, p = 0.006) and also in squatting position (11.5 ± 1.2 cm, md 2.4 mm, p = 0.01) compared to the supine position (11.3 ± 1.2 cm) was observed. Interspinous diameter was wider in hand-to-knee position (11.5 ± 1.1 cm, md 5.4 mm, p = 0.001) and squatting (11.6 ± 0.8 cm, md 6.3 mm, p < 0.001) compared to supine position (11.0 ± 0.7 cm).

Intertuberous diameter was larger in squatting (12.6 ± 0.7 cm, md 4.2 mm, p = 0.004) and hand-to-knee position (12.4 ± 0.7 cm, md 2.1 mm, p = 0.05) than in supine position (12.1 ± 1.0 cm). Intertuberous diameter was also significantly increased in squatting vs. hand-to-knee position (md 2.0 mm, p=0.008).

Obstetric conjugate and transverse diameter did not significantly change in the 3 different positions.

Discussion
Our results show that a difference in maternal posture can result in a significant increase of pelvic distances and thus give scientific evidence that changing position during labor can facilitate delivery.

References