The effect of maternal posture on pelvic outlet MR measurements

Sven Claude André Michel[1], Borut Marincek[1], Annett Rake[2], Karl Treiber[1], Rabih Chaoui[2], Burkhardt Seifert[3], Rahel Kubik-Huch[1]

[1]Departments of Radiology, University Hospital, Zurich, Switzerland; [2]Clinic of Obstetrics, University Hospital, Zurich, Switzerland; [3]Department of Biostatistics, University Hospital, Zurich, Switzerland;

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 interspinal 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°, slthick. 5/0, 2 NEX) in the axial and midline-sagittal plane. Obstetric conjugate, transverse diameter, outlet sagittal diameter, transverse interspinal and intertuberous diameters were measured and results of the different positions were correlated.

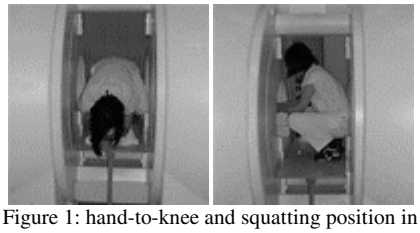

Figure 1: hand-to-knee and squatting position in the open MR system

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. Interspinal 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.

Figure 2: MR pelvimetry in a 35-year-old nulliparous women. An increase from 11.4 to 11.7 cm and 12.1 to 12.6 cm is observed when changing to the hand-to-knee position (2a, 2b).

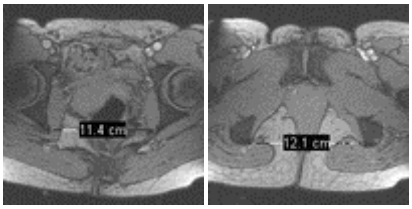

Figure 2a: supine position interspinal and intertuberous diameter

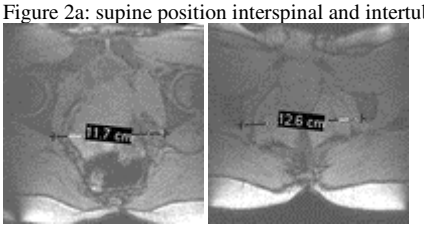

Figure 2b: hand-to-knee position interspinal and intertuberous diameter

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

1. Kelly FW, Terry R, Naglieri R. A review of alternative birthing positions. J Am Osteopath Assoc 1999;99(9):470-474

2. Gardosi J, Hutson N, Lynch C. Randomised, controlled trial of squatting in the second stage of labour. Lancet 1989;8;2(8654):74-77

3. Russel JGB. Moulding of the pelvic outlet. J Obstetr Gynaec Brit Cwlth 1969;76:817-820

4. Levine D, Barnes PD, Edelman RR. Obstetric MR imaging. Radiology 1999;211:609-617

5. Van Loon AJ, Mantingh A, Serlier EK. Kroon G, Mooyaart EL, Huisjes HJ. Randomised controlled trial of magnetic-resonance pelvimetry in breech presentation at term. Lancet 1997;350:1299-1804

6. Fielding JR, Griffiths DJ, Versi E et al. MR imaging of pelvic floor continence mechanisms in the supine and sitting positions. AJR 1998;171:1607-1610