Introduction

The indications for pelvimetry in women scheduled for vaginal delivery include breech presentation, a history of protracted labor or secondary cesarean section for dystocia, suspected feto-pelvic disproportion, and pelvic deformity. Although pelvimetry does not decrease the overall cesarean section rate in breech presentation, it decreases the emergency section rate by improving preoperative selection [1, 2].

By avoiding exposure to ionizing radiation, MR pelvimetry has replaced X-ray and CT to become the modality of choice in assessing the maternal pelvis [2, 3, 4, 5, 6, 7, 8]. Various techniques have been evaluated in the literature. To decrease examination time and energy deposition in tissue, most institutions have replaced T1-weighted spin-echo sequences by fast spoiled gradient-echo sequences [9, 10].

Low-field closed systems are presently established in routine practice [11, 12]. The advent of open-configura-
tion MR imaging systems permits acquisition in the vertical position for functional studies, e.g., defecography [13], together with ready patient access and thus image-guided intervention [14]. It also eliminates the claustrophobia common with closed systems: The extra space is particularly appreciated by heavy patients or pregnant women with large abdominal circumferences.

Pregnant women who undergo MR pelvimetry are generally healthy persons, with a main interest focused on the health of their unborn baby. Results of MR examination can alter the further management of pregnancy and delivery mode (vaginal birth or elective cesarean), and therefore it is likely that these women are under considerable stress.

They are also unfamiliar with MR pelvimetry and may be intimidated by the sheer bulk of the equipment [15]. Despite the evidence (of which the women are pre-informed) that MR has no adverse fetal effects [16, 17, 18, 19, 20, 21], the noise and claustrophobia of an MR exam may well induce fear for the fetus. Physical effects, e.g., vena cava compression syndrome, may also occur. No psychosocial data are available in the literature on MRI during pregnancy; however, anxiety and claustrophobia are well recognized, at rates of up to 30% [22, 23, 24, 25, 26, 27]. The MR pelvimetry in a vertical open-configuration system has, to our knowledge, not been reported previously. The aim of this study was to compare MR pelvimetry and patient acceptability in an open-configuration low-field (0.5-T) system vs a closed-configuration 1.5-T system.

**Patients and Methods**

Between April and November 2000, women referred for MR pelvimetry, either by our Department of Obstetrics or external institutions, were asked to participate in the study provided that both MR systems were available when they attended their appointment and that no language problems were present. Our department performs approximately 240 MR pelvimetries annually. The MR pelvimetry is performed in our institution during the third trimester of pregnancy or post partum in cases when the delivery was complicated by protracted labor and a subsequent pregnancy is planned. Of the consecutive pregnant (n=16) and non-pregnant candidates (n=18), only three refused their consent, and one exam was interrupted due to pre-labor nausea. The study protocol was approved by our institutional review board and informed written consent was obtained in all cases after full explanation of the exam procedure. Pregnant women were informed that, to current knowledge, MR imaging does not harm the unborn child.

The participants comprised 15 women with ongoing singleton pregnancies (mean age 29±3 years, range 25–35 years; weight 84±18 kg, range 66–132 kg; height 161±6 cm, range 150–174 cm; abdominal circumference 115±20 cm, range 98–180 cm; week of gestation 38±2 weeks, range 35–41 weeks) and 15 non-pregnant women with a history of protracted labor and/or secondary cesarean section in a previous pregnancy (mean age 31±4 years, range 22–38 years; weight 66±14 kg, range 51–110 kg; height 163±8 cm, range 146–173 cm; abdominal circumference 90±13 cm, range 66–120 cm). In the non-pregnant group, 13 women were nursing at the time of the MR exam. Two women had previously undergone MR imaging for other indications.

Each woman underwent supine MR pelvimetry in two systems: a vertical open-configuration low-field 0.5-T system with a gradient strength of 12 mT/m (Signa SP, General Electric Medical Systems, Milwaukee, Wis.; Fig. 1); and a 1.5-T closed system with a gradient strength of 40 mT/m (Signa Horizon EZ or CV/i), the modality used to report the result back to the referring physician. In both systems, MR imaging was performed using a T1-weighted fast spoiled gradient-echo sequence (FSPGR) with the following parameters: TR 150 ms; TE 8.5 ms (open system) and 1.6 ms (closed system); section thickness 7.0 mm; gap 0 mm; matrix 256×192; number of excitations (NEX) 2; phase-encoding direction anterior–posterior. The cutaneous marker was positioned in all cases 1 cm above the superior edge of the symphysis pubis (determined by palpation to avoid a localizing scan). Sagittal, axial, and oblique views (in a plane through the symphysis and sacral promontory) were acquired. Since the 0.5-T system has no integrated transmit/receive coil, a body flex coil (size no. 4, quadrature transmit/receive surface coil with two single loops, Signa SP) was used for the examinations in the open system. The body coil, i.e., the coil built directly into the magnet, was used in the closed system. Scan times were recorded per exam in each system and compared using Wilcoxon’s signed-rank test.

**Noise Measurements**

Noise in the MR environment, expressed as the equivalent continuous sound level (Leq) and peak sound level (dB SPL), was measured once in each system next to the patient’s ear using a microphone (Knowles CA-2832, Ruf Electronics, Höhenkirchen, Germany). Recording was digitally (DAT device) and analyzed divided into background, prescan, and scan phases, respectively (Cool Edit 2000, Syntrillium Software Corporation, Scottsdale, Ariz.).