The effect of right versus left lateral-tilt position on compression of the inferior vena cava in parturients

Nobuko Fujita, M.D.¹, Hideyuki Higuchi, M.D.², Kan Zhang, M.D.³, Shunichi Takagi, M.D.², Shiori Sakuma, M.D.², Makoto Ozaki, M.D.²

- 1. Department of Anesthesiology, St. Luke's International Hospital, Tokyo, Japan
- 2. Department of Anesthesiology, Tokyo Women's Medical University, Tokyo, Japan
- 3. Outcomes Research, Anesthesiology Institute, Cleveland Clinic, Ohio, USA

Introduction

A 15° left-lateral tilt position has become an established practice of obstetric anesthesia since the 1970s, especially after the study by Crawford et al.¹ who reported the significant improvement in the fetal clinical and acid-base status by tilting the patient with a wedge cushion at cesarean section. However, in their study the majority of the patients were tilted to the right since surgical access to the uterus was simplified despite it was assumed to be anatomically disadvantage for IVC compression. We recently reported that of a 30° left-lateral tilt, but not a 15° tilt, partially relieves compression of the inferior vena cava (IVC) in parturients at term without anesthesia.² The effect of right lateral-tilt position on the IVC compression, however, is unknown. Here, we used magnetic resonance (MR) imaging to examine the effect of the right lateral-tilt position on the IVC compression.

Patients and methods

MR images of 10 singleton parturients (37 weeks gestation) were obtained for observation of the IVC and aorta in both the supine, left lateral-tilt positions (15°, 30°) and right lateral-tilt positions (15°, 30°) with head to toe placement of a 1.8-m long hard V-block constructed of closed-cell polyethylene foam under the right side of the parturient's body (Fig.1).

Figure 1. A parturient in the left-lateral tilt position by placement of a 45° hard V-block.

Results

In parturients, the abdominal aorta could be identified in any positions. Aortic volume did not change in any of positions. (Figs.2,3). MR images revealed total compression of the IVC when parturients were in the supine positions (Figs. 2,3). The IVC volume in the left lateral-tilt position was not increased at 15° (7 ± 5 vs. 5 ± 4 ml), whereas the corresponding values at 30° were significantly increased (11 ± 8 ml), compared with the supine position ($P < 0.05$). In contrast, the IVC volume in the right lateral-tilt position was increased not at 15° (6 ± 6 ml ; $P = 0.24$) or at 30° (6 ± 6 ml ; $P = 0.08$)(Fig.4).

Figure 2. MR images of a 41-year-old pregnant woman (39 weeks) in the supine, left lateral-tilt positions (15°, 30°) and right lateral-tilt positions (15°, 30°) at the L3/4 disk level. The IVC (→) was almost completely compressed in the supine positions. At the 15° left and right lateral-tilt positions, compression of the IVC was slightly reduced. Compression of the IVC was reduced more in the 30° left and right lateral-tilt positions than in the 15° left and right lateral-tilt positions. The size of the aorta (←) did not significantly change in any position.

Figure 3. MR images of a 38-year-old pregnant woman (39 Weeks) in the supine, left lateral-tilt positions (15°, 30°) and right lateral-tilt positions (15°, 30°) at the L2/3 disk level. The IVC (→) was compressed in the supine position. In the left lateral-tilt positions (15°, 30°) and right lateral-tilt positions (15°, 30°), compression of the IVC was not reduced. The size of the aorta (←) did not significantly change in any position.

Figure 4. The volume of the aorta (red bar) in parturients did not change in any positions. The IVC volume (blue bar) in parturients was not increased in the left lateral-tilt position at 15° or in the right lateral-tilt positions at 15° and 30°, whereas the IVC volume was significantly increased in the left lateral-tilt position at 30° ($P < 0.05$). # $P < 0.05$ compared with each value in the supine position (0°).

Discussion

- The present study indicates that the left and right lateral-tilt position at 15° did not reduce compression of the IVC, consistent with our previous report.²
- These findings also indicate that the left lateral-tilt position at 30°, but not right lateral-tilt position at 30°, was effectively reducing compression of the IVC.
- Limitations
 - Unanesthetized (no muscle relaxation, no block of sympathetic nervous system, no intravenous fluid)
 - Healthy parturients
 - Low resolution of MRI
 - Small number of patients

Conclusion

- In parturients, the abdominal aorta is not compressed by pregnant uterus in any position.
- Only left lateral-tilt position at 30° effectively reduces compression of the IVC.

References

1. Crawford et al. BJA 1972;44:474-84 2. Higuchi et al. Anesthesiology 2015;122:286-93