Effect of Lateral Tilt Angle on the Volume of the Abdominal Aorta and Inferior Vena Cava in Pregnant and Nonpregnant Women Determined by Magnetic Resonance Imaging

To the Editor:
We read with interest the article by Higuchi et al. in which the authors, using magnetic resonance imaging, study the effect of the gravid uterus compression on the aorta and vena cava volumes at 15°, 30°, and 45° left-lateral tilt angles, showing no reduction in the aortic volume and no benefit on the observed cava compression below 30° degrees.

We believe that the study design does not actually allow for any clinically meaningful predictions from a practical point of view. In fact, we do not know the important contribution of the pregnancy mechanical factors.

Although the study was aimed to answer practical questions regarding the management of the gravid women at the operating table, from the obstetrical perspective, the study is too simplistic to achieve its objectives. First, the authors do not take into account the fetal weight percentile, a crucial parameter when weight-related compression is considered in pregnancy. In fact, normality range for fetal weight at 39 weeks spans from 2,500 g (third percentile limit for fetal growth restriction) to nearly 3,800 g (90th percentile limit for fetal macrosomia). Therefore, even normal fetuses may present with a weight difference of nearly 1,500 g, and this may be increased in severely growth-restricted or macrosomic fetuses up to 2,000 to 2,500 g. Second, in their analysis, they ignore the ponderal importance of accessory structures such as the placenta and amniotic fluid, which may also account for notorious differences among different pregnancies. Third, the study lumps different gestational ages together without noticing the existence of differences between 37 and 39 weeks that could reach in case of the fetal 50th percentile up to 350 g.

Most fundamentally, the research question asked could gloss over the importance of the effect of lateral tilt angle in pregnant women with supine hypotensive syndrome receiving intravenous fluid.

As a result of all these considerations, any proposal based only on the tilt angle is obviously incomplete. Because the missing data can be easily evaluated with ultrasound, especially the estimated fetal weight, we would like to propose the authors a multivariate analysis, adding all fetal and maternal ponderal factors, to accurately determine the precise circumstances that should be considered in the hemodynamic management of the term gravid women, especially in the subset of obstetrical patients in whom most need to know the real effect of tilt angle on the relieve of possibly aorta and inferior vena cava compression. We are talking about the pregnant women with supine hypotensive syndrome.

Competing Interests
The authors declare no competing interests.

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References
In Reply:
We thank Abengochea et al. for their interest in our article and their comments.1 We agree that there are individual variations in fetal weight and accessory structures, such as the placenta and amniotic fluid, which may affect the degree of compression of the inferior vena cava (IVC) by the gravid uterus in the supine position and changes in the IVC volume in the 15° left-tilt position. Certainly, these variations may account for the differences between the four parturients in our study in which IVC volume was somewhat increased in the 15° left-tilt position and the other parturients in which IVC volume was not increased compared with those in the supine position. It should be noted, however, that the principal aim of our study was to challenge an “ancient” practice, based on an assumption that had never been morphologically validated.1,2 We did not aim to perform a multivariate analysis of the characteristics of pregnant women. The sample size in our study was determined to evaluate whether there was a significant difference in the IVC volume between pregnant and nonpregnant women. Although we do not know how the left-lateral position is applied in the hospital of Abengochea et al., we believe that, in general, the left-lateral position is routinely used, not only in those limited parturients with supine hypotensive syndrome or obesity but also in healthy pregnant women without consideration of the fetal weight and accessory structures, such as the placenta and amniotic fluid. In addition, in our opinion, the study design should be simple. Therefore, we limited our study to healthy pregnant women and excluded parturients with supine hypotensive syndrome or obesity.

Table 1.  Individual Estimated Fetal Weight, Abdominal Circumstance, and the Changes in the Inferior Vena Cava Volume in Parturients

<table>
<thead>
<tr>
<th>Patient Number</th>
<th>Estimated Fetal Weight (g)</th>
<th>Abdominal Circumstance (cm)</th>
<th>Inferior Vena Cava Volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2,592</td>
<td>90</td>
<td>0.7</td>
</tr>
<tr>
<td>2</td>
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<td>3</td>
<td>2,712</td>
<td>87</td>
<td>0.4</td>
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<td>4</td>
<td>3,153</td>
<td>95</td>
<td>9.7</td>
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<tr>
<td>5</td>
<td>3,533</td>
<td>97</td>
<td>0.3</td>
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<tr>
<td>6</td>
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<td>1.2</td>
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<td>94</td>
<td>3.3</td>
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<td>88</td>
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<tr>
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<td>90</td>
<td>1.1</td>
</tr>
<tr>
<td>10</td>
<td>3,078</td>
<td>96</td>
<td>7.1</td>
</tr>
</tbody>
</table>

References

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As we stated in our article, and Palmer also pointed out in the editorial view accompanying our article, our study has several drawbacks. One drawback of our study is the small number of subjects (only 10 subjects per group).1,2 Accordingly, the statistical power of our study was not sufficient to perform a multivariate analysis. However, we understand that Abengochea et al. are curious about individual variations in fetal weight and accessory structures. The estimated fetal weight based on ultrasound images and abdominal characteristics of the pregnant women when magnetic resonance images were obtained are listed in Table 1. The pregnant women numbers was the same as in Table 2 in our article.1 The relation between estimated fetal weight and IVC volume in the supine position was not significant. The estimated fetal weight of the four parturients (patient numbers 1, 3, 5, and 9) in which the IVC volume was somewhat increased in the 15° left-tilt position was significantly different from that of the other parturients in which the IVC volume was not increased. The same results were obtained when comparing abdominal characteristics.

Competing Interests
The authors declare no competing interests.

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References

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