Increased Blood Pressure Variability in Aging Rats After Intrauterine Growth Restriction

To the Editor:

To determine which aspect of blood pressure is associated with the most end-organ damage, several parameters are used like average blood pressure, pulse pressure, and blood pressure variability. In a recent article, Tatasciore et al\(^1\) showed that blood pressure variability is more closely associated with cardiovascular damage than mean blood pressure levels.

An increased blood pressure and a higher incidence of cardiovascular diseases are frequently described after intrauterine growth restriction (IUGR).\(^2\) It has also been shown that blood pressure variability is highest in children with the lowest birth weights.\(^3\) However, data during aging on blood pressure variability after IUGR are lacking.

We have shown previously that IUGR in a rat model of uteroplacental dysfunction based on uterine artery ligation leads to an increase in blood pressure and pulse pressure in aging rats.\(^4\) We used telemetry to acquire these longitudinal data, because this allowed for measurements in conscious and freely moving animals. To address the issue of aging and blood pressure variability after IUGR, we restudied our data on the nighttime blood pressure and heart rate in this previously described group of male animals at the ages of 6 and 12 months.\(^5\) It has been shown previously in rats, as well, that blood pressure variability is a more critical determinant of cardiovascular damage rather than the blood pressure levels.\(^6\) The variability in blood pressure and heart rate was defined as the SD of the respective parameter during the 12-hour period of measurement, during which 1 value was stored every 6 minutes. To use unstressed, ie, undisturbed by humans, and awake data in the nocturnal rat, we used nighttime data only.

The Table shows the data on the cardiovascular variability at the 2 ages studied and demonstrates that diastolic and systolic blood pressure variability are highly significantly increased in 12-month-old IUGR animals (mean difference in diastolic blood pressure variability: 1.41 mm Hg; 95% CI: 0.88 to 1.94 mm Hg; mean difference in systolic blood pressure variability: 1.69 mm Hg; 95% CI: 1.12 to 2.25 mm Hg). Linear regression between birth weight and diastolic and systolic blood pressure variability showed highly significant negative associations at the age of 12 months ($r = -0.59$ and $P = 0.005$ and $r = -0.59$ and $P = 0.005$ for diastolic and systolic blood pressure variability, respectively).

We conclude that IUGR increases blood pressure variability in aging animals, which may, in part, explain the higher prevalence in end-organ damage and cardiovascular disease that is associated with IUGR. It may, therefore, be of interest to study blood pressure variability in adult IUGR individuals.

None.

Disclosures

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Table. Blood Pressure and Heart Rate Variability

<table>
<thead>
<tr>
<th>Age</th>
<th>Variable</th>
<th>Control Animals*</th>
<th>IUGR Animals</th>
<th>Pt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heart rate variability, bpm</td>
<td>36.6 (7.4)</td>
<td>39.4 (7.4)</td>
<td>0.4</td>
</tr>
<tr>
<td>6 mo</td>
<td>Diastolic blood pressure variability, mm Hg</td>
<td>6.6 (0.8)</td>
<td>7.0 (0.6)</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Systolic blood pressure variability, mm Hg</td>
<td>7.8 (0.9)</td>
<td>8.2 (0.8)</td>
<td>0.3</td>
</tr>
<tr>
<td>12 mo</td>
<td>Heart rate variability, bpm</td>
<td>44.9 (3.1)</td>
<td>45.1 (4.3)</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>Diastolic blood pressure variability, mm Hg</td>
<td>6.7 (0.5)</td>
<td>8.1 (0.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Systolic blood pressure variability, mm Hg</td>
<td>8.0 (0.6)</td>
<td>9.7 (0.7)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

At the age of 6 months, data on 15 control and 11 IUGR animals were available; at the age of 12 months, data on 11 control and 10 IUGR animals were available. *Data are shown as mean (SD).

†P value was based on unpaired t test, control vs IUGR group.
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