Effects of Blood Donation on Arterial Blood Pressure in Retired Racing Greyhounds

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The purpose of this study was to evaluate changes in systolic arterial blood pressure (SABP) immediately after collection of blood for transfusion in retired racing Greyhounds. We prospectively evaluated 19 blood donor Greyhounds before and after the collection of a unit (450 mL) of blood. The SABP was measured with Doppler in the right forearm after the dogs had been in the blood collection room for a few minutes (PRE-FLOOR) and again 5–10 minutes after the dogs were placed on the table where they would be bled (PRE-TABLE). A total of 3–5 minutes after completing the blood collection, the SABP was measured again while the dogs were still in lateral recumbency on the table (POST-TABLE) and once more 60–90 minutes later, when the dogs were on the floor after completing the donation (POST-FLOOR). All dogs were monitored for clinical signs of hypotension, including depression, weakness, collapse, and pallor, for a minimum of 2 hours after donation. There was a significant difference in SABP for the group between PRE-FLOOR and POST-TABLE (P = .02) and between PRE-TABLE and POST-TABLE determinations (P = .01). There were no significant differences for any of the other time points; there were no adverse events. Therefore, we conclude that the collection of 450 mL of blood from normal Greyhounds results in a short-lived yet significant decrease in SABP, but the likelihood of adverse events is negligible.

Key words: Dog; Hypotension; Transfusion; Vasovagal.

Blood transfusion is a relatively new area of specialization in veterinary medicine. Numerous articles have been written on the use of blood and blood components in dogs and cats, but little information is available on collection methods and their effects on donors.1–6

Retired racing Greyhounds constitute ideal blood donors, because they are of an appropriate size (>25 kg); have a gentle temperament and a high hematocrit; and have large, easy-to-access jugular veins. In addition, in our experience, a high proportion of Greyhounds are DEA (dog erythrocyte antigen) 1.1-, 1.2-, and 7-negative, which thus qualifies them as universal blood donors.

Cardiovascular physiology in Greyhounds has been studied for decades,5–10 because several features in this breed are substantially different from those in other breeds. For example, Greyhounds have higher blood viscosity, blood pressure, cardiac output, and cardiac index than mongrel dogs, and they have larger hearts and lower peripheral resistance.7,8,11,12 In addition, a systolic basilar murmur due to high aortic velocity is present in >60% of Greyhounds (Fabrizio et al, unpublished data).

In a recent study of human blood donors, 36% experienced local or systemic adverse events (AEs), including bruising (22%), arm soreness (10%), fatigue (7%), vasovagal reactions (VVRs) (5%), and nausea or vomiting (1%).13 VVRs consist of dizziness, weakness, and pallor and develop in 2–5% of blood donors.14–16 Approximately 0.1–0.4% of human donors who develop VVRs experience syncopal episodes.

In our experience, weakness or syncopal episodes after blood donation are exceedingly rare in dogs. In the past 10 years, we have witnessed only 1 such event in a Greyhound after donation. In that time period, we processed approximately 700 units of canine blood.

The purpose of this study was to evaluate changes in arterial blood pressure immediately after blood donation in retired racing Greyhounds.

Materials and Methods

Nineteen retired racing Greyhounds that were enrolled in the Blood Donor Program at the Transfusion Medicine Service, Veterinary Teaching Hospital, The Ohio State University were prospectively evaluated. The dogs consisted of 9 spayed females and 10 neutered males. The females ranged in age from 4 to 9 years (median = 5.5 years) and in body weight from 27 to 39 kg (median = 29 kg). The males ranged in age from 4 to 8 years (median = 5 years) and in body weight from 30 to 41 kg (median = 34 kg). All dogs had been enrolled in the Blood Donor Program for a minimum of 4 months and had been last bled at least 5 weeks before the study date. Ten dogs weighed <33 kg (8 females and 2 males), and 9 dogs weighed >33 kg (8 males and 1 female).

Systolic arterial blood pressure (SABP) was measured with an Ultrasonic Doppler Flow detector model 811-B® and a 4.0-cm-wide cuff. After the dogs had entered the blood collection room, the SABP was measured in the right limb, with the dogs lying in left lateral recumbency on the floor. The SABP was measured again in the same manner 5–10 minutes after the dogs were placed on the table where they would be bled.

A unit of blood (450 mL) was collected from the jugular vein in standard fashion14 by means of a quad-bag collection set with a 16-gauge needle.2 The blood was mixed with a blood rocker.7 A total of 3–5 minutes after completing the blood collection, the SABP was measured again while the dogs were still in lateral recumbency on the table. The SABP was measured again 60–90 minutes later, when the dogs were on the floor after completing the donation. All dogs were offered a can of moist dog food at that time.4 A minimum of 3 measurements were averaged for each time point. All dogs were monitored for clinical signs of hypotension, including lethargy, weakness, collapse, and pallor, for a minimum of 2 hours after donation.

A one-way repeated-measures analysis of variance was used to compare differences in the SABP among the following: preblood collection with the dog on the floor (PRE-FLOOR), preblood collection with the
Changes in systolic arterial blood pressure (SABP) in Greyhounds before and after collection of 450 mL of blood for transfusion. The asterisk denotes significant difference ($P < .05$). Vertical lines denote the standard deviations.

Fig 2. Changes in systolic arterial blood pressure (SABP) in male and female Greyhounds before and after collection of 450 mL of blood for transfusion.

Table 1. Systolic arterial blood pressure in retired racing Greyhounds (expressed in mm Hg) before and after donating 450 mL of blood for transfusion. Values expressed as means ($\pm$SD).

<table>
<thead>
<tr>
<th>Population</th>
<th>PRE-FLOOR $\pm$</th>
<th>PRE-TABLE $\pm$</th>
<th>POST-TABLE $\pm$</th>
<th>POST-FLOOR $\pm$</th>
</tr>
</thead>
<tbody>
<tr>
<td>All dogs</td>
<td>146 ($\pm$32)</td>
<td>154 ($\pm$27)</td>
<td>146 ($\pm$21)</td>
<td>138 ($\pm$25)</td>
</tr>
<tr>
<td>Males</td>
<td>150 ($\pm$40)</td>
<td>151 ($\pm$28)</td>
<td>142 ($\pm$15)</td>
<td>138 ($\pm$25)</td>
</tr>
<tr>
<td>Females</td>
<td>144 ($\pm$21)</td>
<td>138 ($\pm$25)</td>
<td>146 ($\pm$23)</td>
<td>149 ($\pm$12)</td>
</tr>
<tr>
<td>$&gt;33$ kg</td>
<td>154 ($\pm$41)</td>
<td>155 ($\pm$29)</td>
<td>146 ($\pm$23)</td>
<td>149 ($\pm$12)</td>
</tr>
<tr>
<td>$&lt;33$ kg</td>
<td>140 ($\pm$20)</td>
<td>136 ($\pm$23)</td>
<td>123 ($\pm$13)</td>
<td>128 ($\pm$29)</td>
</tr>
</tbody>
</table>

* Significant differences between groups as follows: $^aP = .02; ^bP = .01$. 

Discussion

A total of 2–5% of human blood donors experience VVRs, and 0.1–0.4% of them have syncopal episodes. Clinical signs associated with VVRs in humans include dizziness, weakness, and pallor. Loss of consciousness, with or without tonic or clonic convulsions, constitutes a syncopal reaction. Systolic blood pressure <75 mm Hg is sufficient to cause a syncopal reaction in humans. To our knowledge, this information is not known for dogs. In humans, VVRs occur as a diphasic process in which there is a transient increase in cardiac output and peripheral resistance, leading to mild hypertension. This process is a normal response to stress and blood loss. This phase is followed by a sudden reduction in peripheral vascular sympathetic activity that causes peripheral vasodilatation and hypotension, and is accompanied by an increase in parasympathetic tone to the heart, with resultant bradycardia. The mechanisms that cause VVRs in humans are incompletely understood, but they are thought to depend on baroreceptor sensitivity, which, in turn, is influenced by age, emotional stress, and hypertension. The magnitude of the baroreceptor response also is related to the percentage of blood volume collected.

This study demonstrates that the collection of 450 mL of blood for transfusion in retired racing Greyhounds is safe but that it results in a significant but transient decrease in the SABP. The standard collection volume of 450 mL rep-
Blood Pressure after Blood Donation in Greyhounds

Fig 3. Changes in systolic arterial blood pressure (SABP) in Greyhounds weighing more or less than 33 kg, before and after collection of 450 mL of blood for transfusion.

mm Hg were protective against syncope. 14 Greyhounds have higher resting blood pressure readings than do dogs of other breeds, 15 and this characteristic may explain the low prevalence of hypotensive complications in the breed. A prospective study comparing age-, weight-, and sex-matched non-Greyhounds with a population of Greyhounds bled under similar conditions should shed light on this topic.

Footnotes

1. Ultrasonic Doppler Flow detector model 811-B, Parks Medical Electronics, Inc, Aloha, OR
2. Sixteen-gauge needle, Baxter Healthcare Corporation, Deerfield, IL
3. Blood rocker, Genesis, Hackensack, NJ
4. Eukanuba Lamb and Rice, The Iams Company, Dayton, OH
5. GraphPad Prism, Graph Pad Software, San Diego, CA

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References


