Right Duct Lymph Flow in Dogs Measured by a New Method

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Warren and Drinker\(^1\) had demonstrated that in the dog, lymph from all parts of the lung except the upper section of the left lung generally flowed to the right lymphatic duct. The right duct is of minute size and frequently presents with multiple channels.\(^2\) Consequently, cannulation is extremely difficult; and when cannulation of one of the minute channels is successful, only representative flow is obtained. These technical factors have limited study of the pulmonary lymphatic drainage.\(^3\) It is the purpose of this paper to introduce a new method for the collection of right duct lymph and present the data obtained by this method of collection in normal dogs.

**Methods**

Fifteen dogs were anesthetized with nembutal (29 mg./kg.) and given 10 to 12 cc. of T-1824 intratracheally. Respirations were maintained by

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**FIGURE 1:** Artificial Chamber Method for the Collection of Right Duct Lymph.
intermittent positive pressure. Right duct lymph was collected by the method illustrated in Figure 1.

This technique consists of creating an artificial chamber within the external jugular veins, in the vicinity of the entrance of the right lymphatic channels, through which is conducted the uncontaminated jugular venous blood. Fig. 1-1 shows a segment of the external jugular vein into which the multichannel right lymphatic duct enters. In Fig. 1-2 a plastic tube is inserted into the vein. The tube is pushed to approximate the entrance of the lymphatic channels and is secured, thus establishing a route for allowing continuity of the venous return and at the same time isolating a pocket into which the lymphatic channels enter. This permits the blood to return to the heart without mixing with the lymph flow. In Fig. 1-4 a venous tributary to the chamber is cannulated with a small polyethylene tube and the residual blood is aspirated. The tube then serves as an outflow channel for right duct lymph.* Flows were collected at 15-minute intervals.

*Although the right duct lymph is principally from the lungs, lymph from other areas (cervical and subclavian) may contribute to the total flow.

**FIGURE 3:** Summary of the Right Duct Lymph Flows.

<table>
<thead>
<tr>
<th>RIGHT DUCT LYMPH FLOW</th>
<th>MEAN</th>
<th>S.D.</th>
<th>RANGE</th>
<th>NO. OF DOGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL FLOW</td>
<td>8.9</td>
<td>± 8.1</td>
<td>.8 - 35.0 ml/hr</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>.38</td>
<td>± .34</td>
<td>.01 - 1.3 ml/kg/hr</td>
<td></td>
</tr>
<tr>
<td>&quot;LOW FLOW&quot;</td>
<td>4.2</td>
<td>± 2.2</td>
<td>&lt; 10 ml/hr</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>.19</td>
<td>± .11</td>
<td>&lt; .5 ml/kg/hr</td>
<td></td>
</tr>
<tr>
<td>&quot;HIGH FLOW&quot;</td>
<td>19.7</td>
<td>± 6.7</td>
<td>&gt; 10 ml/hr</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>.88</td>
<td>± .22</td>
<td>&gt; .5 ml/kg/hr</td>
<td></td>
</tr>
</tbody>
</table>
Results and Discussion

Using conventional methods of cannulation, Drinker obtained right duct flow in approximately 20 per cent of dogs attempted. Using the artificial chamber technique described, 18 successful collections of right duct lymph were made in 20 attempts (75 per cent success).

Figure 2 represents the distribution of mean hourly right duct flows in 14 dogs. The bars indicate the number of hourly flows lying within a given 2 ml. range. It is apparent that flows tend to occur in 2 groups, a "low" and a scattered "high flow" group.

Figure 3 summarizes the recording of the right duct flow. The mean flow is 8,9 ml./hr., however, if the flows are divided into "low" and "high" groups as suggested by the distribution curves, the majority of dogs (10) fall in the "low flow" group which averages 4,2 ml./hr. On the other hand, high flows (averaging 19,7 ml./hr.) were obtained in four dogs. It was noted that half of the "high flow" animals had cloudy lymph strongly suggesting that high flows were due to thoracic duct to right duct shunts and that the flows represented "pure" right duct flows. These figures are higher than those obtained by Warren and Drinker1 (1,1 ml./hr., and Courtice,2 2,3 ml./hr., using conventional cannulation of single lymph channels).

SUMMARY

1. A new method for obtaining right duct lymph in the dog has been described.
2. The mean right duct flow was 4,2 ml./hr. and the presence of higher flows was (mean 19,7 ml./hr.) considered presumptive evidence of thoracic to right duct shunts.

ACKNOWLEDGMENT: The authors wish to express their thanks to Dr. William C. Voorsanger for his assistance in initiating these studies.

RESUMEN

1. Se ha descrito un método nuevo de obtener linfa del ducto derecho del perro.
2. El flujo promedio del ducto derecho, fué de 4,2 ml/hora y la presencia de flujos más copiosos fué (promedio 19,7 ml/hora) considerado como presunción de que existían intercomunicaciones entre los ductos derecho y torácico.

RESUMÉ

1. Une nouvelle méthode pour trouver un canal lymphatique droit chez le chien est décrite.
2. Le faible débit du canal droit fut de 4,2 mml par heure et l'existence de débits plus élevés (19,7 mml par heure) fut considérée comme une présomption de shunts thoraciques.

ZUSAMMENFASSUNG

2. Die durchschnittliche Strömungsgeschwindigkeit im rechten Ductus betrug 4,2 cc pro Stunde und das Vorliegen höherer Geschwindigkeiten (im Durchschnitt 19,7 cc pro Stunde) wurde als mutmassliche Evidenz für einen Kurzschluss zwischen Ductus Thorakicus und rechtem Lymphang angesehen.

REFERENCES

3 Ibid., p. 163.