Evaluation of Effects on Circulating Blood Volume Estimated Using Radioisotope

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In the cases, which needs blood transfusion because of massive bleeding during or after operation there are encountered some cases, the true circulatory state of which cannot be presented by circulating blood volume estimated using radioisotope. The purpose of the experiment is to demostrate what factors effect on this phenomen.

The experiment was performed with the use of adult dogs, femoral artery and vein was exposed, and the former was used for blood sampling and latter for infusion of blood, expander and radioisotope. Circulating blood volume was estimated by volemetron utilizing RIHSA.

The results was as follows:

1) Direct estimation of whole blood volume using Volemetron showed almost right condition, while, when it was calculated by plamsa volume measured using Volemetron, we fail to estimate right state of circulation.

2) Hemolysis had no effect, but, when erythrocytes show some change in character, whole blood is more reasonable for sampling than plasma.

3) As bleeding during mixing time cause maked over estimation, this fact should be kept in mind clinically.

4) Postoperatively there are lots of factors which cause over or under estimation of circulating blood volume, so it is very important that the circuratory condition should be decided by the findings of other test as well as the circulating blood volume measured by Volemetron.

Studies on Lymphography
—Body Distribution of ^{131}I-popyodol following Lymphagiography—

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The Pedal Lymphangiography with ^{131}I-tagged popyodol was performed in 25 dogs, ranging weight from 8 to 16 Kg.

25 dogs were separated to 5 groups as follow:

Group 1 (5 dogs): Dogs were sacrificed 24 hours after the injection.

Group 2 (5 dogs): Dogs were sacrificed 48 hours after the injection.

Group 3 (5 dogs): Dogs were sacrificed 72 hours after the injection.

Group 4 (5 dogs): Dogs were sacrificed 1 week after the injection.

Group 5 (5 dogs): Thoracic duct was drainaged and the dogs were sacrificed 24 hours after the injection.

The conclusions are as follow:

1. ^{131}I-popyodol per gram was highest in Lymphnode.

2. Following the Lymphnode, the lung activity was high and the activity decreased fairly rapidly with the time after the injection.

3. The Thyroid plesented relatively high activity and gradualy increased up to the 3 days. It will be necessary to block the thyroid prior to these studies, especially RI is used.

4. The Bone and Bonemarrow schowed not so high activity, but attempts to be made by using a large amount of RI.

5. The mode of activity loss from the body is chiefly urinary, gall and fecal excretion.

6. ^{131}I-popyodol has no affinity for lymphatic system.

7. Dogs which were drainaged thoracic duct showed the activity in several organs. This fact proves existence of the thoracic-venous anastomosis.

Studies of Venous Return of Lower Extremities by Subcutaneous Clearance of Radioactive Iodine

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The venous circulation of lower extremities was studied by the subcutaneous injection of $Na^{131}I$ on the dorsum of foot. The clearance was measured in 35 cases, 61 limbs on semisitting position and on standing erect position at interval of 24 hours. $Na^{131}I$ solution, 1-5 microcuries/0.1 ml. was injected in the subcutaneous tissue on the dorsum of foot, and the counts were recorded for 30 minutes. The spead of clearance was expressed as the half life time, $t_{1/2}$

The extremities studied were divided into 3 groups according to clinical and venographic findings.

Control group: 30 limbs; No pathological findings were noted in lower extremities.

Venous insufficiency group: 15 limbs; Varices and regurgitation of venous flow were observed in the system of the greater saphenous vein.

Venous obstructive group: 16 limbs; Stenosis or obliteration of the greater saphenous vein or/and deep vein was observed.

On semisitting position, range of $t_{1/2}$ in control group was 10-30 minutes, and mean value was 20.8 minutes. Venous insufficiency group was same as control group, and prolonged $t_{1/2}$ was observed in venous obstructive group and mean value was 33.7 minutes.

On standing erect position, $t_{1/2}$ in control group was almost same as on semisitting position, but in venous insufficiency group, $t_{1/2}$ extended and mean value was 39.1 minutes. In venous obstructive group, $t_{1/2}$ was somewhat shortened.

Then, the standing index was defined as follows:

$$\text{Standing Index} = \frac{t_{1/2} \text{ on standing erect position}}{t_{1/2} \text{ on semisisitting position}}$$

and this index was calculated in each limbs.

The standing index in each groups is as follows; 69-138 with mean value of 105 in control group, 111-292 with mean value of 172 in venous insufficiency group, and 33-97 with mean value of 70 in venous obstructive group.

The clearance test had been used in supine position only, so it was said that there was no relation between this test and venous circulation. However, we measured the subcutaneous clearance of $Na^{131}I$ on both semisitting position and standing erect position, calculated the standing index, and using this index, the difference of status of venous return in various pathological limbs could be clarified.