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The velocity of venous blood to the right heart in man.

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Our previous studies have shown the feasibility of measuring the velocity of blood flow in health and disease by injecting the active deposit of radium into one of the antecubital veins, and determining the time of arrival of the active deposit in the arterial vessels about the elbow of the other arm.

The path of the active deposit coursing through the body necessarily included the veins of the arm, the pulmonary circulation, and the artery of the other arm. The velocity measured was a somewhat complex expression, therefore, of the peripheral as well as of the central blood flow.

This report deals with an attempt to determine the separate velocities along these paths.

A detecting device was placed in a lead block. This block had a hole 5 cm. in diameter bored through its center. The radiations of radium C as it was injected into the veins and as it flowed towards the right heart could not penetrate the lead block and could therefore set up no disturbance in the detecting device. The hole of the lead block with the detector set into it, was placed over the right heart. When the active deposit reached the right heart, the emergent radiations easily traversed the air and tissues between the right heart and the detector, and set up characteristic

disturbances in the detecting device. These disturbances were amplified by three electrode vacuum tubes, and were finally registered automatically by a recording pen galvanometer. Knowing the time of injection of the active deposit and knowing the time of its arrival into the right heart, we have a measure of the velocity of the venous blood flow. Figure I is the record of a typical

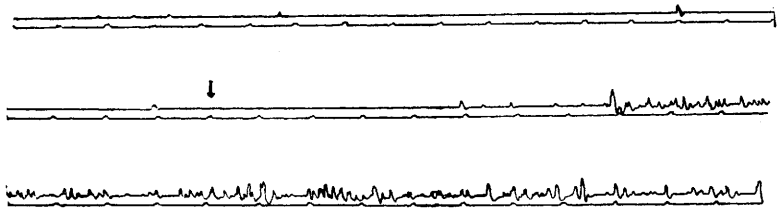

FIG. 1.

determination. The lower line is the time in seconds; the arrow notes the time of the injection.

TABLE I.

No. of Experiment	Position of detector. Costal space	Circ. time Sec.	R. Act. Dep. M. C. injected	Diagnosis
118	4 left	4.5	1.5	Normal
119	4 left	10.0	3.6	Normal
121	4 left	12.0	3.1	Normal
122	4 left	9.0	4.3	Normal
123	4 left	4.5		Normal
126	4 left	9.5	4.4	Cerebr. Hemor.
132	2 right	8.5	3.4	Art. Scler.
133	2 right	10.5	4.2	Normal
134	3 right	9.0	3.4	Normal
135	3 left	12.0	4.0	
140	3 sternum	13.0	3.1	Normal
127	4 left	10.0		Aort. Insuff.
150	3 sternum	8.0	2.5	Normal

Table I contains the data of thirteen venous velocity measurements in thirteen individuals.

Table II shows the results of duplicate determinations in nine individuals.

The trustworthiness of the method is verified by the close correspondence of the results. The one wide variation in the results occurred in determinations 139 and 158, where the former was obtained while the patient showed auricular fibrillation; the latter, after the restoration of normal rhythm by quinidine sulphate.

TABLE II.

No. of Determinations A	Position of Detector Costal Space	Venous Circ. Time Sec. A	R. Act. Dep. M. C. Injected	No. of Determinations B	Position of Detector Costal Space	Venous Circ. Time Sec. B	R. Act. Dep. M. C. Injected	Diagnosis
125	4 Left	12.0	4.1	128	4 Left	10.5	3.1	Cerebr. Hemor.
129	4 Left	9.5	4.8	124	4 Left	5.5	5.2	Normal
130	2 Right	7.0	3.1	131	2 Right	7.5	2.3	Normal
136	3 Sternum	14.0	3.4	146	5 Left	12.0	4.5	Art. Scl.
147	3 Sternum	7.5	3.5	153	3 Sternum	6.5	3.2	Rheum. Fever
149	3 Sternum	9.5	3.5	154	3 Sternum	10.0	2.4	Rheum. Fever
152	3 Sternum	19.0	3.6	155	3 Sternum	15.5	3.1	Malignancy Deep jaundice
151	3 Sternum	4.5	3.4	156	3 Sternum	6.0	3.2	Thromboangitis
139	3 Sternum	15.0	3.4	158	3 Sternum	8.0	3.6	Obliterans A. Aur. Fibr. B. Regular

Knowing the time of arrival of the active deposit in the right heart, and knowing the time of the arrival of the active deposit in the large arteries near the heart, we possess a definite means of gauging the pulmonary circulation time in man.

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The effects of loss of skin and of muscle on the development of spinal ganglia.

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In previous experiments on embryonic limb transplantation in amblystoma,[1] it was shown that when the fore limb is removed, the sensory ganglia of the brachial nerves (third, fourth and fifth) undergo a decrease in the number of cells of approximately

[1] Detwiler, S. R., *Proc. Nat. Acad.*, 1920, vi, 96.