

these 1.5-2.0 cc. Viosterol (Irradiated ergosterol 100 D in oil) mixed in cheese or bread crumbs was fed daily. The fourth rat was fed a like quantity of cheese and oil. The hair became rough and coarse in the Viosterol fed rats within about 10 days and was shed gradually until the skin could be seen. The animals appeared restless and lost weight until at the end of 50 days their weight was reduced 50%. One of the animals died after 55 days, one after 67 days, and the third was killed after 74 days. X-ray examination of the third animal showed a definite shadow in the position of the aorta from its beginning throughout the thorax and abdomen. Macroscopic examination confirmed the X-ray findings, dense annular calcification being evident even to the branches of the iliacs. Similar examination of the other animals revealed the same findings but in less degree. Microscopic examination of areas of the aortae showed the intima to be the chief site of deposition with involvement of the media in the most extensive and thickly calcified areas. The control rat was in healthy condition and showed a normal arterial system at conclusion of the experiment. Further study is in progress.

5014

A Direct Method for the Estimation of Venous Blood Pressure.

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(Introduced by Samuel R. Haythorn.)

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After an examination of the methods in vogue for the determination of the pressure of the venous blood and after a consideration of the difficulties involved in their use, we have succeeded in measuring the venous pressure by inserting a needle into the median basilic vein and observing the rise of the blood in a vertical tube. This simple and direct procedure was first used in 1735 by Stephen Hales, a British clergyman, who inserted tubes into the crural artery and the jugular vein of a mare and observed both arterial and venous pressures. The method has since been neglected, 2 other procedures being now in general use. The indirect, tambour method of Eyster and Hooker¹ is effective only when the veins are distinctly visible.

¹ Hooker, D. R., and Eyster, J. A. E., *Bull. Johns Hopkins Hosp.*, 1908, xix, 274.

It is subject to large personal error and the time required for an observation is appreciably longer. The direct method of Moritz and Tabora² is complicated by the use of an additional fluid, *e. g.*, salt solution. Moreover the results do not appear to be entirely reliable.

The apparatus* which we have used, Fig. 1, is an L-shaped pyrex glass tube, ground at the horizontal end to fit an 18 gauge hypodermic needle. The vertical portion of the tube has an internal diameter of 4 mm. and is 30 cm. in length. The readings are taken with the help of a celluloid metric scale which is fastened to the vertical portion of the tube by means of spring clips. The capillary rise of the blood in such a tube is approximately 0.5 cm. and may cause a positive error of this magnitude in the determination. If the pressure is to be related to a column of water, the specific gravity of the blood will introduce an error in the opposite direction. Since the average specific gravity of blood is about 1.06, these errors are balanced when the venous pressure is equal to 10 cm.

A consideration of the capillarity involves also the question of the ease of wetting the glass by the blood. It would seem more satisfac-

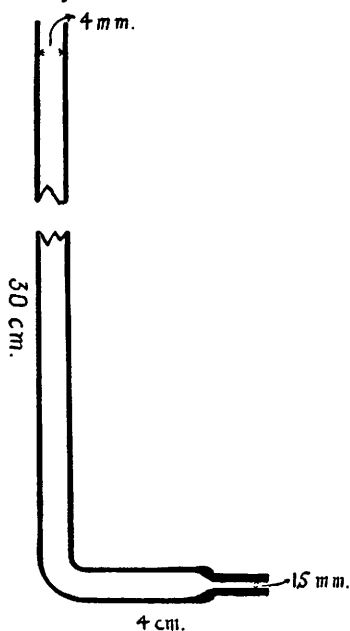


FIG. 1.

Venous pressure manometer tube.

² Moritz, F., and Tabora, D., *Deutsche Arch. f. klin. Med.*, 1910, xcviii, 475.

* The tube has been made for us by the W. J. Gilmore Drug Company, Pittsburgh, Pa.

tory, perhaps, to ignore both these factors and let our reading of the venous pressure represent merely a column of blood without further connotations. The error in obtaining the figure is probably never more than 0.5 cm.

The estimation is made with the patient in the dorsal position, Fig. 2, assumed 15 minutes prior to the reading. The relaxed arm is extended parallel to the mid-axillary line and is supported by a pillow. The veins of the arm are then approximately parallel to the course of the vena cava and possible compression of the veins by contracted muscles is avoided. It would, of course, be desirable to have the inner aspect of the elbow at the level of the right auricle, but to achieve such a position with accuracy is practically an impossibility. We believe, therefore, that, if the arm is always placed in the mid-axillary line a satisfactory basis for comparative readings is furnished. Any constricting clothing should be removed. The cuff of a standard sphygmomanometer is then loosely applied to the arm well above the elbow and the skin at the bend of the elbow cleansed with iodine and alcohol. Slight constriction of the arm is now made by raising the cuff pressure to 10 or 15 mm. of mercury. The needle of the venous pressure manometer is inserted and the

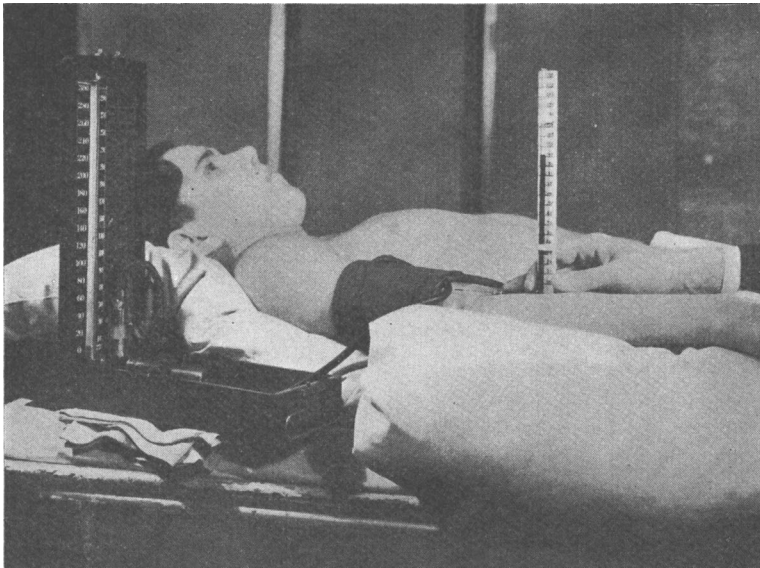


FIG. 2.

Method of observing the venous pressure. It will be noticed that the sphygmomanometer does not register zero. This is due to a fault in the instrument and not to inflation of the cuff.

cuff pressure immediately released by opening the outlet valve of the sphygmomanometer. The constriction by the cuff is thus removed before the blood column has reached the elbow of the manometer. The entire procedure, including constriction of the vein, insertion of the needle and deflation of the cuff, is completed within a few seconds.

The blood rises in the manometer tube at a progressively decreasing velocity until it becomes stationary or pulsates slightly with the cardiac rhythm. The reading is then taken. Finally the cuff is slightly inflated. If the blood rises in the tube, the patency is assured. The cuff is again deflated and the needle immediately re-

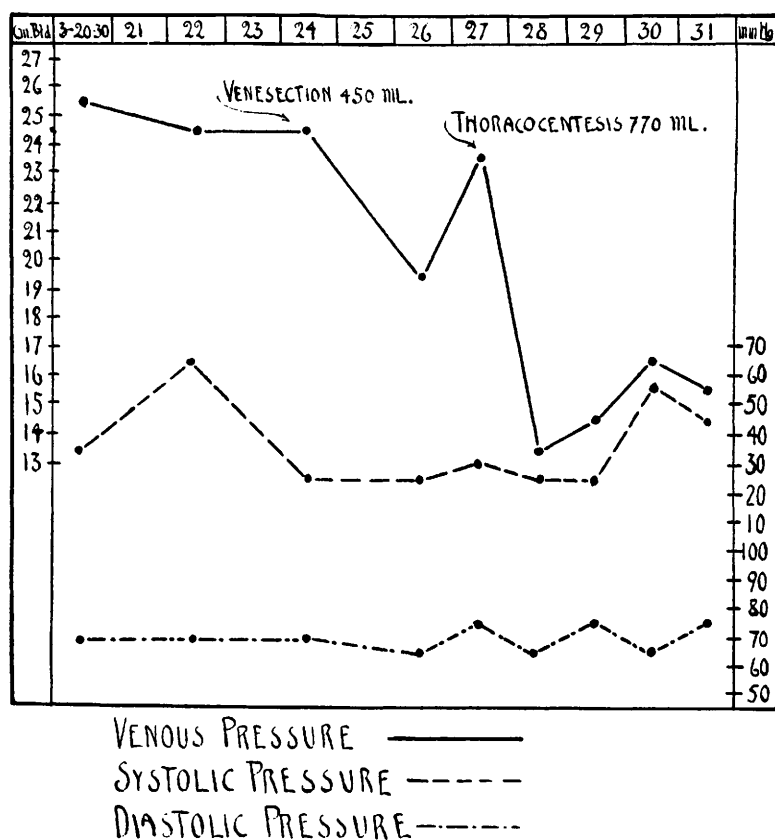


FIG. 3.

The appended graph is that of a case of congestive heart failure, showing the results on venous pressure produced by venesection and subsequent thoracocentesis. The readings were made by the direct manometer. The first 3 readings (taken by 2 different observers) are practically uniform. Following the removal of 450 ml. of blood there is a drop to 19.5 cm. with a prompt subsequent rise. A further and more decisive drop is seen following the removal of 770 ml. of fluid from the left pleural cavity.

moved to prevent a return flow of blood. The site of the puncture is then cleansed with alcohol. The entire procedure requires little more time than an average estimation of arterial blood pressure. We have noted no major technical difficulties nor significant sources of error.

The venous pressure in a series of 40 normal individuals varied between 4 and 10 cm. with most of the figures ranging between 6 and 8 cm. The determination has been applied largely to patients with hypertension, pneumonia or congestive heart failure. It has not seemed necessary to take readings oftener than once daily, except in the most severe cases, in which a second observation has been made only after venesection or after the removal of pleural transudate. Otherwise observations have been made at intervals of 1, 2 or 3 days.

In a series of over 200 readings, we have not been confronted by any difficulties from traumatism by the needle and have not been obliged to resort to other veins than those at the elbow. The amount of blood lost during a reading—1-3 ml.—is negligible. We have not encountered any instances of clotting in the vein. Our experience leads us to believe that this method possesses simplicity, reasonable accuracy and freedom from error of a personal nature.

We are grateful to Dr. A. J. Bruecken for the preparation of the photograph and to Mr. C. F. Thilo for the drawings.

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Utilization of Calcium Soaps by the White Rat.

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The formation of calcium soaps in the intestine has been accepted by many authors as being fatal to calcium and fatty acid absorption (Givens,¹ Bosworth,² Telfer,³ *et al.*). On the other hand Holt, Courtney and Fales⁴ found evidence that calcium was better assimilated by infants when the diet contained a liberal amount of fat.

¹ Givens, M., and Mendel, L. B., *J. Biol. Chem.*, 1917, xxi, 421.

² Bosworth, A. W., Bowditch, H. I., Giblin, L. A., *Am. J. Dis. Children*, 1918, xv, 397.

³ Telfer, S. V., *Quart. J. Med.*, (Oxford), 1922-23, xvi, 45.

⁴ Holt, E., Courtney and Fales, *Am. J. Dis. Children*, 1918, xvi, 52.