

# ARTERIAL AND VENOUS PRESSURE READINGS DURING OPEN-HEART OPERATIONS

## Apparatus and Technic

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CONTINUOUS pressure readings, both arterial and venous, are necessary in open-heart surgery. These values may be obtained by means of a strain gauge and an oscilloscope screen (or direct writer). A simpler, more direct method of determining these pressures throughout the period of anesthesia and operation has proved to be satisfactory in more than 800 cases at the Cleveland Clinic Hospital.

Arterial pressures are read on an aneroid manometer that is connected by means of an arterial pressure set\* (consisting of plastic tubing and various adaptors) to a cannula in the femoral artery. A 500-ml. flask of 5 percent dextrose containing 10 mg. of heparin is attached to the screw cap (microdrip of the arterial set) (Fig. 1).

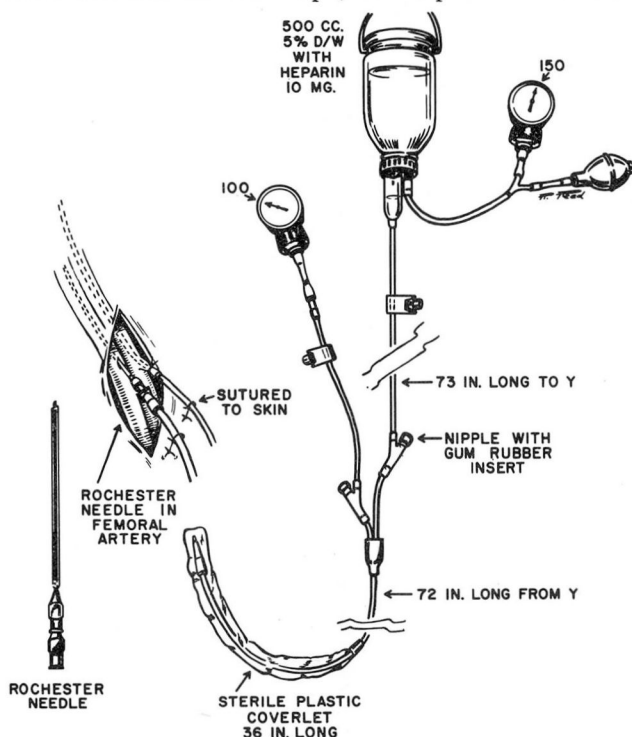


Fig. 1. Apparatus for direct reading of arterial pressure.

\*Abbott Laboratories, North Chicago, Illinois.

The solution is allowed to fill the portion of the tubing covered with a sterile sleeve, and also another limb (which serves as a manometer connection) to within 4 in. of its end. One manometer is attached to this end (shown on the left in *Figure 1*) and another manometer (with pressure bulb) is attached to the flask as indicated.

A cut-down is made upon the femoral artery in the upper thigh, and the point of a Rochester needle\* is passed into the lumen of the vessel. The sterile end of the arterial pressure set is now uncovered and is secured to the needle. By means of the pressure bulb, an air pressure of about 150 mm. of Hg is induced in the flask containing the dextrose and heparin solution. The solution flows slowly through the microdrip, controlled by the screw clamp, into the patient's artery, thus preventing blood from entering the plastic tubing. Systolic and diastolic pressures may be read on the manometer dial. The damping of the pressure waves results in values that are slightly below and above (respectively) the true systolic and diastolic values. However, the mean pressure is satisfactorily indicated.

The technic for measuring venous pressure during open-heart operation is indicated in *Figure 2*. A bank of stopcocks is shown with its various connections.

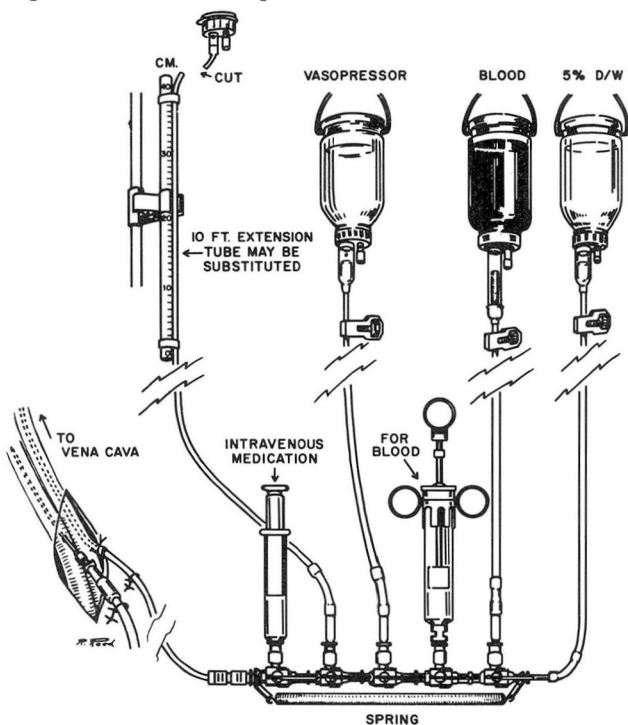


Fig. 2. Stopcock bank and attachments for measurement of venous pressure and administration of fluids and medications during open-heart operation.

\*Rochester Products Company, Rochester, Minnesota.

Proceeding from right to left, the stopcocks afford attachments for (1) a flask of 5 percent dextrose and water which flows to keep the system open when no other solution is being given; (2) a flask of blood, which may be given rapidly, and in measured quantities if necessary, by (3) the syringe attached to the adjacent stopcock; (4) a flask containing a vasopressor; and (5) a Venopak\* from which the top has been removed. This tubing is laid along a centimeter scale on a rod, the zero mark of which is placed level with the heart as shown in *Figure 3*. This tube is filled

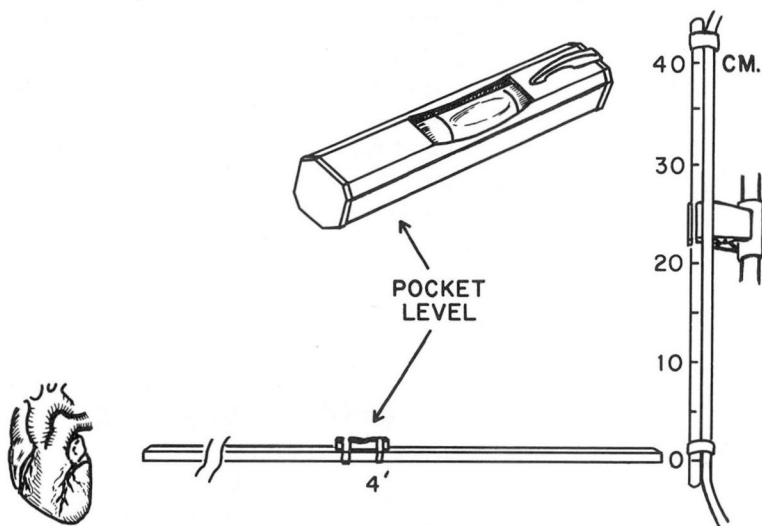


Fig. 3. Procedure for establishing zero venous pressure.

above the estimated level that would indicate the venous pressure, with 5 percent dextrose from the first flask. When the filled tube is connected through its stopcock with the cannula in the vein, the venous pressure may be read at the point to which the meniscus falls. The last stopcock is available for the intravenous injection of various medications. From the bank of stopcocks, a polyethylene catheter leads to the vena cava by way of the femoral vein adjacent to the cannulated femoral artery.

The apparatus described is simple in construction and application, and provides dependable readings of arterial and venous pressures.

\*Abbott Laboratories, North Chicago, Illinois.