1. Isojima, S., Graham, R. M., Graham, J. B., *Proc. Am. Assn. Cancer Research,* 1958, v2, 310.
2. Hirsch, H. M., Iversen, I., *Cancer Research,* 1961, v21, 752.
3. Cook, E. S., Turumi, K., Perez, N. T., Juhasz, R., *Acta Unio intern. contra Cancrum,* 1959, v16, 952.
4. Nutini, L. G., Fardon, J. C., Prince, J. E., Duarte, A. G., *ibid.,* 1960, v16, 110.
5. Prince, J. E., Fardon, J. C., Nutini, L. G., Sperti, G. S., *Cancer Research,* 1957, v17, 312.
6. Prince, J. E., Morgan, C. M., Fardon, J. C., Nutini, L. G., Duarte, A. G., *ibid.,* 1958, v18, 760.
7. Nutini, L. G., Fardon, J. C., Cook, E. S., Perez, N. T., Medley, D. L., Mamola, N. J., *Proc. Am. Assn. Cancer Research,* 1961, v3, 255.

Received August 30, 1962. P.S.E.B.M., 1963, v112.

Technique for Temporary or Chronic Vascular Occlusion or Narrowing In Intact Animals.* (28028)

R. W. ECKSTEIN AND THOMAS E. DRISCOL†
Department of Medicine and Physiology, Western Reserve University School of Medicine, Cleveland, Ohio

A snare constructed from polyethylene tubing has been developed and successfully used during the past several years to produce both temporary and permanent coronary arterial occlusion in intact dogs. It may be useful in other situations where control of arterial or venous flow is desired.

Materials and methods. The snares are constructed from tubing purchased from Clay-Adams, Inc. A ¼-inch length of P.E. 280 tubing is slipped over the end of a length of P.E. 205. The resulting cuff is enlarged by a ¼-inch length of P.E. 330 tubing (Fig. 1, A). The end is heated over a cautery tip until the softened tubing molds itself into a flange which measures 6 to 7 mm in diameter. Three holes are melted through the flange with a hot wire or ordinary straight pin to a size which will admit P.E. 50 tubing (Fig. 1, B).

Approximately 1 cm of one end of a length of P.E. 50 tubing is melted to form a cup-shaped expansion. The opposite end is passed through one of the holes in the flange and pulled so that the expanded end is tight against the flange. Excess plastic is trimmed from the opposite rim of the flange. A length of No. 1 surgical silk is passed through the smaller tubing and anchored in place with a knot pulled into the expanded end (Fig. 1, B). The thread is cut to project several inches beyond the free end of the small tubing.

This device has been successfully used to produce both temporary and chronic occlusion of the left circumflex coronary artery of dogs. With the chest open, the artery is dissected free for a length of about 5 mm. The free end of the small tube along with the projecting thread is passed beneath the artery toward the cardiac apex and then through the center hole in the flange to form a loose snare about the artery. The pointed end of a hollow trocar is forced through the chest wall from inside to outside near the sternum between the sixth and seventh or seventh and eighth ribs while the skin is drawn toward the incision. The free end of the snare is passed into the hollow end of the trocar and both are pulled through the chest wall. Threads through the remaining holes in the flange are sutured to available tissue near the artery to prevent rotation of the snare. The outside tube is cut to extend about 2 inches beyond the skin allowing some slack within the chest. A source of heat is used to produce a slight flare on the end of the larger tubing.

An air seal is constructed from a pull-over type rubber serum bottle stopper with a plug

* This work was supported by a grant from U. S. Public Health Service.

† Research Fellow of Cleveland Area Heart Society.

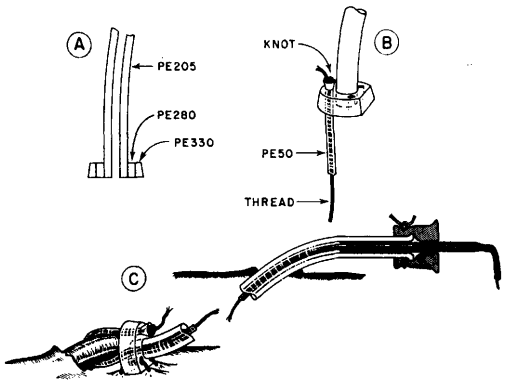

FIG. 1. Three stages in construction of polyethylene snare. (A) Expanded end of P.E. 205 before heating. (B) After heating to form flange. The length of P.E. 50 tubing containing the thread is in place. (C) The completed unit sutured near the vessel. On the right are shown details of placement of rubber seal and flattened bent metal tubing.

7 mm in diameter and 8 mm in length. After the sleeve is trimmed off, a hole is burned through the stopper of a size to form a snug fit around the shaft of a 17 gauge needle. A 5 cm length of 17 gauge needle tubing‡ is previously marked with a file at 1 or 2 mm intervals along its middle 2 or 3 cm. The cut ends are carefully smoothed to prevent damage to the plastic tubing. The bottle stopper is slid to the middle of the steel tubing. The thread and its surrounding small tubing is passed through the metal tube and the vial stopper is pressed over the flared outer tube and ligated in place. The loop is adjusted to fit loosely around the artery. The steel tube is positioned to permit tightening of the snare. The distal 5 mm of the steel tubing is crushed with a vise grip pliers to anchor the inner tube and thread and bent at about 45° (Fig. 1, C). The position of the calibration marks in relation to the outer surface of the rubber seal is noted when the snare is open and when closed sufficiently to just occlude the vessel. Careful attention to these details is necessary to prevent damage to the artery if multiple temporary occlusions are to be produced.

The chest is then closed and the external end of the device is fastened under adhesive tape and a heavy canvas body jacket. Prior to placement the entire unit is soaked in a solution of Zephiran®.

The exact functional life of these snares has not been determined but it has been possible to produce circumflex occlusion for as long as 3 weeks after placement. In a number of animals units have remained intact for months after the snares were tightened to produce complete permanent circumflex occlusions. Units containing the thread have been used to produce temporary occlusions many hundreds of times without stretching or other types of mechanical failure.

Originally P.E. 20 without thread was used as the inner tube. A 1½ inch length of wire 0.016 inch in diameter was inserted into the outer end to provide stiffness. Although this unit without the thread is satisfactory for production of permanent occlusions, the inner tube does stretch after it is used to produce multiple temporary occlusions.

Summary. Details are given for construction of small polyethylene snares for chronic implantation for the purpose of producing subsequent permanent or temporary vascular narrowing or complete occlusion in intact awake or anesthetized animals.

‡ Purchased from Becton Dickinson & Co., Rutherford, N. J.

Received September 5, 1962. P.S.E.B.M., 1963, v112.