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November 1, 1967

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An intravenous catheter for chronic use

SIR,—The use of conscious animals in experiments extending over weeks or months often necessitates the intravenous injection of fluids. Several indwelling catheters terminating in closures attached to the skin have been described but generally these require special machined parts (Khouri, Gregg & Rayford, 1965; Davis, 1966; Goetz & Hanis, 1967). We have designed and used a catheter which is easy to construct and whose components are usually found in research laboratories.

Fig. 1 is a diagram of a section through the catheter and skin-button connector. The connector is built around a No. 1 Record-fitting syringe needle. The needle mount (D) is first cut down to 1 cm in length and filed to an approximately cylindrical external contour. Next, the tapered mount hole is enlarged and a 1 ml serum closure cap (A) inserted. The cap is first cut as in the insert of Fig. 1 along the dotted lines. The closure skirt is then everted over the needle mount and covered with a short length (1 cm) of heat-shrinkable polyethylene tubing.

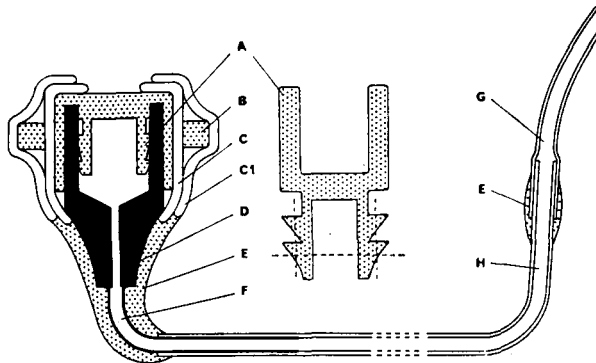


FIG. 1. Diagram of a section through the skin button connector and catheter to show the method of assembly.

A. Serum closure cap. B. Thick-walled rubber tubing. C and C₁, Heat shrinkable polyethylene tubing. D. Needle mount. E. Silicone rubber. F. Syringe needle. G. Silicone rubber tubing. H. Teflon tubing.

Careful application of a small gas flame to this tube shrinks it so that it takes up the form shown in the diagram (C), holding the closure cap firmly in position. A narrow ring (2-3 mm) made from thick walled rubber tubing of suitable diameter (B) is pushed over the shrunken tube. Heat shrinkage of a second, wider bore polyethylene tube (C₁), over this ring produces a rounded ledge around the circumference of the button.

In our experience, Teflon tubing is too resilient for direct venous catheterization. Silicone rubber tubing, although ideal for this purpose, is very flexible and may kink along a subcutaneous pathway in a free moving animal. The catheter we have designed makes use of the properties of both Teflon and silicone rubber. The portion of the catheter (H) between the skin button and the vein is a Teflon tube (i.d. 1/32 in). This is pushed over the shortened syringe needle (F) and shaped in a gas flame to fit the expected contours of the subcutaneous pathway. The last centimetre is arranged to lie parallel with the vessel when *in situ*. The free end of the Teflon is prepared for bonding with an etching fluid (Tetra Etch) and inserted 5 mm into a 3-4 cm length (G) of silicone rubber tubing (i.d. 1/32 in). Cold curing silicone rubber (E) is used to strengthen this junction and to coat the exposed base of the needle mount. The completed catheter and termination button may be sterilized by the usual methods and filled by piercing the rubber cap with a fine syringe needle attached to a syringe of saline.

The operative procedure we use for the chronic catheterization of the jugular vein of a cat or rabbit is as follows. The catheter is pulled subcutaneously from a small x-shaped incision between the shoulder blades so that the rubber tube emerges near the mobilized vein. The vein is catheterized so that the rubber/Teflon junction just enters the vessel. Sutures are tied around the vein over this junction and the Teflon is secured to subcutaneous tissue. The skin button is secured in place by sutures which are passed through the outer polyethylene tube (C₁) and the rubber ring (B). Care is taken that the inner polyethylene tube (C) is not punctured by the suture needle. In use, a fine syringe needle attached to a length of fine polythene tube is pushed through the rubber diaphragm of the skin button. Intravenous injections may be made as often as necessary through this tube without further disturbance of the animal.

We have found that these catheters, implanted in the jugular veins of cats and rabbits, have remained patent over periods of several months with little attention other than occasional flushing with heparin/saline. These experiments were never terminated because of failure of the indwelling venous catheter.

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November 13, 1967

The manufacturers of the components used in the venous catheter are: 1 ml serum closures (Suba seal), Freeman & Co. Ltd., Steincross, Barnsley. Heat shrinkable polyethylene tubing, Hellermann Electric Ltd., Crawley, Sussex. Teflon tubing, X-Lon Products Ltd., London, S.E.11. Silicone rubber tubing and Silastic Elastomer 382 (Dow Corning), Down Bros. & Mayer & Phelps, Mitcham, Surrey. Tetra-Etch, W. L. Gore & Associates Inc., Newark, Delaware, U.S.A.

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