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Improved Injection Chamber for Flow-Guided Catheters

Gerald V. O'Reilly,[1] Jonathan Kleefield, Paul A. Svendsen, and Ay-Ming Wang

Selective catheterization of intracranial arteries for angiographic, embolization, and perfusion procedures is usually performed with a calibrated-leak balloon catheter first developed by Kerber [1]. This system employs a leaking latex microballoon glued to the end of a very flexible 2.5 French Silastic catheter [2, 3]. The flexibility of this catheter necessitates that it be injected into the blood stream via a guiding catheter. Initially, the catheter was coiled and injected from a glass syringe. Lately, more sophisticated injection chambers have been developed that are either expensive or difficult to procure [4, 5]. We constructed an injection chamber using medical equipment available in most angiographic laboratories.

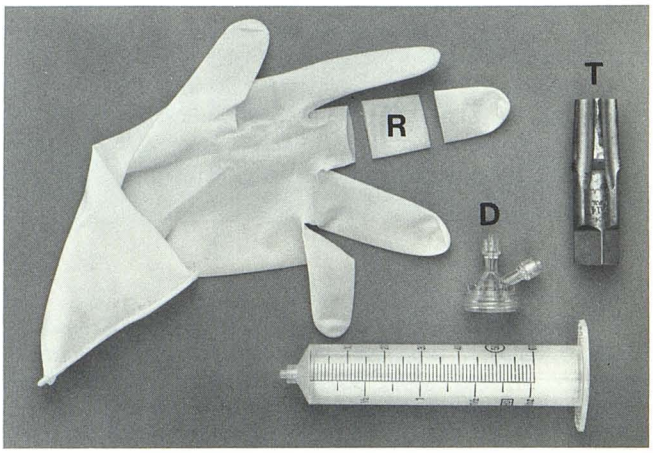

Fig. 1.—Basic materials for construction of injection chamber. Modified steel tap (T) is used to make threads in syringe barrel. D = transducer dome; R = rubber cylinder.

Materials and Methods

The following materials were used: (1) 50 ml Luer-Lok-tip plastic syringe 5663, Becton-Dickinson, Rutherford, NJ; (2) steel tap Ace 3/4 14 N.P.T., Henry L. Hanson, Worcester, MA; (3) disposable transducer dome 713, U-Onics Labs., Wayland, MA; (4) Tuohy-Borst adapter PFLLA–UCC and straight forming wire FW .025 S1, Cook Inc., Bloomington, IN; (5) male Luer-Lok/three-way stopcock with vinyl tubing 59030; female Luer-Lok nylon coupler 0; male Luer-Lok/female Luer-Lok with vinyl tubing 53010, Surgimed Inc., Summerville, SC; (6) roller clamp 1400 (intravenous set), McGaw Labs., Irving, CA; and (7) a sterile latex surgical glove.

The syringe barrel is divided with a hacksaw at the 33 ml graduation mark, and the edge is made smooth with a file. The cutting processes of the steel tap are removed, saving the last three to four, using a rotating stone grinder (fig. 1). The modified tap is then used to hand-bore three threads on the inner surface of the cut edge of the syringe barrel. The threads must be carefully hand-cleaned to remove plastic debris. The thin plastic diaphragm in the transducer dome is removed easily. A rubber cylinder is cut from the middle finger of a latex surgical glove and rinsed in saline to remove any adherent powder.

The injection chamber is assembled by doubling over the rubber cylinder and using it to cover the threads of the transducer dome to produce a watertight seal. The dome is then screwed into the syringe barrel. The Tuohy-Borst adapter is attached to the straight port on the transducer dome. The male Luer-Lok adapter on the tubing with the three-way stopcock is exchanged for a female fitting, enabling it to be attached to the oblique port on the transducer dome (fig. 2). The Silastic catheter is introduced into the chamber by slipping its proximal end over the tip of a straight forming wire, which is passed

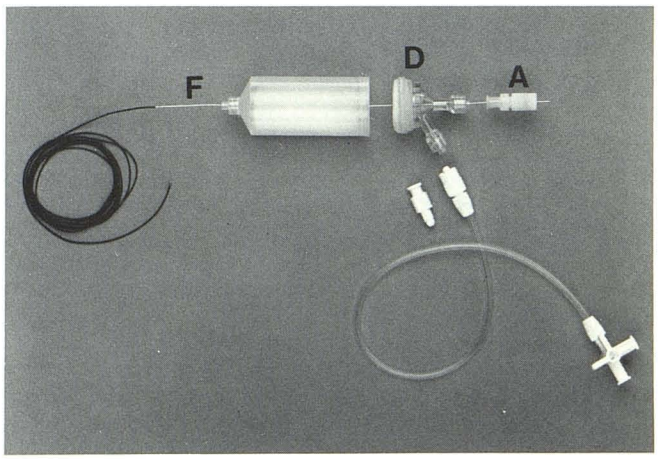

Fig. 2.—Components of catheter delivery system before assembly. Doubled rubber cylinder covers threads on dome (D) to produce watertight seal. Dome is more easily screwed into syringe barrel when surfaces are lubricated with saline. Forming wire (F) is used to guide proximal end of Silastic catheter through chamber. Tuohy-Borst adapter (A) is tightened to lightly grip catheter.

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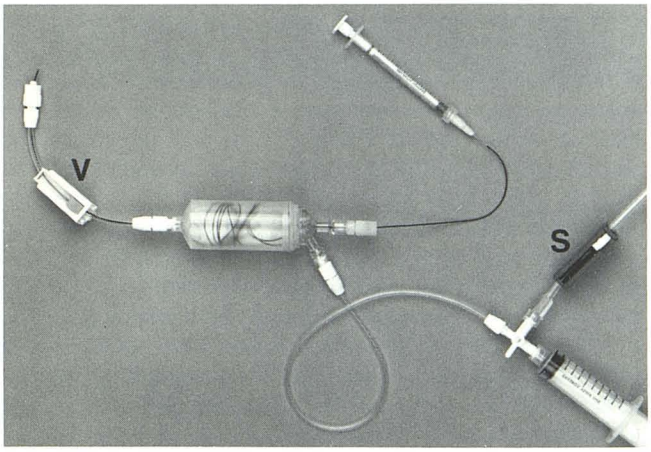

Fig. 3.—Assembled injection chamber and delivery system. Roller clamp (V) acts as simple valve and can, if necessary, isolate injection chamber from guiding catheter. S = continuous saline infusion under pressure.

through the chamber and out through the Tuohy-Borst adapter. Once the chamber is filled with heparinized saline, the catheter can be neatly coiled within it.

We prefer to use a simple valve mechanism with an observation area between the chamber and the guiding catheter. This is constructed by putting a roller clamp on a short, clear, vinyl connecting tube (fig. 3).

This injection chamber is easy to manufacture, assemble, and, if necessary during a procedure, disassemble. All the constituent parts are obtained from acceptable medical devices.

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