New Intraventricular Catheter for Volume Pressure Response Measurements

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ABSTRACT: Measurements of the volume-pressure response (VPR) to determine the relative position of a patient on the graphic volume-pressure curve have been used to derive clinically useful information. One reason that these measurements have not been used more frequently has been the fear of introducing infection into the ventricular system. We have designed an intraventricular catheter that allows repeated VPR measurements and reduces the risk of infection.

RÉSUMÉ: Les mesures de la réponse au volume-pression (RVP) pour établir le lieu relatif d'un patient sur la courbe graphique de volume-pression ont été employé pour retirer des renseignements cliniques utiles. Une des raisons pour laquelle ces mesures n'ont pas été utilisés plus fréquemment est la crainte d'introduire l'infection au système ventriculaire. Nous avons dessiné un sonde intraventriculaire qui permet la mesure répétée de la RVP et qui réduit la risque d'infection.

Can. J. Neurol. Sci. 1984; 11:479-480

Lungbert (1960), Miller (1972), Langfitt (1969), and others have demonstrated that intracranial pressure is a measurable quantity. In the last 20 years much time and effort has gone into techniques for measuring intracranial pressure, assessing its dynamics and, if appropriate, modifying it.

Miller (1972), has emphasized that one technique is useful in trying to establish the graphic position of an individual patient on the standard volume-pressure curve. This method is the 1 ml. infusion test to determine the volume-pressure response. One ml. of fluid is injected through the intraventricular catheter and the resulting pressure change is recorded. Its usefulness as a diagnostic study is established, but several potential complications have prevented it from becoming useful clinically and repeatable. A patient may be lying at the base of the upswing part of the curve and the introduction of a fluid volume may initiate a pressure wave. Repeated handling of the tubing and opening of the system to the intraventricular fluid may increase the risk of infection.

We have designed a catheter based on the same technology used for Swan-Ganz lines (Figs. 1 and 2). Two catheters are placed together but do not communicate. One enters the ventricular space and the other ends blindly in an expansible balloon. The balloon is expanded with 1ml. of fluid and the intraventricular pressure is then recorded. The introduced fluid is not in contact with the cerebrospinal fluid and the risk of infection is thereby reduced.

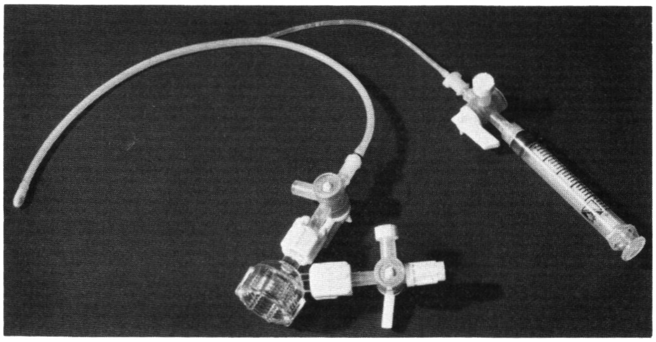

Figure 1 — Intraventricular catheter with balloon deflated. The separate injection port is shown with the attached syringe.

We have used the prototype of this device on several occasions. Repeated examinations are feasible. No infections have occurred in our experience. We have experienced no complications of the inflatable balloon either bursting or failing to deflate. The present catheter is slightly larger than an infant feeding tube or Fischer cannulae, but it still may be passed through a standard twist drill hole.

The technology can still be improved, but we feel that if intraventricular pressure is to be recorded and infusion tests initiated, then this catheter offers advantages over present technology.

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Received January 30, 1984. Accepted in revised form August 28, 1984.

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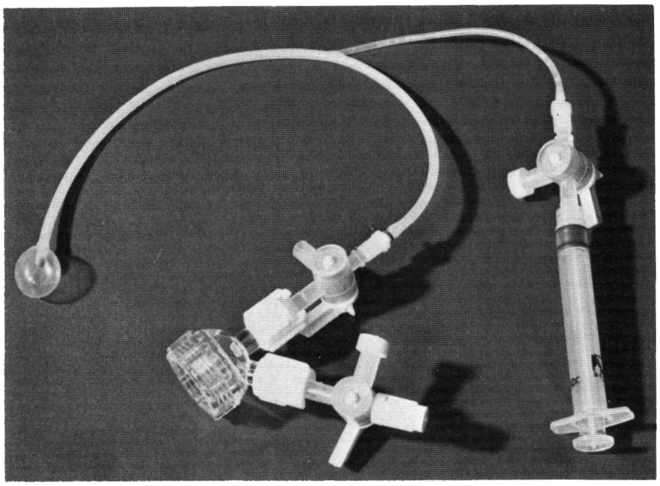

Figure 2 — Intraventricular catheter with balloon inflated. The holes for CSF drainage are above and separate from the balloon to allow continuous measurement.

Acknowledgement

This work was done with the technical and production assistance of the Heyer-Schulte Co.

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