AN APPARATUS FOR CONTINUOUS VENTRICULAR DRAINAGE*

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Many authors1,2,4-10 have devised their own methods and instruments for continuous ventricular drainage, but could not overcome complexity of construction, inconvenience in manipulation, difficulty in assuring asepsis, and prevention of too low an intracranial pressure. Recently, Haft et al.2 reported cases in which massive epidural hemorrhage developed while the patients were on ventricular drainage, but we suspect that their bleedings probably were caused by too low intracranial pressure after release from the increased pressure. In consideration of such defects, the present authors have contrived to make a type of drain that has the merits of being small-sized, easy to manufacture, and easy to disinfect and apply and, above all, is useful in preventing low intracranial pressure and in facilitating measurement of the pressure at any moment. A description of the construction and the mode of application of the device follows.

CONSTRUCTION AND APPLICATION

A small hole is drilled in the frontal region on one side and a soft polyethylene tube, 2.5 mm. in diameter with 2 side-holes near the tip, is inserted through the burr hole into the anterior horn of one of the lateral ventricles. This tube first is boiled in sodium bicarbonate solution for 20 min., then kept immersed in anhydrous alcohol and again boiled in distilled water for 20 min. just before insertion. It is very important to fix the draining tube properly. We make it a rule first to fix it to the aponeurosis with one stitch of silk thread, then to turn the tube for one or two revolutions screw-wise and to sew it down at five different points. If the fixture is not steady enough, the tube will come out or go in too deep for long continuous drainage.

A similarly sterilized polyethylene tube, 4 mm. in diameter (Fig. 1, B), is then connected to the tube described above at its outer end and a crystal-glass device, as shown in Fig. 1, is connected to the other end of the larger tube.

Now the glass instrument is placed at the bedside at a higher level so that the difference of the height of the end of the tube within the ventricle (A) and that of the proximal end of the glass instrument (C) is just 15 cm., and a manometer is mounted on the opening (H). When the intracranial pressure is to be kept constant at 15 cm. H~O, the taps (E) and (I)) are left open, and the cerebrospinal fluid in the quantity excessive for this pressure will run down through (C) into the bottle (J), which contains Lysol solution up to the mark of 2 cm., and the free end of the tube is immersed in it. If the tap (E) is omitted, the part between A, B, D and J will form a syphon and the intracranial pressure will fall to a low level, but when the tap (E) is opened the action of the syphon will be shunted out and the head between (A) and (C) will remain effective. The partition (G) has been mounted to keep the aseptic condition as nearly perfect as possible. Antimicrobic dry cotton is inserted lightly in (F). When intracranial pressure is to be measured, the taps (E) and (D) are closed and the manometer will register the pressure accurately. The use of a strain-gauge manometer and such automatic recording devices will enable accurate study of the intracranial pressure from various angles. If the nature, composition, etc. of the cerebrospinal fluid is to be examined, samples of the fluid can be drained with a fine injection needle inserted below the tap (D). We have applied this device in about 235 cases, up to 20 days at the longest and 7 days on the average, and have experienced few cases of direct infection. In applying it for more than about 2 weeks, the side or the horn of the ventricles of application may be changed. When the polyethylene tube is to be extracted, mere drawing out of the tube and cutting of the fixing threads will

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Fig. 1. Diagram of apparatus for continuous ventricular drainage (see text).
suffice, no suture of the wound being needed. In case of unilateral obstruction of the foramen of Monro, the tube should be inserted on the affected side, for if it is inserted contralaterally, the pressure in the affected side will rise pressing the ventricle farther to the healthy side and causing serious harm to the function of the brain. This polyethylene tube may be used conveniently in introducing air or iodine oil for ventriculography—a process serving to minimize the danger of intracranial pressure rising after ventriculography. During operation, the tube allows free efflux of the cerebrospinal fluid, thus facilitating the operative procedure.

SUMMARY

In considering the defects of systems of drainage used currently, the present authors devised an apparatus easy to prepare and simple to apply, which facilitates complete prevention of too low an intracranial pressure. It consists of pieces of polyethylene tubes, a glass device measuring 10 cm. in length and 3 cm. in diameter, and a manometer. In using this apparatus in the treatment of 235 patients with brain tumor, very satisfactory results were obtained. Our drainage system is found useful before and after operations on the brain, for effects such as excessive increase or excessive reduction of intracranial pressure can be predicted and effective countermeasures can be performed.

REFERENCES