REFERENCES


A SIMPLIFIED APPARATUS FOR CONSTANT VENTRICULAR DRAINAGE

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Several techniques for effecting constant ventricular drainage have been described. Any successful routine method should be easily available at all times, provide a means of measuring and controlling the intracranial pressure and the amount of ventricular fluid drained, afford maximum protection against infection and be well tolerated by the patient. An apparatus that meets these requirements has been developed by the neurosurgical services of The Peter Bent Brigham Hospital and The Children’s Hospital, Boston.

The apparatus consists of the following parts: (A) an ordinary graduated 1 liter Fenwal intravenous bottle which is held inverted by a ring attached to the head of the patient’s bed; (B) a “J”-shaped double lumen glass tube which fits the standard Fenwal single hole rubber stopper and extends into the bottle about 22 cm.; (C) connecting rubber tube attached to the glass tube at one end and a glass adapter and standard intravenous needle at the other; (D) a 12-inch length of small-caliber polyethylene tubing, which is used as the ventricular catheter. All of this except the polyethylene tubing is sterilized as a unit; several units are kept available at all times.

To institute drainage, a ventricular tap is made in the usual fashion using an open-end needle fitted with a stylet. When a free flow of fluid has been obtained the polyethylene catheter is threaded into the ventricle through the needle and the needle withdrawn, leaving the catheter in place. An intravenous needle of proper size is inserted into the end of the catheter and attached to a 1 cc. syringe. When adequate flow of ventricular fluid through the catheter is assured it is anchored to the skin with stitch and a sterile dressing is applied to the head around the catheter. The needle is then removed from the syringe and attached to the tubing from the drainage bottle. The bottle is usually positioned so that the curved top of the glass tube is about 150 mm. above the former magnum, but any desired pressure can be maintained by raising or lowering the bottle. If the rubber connecting tube is passed over a pulley at the head of the bed and a small weight attached to the bottom of the hanging loop, the patient has considerable freedom of motion without tension on the ventricular catheter. To protect against kinking and tearing, the polyethylene catheter should be reinforced with adhesive tape where it receives the intravenous needle. The system is shown diagrammatically in Fig. 1.

COMMENT

During a 9-month period from June 1949, to April 1950, this type of drainage was used on 26 patients 29 times. The diagnoses in these cases included brain tumor, brain abscess, hydrocephalus of various types, myelomingingocele with Arnold-Chiari malformation, and tuberculous meningitis. The duration of drainage, dictated by the clinical requirements of the patient, was usually 8 days or less (21
patients). However, 2 patients were on drainage for 10 days and 6 patients were on drainage for 15 to 18 days.

In 3 patients drainage was complicated by ventriculitis; the most severe case, manifest the day drainage was started, was probably the result of a gross breach of technique in instituting the drainage. The other 2 cases of ventriculitis, which did not appear until the 5th and 6th days respectively, were associated with moving the patient for special diagnostic procedures requiring the temporary removal of the patient from the drainage bottle. All of these patients responded to penicillin therapy. In 1 patient there developed a sterile pleocytosis of the cerebrospinal fluid associated with a fever of 102°F. Both the fever and the pleocytosis vanished when

![Diagram of constant ventricular drainage apparatus in use.](image)

**Fig. 1.** Diagram of constant ventricular drainage apparatus in use. (X) The height of the top of the tube above the ventricle determines the intracranial pressure.

the drainage was removed. Occasionally when drainage had been placed for long periods there was some maceration and inflammation of the skin around the polyethylene catheter. This cleared up quickly when the catheter was removed or shifted to another site.

Varying the level of the drainage bottle has been particularly valuable in determining whether patients no longer need external drainage. With the bottle well elevated the drainage can be effectively stopped, but easily reinstated by lowering the bottle if untoward symptoms develop.

This apparatus has been useful in administering constant intraventricular antibiotic therapy. A constant drip of the desired antibiotic was directed into one ventricle while constant drainage was maintained from the other. By proper adjustment of the bottle, the intraventricular pressure was held at a physiological level throughout the period of therapy.

The length of time a patient has been kept on drainage has been dictated by
his clinical state. This has in many instances meant periods of 2 weeks or longer on continuous drainage.

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REFERENCES

THE STEREOENCEPHALOTOME
(MODEL III OF OUR STEREOELECTRIC APPARATUS FOR OPERATIONS ON THE HUMAN BRAIN)

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The first stereotaxic apparatus (stereencephalotome) described by us (1947) for operations on the human brain was fixed to the skull by means of a plaster cast. A second instrument (1949) had a metallic base. From it the present model has been developed which has the following advantages: 1) relatively low weight (5.5 lbs.); 2) great rigidity; 3) it can be easily mounted to the skull at operation in exactly the same position as at the pre-operative x-ray study; 4) the electrodes may be inserted into the brain from the top, the dorsal or either lateral aspect of the skull; 5) it has a multiple electrode holder.

The present model consists of four parts: a base (B); a frame (F) which attaches to the base; an electrode carrier (C) which is mounted on a square frame; a gauge (G) which carries five movable calibrated pins (Figs. 1 and 2). Alignment of the base parallel to Reid’s base line is obtained by ear plugs (a) and orbital bars (b), fixation to the skull by rubber-cushioned stops (c) on supports (d), an occipital rest (e) and a maxillary support (f) and a ring (g) suspending the base by graduated steel tapes (replaced by strings in Figs. 1 and 2). Identical application during roentgenography and operation is insured by graduated pins (i, k) on the base and on the gauge (G). The points where these pins touch the scalp are tattooed before roentgenography. At the operation the pins must touch the corresponding tattoo marks at exactly the same calibrated distances as they did previously. The frame (F) is so constructed that the electrode carrier (G) can be placed on its posterior, top or either lateral aspect. Up to 15 electrodes may be inserted into the brain in any of these positions at angles between 0–45° on either side of the center of the protractor (p). The bars holding these electrodes can be moved alongside each other; the transverse distance is also variable, therefore providing a great variety of needle positions. For more details the reader is referred to our forthcoming monograph.