left but the right knee kick and both ankle jerks were still absent. Subjectively the patient felt much better with complete relief from the paraesthesias in the lower extremities, the only residual pain he complained of being in the right scrotum. It should be mentioned that the anal reflex was still absent and that the sphincter was relaxed as on admission. Three months after operation the picture was as above, the patient continuing to be free of pain with no evidence of any recurrence of the meningocele. There was no sign at any time of increased intracranial pressure and he was free of headache after the first few days postoperatively.

The patient was re-examined October 22, 1947. He had gained 20 pounds in weight and seemed generally in better condition. The operative incision was well healed and there was no bulging. Flexion, extension and adduction of calves and thighs were quite strong. No movement was present at the ankles. Both ankle jerks were absent, as was the right knee kick. The left knee kick was quite active. Patient still had some pain in legs but less than preoperatively. There was no improvement in bowel or bladder function. His morphine addiction was less marked, according to his wife. B.P. was 185/125 and he suffered from suboccipital and vertex headaches. Fundi were normal except for slight increased light streaking and A-V compression, and there was no clinical evidence of increased intracranial pressure.

SUMMARY

A case of meningocele which became suddenly progressive in an adult at the age of 32 years with development of flaccid paralysis of the lower extremities and urinary difficulties is presented without any adequate explanation for the sudden progression. On pantopaque myelography and at operation there was no evidence of any associated lesion such as a lipoma to account for part of the picture. There was some improvement in motor function and definite relief from the pain and paraesthesias following operative repair.

REFERENCES


AN APPARATUS FOR CONTINUOUS VENTRICULAR DRAINAGE AND INTRAVENTRICULAR THERAPY

FRANKLIN ROBINSON, M.D.

Neurological Division, St. Vincent's Hospital, New York, N.Y.

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Ventricular drainage as a palliative approach to the problem of increased intracranial pressure is by no means a new concept. Occasions do arise, however, when resort to this procedure is tantamount to the best interests of the patient. The technique may be used to advantage pre-operatively in patients who are poor risks by reason of nutritional depletion or dehydration, postoperatively following incomplete removal of infiltrating tumors, and in blockade to the normal circulation of fluid in the ventricular system during the course of pyogenic or more desultory inflammatory processes of the brain.
APPARATUS FOR CONTINUOUS VENTRICULAR DRAINAGE

Periodic puncture and drainage of the lateral ventricles through burr hole openings is unfortunately attended by rather abrupt and undesirable changes in intracranial pressure. Within recent years success has been reported employing the rationale of continuous ventricular drainage with varying types of aseptic closed systems. The following method is described as a clinically useful, yet relatively simple device for continuous ventricular drainage and intraventricular therapy. No claim to originality is made for either the principles underlying continuous ventricular drainage or for continuous intraventricular therapy.

I. DESCRIPTION OF APPARATUS

The apparatus has been assembled from readily accessible items to be found in any general hospital and presents no operational difficulties if attended regularly by an alert house staff. It is presented as an additional method of closed-system ventricular drainage alone (or combined with continuous intraventricular therapy), applicable to some of the rather difficult problems met with in the care of neurosurgical patients.

A woven silk, whistle-tip, ureteral catheter (No. 7 French) 12 cm. in length, is used to cannulate the lateral ventricle. The shaft of a regular 18 gauge intravenous needle is cut transversely 2 cm. from the hub, eliminating the bevel, and is introduced into the other end of the catheter, thus making a snug water-tight fit. The catheter is connected by means of a metal adapter to flexible non-compressible rubber tubing (45 cm. in length) with a bore of 8 mm. to a set of two three-way stopcocks soldered in tandem. To the 1st stopcock is attached a closed type Murphy drip system, with a screw clamp fitted to the tubing, adjustable for the desired rate of delivery of fluid. This circuit may be excluded functionally from the apparatus by turning off the 1st stopcock. The lower half of a spinal fluid manometer is screwed into the vertical connection of the 2nd stopcock and registers fluid pressures to 300 mm. The tip of the manometer is covered with multi-layered sterile gauze fastened in place by a silk tie. The horizontal portion of the 2nd stopcock is connected to flexible non-compressible rubber tubing of the same bore as above by means of a metal adapter. The tubing is directed vertically alongside the manometer to the 100 mm. mark where it is then led by means of a right-angle glass tube into a glass bottle with a calibrated capacity of 100 cc. A glass tubing air vent (6 cm. in length) and drawn out to a 2 mm. diameter at each end is placed in the 2nd hole of the rubber-stoppered bottle. The exposed tip is similarly protected with sterile gauze.

The apparatus, exclusive of the catheter and lead-off tube, is mounted on an adjustable stand with snap clamps to the manometer and a circular metal band about the glass bottle receptacle. The supporting stand is attached to the head of the bed by means of 2 wood brackets and tightened by turn-bolts.

II. OPERATIONAL USE OF APPARATUS

A. Ventricular Drainage. Ventricular drainage pre- and postoperatively, as well as during the operative procedure, is not a new adjunct in the management of intracranial tumors. At the time of ventriculogram the woven silk catheter is passed along the tract of the ventricular needle into the posterior portion of the lateral ventricle on the side opposite to the suspected lesion. Fluid is removed and filtered atmospheric air is instilled in the usual manner. The hub of the needle (in the catheter) is then occluded with sterile cotton, the wound closed in layers, and the catheter fastened in situ by means of a cutaneous silk tie. The end of the catheter is protected by a sterile dressing and X-rays are taken. During the craniotomy free ventricular drainage is allowed and is of immeasurable technical assistance.

After operation the catheter with the adapter portion of the lead-off tubing is surrounded with sterile fluffy gauze and incorporated into the head dressing. While in the operating room the patient is transferred to the bed, the head of which is elevated to 10°, and the apparatus is attached and set with the level of the stopcocks at the level of the cannulated ventricle. Should there be no indication for intraventricular therapy the 1st stopcock is turned to exclude that portion of the circuit and its tubing rolled up and taped to the stand. The 2nd
stopcock is then set to register the intraventricular pressure. After this determination the knob is then turned to the horizontal position, allowing ventricular fluid to rise in the distal tubing to the height of 100 mm. Fluid in excess of this pressure is automatically collected in the calibrated bottle. The character of the fluid is thus readily observed and the quantity of drainage at once recorded at any given time. The catheter is connected to tubing of sufficient length (45 cm.) so as to provide ample play, preclude the possibility of being dislodged, and allow for the proper turning and posturing of the patient.

Ventricular fluid is thus allowed to drain slowly at a constant physiological pressure. At any time manometric determination of the intraventricular pressure is possible. Whenever the collection bottle nears filling it should be replaced by another sterile receptacle. When the cerebrospinal fluid pressure has become stable over a period of 12–24 hours automatic drainage ceases and the apparatus is disconnected. Usually after the 3rd day ventricular drainage is unnecessary. If it is essential to continue drainage beyond this period the apparatus should be replaced by a fresh sterile set leaving the indwelling ventricular catheter in place. Poppen reported allowing a catheter (No. 8 French, soft rubber type) to remain in place as long as 12 days without known deleterious effect.

Fig. 1. Continuous drainage and intraventricular therapy apparatus in use. Inset: A, Oblique view showing brackets for application of the stand to the bed. B, 18 gauge intravenous needle inserted into the ventricular catheter serving as the connecting piece for the adapter of the lead-off tubing. C, Alternate positions of stopcocks 1 and 2, respectively: 1, For ventricular drainage to the collecting bottle. 2, For manometric determination of the ventricular pressure. 3, For continuous intraventricular drip therapy. 4, Apparatus excluded functionally from the lead-off tubing.
APPARATUS FOR CONTINUOUS VENTRICULAR DRAINAGE

B. Intraventricular Therapy. Recent work concerning the neurotoxicity of intraventricular penicillin has permitted this mode of administration in the management of certain central nervous system infections with relatively little liability. Cairns, et al. \(^1\) reported successful treatment of a patient with pneumococcal meningitis by means of intraventricular penicillin. Favorable results were obtained by McCune and Evans \(^2\) in the management of staphylococcal meningitis. Walker and Johnson \(^3\) advise intraventricular penicillin for relapses in meningitis with suspected residual loculated or focal areas of infection that are not responsive to other routes of penicillin administration. The apparatus presented is easily adapted to continuous slow intraventricular instillation of penicillin or other medications. The unit dosage is readily controlled per unit time and the intraventricular pressure may be determined at once.

C. Care of Equipment. The woven silk catheter (boilable) is rather durable and is autoclaved with the instruments for the ventriculogram. The apparatus is autoclaved as a unit with the protective gauze cuffs to the manometer and air-vent tips already in place and packaged in a sterile wrapper. It is delivered ready for use and then installed into the supporting stand.

REFERENCES