

# NOTES ON OPERATIVE TECHNIC IN NEUROSURGERY

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THE MINOR PRINCIPLES of operative technic to which a surgeon adheres are the product of his surgical inheritance, the traits of his character and his capacity for imitation. Neurosurgeons have borrowed freely from each other and I have learned much from my own colleagues, William Cone and Arthur Elvidge. Consequently, no claim is made to originality in this field. But it was Professor Allen Whipple who first called my attention to the importance of these minor principles of surgical technic. The following notes are, therefore, set down here by his grateful pupil and friend.

*Classical Technic.*—Harvey Cushing was the first superlative technician among neurosurgeons. Fastidious care in every detail of opening and closure of the skull was perhaps his greatest contribution to the operative technic of craniotomy. Fastidiousness was his by inheritance from Professor Halsted and as an inborn characteristic.

He made a habit of closing the dura after an osteoplastic craniotomy without drainage. On the other hand, he left the dura open under a subtemporal decompression and after a suboccipital craniotomy. He almost never drained a craniotomy wound. But he took great care to close the galea aponeurotica with a careful line of interrupted fine silk sutures. This was a technical maneuver of the greatest importance to which almost all neurosurgeons still adhere because it relieves the skin sutures of tension and prevents fistular drainage.

But Cushing found it necessary to puncture the scalp and aspirate fluid from beneath the aponeurosis frequently during the first ten postoperative days. That was his way of relieving tension on his unfastened bone flap and his undrained scalp, and it worked well in his hands, however tedious the dressings.

This set of technical procedures might be called the classical pattern. When one detail is altered many others must be changed. But to continue to adhere to it would be to miss the opportunity for advance.

*Drainage.*—A rubber drain through a small scalp incision, "stab wound," not far from the incision for an osteoplastic craniotomy, may serve to allow fluid to escape from outside the dura. If the inner end of the drain is placed inside the dura, fluid and air are allowed to escape from the intradural as well as the extradural space.

Such a drain should be covered with gauze and over that a layer of impermeable protective tissue, the borders of which are brought down to the sterile scalp surface on which sterile vaseline may be placed. This avoids any danger of retrograde contamination provided the drain is withdrawn within one to

three days. This type of drainage makes it possible to fasten the bone flap at one or two points with steel or tantalum wire if it seems desirable.

*Cosmetic Note.*—The bur holes of the bone may be covered with small round disks of sheet tantalum. This is preferable to replacement of bone buttons or bone fragments, for these implants shrink with the passage of years and most surgeons are distressed by the dimpled foreheads or, even worse, the dimpled bald heads that return to their consulting rooms from time to time.

*Lumbar Puncture.*—When bone flaps are fastened with wire they reunite with the surrounding bone of the skull much more rapidly and with less bone atrophy. But if the removal of tumor or scar has been so small as not to compensate for postoperative brain swelling then lumbar puncture, carried out more or less frequently, may become necessary in order to decrease intraventricular pressure temporarily. Punctures are rarely needed as long as drainage is used.

The old fear of lumbar puncture is no longer justified, provided a surgeon understands the syndromes of (1) midbrain compression due to temporal lobe herniation into the incisura tentorii (enlarging pupil and loss of reaction to light and failing consciousness, *etc.*); and (2) bulbar compression due to herniation of cerebellum into the foramen magnum (slowing pulse and slowing irregular breathing, *etc.*).

*Aseptic Meningitis.*—This is a term which may be applied to the meningismus and fever associated with the continuing escape of fluid from an operative field into the subarachnoid spaces at the base of the brain, the basal cisternae. Elevation of temperature, because of this, often continues for a week or two after operation. But it may persist for many weeks as a continuous state or as a recurring phenomenon separated by several days of freedom from symptoms. In the recurring type of aseptic meningitis there is sudden headache, fever, leukocytosis in the cerebrospinal fluid and nuchal rigidity.

The most frequent cause of persistent aseptic meningitis is an opening between one of the ventricles and the field of a large operative procedure. Through such an opening into the ventricle the fluid from about the operative blood clot passes through the ventricular system and into the basal cisterns. The second most frequent cause is a wide opening between cisterna magna and operative site.

To prevent this irritative state, care should be taken not to open through the ependymal wall of a ventricle. This is usually not difficult. If, however, a large opening is made into the ventricle the ependymal lining may be closed by a few loosely tied silk sutures. It is helpful to place fibrin film or a strip of gelatin sponge over the rent in the ependyma so as to be included within the sutures when they are tied.

In the posterior fossa, however, it may be impossible to prevent opening the arachnoid covering of the cisterna magna. But when the site of operation is the cerebellopontile angle care should be taken to make only a small decompressive opening in this arachnoidea which covers the cisterna magna.

*Dural Defects.*—When it seems advisable to close a dural defect after a

supratentorial craniotomy it is practically never necessary to resort to the use of a fascial transplant from an incision in another part of the body. Instead of this it is a simple procedure to split the outer layer from the inner layer of adjacent intact dura and to use the outer layer to fill in the defect. If this is not convenient or if the dura is very thin, the epicranium may be removed from adjacent skull and used as a transplant. These procedures provide a satisfactory dural substitute which is preferable to prepared membranes.

*Decompression.*—Subtemporal decompression by means of an opening in the dura over one temporal lobe, so that the brain may bulge outward against the elastic wall of the temporal muscle, still has a restricted field of usefulness, but it is an extremely small field. Decompression of the brain by means of removal of an expanding blood clot or tumor is a very much better procedure, for this removes the cause. In case it is not enough, internal decompression may be employed. By this term is meant the removal of relatively dispensable brain tissue.

For example, one frontal pole or the temporal lobe of the nondominant hemisphere may be removed, and even on the side of the dominant hemisphere the anterior end of the temporal lobe, *i.e.*, 4 to 5 cm. back from the tip of the lobe, may be removed without fear of aphasia.

Improvements and modifications of technic come each year. Men who are young in years, or in mind, are apt to accept them eagerly. Others are more cautious; but nothing can replace the rules of delicate handling of tissue introduced by Halsted.

New methods are not necessarily better methods, and the safest guide to progressive modification is an understanding of the basic principles of intracranial physiology and of wound healing.

#### REFERENCE

- <sup>1</sup> Finlayson, Alister I., and Penfield, Wilder: Acute Postoperative Aseptic Leptomenigitis. *Arch. Neurol. and Psychiat.*, **46**, 250, 1941.