Neurosurgical Techniques

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Surgical Removal of Intramedullary Tumors

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This technique for the surgical removal of an intramedullary tumor of the spinal cord was first reported to the Harvey Cushing Society in 1954. Our first patient, who underwent the operation in 1941, is still alive and shows no neurological abnormalities; an ependymoma, extending through seven vertebrae, was completely removed. Most ependymomas, in fact, can be completely removed. On the other hand, in our series this has been possible with only one astrocytoma. Certain other intramedullary tumors, such as lipomas, often can only be partially removed; in these we use cord stimulation with 1-1/2 to 2 volts AC, or less, to be certain at each stage of the procedure that no viable tissue is being excised. Secondary operations have never achieved a perfect result; nevertheless, since several years of relief may be obtained by partial excision and decompression, complete excision should not be attempted where a definite plane of cleavage cannot be developed.

Surgery, to be effective, must be carried out before paralysis is far advanced. A good plane of cleavage between tumor and cord should be visible or carefully developed. Gentle traction, if used, must not exceed the limits of cord elasticity. The multitude of fine, almost invisible, vessels which pass from the tumor into the cord, particularly in the region of the central canal, should be properly coagulated and cut so that a dry field and good visibility will be maintained throughout the procedure. Unipolar coagulation is inapplicable in or near the spinal cord, but bipolar or two-point coagulation seems to do little damage provided the area is constantly irrigated with saline solution during coagulation. With this method, current does not pass into the spinal cord, and if it is kept low, there is little radiation of heat. Originally the operation was done using fairly strong magnifying eyeglasses, but the use of a binocular loop is now preferable. There may be an aggravation of symptoms for several weeks following complete removal, but the completeness of eventual recovery makes total removal a worthwhile procedure.

We have not used radiation therapy when removal was felt to be complete.

Incision of the Cord

An imaginary line for parasagittal incision of the cord is planned to one side of the posteromedian vein where the cord seems to be the widest and the tumor nearest the surface. The cord is tapped for cystic fluid with a 25-gauge needle, as shown in Fig. 1. If fluid is encountered, it should be only partially removed, since it may be difficult to locate the cavity if it is completely collapsed.

![Fig. 1. Tapping for cystic fluid, after the cord has been exposed.](image)