USE OF POLYVINYL SPONGE IN NEUROSURGERY

HENRY W. DODGE, JR., M.D., JOHN H. GRINDLAY, M.D., WINCHELL MCK. CRAIG, M.D., AND PAUL J. ROSS, M.D.

Section of Neurologic Surgery and Section of Surgical Research, Mayo Clinic and Mayo Foundation,* Rochester, Minnesota

(Received for publication November 25, 1953)

One of the primary problems facing a neurosurgeon in operative procedures necessitating sacrifice of the dura mater or requiring repair of cranial or spinal dural or bony defects is the assurance of watertight closure of the cerebral or spinal dural envelope. Polyvinyl plastic sponge has been used recently with success in various surgical procedures.1–3 It occurred to us that such material, namely, wettable plastic sponge with numerous interstices through which blood vessels and connective tissue can grow to form a neomembrane of connective tissue and sponge, might be useful in its application to some of the problems encountered in the practice of neurosurgery.† To this end a series of dogs was operated on in an attempt to elucidate the mechanism by which this material is incorporated into living tissue in and about the nervous system.

PRESENT STUDY

During the past 3 years, portions of spinal or cranial dura mater have been excised in 12 dogs. The portions excised were of various sizes and were situated over normal and also over traumatized cortex. Polyvinyl sponge was placed over normal and traumatized nervous tissues in the dural defects thus created in both the cranium and spinal cord. Observations were made at necropsy and at reoperation as to the microscopic and gross pathologic changes encountered during periods ranging from 6 months to 2 years (Figs. 1 and 2). It is our opinion that polyvinyl sponge is a useful and worthwhile substance for repair when it is properly used for correction of defects in the covering of the nervous system in animals. This type of sponge also has been placed in and about the nervous system in 27 patients during the past 2 years.

COMMENT

In the use of new synthetic materials in surgery, it is important to be cognizant of the disadvantages as well as the advantages of the material to

* The Mayo Foundation is a part of the Graduate School of the University of Minnesota.
† The polyvinyl sponges used in this study were kindly furnished by the manufacturer, Ivano, Inc., Chicago, and are available from Clay-Adams, Inc., New York City.
the patient and to the surgeon who uses it. Therefore, on the basis of our experience with polyvinyl sponge, we consider that this material is a useful substance when employed in certain situations. This sponge can be used as a watertight dural substitute when it is sewed in place in dural defects in the spinal cord and cranial cavity, provided edematous brain or spinal cord is not tightly approximated to the cut edges of the dural defect if the pia-arachnoid has been disrupted. It may be utilized satisfactorily in the repair of conditions producing cribiform rhinorrhea or cerebrospinal otorrhea. It may be used for the performance of orbitoplasty after transcranial removal of orbital tumors if the defect cannot be repaired satisfactorily by means of the usual stainless-steel or acrylic plates. It may be employed for reinforcement of walls of intracranial aneurysms or for closure in the management of certain meningoceles.

Effective and watertight closure after high cervical laminectomies, sub-occipital craniectomies or combined cervico-occipital operations may be achieved by use of polyvinyl sponge in occasional difficult cases. The removal of malignant lesions in and about the nervous system may produce operative defects in which the plastic sponge is helpful for repair. We have noted that the involved area may leak cerebrospinal fluid for several days after repair of dural defects by use of these sponges. When invasion of the sponge by fibrous tissue takes place, the closure becomes satisfactorily watertight.

One of the most important contraindications to the use of polyvinyl sponge is the presence of considerable edema or trauma of the brain or spinal cord, with disruption of the pia-arachnoid. Gliosis through the lacerated pia mater into the sponge may take place more rapidly than does the desired