THE USE OF GELATIN SPONGE IN PREVENTION
AND TREATMENT OF CEREBROSPINAL
RHINORRHEA

RALPH B. CLOWARD, M.D.,* AND E. BEARDEN CUNNINGHAM, M.D.*
Honolulu, Hawaii

(Received for publication July 16, 1947)

Probably one of the most dangerous and distressing complications of
fractures or operations on the frontal bones of the skull is the de-
development of cerebrospinal rhinorrhea. The resultant fistula through
the cribriform plate, frontal or ethmoid sinuses and, more recently de-
scribed, through the eustachian tube 5 with direct communication between
the nasal and intracranial cavities, opens a direct pathway for infection,
and meningitis is the inevitable result. Before the days of chemotherapy
the mortality of this complication was very high. The mortality rate of un-
treated cases has been given as 39 per cent and Lawson 6 stated, "These
traumatic cases are always fatal in course of time from a secondary menin-
gitis, unless the leakage is arrested by virtue of a healing process or by
operative interference." The surgical attack on the problem required
courage and skill, for the operative mortality in the best hands has been
given as 30 per cent. This high death rate was due to sepsis. But, according
to Gissane and Rank 7 "This mortality rate could be reduced if an effective
method of occlusion of the fistula could be established by using a technique
requiring no buried suture material, and a graft of high viability to cover
the bone defect."

Numerous operative methods and techniques to occlude the fistula have
been described. Either the defect in the bone or the dura was closed—
usually the latter. Closure of both was unnecessary. Dandy 3 claimed the
first successful closure (1926) using an autogenous fascia lata graft. Rand 10
(1930) and Cairns 2 (1937) also used fascia lata. Learmonth 11 described turn-
ing a flap over the forehead, elevating the frontal lobe, inserting several
packs soaked in iodine between the dura and cribriform plate, and removing
these singly at intervals of several days! Trotter, cited by Lawson, 11 used
temporal fascia or pericranial fascia. These free grafts were sutured in
place, presumably with silk.

Gissane and Rank 7 employed an osteoperiosteal transplant from the
tibia, placing it over the defect in the skull without sutures. Stuck and
Weatherby 17 used fascia lata in the same manner without sutures. Echols and
Holcombe 4 cauterized the fistula and plugged it with muscle. Graham 8 and
Adson 1 used Horsley's bone wax to obliterate the bone defect. More recently
German 6 and Gurdjian and Webster 9 described a method of turning down

* 388 Alexander Young Building, Honolulu 9, Hawaii.
an oval dural flap from the falx and suturing it over the defect to close the fistula.

The pioneering work of Ingraham and Bailey in developing fibrin foam for hemostasis in neurosurgery was hailed with enthusiasm. These authors demonstrated the use of fibrin films in repair of dural defects and in prevention of meningeocerebral adhesions. The experimental work of Light and Prentice demonstrated the efficiency of the gelatin sponge, dipped in topical bovine thrombin, as a hemostatic agent to arrest bleeding from lacerations of dura, brain and sagittal sinuses with minimal tissue reaction.

Pilcher and Meacham and Naffziger and Boldrey showed that the advantages of thrombin-soaked gelatin sponges are: ready hemostasis, adherence to the bleeding surface and lack of tissue reaction.

We have recently treated 3 patients by this method. In 2 cases, a rhinorrhea was prevented. In one, a neoplasm, and in the other, an extensive depressed skull fracture, resulted in a large bony defect in the floor of the frontal fossa of the skull communicating with the nasal cavity. They were both closed by placing a loose piece of tantalum over the bony defect and covering it with strips of gel foam. The dura at the periphery of the defect was scarified to produce a bleeding surface. The gelatin became rapidly adherent. In the third case, in which there was a spontaneous rhinorrhea of 4 months’ duration due to a congenital defect in the cribiform plate, the defect was covered with gel foam after the oval dural flap (after the method of German) was found too small to cover the opening. The patient was cured.

Case 1. M. M., Queen's Hospital #208,691. A Caucasian female, aged 44, entered the hospital on Nov. 4, 1946 because of severe headaches. She had been in bed for 5 weeks because of their severity. She gave a history of having had severe attacks of right frontal headaches for 10 years, associated with a chronic postnasal discharge. She had received considerable treatment for sinusitis and migraine. In a severe attack of headache 1 year before she had lost her sense of smell and since that time had been unable to recognize odors with either nostril.

The neurological examination disclosed a complete anosmia. The visual fields were full; the fundi appeared normal. The margins of the optic discs were slightly blurred but not elevated. The other cranial nerves were normal. She insisted that the left half of her body was less sensitive to pin and cotton, and the tendon reflexes were found much more active in the left extremities.

A lumbar puncture disclosed normal fluid except a high total protein, 108 mgm. per cent. A pneumoencephalogram was done. The x-rays demonstrated a good filling of the entire ventricular system which appeared normal. The lateral ventricles were small in size, symmetrical, in the midline and not distorted. The roentgenologist, Dr. L. L. Buzaid, however, described a demineralization and depression of the olfactory groove and adjacent ethmoid cells. A tentative diagnosis of an olfactory groove meningioma was made and an exploratory craniotomy recommended.

Operation. Under local anesthesia on Nov. 6, 1946, a right frontal bone flap was elevated, the dura opened and upon elevating the frontal lobe a large, hard meningioma of the olfactory groove was encountered. It was found to extend about 6 to 7 cm. in its transverse and anteroposterior diameter and 4 cm. vertically. After removing the tip of the right frontal lobe and splitting the falx, the tumor was removed piecemeal with the electric loop. One large artery was cut with the loop, resulting in furious bleeding. It was later identified as the right anterior cerebral artery. The bleeding was arrested by a silver clip and with gelatin-thrombin packs.