EXTRADURAL AEROCELE*

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(Received for publication November 27, 1961)

The subject of pneumocephalus has been covered thoroughly in reports by Dandy,3 Jelsma and Moore,4 and Mothersole.6 It may occur spontaneously as in patients with osteoma of the paranasal sinuses, but most often it follows trauma secondary to gunshot wound of the head, or to injury of the face and base of the skull, or to direct compound injury of the skull. In certain unconscious patients, the communication between the intracranial cavity and the outside, which may result in meningitis, may not be recognized initially.

Pneumocephalus may occur in the subarachnoid or subdural space or within the substance of the brain when there has been sufficient local contusion to the brain; where the dura mater is intact, air may collect in the epidural space.2,7 Such collections are extraordinarily rare and are omitted in most reviews. Cases reported by Alcock,1 Mothersole,6 and Madigan to be of epidural collections of air do not appear convincing on the roentgenograms shown in the papers as collections of air in the epidural space. Jelsma and Moore in 1954 included in their series a patient with subaponeurotic extracranial and epidural air.

The subject of epidural aerocele was brought forcibly to the attention of the authors by the following case:

Case 1. A 37-year-old man was admitted with a chief complaint of left-sided headache. Nineteen years previously he was in an automobile accident and was admitted to a hospital in Baltimore, Maryland. He was unconscious and bled from his left ear. A left temporal craniectomy was done and he did well afterwards with no neurologic deficit except for decreased hearing and ringing in his left ear.

One year later he was readmitted to the same hospital showing signs and cerebrospinal fluid findings of meningitis, from which he improved and returned to work.

Nineteen years after the accident he was admitted to the North Carolina Baptist Hospital with short attacks of aching pain on the left side of his head, aggravated by sneezing and by straining at bowel movements.

A roentgenogram of the skull (Fig. 1) showed irregular erosion of the inner table of the cranial vault and underlying loculation of air. On the brow-up view taken with horizontal roentgen beam, there was evidence of fluid level in some spaces.

A left temporoparieto-occipital craniotomy was performed. The undersurface of the skull was found to be extremely irregular. The dura mater and underlying brain were separated about 2.5 cm. from the skull by multilocular cavities containing fluid and air. In the temporal region there was evidence of an old fracture extending from the craniectomy defect into the middle fossa. Just above the ear an opening was seen in the temporal bone which extended into the mastoid cells (Figs. 2 and 3). The cavity extended from the frontal to the occipital poles, beyond the midline to the right, and beyond the occipital protuberances into the posterior fossa. A piece of muscle was placed over the opening and stainless-steel mesh was sutured carefully over the opening.

The patient did well after the operation. Roentgenograms of the skull taken 5 months later showed complete absorption of all the air in the head (Fig. 4).

In a series of 32 patients with cerebrospinal fluid rhinorrhea or otorrhea and pneumocephalus following acute head injury, have required surgical repair of the fistula. In 1 of these, the repair of the dural fistula was followed subsequently by the collection of air beneath the scalp in the frontal region.

* Presented at meeting of the American Academy of Neurological Surgery, Boston, Massachusetts, October 7, 1961.
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where a compound comminuted fracture had been debrided and closed. This case, called to attention by Case 1, follows:

Case 2. A 36-year-old man had a depressed fracture in the frontal region involving the frontal sinuses and the cribriform plates. He had cerebrospinal fluid rhinorrhea but no intracranial air. Operative repair of the dural tear and the defect at the cribriform plate was performed. The posterior walls of the frontal sinus were comminuted and had to be removed. The mucous membrane of the frontal sinus was removed (Fig. 5).

The rhinorrhea disappeared but swelling developed over the area of the bony defect of the forehead when the patient strained or sneezed. An aerocele was found between the scalp and dura mater in the frontal region with communication through the frontal sinus. The lining of the cyst and frontal sinus was removed and the sinus was packed with Gelfoam and muscle. The aerocele disappeared. Two years later the patient had a cranioplasty and was doing well.

DISCUSSION

Since it is evident that communications between the intracranial cavity and the exterior may occur in severe head injuries and
since leakage of cerebrospinal fluid through the nose, the ears, or the pharynx may result in the introduction of air or infection, or both, into the cranial cavity, it is common practice to survey all patients with head injury for such complications. This is done by taking a lateral roentgenogram of the skull in the brow-up position with a horizontal roentgen beam. A similar film is taken of the cervical spine before moving the patient. A small amount of intracranial air with fluid level will be recognized easily, whereas ordinary films of the skull taken in the anteroposterior, lateral or posteroanterior projections with vertical roentgen beam usually will not show small collections of air.

In those patients with leakage of cerebrospinal fluid or pneumocephalus, or both, leakage of fluid is likely to persist if there is a wide diastatic type of linear or comminuted fracture, particularly if there are one or more indriven fragments of bone which may lacerate the brain and dura mater. The practice has been followed to protect all patients with leakage of cerebrospinal fluid against meningitis by adequate antibiotic and sulfonamide therapy and to repair the fistula if the leakage persists for 2 weeks or more. The repair may be made sooner, depending on the patient’s general condition, if there are obvious indriven fragments of bone.

Closure of the mastoid sinuses in their communication with the extradural space ordinarily was not felt to be particularly important until presentation to us of Case 1. In resurrecting Case 2, however, it was emphasized that though the dura mater and arachnoid had been closed adequately,
there was an extradural pneumocele or pneumocephalus which required closure.

In Case 1, in which the condition had persisted for such a long period of time, it was our impression that this had been a gradual process of air and chronic infection being fed into the epidural space resulting in huge cavitation between the skull and the dura mater with chronic granulation tissue. Closure of this fistula between the mastoid and the epidural space with a piece of stainless-steel mesh and removal of some of the granulation tissue has resulted in absorption of air, closure of the space, and clinical improvement of the patient.

CONCLUSION

Two cases of collection of air in the epidural space are presented. They resulted from fracture of the skull involving the paranasal sinuses or mastoid cells. Operative treatment by partial removal of the granulation tissue and obliteration of the fistulous opening rendered good results.

REFERENCES