Since McKenzie's original description of a cerebellar extradural hematoma, there has been an increasing awareness of the syndrome caused by posttraumatic compression of structures in the posterior fossa. The earliest reports were of isolated cases, many of which were discovered post mortem, but more recently Hooper published a series of 9 cases and Fisher et al. described 8 cases. Similarly, supratentorial subdural hygromas have received much attention since the original report by Payr but subdural hygromas of the posterior fossa have been reported infrequently. In 1 of Payr's original 4 cases the lesion was in the posterior fossa. Chronic subarachnoid cysts in the posterior fossa with a probable traumatic etiology have also been described.

In the present case an extradural hematoma of the posterior fossa was removed at operation and, in addition, a large collection of clear cerebrospinal fluid was evacuated. It is the authors' impression that the fluid could have been in the subarachnoid, subdural, or perhaps both spaces, and one of the purposes of this communication is a discussion of the possible mechanisms whereby fluid may accumulate under increased pressure in the posterior fossa following trauma.

CASE REPORT

Z.S., a 30-year-old Norwegian sailor, fell down a flight of stairs and was found after an undetermined period of time, perhaps several hours. He was confused and could not remember what had happened to him.

Examination. On admission he was drowsy and complained of frontal headache. He spoke only a few words of English. Blood pressure was 160/110 and pulse rate was 84. There was no external evidence of head trauma but blood was present in the right external auditory canal. There was a virtually complete palsy of the right 6th nerve with nystagmus of the left eye on conjugate gaze to the right, but otherwise neurological findings were unremarkable. Roentgenograms of the skull showed two vertical linear fractures of the occipital bone extending into the foramen magnum.

Course. He was observed for the following week and there was no change in his condition except for development of ptosis of the right eyelid which could have been voluntary because of diplopia. He continued to complain bitterly of frontal and occipital headache and also of loss of hearing in the left ear. His pulse rate varied between 54 and 100. On standing he was able to maintain the Romberg position but refused to walk. He took fluids well orally and did not vomit. A hematoma of the posterior fossa was considered on admission but because of gradual improvement in the patient's level of consciousness, observation was continued.

On the 9th day minimal papilledema was noted for the first time. Because of this finding, and his failure to show marked improvement, a right carotid arteriogram was performed and was normal. Ventriculography was then carried out through posterior burr holes, and brain herniated through the incisions in the dura mater. The lateral ventricles were dilated minimally, and there was a vague shadow suggesting air in the 4th ventricle. Pneumoencephalography then was performed which showed air in the posterior fossa and basal cisterns. There was no air in the 4th ventricle. There were two collections of air in the posterior fossa, and these were separated from the inner table of the occipital bone by a distance of 1.5 cm. This appeared to delineate a hematoma (Fig. 1).

Operation. The posterior fossa was explored. The linear fractures of the occipital bone were identified and a burr hole revealed a solid extradural hematoma. Through a small craniectomy the hematoma, which extended equally over the cerebellar hemispheres, was evacuated. The volume of clot was estimated to be 25 cc. The origin of the hemorrhage was not determined. The dura mater then was incised on the right and fluid escaped under increased pressure. The opening was tamponaded immediately with a finger to prevent too rapid egress of fluid, and when the finger was removed there was a large cavity, estimated to contain about 40 cc of fluid. The cerebellum was displaced superiorly and to the left. The arachnoid was floating in fluid about 1 cm. below the dura mater, and there was a slit in the arachnoid which appeared to have been made at the time the dura mater was incised. On the basis of these observations it appeared that the fluid was not exclusively within the subdural space. An incision then was made over the left cerebellar hemisphere, and the cerebellum approximated the dura mater at the margins of the incision.

Postoperatively the patient was awake and well ori-
ented, and his headache had completely disappeared. On the 2nd postoperative day he walked for the first time and had a definite truncal ataxia which undoubtedly was present prior to surgery. Audiometry revealed a complete nerve deafness on the left. There was gradual recovery from the palsy of the right 6th nerve and the nystagmus and ataxia disappeared. Four weeks after operation the weakness of the 6th nerve was minimal and there was no papilledema, but hearing in the left ear was unimproved. The remainder of the neurological findings were unremarkable. Pneumoencephalography was performed again and showed air closely approximated to the inner table of the occipital bone over the posterior fossa.

DISCUSSION

An attempt has been made to correlate the pneumoencephalographic findings in this case with the pathology observed at surgery. The separation of the air shadows in the posterior fossa from the occipital bone is compatible with the size and location of the extradural hemorrhage and this particular pneumoencephalographic appearance has been described previously by Aronson and Ransohoff. However, there are two collections of air which may be on one or both sides of the posterior fossa since an anteroposterior view was not obtained. Because the subarachnoid space over the cerebellum on the side opposite the collection of fluid appeared to be obliterated at surgery, and because any potential space around the collection of fluid, irrespective of its location, must have been occluded by the increased pressure, it seems likely that air had entered the collection of fluid. However, this observation does not help in identifying the location of the fluid because air could have entered a subdural hygroma through a tear in the arachnoid. Failure of air to enter the 4th ventricle could have been caused by obstruction of the foramina of the 4th ventricle or could have been an artifact. If fluid accumulated in the posterior fossa relatively rapidly following the trauma, this accumulation in combination with the extradural hematoma could have produced an intermittent obstruction of the 4th ventricle. The presence of increased intracranial pressure and slight dilatation of the lateral ventricles supports this hypothesis.

In order for subarachnoid fluid to collect under pressure in the posterior fossa there should be an obstruction in the spinal-fluid pathway distal to the collection. Such an obstruction could occur by the hematoma producing an upward herniation of the cerebellum through the tentorial opening with consequent occlusion of the basal cisterns. However, obstruction of the basal cisterns was not present in this case because air introduced into the lumbar subarachnoid space
is clearly present in the interpeduncular and ambient cisterns.

A second possibility is the accumulation of fluid in a pouch formed by posttraumatic arachnoid adhesions. Chronic subarachnoid cysts of the posterior fossa have been described by several authors, and in most cases a definite etiology could not be established. Horrax reported 33 cases of arachnoiditis of the posterior fossa which resembled tumors of the cerebellum. Trauma was not considered a significant etiological factor in any of these cases. However, Nichols and Mangiello reported 1 case each of a cyst of the posterior fossa which produced progressive signs and symptoms for 3 years and 2 years following trauma. Both patients recovered completely following evacuation of the cysts. In the present case, the arachnoid seen through the relatively small site of craniectomy at the time of operation appeared somewhat discolored, but the boundaries of the collection of fluid were not explored.

Subdural hygomas of the posterior fossa have been reported infrequently. Wycis reported 99 cases of subdural hygroma from a review of the literature and only 1 of these was in the posterior fossa. This was one of Payr’s original cases but since the fluid present was described as bloody it may not be in the same category as the present case. More recently Fisher et al. described a series of 8 posttraumatic subdural hygomas of the posterior fossa. All patients presented signs and symptoms suggesting a space-occupying lesion of the posterior fossa. There were no deaths and all patients showed marked improvement or complete recovery following operation. In one case report they stated: “The arachnoid membrane was visualized and fluid was outside this.” It has been generally accepted but not proven that subdural hygromas are formed by a tear in the arachnoid which allows fluid to escape from the subarachnoid into the subdural space, but flow in the opposite direction is prevented by a ball-valve action of the tear in the arachnoid. In the present case, we assumed that the rent in the arachnoid observed at operation was made at the time the dura mater was incised, but it could have been secondary to the trauma, thus supporting the possibility that this was a subdural hygroma.

A review of the literature on extradural hematomas, subdural hygromas, and arachnoid cysts of the posterior fossa has failed to reveal a case report of the simultaneous occurrence of any two of these conditions. However, Kessel reported that following evacuation of an extradural hematoma “the cisterns were opened wide and fluid escaped under considerable pressure.” Schneider et al. reported 4 cases of posttraumatic intracerebellar hematoma. In their Case 2 the superior portion of the right cerebellar hemisphere was removed and “there was a sudden release of cerebrospinal fluid under increased pressure.” In both cases the fluid was most likely in the subarachnoid space. Gillingham has emphasized the obstruction and subsequent formation of pouches in the subarachnoid space which occur beneath supratentorial subdural hematomas, particularly in the Sylvian fissure.

In the present case the operative findings suggested that at least a portion of the accumulation of fluid in the posterior fossa was in the subarachnoid space. However, with the available facts it has been difficult to reconstruct the mechanics whereby subarachnoid fluid could have collected under pressure. The pneumoencephalogram does not aid in establishing the location of the fluid. Thus, although we cannot exclude the possibility that the fluid was entirely within the subdural space, we wish to emphasize that posttraumatic subarachnoid pouches or cysts have been described. Since at operation the position of the arachnoid relative to the dura mater is the only certain means of identifying the location of the collection of fluid, extreme care should be exercised in such cases so that a positive diagnosis can be made.

SUMMARY

1. The case history is reported of a patient with an extradural hematoma of the posterior fossa and subjacent space-occupying collection of cerebrospinal fluid which was subarachnoid and/or subdural in location.

2. A pneumoencephalogram was diagnostic of the extradural hematoma.

3. The hematoma and collection of fluid were evacuated and the patient has made an almost complete recovery.

4. The possible mechanisms leading to formation of a subarachnoid pouch are discussed.

REFERENCES


