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everal well-documented examples of a
false traumatic aneurysm of the middle
meningeal and other intracranial arter-
ies have been reported. Allegedly
"true" saccular aneurysms occurring as a re-

sult of varied kinds of trauma have also been
described. The purpose of this com-
munication is to present the successful diag-

nosis and treatment of a traumatic false an-

eurysm of a cortical branch of the middle ce-

rebral artery, and to discuss the relation-

ship of trauma to the formation of false in-

tracranial aneurysms while posing the ques-

tion of whether indeed trauma plays any con-

vincing part in the pathogenesis of the "true" saccular
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Case Report

to the right while the left middle cerebral ar-
tery was considerably elevated and medially
displaced together with its major branches.

An aneurysmal cavity was filled with contrast
medium via the posterior temporal branch of
the middle cerebral artery and emptied very
slowly. In the anteroposterior films, the mid-

dle cerebral branches appeared to be slightly
displaced away from the cranial vault (Fig.
1). The bone fragments adjacent to the an-

eurysm which had previously been noted to
be slightly depressed had now become ele-

cated. The boy was transferred to the Neu-

rosurgical Centre with a diagnosis of "false"
aneurysm of the posterior temporal branch
of the left middle cerebral artery, associated
intracerebral hematoma, and superficial he-

matoma overlying the left parietal and tem-

poral cortex.

Second Examination. On examination at
the Neurosurgical Centre, the patient was
found to be conscious but drowsy and inat-
tentive and would not articulate. There was
a fixed conjugate deviation of his eyes to the
left and a right homonymous hemianopia.

He had a right hemiplegia including facial weak-
ness; the arm was affected more profoundly
than the leg. Palpation of his head disclosed
a large subgaleal left parietal mass, partly
semi-solid and partly fluid.

Operation. On August 28, a left parieto-
temporal scalp flap was reflected with the
subgaleal mass in its center. This exposed a
bulky herniation of the brain emerging from
the wide horizontal fracture between the up-
turned parietal and temporal fragments and
eveting upwards and downwards over these
fragments. In addition to the brain, there
was a substantial amount of semi-solid blood
clot. The latter was aspirated. The upper
fragment was converted into a small bone
flap while some of the lower fragment was
nibbled away. The dura around the herni-
ating brain was adherent to it and had to be
opened and dissected all round to free the

Received for publication April 22, 1968.
extrusion. While this was being done, a substantial fluid subdural hematoma was released. On opening the dura downwards, an aneurysmal structure on the surface of the brain was displayed with the artery entering and emerging from it. A clip was placed on either side, and the dome of this structure was removed. There was no formed "fundus" to this aneurysm but an enormous cerebral blood clot was lying deep to it. With suction, the clot was aspirated leaving a cavity replacing the posterior half of the temporal lobe and the lower region of the parietal lobe deep to the angular gyrus. The clot also filled the temporal horn of the lateral ventricle and when it was removed, there was a gush of cerebrospinal fluid from the body of the ventricle into the brain cavity. The herniating brain was now easily replaced without sacrificing any of it. The wound was closed in layers.

Pathological Report. Macroscopically, the tissue was made up of brownish blood clot 1½ cm in diameter which contained an "aneurysmal" sac 1 cm in diameter in which was firm, laminated blood clot. This sac was attached to a small artery 1½ mm in diameter which ran through the specimen.

Microscopically, there was a breach in the wall of the artery which was surrounded by blood clot. Immediately adjacent to the breach, the blood clot was organized and with young collagen fibres had formed a rather poorly defined sac. Within it the blood clot was laminated, and outside it the clot was more friable. The arterial wall and its internal elastic lamina were quite normal apart from the small area breached. Here, the elastic lamina ended abruptly and curled over slightly as though it had been torn. No elastic tissue was seen in the wall of the sac (Fig. 2).

The lesion was interpreted as a traumatic "false" aneurysm, with the wall of the sac formed by organized blood clot.

Postoperative Course. During the remaining months of 1966, the boy improved and gradual rehabilitation was continued. He was discharged to a special Residential Nursery on the last day of January 1967. At that time, he still had a right homonymous hemianopia. His eyes tended to deviate to the left but he had learned not to disregard the right side. He could use the right hand as a prop and with a below-knee caliper he raced around the wards. He could say many words and a number of short sentences.

Discussion

Radiology and Angiography. Unlike false aneurysms of the middle meningeal artery which opacify in a late stage of arteriography consistent with the normal disparity between the internal and external carotid circulations, the sac of the false aneurysm we have reported was demonstrated in the early
arterial phase of the angiogram. It was located on the surface of the brain, arising from the posterior temporal branch of the middle cerebral artery. The opacity of this and other reported false aneurysms was fainter than that of the usual berry aneurysm.

The reported delay in emptying of the sac of the false aneurysm has been also confirmed in this case. It seems to be simply an indication of the narrowness of the lumen of the parent vessel and the small size of the rent in the arterial wall in relation to the size of the lumen of the false aneurysm. This is frequently observed with false aneurysms arising at other sites in the body.

Displacement of cerebral arteries in appropriate situations is diagnostic of either an extradural hematoma in connection with false aneurysm of the middle meningeal artery or of a subdural hematoma of the same origin. In the presence of a false aneurysm of a cerebral cortical artery, the displacement indicates a cerebral hematoma or a subdural hematoma, as in our present case.

**Clinical and Pathological Manifestations.**

The boy fell from a height and struck his head with resultant multiple linear fractures with temporary depression and overriding of two large fragments. The dura was widely torn in the line of these fractures and a cortical arterial branch was incompletely severed. Hemorrhage into the substance of the brain, the subdural space and to a lesser extent into the subgaleal plane continued until the resulting clot temporarily sealed the bleeding rent.

While the intracranial contents were decompressing themselves by forming a brain hernia in the extracranial, subgaleal space, the general condition of the patient and the state of consciousness improved. The overriding fracture fragments were then distracted and pushed outwards. During those 2 weeks, the blood flowing through the injured artery excavated enough of the surrounding blood clot to produce the false aneurysmal sac, disclosed by timely angiography and removed before it ruptured.

The clinical progress and radiological and operative findings proved that a massive cerebral hematoma with rupture into the temporal horn of the lateral ventricle was compatible with survival. This substantiated observations not infrequently made in the course of aneurysmal surgery. When confronted with an intracerebral clot, one wonders how the bleeding from an aneurysm or arteriovenous malformation ever stopped without killing the patient. The buttressing effect of the brain tissue must play at least a part, and probably a substantial one, in confining the hemorrhage.

Aneurysms in association with trauma have usually been one of two main types. One type of false aneurysm, of which our case is an example, follows damage to all coats of a small artery with partial or total rupture of the vessel wall; blood is extruded and a hematoma forms. The size of this hematoma is limited by the buttressing effect of the tissues against the blood pressure in the damaged vessel and by the size of the defect in its wall. The center of the hematoma at the site of the leaking artery remains fluid and tends to be excavated by the swirling arterial blood, while the periphery becomes organized over a few days and this granula-
tion tissue with young collagen fibers forms the outer wall of the false aneurysm. This type of lesion has been reported in association with injuries to meningeal or cortical arteries, often beneath a skull fracture when extra or subdural hematomata may also be present. Such false aneurysms are important as they may themselves rupture and so perpetuate an extradural, subdural, or cerebral hematoma.

The second type of traumatic aneurysm is thought to arise from damage to the arterial wall affecting the internal elastic lamina or the muscle coat. The weakened vessel wall then balloons out in the same way as a congenital berry aneurysm is thought to arise from an elastic and medial defect.

Reports of the second type of aneurysm are not entirely convincing except for that of Overton and Calvin who described a case which was thought to follow needle puncture of a cortical artery during evacuation of subdural hematoma in an infant. They discussed the studies of White, et al., who tried to produce experimental "berry" aneurysms in dogs. They damaged the arterial wall in some by simple needle puncture and in some by intramural injection of irritants. The damage in affected animals resulted in defects of the elastic membrane and replacement of the muscularis by degenerated and fibrous tissue. Although the lesions were reported as resembling congenital berry aneurysms, no actual bulging of the wall of the artery occurred, possibly because these were short-term experiments and the animals were sacrificed after 3 weeks.

These histological changes give some support to the theory that trauma may play a part in the pathogenesis of some "true" saccular aneurysms of the cerebral vessels.

Summary

We have described the successful diagnosis and treatment of a case of traumatic "false" aneurysm of a branch of the middle cerebral artery. The child had suffered a closed head injury with depressed skull fracture. The possible though doubtful role of trauma in the pathogenesis of "true" saccular aneurysms has been briefly considered.

References