Angiographic Images of False Aneurysmal Sac Caused by Rupture of Median Meningeal Artery in the Course of Traumatic Extradural Hematomata

Report of 3 Cases

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In one year we have observed 3 cases of traumatic extradural hematoma of subacute development, with particular angiographic images: a pseudo-aneurysmal sac opposite a fracture line, and suspended from a large branch of the median meningeal artery. Also there were the classical angiographic signs of extradural hematoma, viz. on the anteroposterior angiogram, detachment of the corticomeningeal vessels from the internal lamina of the skull and, on the lateral angiogram, displacement of the vessels at the site of the hematoma. Our third observation demonstrates the value of selective angiography of the external carotid artery for the elucidation of such images.

The literature is not very communicative on the subject of these phenomena; Lindgren, in his book on roentgenology, shows a single image resembling ours. Pouyanne et al., in 1959, published the first French observation, but this aneurysmal hematoma had developed on the internal surface of the dura mater and was associated with a subdural and intracerebral hematoma. Vaughan in 1959 published the observation of a woman, aged 70 years, who presented the angiographic image of rupture of the median meningeal artery, with the contrast medium spreading in a large, irregular pool. Billet has described the same finding in a case of acute extradural hematoma. Huber has described a similar image observed during the angiographic study of a case of acute extradural hematoma, performed between the 6th and the 32nd hour after the trauma: the epidural extravasation of blood revealed itself by a round or drop-shaped opaque spot along the route of the artery; its dimensions were not correlated with the volume of the hematoma.

Case Reports

Case 1. R. C., aged 34 years, had an accident late in April 1962: right frontotempo-orbital shock was followed by obnubilation with retrograde amnesia. During the next few days, there was return of consciousness, with left hemiparesis, which regressed, and right exophthalmia.

On May 22, 1962, neurological findings were normal, with the exception of a stiff neck. Electroencephalography revealed a right temporal lesion, and roentgenograms showed a right frontotemporal fracture. Arteriography (Figs. 1 and 2) revealed a displacement of the vessels indicating the presence of a mass in the right temporal region, a clear arrest of the filling of the median meningeal artery in the first arterial stage, and an opaque spot, the size of a cherry stone, visible in the anteroposterior and lateral projections in the capillary stage. Finally, in the capillary stage in the anteroposterior projection the detachment of the cerebral and meningeal vessels from the wall could be clearly seen. The diagnosis made was: extradural hematoma with false aneurysmal sac in the territory of the median meningeal artery.

At operation, an extradural hematoma was evacuated which occupied the tip of the temporal fossa. Close under the line of the fracture was a tear of the middle meningeal artery which opened into the blood pouch. The latter constituted the false aneurysmal sac adhering to the dura mater. This false sac was resected, a clip being placed on the median meningeal artery. There was no subdural hematoma.

The postoperative course was uneventful. Rapid recovery ensued.

Histological examination showed that the aneurysmal sac was in fact the outer coat of a hematoma. Accordingly, the case was one of organized pseudo-aneurysmal hematoma and not of true, saccular, congenital hematoma, because no arterial wall was found.
al., and the other by Dilenge. Our cases are reported below.

Case 2. Mr. O. N., aged 63 years, on April 25, 1961, presented a cranial trauma with brief loss of consciousness. The radiograms revealed a right temporal fracture. Ten days later, only stiffness of the neck persisted, without any sign of focalization, but electroencephalography showed a right temporoparietal lesion with depression of the electrogensis on the right side. In spite of the normal clinical findings and the normal F.O., this electroencephalogram and the slowing of the pulse to 48 justified right carotid arteriography. The arteriogram revealed an opaque spot near the median meningeal artery precisely where this artery crossed the line of fracture (Fig. 3).

Otherwise, the arteries and veins showed no displacement on the lateral arteriogram. On the anteroposterior arteriogram, in the capillary phase, there was a clear spot between the internal lamina of the skull and the corticomeningeal vessels. This clear spot indicated the site of the extradural hematoma (Fig. 4).

Two cases similar to ours, aneurysmal hematoma originating from the median meningeal artery, with extradural hematoma, have been reported, one by Hirsch et

Fig. 1 and 2. Case 1. (Above) Lateral projection, arterial stage. Arteriography via the common carotid artery. Note lifting of the sylvian axis and sudden interruption of a meningeal branch of the external carotid artery slightly above the quadrilateral lamina. (Below) Lateral projection, capillary stage. At the site of the interruption of the meningeal branch of the external carotid artery, an opaque spot becomes visible.

Fig. 3. Case 2. Lateral projection, arterial stage. Note the pseudo-aneurysm and the meningeal branch of the external carotid artery.

Fig. 4. Case 2. Anteroposterior projection, capillary stage. The spot of the pseudo-aneurysmal hematoma is visible, but one can distinguish also a clear band between the internal table of the bone and the corticomeningeal vessels; this image indicates the presence of the extradural hematoma.
Operation was performed on May 12, 1961. A small right temporal flap was centered on the line of fracture. When the bone was lifted away, it was found that the groove of the median meningeal artery was much wider than usual. The artery was divided but also closed at the line of fracture. An extradural hematoma, 2-3 cm. in thickness, was evacuated. A dural flap then was detached and it was found that a large arteriole passed through the dura mater descending directly into the sylvian fossa. In other words, there was a transdural anastomosis which had been involved accidentally by the fracture. The aneurysmal sac was the size of a lentil, and the question might be raised whether the transdural arterial anastomosis had not favored its formation.

The postoperative course was uneventful. Control radiography confirmed that the clip had been placed at the site of the aneurysmal sac.

Case 3. Mr. R. M., aged 35 years, fell from his motorcycle on Oct. 14, 1961. After a brief loss of consciousness, the patient had mounted his vehicle again and had arrived home with only a headache.

On October 16, 2 days later, he had headache, obtundation, and agitation. However, the patient was admitted to our service only on October 18. The pulse rate was 100. Neurological findings were normal. Roentgenograms revealed a left frontoparietal fracture. Electroencephalography revealed generalized abnormality of the electrogenesis with flattening of the rhythms on the left.

On October 20, the pulse rate was 54. Carotid angiography revealed the presence of an opaque mass the size of a lentil along the tract of a branch of the median meningeal artery. It was particularly clearly visible on the selective angiogram of the external carotid artery. In the anteroposterior projection it could be seen that the cerebral vessels were slightly detached from the wall opposite the line of fracture (Figs. 5 and 6).

Operation, carried out on Oct. 21, 1961, disclosed a clotted extradural hematoma, 3 cm. in thickness, causing displacement of the dura mater. During its evacuation, the lesion of the middle meningeal artery was found, from which blood issued with force; coagulation was carried out and a clip was applied as a landmark.

The postoperative course was uneventful. Control angiography revealed the disappearance of the aneurysmal sac.

Discussion

Clinically, these 3 patients did not present the dramatic aspect of the acute extradural hematomata which require emergency operation. On the contrary, there were only mild symptoms: a stiff neck, a slower pulse, a cranial fracture and an electroencephalographic focus of cerebral damage were the signs that constituted the indications for angiography.

The presence of a pseudo-aneurysmal shadow along the tract of the median meningeal artery facilitated the angiographic diagnosis. The serial angiograms gave a clear impression of the arterial wound in contact with the fracture that had caused it, and of the particular hemostasis of this arterial wound.

The wound may be total, i.e. the artery may be completely divided (Case 1) or it may be lateral, with involvement, however, of all three arterial tunics (Cases 2 and 3). In these cases a fairly favorable process occurs: the organization of the clot into an aneurysmal sac, proving that hemostasis has taken place. It indicates that the hemorrhage has been profuse, because the clot has not completely closed the lesion of the artery, but
that it has not been massive, and that the case has therefore run a subacute course. Possibly the subacute course can be attributed to the site of the arterial rupture. It is situated in a branch of the median meningeal artery, rather far from the base of the skull and accordingly of a rather small diameter. The subacute course also has been observed clinically: our 3 cases of extradural hematoma have run a course of a week or of several weeks; and we are all familiar with the ultra-rapid course within 6–48 hours of cases of extradural hematoma from rupture of the median meningeal artery that frequently is completely catastrophic.

Histological examination of the aneurysmal sac (Fig. 7) confirmed that it was only the organized wall of the hematoma and not a true congenital aneurysm.

In our opinion these observations have demonstrated that, instead of angiography of the internal carotid, we should use angiography of the common carotid artery, which divides into the two carotid systems, the internal and the external. Only by this method of examination can we demonstrate simultaneously the lesion of the median meningeal artery with its small contrast spot, and the displacement of the cerebral vessels as proof of the existence of an extradural hematoma, the size of which shows no correlation with the size of the aneurysmal sac. In order to obtain better certainty and an even more demonstrative image the angiographic examination may be completed by a selective injection of the external carotid artery (Case 3).

However, it is sufficient to be aware of the
existence of these pseudo-aneurysms and of these angiographic images to avoid the confusion with genuine aneurysm.

References