RUPTURED INTRACRANIAL ANEURYSM COMPLICATED BY SUBDURAL HEMATOMA

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There are many etiologic factors that can be important in the production of a subdural hematoma. One of the more unusual is the rupture of an intracranial aneurysm. It is reported that 1–2 per cent of all subdural hematomas result from ruptured intracranial aneurysms, and approximately 2–8 per cent of all ruptured aneurysms have an associated subdural hematoma. However, a review of the literature reveals very few case reports. Clarke and Walton1 in 1953 found reports in the literature of only 6 clinically significant cases of subdural hematomas produced by aneurysms. To these they added 6 of their own cases. Bassett and Lemmen1 reported an additional 5 cases. The present case is reported because of the rare location of the aneurysm and the unusual manner in which it presented clinically. In these respects it was entirely different from those cases reported in the literature.

CASE HISTORY

Edmond G. C., a 37-year-old white male laborer, was admitted to the Veterans Administration Hospital, Minneapolis, Minnesota, on Aug. 19, 1960 because of stupor and right hemiparesis. The veteran had a service-connected disability of chronic osteomyelitis of the lower end of the right humerus resulting from a shrapnel wound, but otherwise had been in good health. The patient’s wife stated that on Aug. 16, 1960 her husband “had a fit” while resting in bed. This consisted of generalized tonic contraction and stupor. The latter persisted until his admission on Aug. 18, 1960 to the Veterans Administration Hospital in Minneapolis.

Examination. On admission to the Veterans Administration Hospital in Sioux Falls, South Dakota. The examining physician recorded that, although stuporous, the patient could be aroused by vocal and/or painful stimuli to the extent that he would follow objects with his eyes and move all extremities. Right hemiparesis was present.

Lumbar subarachnoid puncture revealed grossly clear fluid with an opening pressure of 280 mm. H2O. There were 16 polymorphonuclear cells and 5 red blood cells/c.mm.

Examination. On admission to the Veterans Administration Hospital in Minneapolis positive findings were right hemiparesis (greater in the leg than the arm), right hyperreflexia with a right Babinski’s sign, absent abdominal and cremasteric reflexes bilaterally, a central type of right facial palsy, a dilated left pupil which reacted sluggishly to light, and bilateral papilledema. The patient was very lethargic. Tentative diagnosis was left subdural or intracerebral hematoma.

Left carotid angiography revealed a marked shift of the anterior and middle cerebral arteries to the left. A right carotid angiogram revealed a large semilunar radiolucency characteristic of acute subdural hematoma over the right hemisphere. Also evident was an aneurysm, 6 mm. in size, located on a cortical branch of the right middle cerebral artery. The aneurysm projected into the area of subdural hematoma (Fig. 1).

Operation. On Aug. 20, 1960 a right parieto-occipital craniotomy was carried out. After evacuating approximately 200 cc. of dark red, semisolid clot from the subdural space, an older, organized clot was removed from the area of the hemisphere containing the aneurysm. A saccular aneurysm was found exactly as shown in the arteriogram and two silver clips were placed across the base of the aneurysm. The aneurysm was then excised distal to the clips.

Postoperative course was uneventful. Within 24 hours the patient could speak, and within 48 hours the pupils became equal and movements of the right side of the body were observed.

He was discharged on Sept. 21, 1960 with no detectable deficit other than his service-connected disability. When the patient became oriented and could be questioned, he disclosed that a brief, seizure-like episode had occurred in October, 1959 for which he had been seen in the emergency room at his local hospital and released. He had received no trauma to the head in the months preceding admission to the hospital.

DISCUSSION

The question that arises is just how does a hemorrhage arising from vessels located in the arachnoidal space reach the subdural space. Voris10 and Vance9 stated that the blood reaches the subdural space through tears in the arachnoid. The tears are produced by the force of the hemorrhage and it was postulated that the torn arachnoidal tissues formed a ball-valve type of one-way flow.10 Clarke and Walton1 stated that one may also find an aneurysm that bleeds directly into the subdural space and not via such an arachnoidal tear. They felt that this is more likely to occur in the second or a subsequent bleeding episode because of formation of adhesions around the sac of the aneurysm. In such an instance, one, of course, would find negligible hemorrhage into the subarachnoid space. Examination of the cerebrospinal fluid may reveal no
evidence of hemorrhage. The presenting symptomatology would be that of sudden development of a subdural hematoma. It is felt that the latter mechanism of production of subdural hematoma occurred in the case presented in this report. The lumbar subarachnoid fluid did not reveal the usual findings characteristic of a subarachnoid hemorrhage secondary to a ruptured intracranial aneurysm. At the time of operation, an old organized blood clot was found in close proximity to the aneurysm. A moderate hemorrhage must have occurred from the aneurysm through this fibrotic tissue and directly into the subdural space, for the blood located there was of a fresh nature. It is felt that the seizure-like episode that occurred 10 months prior to the last hospital admission may have been the result of the initial hemorrhage from this aneurysm.

There is a general agreement that a subdural hematoma resulting as a complication of a ruptured aneurysm has few if any specific clinical features. The cases reported have been classed clinically either as subdural hematomas (with aneurysm unsuspected) or as subarachnoid hemorrhage (with subdural hematoma unsuspected). Correct diagnosis before operation or autopsy has been rare. Bassett and Lemmen suggested that when treating a subdural hematoma, the surgeon should keep this entity in mind and seek for an aneurysm angiographically if he should find continued marked tension of the brain after evacuation of a subdural hematoma, a subarachnoid hemorrhage associated with the subdural hematoma, xanthochromic or bloody ventricular fluid under increased intracranial pressure, or a subcortical clot. Additionally, it is our belief that whenever patients with a subarachnoid hemorrhage have an unusual clinical course, they should be studied for the presence of a subdural hematoma.

This case presented the findings of an ipsilateral hemiplegia and a contralateral dilatation of the pupil. It is felt these neurological signs were the result of herniation of the ipsilateral hippocampal gyrus through the incisura of the tentorium causing compression of the brain stem and of the 3rd cranial nerve against the contralateral free edge of the tentorium. Kernohan and Woltman demonstrated that notching of the pes pedunculi by the free edge of the tentorium on the side opposite such herniation occurred in 12 per cent of 276 autopsy examinations of patients with brain tumors, and Munro and Sisson reported an incidence of 17 per cent of ipsilateral incisural herniations in 376 patients with craniocebral trauma. This latter figure was increased to 25 per cent if only patients with subdural hematoma were considered. The exact mechanism for the development of a contralaterally dilated pupil is somewhat obscure. Voris, in reporting 100 consecutive cases of subdural hematomas, found 45 patients with unilaterally dilated pupils; in 5 of these patients the dilated pupil was on the contralateral side. Laudig et al., reporting on 143 cases of subdural hematomas, cited 26 patients with dilated pupil on the contralateral side.

Recently Jennett and Stern demonstrated in cats four patterns of pupillary involvement with tentorial herniation, including pure ipsilateral dilatation, ipsilateral dilatation with mild contralateral dilatation, contralateral dilatation and bilateral dilatation. However, at autopsy no explanation could be found for the 1 case in which there was only a contralateral pupillary dilata-

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**Fig. 1.** Right carotid angiogram. (Left) Anteroposterior view is characteristic of an acute subdural hematoma over the right hemisphere. An aneurysm of a cortical artery projects into the area of hematoma. (Right) Lateral view shows the aneurysm to be located on a branch of the middle cerebral artery in the parietal region.