VERTEBRAL ARTERIOGRAPHY IN THE STUDY OF SUBARACHNOID HEMORRHAGE

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The understanding and definitive treatment of subarachnoid hemorrhage must necessarily develop with the evolution of effective methods of investigating the cerebral vascular tree. Bilateral percutaneous carotid arteriography has become almost routine practice in the study of subarachnoid hemorrhage. This technique has shown that aneurysms, angiomas, and, very rarely, tumors are responsible for a large percentage of hemorrhages. A significant group remains in which no source for bleeding is found.

The purpose of this paper is to report the additional information gained by vertebral arteriography.

This series is composed of 60 cases of spontaneous subarachnoid hemorrhage in which bilateral carotid arteriography failed to reveal a source of bleeding. No cases were included in which a posterior lesion was suspected and diagnosed by vertebral arteriography as a primary procedure. The diagnosis was confirmed by lumbar puncture in all cases. In no case was there an apparent hemorrhagic diathesis. None of the patients had suffered craniocerebral injury as part of his illness, so that traumatic subarachnoid hemorrhage is not germane to this group.

Vertebral arteriography was entirely percutaneous via an anterior approach. Difficulties of technique have been largely overcome since adoption of the Sheldon needle. General endotracheal anesthesia was used in the great majority of cases to spare the patient the pain of inadvertent nerve-root irritation by the needle (carotid angiography is routinely performed under local anesthesia).

Radiological Findings. In 16 cases (26 per cent) vertebral arteriography demonstrated a lesion capable of producing and assumed to be responsible for the subarachnoid hemorrhage. Eight of these were aneurysms and 8 were angiomas. An analysis of the findings is given in Table 1.

The posterior cerebral arteries were demonstrated by carotid injection in 21 of the 60 cases (35 per cent), a considerably higher number than the 20 per cent reported by Moniz. Analysis of the 16 pathological cases showed no filling of the posterior cerebral arteries in 13. Both posterior cerebral arteries were demonstrated in 1 case, and one posterior cerebral artery was filled in 2 cases. In none of the last 3 was the "feeding" or source vessel demonstrated.

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Table 1

Analysis of 16 pathological cases

I. Aneurysms—8 cases
   A. Basilar bifurcation—3 cases
   B. Posterior cerebral—4 cases
      all near basilar bifurcation
      Left—3
      Right—1
   C. Vertebral—1 case
      left vertebral artery at level of foramen magnum (Figs. 1 and 2)

II. Angiomas—8 cases
   A. Supratentorial—2 cases
      1. inferomedial surface of left occipital lobe (Fig. 3)
      2. posterior portion of right temporal region
   B. Supra- and infratentorial—1 case
      3. mainly in distribution of right posterior cerebral artery
   C. Infratentorial—5 cases
      Midline
      4. limited to vermis of cerebellum
      5. pontine-filling mainly from right posterior cerebral artery
      6. filled by both posterior cerebral arteries
      Lateral
      7. superior surface of right cerebellar hemisphere
      8. left cerebellum-filling mainly from left superior cerebellar artery and left posterior inferior cerebellar artery

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Fig. 1. Left anteroposterior vertebral arteriogram showing aneurysm.
Fig. 2. Same case as in Fig. 1. Postoperative left vertebral injection showing occlusion of the artery with slight retrograde thrombosis.

The plain roentgenograms of the skull were normal in all but 1 case, in which erosion of the dorsum sellae was seen—a sign of no localizing value.

Clinical Findings. The series was comprised of 32 males and 28 females, ranging in age from 6 years to 66 years. Seven patients (11.5 per cent) were under 20 years of age; 36 (60 per cent) were between 20 and 50; and 17 (28 per cent) were over 50 years of age.

Fig. 3. Left lateral vertebral arteriogram showing anterior occipital angioma.
Nine (15 per cent) of the patients exhibited hypertension as judged by several recordings of diastolic pressure over 90 mm. of mercury.

Of the group, 37 (61.5 per cent) retained consciousness while 23 patients lost consciousness, either initially or early in the course of their illness.

In every case save one, the main symptom was severe headache, usually of abrupt onset. The physical signs were of two types: those caused by contamination of the subarachnoid space with blood, and the signs of focal neurological deficit. Stupor, stiff neck, Kernig’s sign, i.e., the manifestations of meningeal irritation, were reported in some degree in all cases. Focal neurological abnormality was present in 15 patients (25 per cent), in 7 (11 per cent) of whom total arteriography had revealed no lesion. Eight (50 per cent) of the pathological group had physical signs. Hemiparesis, hemianopia, facial weakness and ocular nerve palsies (mainly 3rd and 6th nerves) were common to both groups, as was the occasional finding of retinal hemorrhages.

DISCUSSION

The number of angiomas and aneurysms discovered by vertebral arteriography was surprisingly high. Walton,10 summarizing many published reports including postmortem material, felt that 15 per cent of aneurysms were on the vertebral-basilar system. McKissock and Walsh,2 and Falconer4 reported posterior aneurysms as occurring in 3 to 6 per cent of their clinical series. Angiomas of the brain stem and cerebellum have been considered quite uncommon.3,6,10

It was further thought by Olivecrona and Riives4 that since the majority of angiomas received part of their blood supply from the internal carotid artery, they would be revealed by carotid arteriography. In the present series, despite a high percentage of cases in which there was filling of the posterior cerebral artery from the internal carotid artery (35 per cent), none of the posterior lesions was demonstrated by carotid arteriography.

Few have been optimistic about the surgical treatment of posterior vascular lesions. Yet, 3 of the 16 patients were cured by total excision of the lesion: occipital angioma, vermis angioma and vertebral aneurysms (Mr. W. McKissock, Mr. V. Logue).

Many physicians have felt that those patients who survived their original ictus and had no lesion demonstrated by arteriography, had a far better prognosis than those in whom a lesion was shown. Walsh9 has recently published data to support this belief. We subscribe to this theory albeit the follow-up of the present series is not long enough to be valid statistically.

CONCLUSIONS

Vertebral arteriography should be undertaken when bilateral carotid arteriography fails to show a source for subarachnoid hemorrhage.

Vertebral arteriography may show a surgically accessible lesion. If total study is negative, the physician can more securely offer the patient a good prognosis.
Both posterior cerebral arteries must be filled to exclude supratentorial angiomas and aneurysms.

SUMMARY

1. Sixty cases of subarachnoid hemorrhage with negative carotid arteriograms have been investigated with vertebral arteriography.
2. The radiological findings have been detailed.
3. A résumé of the major clinical findings has been presented.

We wish to thank Mr. Wylie McKissock for allowing us to analyze his cases of subarachnoid hemorrhage. A few of the patients were under the care of Mr. Logue and Dr. Carmichael, whom we also wish to thank.

REFERENCES

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