Subtraction-Angiography of Spinal Cord Vascular Malformations

Report of a Case

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The radiographic diagnosis of vascular malformations of the spinal cord depends largely upon the myelographic demonstration of linear, serpiginous, filling defects in the Pantopaque columns.\(^1\)\(^1\)\(^2\)\(^7\)\(^8\)\(^9\) The reported accuracy of myelographic diagnosis has varied widely. Lombardi and Migliavacca\(^10\) noted positive myelographic findings in 15 out of 18 spinal angiomas. However, Teng and Papatheodorou\(^11\) demonstrated typical findings in 6 out of 12 cases and Verbiest and Callhauw\(^12\) in only 3 of their 12 cases. Both these latter groups commented upon the inadequacy of myelographic diagnosis: the findings may resemble those of non-specific arachnoiditis and, when a complete block is present, the differential diagnosis from tumor may be impossible. These malformations cannot be diagnosed at all by gas myelography.\(^4\) Teng and Papatheodorou\(^13\) concluded that if reliance is placed on myelography alone for the diagnosis of vascular lesions of the cord, a great many will be missed.

The acknowledged accuracy of cerebral angiography in the diagnosis of intracranial vascular malformations has suggested the application of this technique to similar lesions of the cord. The demonstration of cervical cord vascular malformations by vertebral arteriography has been reported by Henson and Croft,\(^11\) Di Chiro,\(^3\) Höök and Lidvall,\(^13\) and Morris.\(^14\) Single examples of angiomas in the dorso-lumbar cord opacified by retrograde lumbar aortography have been reported by Shephard\(^15\) and Bergstrand et al.\(^2\) Since 1962, Djindjian and his colleagues\(^4\) have demonstrated vascular malformations of the cervical and dorso-lumbar cord (12 cases) by subclavian and retrograde lumbar arteriography. They have emphasized the importance of the subtraction technique\(^4\) in highlighting the details of these vascular lesions. Subtraction is a photographic or electronic method which allows the almost complete cancellation of the image components common to both preliminary and subsequent contrast-filled radiographs. In subtraction-angiography we try to eliminate as much as possible the overlying bone structure.

The following case is presented as an example of the subtraction-angiographic visualization of a vascular malformation of the spinal cord.

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Case Report*

A 34-year-old white man was admitted with a 2-week history of paresthesias of the right lower extremity and neck pain. At the age of 18, he had an episode of subarachnoid hemorrhage. Since that time, the patient had experienced transient episodes of paresthesias involving both lower extremities and occasionally his left arm.

Examination. Physical examination revealed mild hemiatrophy of the left side of the body as well as dysesthesias of the right leg from knee to toes. The cerebrospinal fluid protein was elevated (173 mgm. per cent). Skull and cervical spine x-rays were normal. Bilateral carotid arteriography revealed a berry aneurysm at the origin of the right posterior communicating artery. Myelography showed multiple tortuous linear filling defects extending from C4 to C7. These were considered typical of a vascular malformation (Fig. 1).

Angiography. To identify feeding vessels, an arch aortogram was performed by means of femoral catheterization. The carotid and vertebral arteries in the neck were normal; however, the left vertebral artery originated from the arch of the aorta between the left common carotid and left subclavian arteries, an anomaly occurring in about 3 per cent of patients.\(^16\) A large vessel originating from the left subclavian artery, most probably the ascending cervical artery, coursed laterad to the cervical spine, and turned medially at the level of C4 to enter the spinal canal through the left C4-5 intervertebral foramen. Later films revealed opacification of multiple vessels within the cervical spinal canal corresponding in location to the serpiginous filling defects visualized on the cervical myelogram. No other feeding arteries were demonstrated. A large central vein drained the lesion (Fig. 2).

On conservative therapy, the neck pain and paresthesias of the leg subsided and the patient returned to full employment.

Discussion

For successful angiography of vascular malformations of the spinal cord, the contrast material must be injected as close as possible to the origin of the feeding vessels. The artery of Adamkiewicz, usually arising from an upper lumbar or lower intercostal artery,\(^20\) will supply most vascular lesions of the lower cord and conus. Angiomas of the dorsolumbar cord are best opacified by a retrograde aortography injection at the same level as the

* This patient was under the clinical care of Dr. Maitland Baldwin.
The present case, cervical in location but with only a single afferent vessel, is somewhat atypical. Djindjian and his associates have ligated the afferent vessels in 5 spinal cord angiomas without complications. When multiple feeders were present, staged procedures were done. Postoperative arteriograms showed definite diminution in the size of the vascular lesions.

Summary

The angiographic demonstration of an arteriovenous malformation of the cervical spinal cord with a single afferent vessel from the left subclavian artery is reported. The importance of subtraction technique is stressed.

References

9. FAURÉ, C. Personal communication.