CT Cisternography of Dolichoectatic Arterial Compression of the Optic Chiasm

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Dolichoectasia of the distal internal carotid arteries and the proximal anterior cerebral arteries is a well recognized abnormality. The angiographic and computed tomographic (CT) findings have been described [1-8]. Arterial enlargement has been implicated in chiasmal and optic nerve syndromes [1, 3-9]. We report a symptomatic patient with chiasmal deformity and associated arterial dolichoectasia who was examined using high-resolution CT (GE CT/N 8800, ReView) with metrizamide cisternography.

Case Report

A 19-year-old woman was referred for evaluation of episodic left-leg weakness and visual disturbances. At the age of 15 she began having recurrent episodes of transient visual blurring and, occasionally, blindness that lasted as long as 2 min. No medical attention was sought at that time. Her condition was then quiescent until age 17, when she began having episodes of transient left-leg weakness every 2-4 weeks. At age 18, she had a particularly severe occurrence without resolution. A contrast-enhanced CT scan obtained elsewhere showed marked gyriform enhancement in the distribution of the right anterior cerebral artery suggesting infarction. Cerebral angiography demonstrated marked ectasia of the intracranial parts of the internal carotid arteries and the proximal anterior cerebral arteries. The right anterior cerebral artery was occluded distal to the anterior communicating artery. She was treated with Coumadin but had two more episodes of transient left-sided weakness before presenting at our institution. Her family history included diabetes mellitus but did not include migraine headaches.

On examination, the patient was normotensive. Visual acuity was profoundly impaired in the right eye with finger-counting ability at 10 cm only. Visual acuity on the left was 20/25. An afferent pupillary defect with advanced optic atrophy was present on the right. There was rapid slowing of alternating movements on the left with awkwardness of fine dexterity. The left knee jerk was hyperreflexic. There were no vascular bruits and the cardiac examination was normal.

Electroencephalography showed bifrontal, intermittent, rhythmic slow wave bursts, greater over the left hemisphere. The visual evoked responses showed no reproducible response from the right eye; however, the p-100 for the left eye was 126 msec, which is significantly prolonged for our laboratory.

Repeat four-vessel cerebral angiography at our institution again revealed the severe dolichoectasia of the arteries at the base of the brain with occlusion of the right anterior cerebral artery (fig. 1). Coronal CT with intravenous iodine enhancement also revealed the tortuous and enlarged distal internal carotid, proximal middle, and proximal anterior cerebral arteries along with infarction in the cerebral in the right anterior cerebral artery distribution (fig. 2). Compressive or ischemic injury to the optic chiasm caused by the enlarged anterior cerebral arteries was clinically suspected, prompting further examination using metrizamide CT cisternography. Using the usual technique for sterile lumbar puncture, 6 ml of 170 mg/ml metrizamide was injected into the lumbar subarachnoid space. The patient was then placed in a head-down position and subsequently scanned in the axial and coronal planes using the 1.5-mm-slice-thickness mode of the GE CT/N 8800 scanner. This CT examination showed deformity and diminution of the optic chiasm (fig. 3).

Neurosurgical intervention was considered, but was believed to be risky and the outcome doubtful. The patient was maintained on medical hypotenstion using Propanolol and diuretics. She was also treated continuously with aspirin and Persantine. Her blood pressure remained stable at 90/60 mm Hg, and she had no recurrent visual symptoms during the subsequent 18 months.

Discussion

From 1942 to 1945 Le Riche [10-12] described “arteria magna et dolicho” as a process of severe dilatation and elongation of the major pelvic arteries. Other, similar contributions to the literature followed, until the development of angiography allowed better delineation of the process [13-15].

The angiographic findings have been described in several anatomic locations, including the brain [1, 2, 13-16]. Typically, the involved arteries are elongated, tortuous, dilated, and slow-flowing. Patients often have symptoms of local mass effect or ischemia [1, 2, 4, 5, 7-9, 16-18]. These patients have an increased incidence of thrombosis, embolization, and associated aneurysms [14]. Intravenous-contrast-enhanced cranial CT scans have characteristically shown fusiform dilated and elongated enhancing siliconettes, generally in the courses of the intracranial internal carotid or basilar arteries [1, 2, 19, 20].
Fig. 1.—Anteroposterior left (A) and right (B) cerebral arteriograms. Marked fusiform enlargement of distal internal carotid arteries and proximal anterior and middle cerebral arteries. Right anterior cerebral artery is occluded (arrow). Arteries in midline are dorsal callosal collaterals supplied by posterior cerebral arteries.

Fig. 2.—Intravenous-contrast-enhanced coronal CT scan. Enlarged distal internal carotid artery bifurcations (long arrows). Optic chiasm (short solid arrow) visible, but shape is not clearly defined. Infarction of right cingulate cortex (open arrow).

Fig. 3.—Metrizamide-enhanced axial (A and B) and coronal (C) CT cisternograms. Enlarged internal carotid (long arrows) and anterior cerebral (open arrows) arteries outlined by metrizamide in subarachnoid space. Optic chiasm (short solid arrows) is small and deformed.

Pathologic examination of the arteries has revealed fragmentation or complete loss of the medial elastic lamina [13, 15]. The presence ofatheromatous change has been variable but is usually evident [5, 13]. Since even a 2-year-old patient has been reported with dolichoectatic arteries, the process is thought to have a congenital or acquired cause unrelated to atherosclerosis. It appears that the frequent presence of atherosclerosis probably is coincidental [5, 21].

Several patients have been reported with visual symptoms ascribed to compression or ischemia of the optic chiasm or nerves by enlarged internal carotid and/or proximal anterior cerebral arteries [1, 4-6, 8, 9, 22, 23]. Pathologic examinations have shown deformity and atrophy of the optic chiasm and/or grooving of the optic nerve at the site of the entrance into the cranial end of the optic canal in cases of this type [3, 5].

The blood supply of the intracranial optic nerves and chiasm is known to originate predominantly from the distal internal...
carotid artery, ophthalmic artery, proximal anterior cerebral arteries, and the anterior communicating artery via small branches. The hypophyseal, posterior communicating, anterior choroidal, and proximal middle cerebral arteries play a variable role [24].

The visual symptoms and type and degree of visual field defects appear to be highly variable, probably depending on the size, shape, and position of the dolichoectatic segments. Since atherosclerosis is often associated, it is probably impossible to determine the degree of the symptomatology caused by direct-pressure atrophy as opposed to that caused by ischemia secondary to occlusion of small arterial supply branches.

The normal and pathologic CT appearance of the optic chiasm and suprasellar cistern using subarachnoid metrizamide has been reported [25–27]. Our case demonstrates the appearance of carotid and anterior cerebral artery dolichoectasia using high-resolution CT with subarachnoid metrizamide. Clearly, there has been a marked decrease in the size of the optic chiasm with deformity of its shape. Presumably, this has been caused by chronic pulsatile pressure atrophy. Even though thrombosis and embolization appear to be seen more often with dolichoectasia [14], the pathogenesis for our patient’s right anterior cerebral artery occlusion is not entirely clear. This certainly could have played a role in her chiasmatic symptoms.

Therapy for such a diffuse process can be very difficult. Some have argued that surgical manipulation of the dolichoectatic arteries can be beneficial [6]. Our patient was stabilized under conservative antihypertensive management.

REFERENCES

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