Atypical fibromuscular hyperplasia

Report of two cases

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Two cases of atypical fibromuscular hyperplasia of the internal carotid artery (ICA) are reported. These cases are unique because the changes involve the intima of the vessels without involvement of medial structures as seen in the more common form of fibromuscular hyperplasia. Case 1 is only the fourth report of a symptomatic fibromuscular stenosis at the origin of the ICA. Case 2 is the first report of fibromuscular hyperplasia involving the common carotid artery. Changes similar to those in Case 2 (an elongated area of tubular fibromuscular stenosis) have been reported in the ICA. These atypical or intimal forms of fibromuscular hyperplasia appear to be more common in males and blacks, and may be more often unilateral as well.

KEY WORDS • carotid artery • fibromuscular dysplasia • cerebral ischemia • medial fibroplasia

Fibromuscular hyperplasia of the internal carotid artery (ICA) is an infrequent cause of cerebral ischemic symptoms. Also known as "fibromuscular dysplasia" and "medial fibroplasia," this disorder was first described in 1964. Since that time, over 300 cases have been reported. The disorder is known to be nine times more common in women than in men and is bilateral in 65% of cases. The typical case presents in the first half of the fifth decade of life. Although the extracranial ICA is the most frequently involved cerebral vessel, the disorder has been reported in the vertebral artery and the intracranial carotid artery and its branches. Aneurysms have been associated with fibromuscular hyperplasia in up to 46% of cases.

Despite considerable recent interest, the etiology of fibromuscular hyperplasia is unknown. Genetic predisposition, chronic trauma and stretching of involved vessels, hormonal factors, and abnormalities of the vasa vasorum have all been implicated as potential etiological agents. Three pathologically distinct forms of the disease have been described in the renal artery. These include the most common form of medial dysplasia and the less commonly encountered intimal fibromuscular hyperplasia. The third, peri-adventitial form, is extremely rare. Although similar pathological changes have been reported in the carotid artery, they have not been systematically cataloged. The natural history of the disorder also remains poorly defined. Progression of this condition in the renal arteries has been suggested, but this has not been established for cases of carotid artery disease.

The radiographic characteristics of this disease have been carefully described by Osborn and Anderson. They proposed three radiographically distinct patterns. The first, by far the most common and accounting for 89% of cases, is characterized by the "stacked coin" appearance of multiple constrictions and aneurysmal dilatations. With rare exception, the literature relevant to fibromuscular dysplasia of the carotid artery refers to this form of the disease. Surgical experience with this type of fibromuscular hyperplasia has encompassed resection, vein patch angioplasty, and graduated intraluminal dilation of the involved artery. The efficacy of these treatment modalities has been well documented, and our own experience corroborates the results of graduated intraluminal dilation.
Types II and III described by Osborn and Anderson are less common forms of this disorder, and represent 7% and 4% of cases, respectively. Type II changes consist of areas of concentric narrowing of the ICA. It is important to distinguish these changes from spasm or standing waves at the time of angiography. Aneurysmal dilations of the wall are not present. Type III fibromuscular hyperplasia involves only one wall of the ICA at the level of the C-2 vertebra. Aneurysmal stenosis at the origin of the ICA is atypical, and has been reported only three times. These changes have been classified angiographically as a variant of Type III fibromuscular hyperplasia. Two of the patients described with these changes had symptoms caused by a "web-like" narrowing of the lumen, and responded to endarterectomy.

We are reporting a fourth case of symptomatic fibromuscular stenosis at the origin of the ICA (Case 1), and a unique case of tubular fibromuscular stenosis of the common carotid artery (Case 2).

Case Reports

Case 1

This 57-year-old black man presented in December, 1976, with a history of transient episodes of weakness involving the left side. On the day of admission, he experienced the sudden onset of weakness and partial sensory loss which did not clear.

Examination. The patient was normotensive. General physical and cardiovascular examination was normal except for a right carotid bruit. Computerized brain tomography, skull x-ray films, and hematological studies were unremarkable. Selective translumbar cerebral angiography consisting of oblique 105-mm films of the right carotid bifurcation revealed a web-like defect located on the posterior wall of the ICA at its origin (Fig. 1). Changes were also present in the contralateral carotid bifurcation where minimal irregularity was believed to be consistent with arteriosclerosis. The intracranial vasculature was normal. The patient was placed on aspirin, 10 grains twice daily, and Persantine (dipyridamole), 25 mg four times daily, and allowed to return home.

Operation. He was admitted 5 weeks later, at which time he had recovered from his neurological deficit, and underwent a right carotid endarterectomy. At operation, a web-like constriction was found at the origin of the ICA and was removed. This was more prominent at surgery than it appeared angiographically. Pathological examination revealed pronounced areas of focal intimal thickening due to hyperplasia of the fibromuscular stroma (Fig. 2). These changes were typical of fibromuscular hyperplasia, and elastic tissue stains revealed an intact internal elastic lamina. Arteriosclerotic changes were not seen. The patient has remained asymptomatic during the ensuing 3 years. An oculoplethysmogram obtained 34 months after endarterectomy was normal.

Case 2

This 71-year-old black man was employed regularly as a baker until May, 1978, when he experienced the sudden onset of severe headache and left-sided weakness. He presented 24 hours following his ictus.

Examination. He was drowsy, but oriented and cooperative. A left hemiparesis of moderate severity was present. The patient's blood pressure was 180/90 mm Hg. A right carotid bruit was noted. Computerized brain tomography revealed a high-density right frontal lesion consistent with intracerebral hematoma. Hematological evaluation was normal. After his hypertension was controlled, transfemoral selective cerebral angiography was performed. This revealed an area of severe narrowing in the right common carotid artery at the level of C5-6. The constriction extended over a 3-cm length and was a concentric narrowing with lobulated irregularities along the right anterolateral arterial wall (Fig. 3). The ICA's were normal in configuration, and the remainder of the
Atypical fibromuscular hyperplasia

FIG. 2. Case 1. Photomicrograph of the endarterectomy vessel. The abrupt segmental thickening (bottom of the figure) with hyperplasia of the fibromuscular stroma is consistent with fibromuscular hyperplasia. The vessel lumen is on the right. H & E, × 80.

study was negative except for flow abnormalities due to the narrowed common carotid artery. Selective catheterization of both renal arteries was normal. Computerized brain tomography 2 weeks following the onset of illness indicated resorption of the hemorrhage. Although these changes were more consistent with hemorrhagic infarction than an intracerebral hematoma, this was not confirmed pathologically.

Operation. Although a definite relationship between the patient’s ictus and the narrowed common carotid artery could not be established, we believed that total occlusion of the artery was likely and an endarterectomy of the common carotid artery was performed 4 weeks after admission. A 3-cm length of thickened, fibrous intima, densely adherent to the media, was removed. The bifurcation was not involved. Microscopic examination of the plaque revealed areas of pronounced focal thickening of the arterial wall with intimal fibromuscular hyperplasia (Fig. 4). Elastic tissue stains revealed an intact internal elastic lamina. In the 3 months following surgery, the patient’s neurological deficit cleared completely. During 18 months of observation since discharge, no transient ischemic attacks have occurred. Oculoplethysmography has remained normal.

Discussion

Case 1 represents the fourth case of fibromuscular stenosis at the origin of the ICA, and is quite similar to the cases reported previously. Lesions of this type may be the source of cerebral emboli. Experience in three of these cases indicates that endarterectomy is an effective treatment modality for this type of fibromuscular hyperplasia.

Case 2 is unique. We have been unable to locate a comparable case in the literature. Although angio-
FIG. 4. Case 2. Photomicrograph of the endarterectomized vessel showing hypertrophy of fibromuscular elements (lower right) consistent with fibromuscular hyperplasia. Muscularis is seen at the left, lumen to the right. H & E, × 80.

graphically similar to Type II fibromuscular hyperplasia of the ICA, it involved the common carotid artery. Contralateral arterial changes of fibromuscular hyperplasia were not observed in this case or in Case 1. Contralateral changes of fibromuscular hyperplasia have been identified in most of the reported cases classified angiographically as Type II and Type III. The adherence of the common carotid artery to surrounding structures in Case 2 suggested an inflammatory etiology; however, there was no evidence of inflammatory change on histological examination of the vessel wall. No other evidence of arteritis was identified, and there has been no recurrence of symptoms to suggest Takayasu's disease or other forms of arteritis. No preceding illness suggested that a dissection had occurred previously in this vessel.

There are many features, both clinical and angiographic, which distinguish these two cases from the more frequently observed fibromuscular hyperplasia Type I. Neither case exhibited bilateral changes, nor did the cases described previously. Type I changes have been bilateral in 65% of the reported cases, and bilateral changes have also been described in cases of Type II and Type III disease. Both of our patients were black, as was the patient reported by So, et al. and both were males. This is in contradistinction to the usual cases of fibromuscular hyperplasia wherein the disease is limited primarily to Caucasians and occurs in the female nine times as often as in the male.

It is suggested, therefore, that the two cases that we are reporting and the cases of Houser, et al., So, et al., and Rainer, et al. represent a variant of fibromuscular hyperplasia. These cases are quite distinct radiographically. They do not involve the ICA at the level of the C-2 vertebra as does the typical case. The pathological changes are also distinct. Proliferation of the intima in these cases is similar to the intimal proliferation seen in a small percentage of renal artery lesions. Although classification of these lesions as fibromuscular hyperplasia may ultimately be incorrect, in light of present understanding such classification appears logical. There were no changes of medial dysplasia, a pathologically distinct lesion associated with the "string of beads" appearance in the renal artery. The etiology of the intimal form of the disorder may also be different from that associated with the "string of beads" appearance. Chronic stretching of the high cervical ICA and alteration of its vasa vasorum cannot be implicated. That these changes appear to occur more frequently in males also makes hormonal influences a less likely etiological factor. Healing of an organized thrombus, described so well by Dirrenberger and Sundt, is also unlikely, since the late stages of healing they described involved the media, not the intima as in these cases.

We suggest that these cases represent a distinct pathological, angiographic, and clinical subclassification of fibromuscular hyperplasia. This intimal type of fibromuscular disease may be symptomatic and can be identified angiographically. Carotid endarterectomy provides an effective treatment modality. That fibromuscular hyperplasia is not restricted to the ICA or its distal branches is also clear. With pathological confirmation of fibromuscular hyperplasia in the common carotid artery, there is now evidence for the occurrence of this disease in all cephalic vessels.

**Addendum**

Since submission of this material, another case of atypical fibromuscular hyperplasia has been treated in a 48-year-old black woman. This patient presented with a mild submaximal cerebral infarction, and was found to have stenosis of the appropriate ICA at its origin. Unlike Case 1, the area of stenosis in this patient was similar angiographically to an arterio-
Atypical fibromuscular hyperplasia

sclerotic plaque. Histological examination revealed changes consistent with fibromuscular hyperplasia as seen in Cases 1 and 2.

References


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