17. Ponder E: The coefficient of thermal conductivity of blood and of various tissues. J Gen Physiol 45: 545-551, 1962

Sonographic Demonstration of Fibromuscular Hyperplasia of the Cervical Internal Carotid Artery

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SUMMARY Ultrasound examination of the carotid artery has recently become an accepted procedure in screening patients with transient ischemic attacks. We report a patient with fibromuscular hyperplasia of the carotid artery diagnosed successfully with digital gray scale contact ultrasonic scanning and confirmed with arteriography.

FIBROMUSCULAR HYPERPLASIA involving the cervical portion of the internal carotid artery has been reported to be a cause of cerebrovascular insufficiency.1 2 Demonstration of this lesion, however, has been limited to arteriography. We report a patient with fibromuscular hyperplasia demonstrated with gray scale digital sonography. The advantages of sonographic evaluation of the carotid arteries as a non-invasive screening procedure are discussed.

Report of a Patient
A 44-year-old normotensive white female was found to have loud, high-pitched bilateral carotid bruits during a routine physical examination. She was referred for neurological evaluation and follow up. Initial clinical examination revealed a rather intense, nervous lady with a blood pressure of 126/68; no cardiac murmurs were found on auscultation. No signs or symptoms suggestive of peripheral arterial disease were detected. She had bilateral loud pansystolic bruits over both areas of carotid bifurcation. Neurological examination was normal. Non-invasive cerebrovascular tests were performed. Carotid phonoangiogram confirmed the bruits to be of carotid origin and her oculophthalmoscopy (OPG) was found to be normal bilaterally. Carotid sonography, utilizing a commercially available Rohé digital gray scale ultrasound unit, model 5580, equipped with a 5 MHz short focus transducer, was used. Several areas of segmental stenosis were demonstrated revealing multiple areas of shadowing (figs. 1A, 1B) similar to a sonogram demonstrating atherosclerotic disease with calcific plaques of the carotid arteries. Subsequently a bilateral internal carotid angiogram showed typical findings of bilateral internal carotid artery fibromuscular hyperplasia (figs. 2A, 2B). Because the natural history of fibromuscular hyperplasia of the carotid artery is still unclear,2 it was decided to follow the patient clinically. In the past 16 months, the patient continued asymptomatic.

Discussion
Fibromuscular hyperplasia is an arterial dysplasia of unknown etiology which usually involves the renal arteries.1 2 It has also been reported to involve the internal carotid arteries often producing transient cerebrovascular insufficiency.1 3 Arteriography is usually the procedure of choice in evaluating the extracranial portion of the internal carotid artery. However, carotid arteriography, either by direct puncture of the carotid artery or catheterization of the femoral artery, is a traumatic and invasive procedure which requires ionizing radiation. Ultrasound, on the other hand, is atraumatic and non-invasive. It has recently gained considerable popularity in evaluating carotid artery disease. More sophisticated Doppler-flow units, as well as ocular pneumoplethysmography, have been reported to be valuable for the detection of carotid artery stenosis.4 5 More recently, high resolution realtime ultrasound has produced scans of considerable detail in visualizing the area of the carotid bifurcation.4 6

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FIBROMUSCULAR HYPERPLASIA OF ICA DIAGNOSED BY SONOGRAPHY/Edell and Huang

**FIGURE 1A** Right carotid sonogram with arrows demonstrating the areas of stenosis.

**FIGURE 1B** Left carotid sonogram with arrows demonstrating the areas of stenosis.

**FIGURE 2A** Right brachial arteriogram with arrows demonstrating the areas of fibromuscular hyperplasia.

**FIGURE 2B** Left carotid arteriogram with arrows demonstrating areas of fibromuscular hyperplasia.
Detection of thrombosis as well as luminal narrowing in the carotid artery has been documented with commercially available digital gray scale units which produce a static image of the area scanned.\(^4\)

The appearance of an acoustic shadow with tortuosity of the vessel is usually found in patients with atherosclerotic disease of the carotid arteries where calcific plaques produce the acoustic shadow due to sound absorption. Our patient demonstrated acoustic shadows similar to those found with atherosclerotic disease of the cervical portion of the internal carotid artery without any evidence of calcification in the arterial wall. Fibromuscular hyperplasia produces multiple stenoses and dilatations along the course of the artery similar to a “string of beads” configuration.\(^1\) This appearance was shown by the sonogram as multiple areas of shadowing corresponding to the sites of stenosis and dilatation seen in the angiogram.

The lack of more precise detail in examining the carotid artery with conventional gray scale ultrasound units requires arteriography as the definitive diagnostic procedure. The increased resolution, accuracy and reliability of newly available ultrasound units may provide useful information which can help select patients for additional study. These newer, more sophisticated high resolution real-time ultrasonic scanners have become available with a resolution of less than 1 mm in study of structures close to the skin’s surface. The cost of the more elaborate systems does not make them readily available to most smaller hospitals. When the commercially available digital gray scale units reveal an abnormal vessel, a more detailed examination, such as contrast arteriography, should follow.

Acknowledgment

We wish to thank Rose Turgeon for her technical assistance, Betty Zimmerman for her preparation of the manuscript, and Roger Stevenson, M.D., for referring the patient for carotid sonography.

References

Sonographic demonstration of fibromuscular hyperplasia of the cervical internal carotid artery.
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doi: 10.1161/01.STR.12.4.518

*Stroke* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 0039-2499. Online ISSN: 1524-4628

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