Sonographic Findings in Dissection of Extracranial Brain-Supplying Arteries

To the Editor: I read with great interest the Case Report entitled “Serial Transoral Carotid Ultrasonographic Findings in Extracranial Internal Carotid Artery Dissection” Yakushiji et al. In this article, the authors highlight the importance of early diagnosis in extracranial internal carotid artery dissection. They report a case of transient ischemic attack detected clearly with transoral carotid ultrasonography (TOCU) in the early stage of extracranial internal carotid artery dissection. The transoral approach is not frequently applied. The article by Yakushiji et al makes a valuable contribution, especially with regard to obtaining more diagnostic reliability in cases with flow obstruction in the distal extracranial segment of the internal carotid artery below the C1 to C2 vertebral level. Although we do not presently use this technique, we agree with the authors that this approach can be considered, especially if the pathologic findings cannot be imaged directly with extracranial ultrasonography.

The reason for this letter is that we would like a clarification of the term “false lumen” used in this report and also in the figures legends. On the basis of our serial examinations of patients with dissection of the extracranial vertebral artery, we suggest the possibility that the structure that was described as a “false lumen” was more likely an “intramural hematoma.”

The characteristic ultrasonographic features of a dissection can vary from minor lesions (irregularities and thickening of the vessel wall with a hypoechoic intramural hematoma and/or narrowing of the lumen without hemodynamic alterations) to major structural lesions such as a severe stenosis or occlusion (Figure 1). The vessel lumen may contain hypoechoic structures of varying echogenicity; sometimes it is possible to image a dissecting membrane, which separates the lumen into a true- and false-perfused lumen. An intramural hematoma appears in the acute stage as a hypoechoic structure but becomes more echogenic in the further course (Figure 1, A and C). Just such features were also described in the suspected area of a dissection in the article by Yakushiji et al. In contrast, a typical characteristic of a false lumen is that this structure is perfused with blood (ie, a color-coded signal as well as the Doppler signal can be detected in the false lumen of the artery; Figure 1B). This is not visible in the figures shown by Yakushiji et al. The recovery in the size of the true lumen and the normalization of the peak systolic velocity on the affected side would also favor our notion that the intramural hematoma was slowly reabsorbed. This interpretation might have been verified by magnetic resonance imaging (MRI) with a fat suppression technique.

Figure 1. Dissection of the left vertebral artery expanding from V0 to the distal V2 segment during a chiropractic manipulation in a 32-year-old woman. A, Color-coded image of the V1 segment. Two intramural hematomas (arrows) appear as hypoechoic longitudinal formations. Reduction of the lumen diameter by 2.1 mm can be seen. B, Color-coded image of the V2 segment. Between processus transversi of C4 and C5 vertebrae, 3 lumina can be seen. The false lumen with blood flow (with a red-coded signal) is delineated by a dissecting membrane from the nonperfused true lumen (arrows). The third lumen is the vertebral vein. The transverse processes C4 and C5 are causing acoustic shadowing. (continued)
which would show up an intramural hematoma as a concentric, signal-intense thickening of the vessel wall.\textsuperscript{3,4} Perhaps the authors also have these findings and can additionally provide them.

Eva Bartels, MD, PhD
Department of Clinical Neurophysiology
University of Göttingen
Göttingen, Germany

References


Reply

To the Editor: We thank Dr Bartels for her useful comments and welcome the opportunity to provide additional MR images of our patient. We agree with the suggestion that the structure described as a false lumen in our case report is more likely to be an intramural hematoma because changes in echogenicity of the structure described and size of the true lumen are influenced by serial organization of a hematoma. However, the term “false lumen” merely refers to the space separated from the true lumen by a dissecting membrane. In our patient, cerebral angiography revealed outpouching of the internal carotid artery at the C1 vertebral level; this may indicate blood perfusion in the false lumen, although this could not be shown by TOCU. On the other hand, organization from hematoma to thrombus can occur because of accumulation of blood within the false lumen; indeed, this was shown in our patient by TOCU. Thus, hematoma, thrombus, and blood perfusion coexist in the false lumen. Hence, when attempting to clarify this term, we suggest that “intramural hematoma” should be used to indicate the organized structure formed by accumulation of blood derived from
the true lumen, and “false lumen” should be used to indicate the space separated from the true lumen by a dissecting membrane.

T1-weighted fat-suppressed MRI is indeed a superior technique to show intramural hematoma in the carotid artery. However, we did not perform MRI of the extracranial carotid artery in the acute stage because TOCU and cerebral angiographic findings enabled the diagnosis of extracranial internal carotid artery dissection. Six months after the onset, time-of-flight MR angiography (TOF MRA) was performed. This is regarded as the first choice among MRI protocols to detect intramural hematoma. Axial source images of TOF MRA (Figure 1) depicted the double lumen of the right carotid artery; one lumen showed hyperintensity, indicating blood flow, whereas the other exhibited hypointensity, indicating absence of blood flow. The right carotid artery was larger than the left. Although these findings support a diagnosis of carotid artery dissection, our axial source images of TOF MRA provided little information about the intramural hematoma. Accordingly, to obtain more information about the intramural hematoma, we should have performed further imaging investigations, such as proton density- and T2-weighted axial spin echo images or T1-weighted axial spin echo images with frequency-selective fat suppression, according to the protocol recommended by Oelerich et al.

Again we thank Dr Bartels for her attention to our report.

Yusuke Yakushiji, MD
Masahiro Yasaka, MD
Tatsuro Takada, MD
Kazuo Minematsu, MD.
Cerebrovascular Division
Department of Medicine
National Cardiovascular Center
Osaka, Japan

References

Figure 1. Axial source image of TOF MRA performed 6 months after the onset depicts the double lumen of the right (R) carotid artery. One lumen shows hyperintensity, indicating blood flow (arrow), whereas the other lumen shows hypointensity, indicating absence of blood flow (arrowhead). The right carotid artery is larger than the left.