The Distal Dural Ring: MR Imaging with Anatomical Correlations

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Purpose
To evaluate the efficacy of a specific MR sequence to consistently identify the distal dural ring surrounding the internal carotid artery (ICA), the precise anatomical point at which it becomes intradural. This precise point is of critical importance as it denotes the point beyond which an aneurysm of the distal internal carotid artery will give rise to subarachnoid hemorrhage on rupture. The dura has not been seen previously to any satisfactory extent on any imaging modality. We proposed that using MR imaging to image this segment of the ICA allows visualization of the distal dural ring and its intimate anatomical relationships. This information significantly enhances the decision-making process regarding the multidisciplinary management of clinoidal segment aneurysms. Our study evaluates the efficacy of a particular MR sequence in identifying this critical anatomical boundary.

Materials & Methods
Twenty patients were randomly selected from the cohort of neurologic referrals to our neuroradiologic unit. Each underwent thin-slice coronal heavily T2-weighted imaging in addition to their initial diagnostic examination. A 1.5 T GE magnet was employed and MR imaging parameters were as follows: fast spin-echo, TR 5000 ms, TE 99 ms, FOV: 24 x 18, 2 mm coronal slices with zero spacing, 384 x 256/4 NEX. Examination time for this additional sequence was 4 minutes. Each examination then was reviewed on a workstation and the clarity of definition of the distal dural ring surrounding the distal internal carotid artery on each side was assessed. Two human cadavers with intravascular latex injection were used for anatomical correlation with the MR images. One cadaver was sliced in the sagittal plane and the other underwent coronal sectioning. The anatomical sections were studied with the aid of the surgical microscope and compared with the corresponding MR slices.

Results
The distal dural ring was clearly visualized bilaterally in all patients, as was the intimately related distal internal carotid artery. The level of the distal dural ring on MR imaging corresponded with its anatomical location in the studied cadaveric sections.
Conclusion
Thin slice coronal MR imaging is an excellent means of demonstrating the distal dural ring surrounding the internal carotid artery, an anatomical feature of considerable clinical importance. Our study demonstrates the ease with which this rigid and precise anatomical landmark can be identified noninvasively with application of the correct MR protocol and good patient cooperation.

References