Coregistration and Fusion: An Easy and Reliable Method for Identifying Cranial Nerve IV on MRI

A. Lecler, J. Savatovsky and F. Audren

doi: https://doi.org/10.3174/ajnr.A5286
http://www.ajnr.org/content/38/10/E81
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We read with much interest the article by Bunch et al in the March 2017 issue of the American Journal of Neuroradiology, in which they described the trochlear groove and trochlear cistern as reliable anatomic landmarks when searching for the tentorial segment of cranial nerve IV on MR imaging. The authors provided useful indications to recognize these 2 structures with a T2-weighted driven equilibrium radiofrequency reset pulse sequence. Confirming these 2 landmarks was significantly associated with correctly identifying the trochlear nerve.

We agree that short sequences are more practical for routine clinical use as opposed to those previously reported in the literature using high-resolution motion-sensitized driven equilibrium sequences with a 26-minute acquisition time. This sequence use is particularly true for cranial nerve IV imaging because a substantial number of patients being evaluated for suspected trochlear nerve pathology, including congenital palsy, are children, who are more prone to movements than adults. Therefore, a long scanning time may exacerbate motion artifacts on MR images.

However, we believe that this study has a few limitations that may impair its scope. The trochlear nerve remains the thinnest of all cranial nerves, with a mean diameter of approximately 0.5 mm (range, 0.3–0.9 mm). It has a complex course around the midbrain and is in close proximity to many arteries and veins with similar courses and calibers. The voxel size acquired in this study ranged from $0.3 \times 0.35 \times 3.0$ to $0.4 \times 0.44 \times 3.0$; thus, the section thickness (resolution of the z-axis) provided was 3.0 mm, which is too large to identify the trochlear nerve consistently. Moreover, the gap ranged from 0.3 to 1 mm, which is too high to observe a 0.5-mm structure. Much thinner sections are required to visualize the trochlear nerve, with a maximum of 0.25-mm section thickness and no gap.

The imaging findings of this study remain subjective and are not supported by surgical or pathologic correlations. Additionally, significant discrepancies between the MR imaging and anatomic findings were reported in cadaveric studies. Our colleagues’ images are somewhat noisy, with CSF flow-related artifacts and are therefore not very convincing, even with annotations.

An interesting option for reliably identifying cranial nerve IV on MR imaging within a reasonable acquisition time may be the use of coregistration and fusion of an MR angiography sequence and a T2-weighted driven equilibrium radiofrequency reset pulse sequence allowing to distinguish cisternal vessels colored in white from the trochlear nerves in black (arrows).

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FIGURE. Coregistration-fusion of an MR angiography and a T2-weighted driven equilibrium radiofrequency reset pulse sequence allowing to distinguish cisternal vessels colored in white from the trochlear nerves in black (arrows).
Finally, it is possible that the key for reliable and accurate identification of the trochlear nerve may be the use of a simple coregistration and fusion instead of long and complex high-resolution MR imaging acquisitions.


REFERENCES

A. Lecler
J. Savatovsky
F. Audren
Department of Radiology
Department of Ophthalmology
Fondation Ophtalmologique Adolphe de Rothschild
Paris, France