

## Diffusion tensor tractography of optic radiation within temporal lobe and inter-individual variation: Information for surgical planning of anterior temporal lobectomy

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### Purpose

Anterior temporal lobectomy is a widely accepted surgery for temporal lobe epilepsy. However, there are some side effects including visual field defect due to optic tract injury. In anterior temporal lobectomy, resection of anterior temporal lobe “no more than 45 mm from temporal tip” is recommended uniformly in order not to injure optic tract. Our purpose of this study is to delineate the positions of optic radiation in temporal lobe (Meyer’s loop) by using diffusion tensor tractography, evaluate their inter-individual variation and verify the adequacy of usual surgical method.

### Materials and Methods

Our subjects consist of 10 normal volunteers (18 to 28 years old). All of them gave informed consent to undergo tensor MRI examination. Diffusion tensor images were obtained using an echo planar sequence (TR = 2300 ms, TE = 122 ms, b = 1000 sec/mm<sup>2</sup>, 6 axes encoding, FOV = 230 mm, matrix = 128 x 128, slice spacing = 5 mm, slice thickness = 4 mm, averaging = 6).

Tractography of Meyer’s loop was made using diffusion tensor imaging software developed by Masutani et. al (University of Tokyo, dTV; diffusion tensor visualizer ver. 1.5, available at <http://www.ut-radiology.umin.jp/people/masutani/dTV.htm>). Tractography was obtained by setting “seed” in the white matter just anterior to lateral geniculate nucleus and “target” in ipsilateral sagittal stratum. We measured the distance from the anterior edge of Meyer’s loop to the temporal tip. In order to cancel effects of distortion on EPI images, the distance was corrected with the distance from temporal tip to anterior edge of inferior horn on both EPI image and T2 weighted image by fast spin echo method.

### Results

Tractography of Meyer’s loop can be obtained in nine cases on both sides and in one case in the left side. Corrected distance from temporal tip to anterior edge of Meyer’s loop was 37.0 mm (SD=4.2mm) on average in the right side and 37.1mm (SD=2.9mm) on average in the left side. Range of the distance was from 30.3 to 44.0 mm on the right side and 32.3 to 41.1 mm on the left side.

### Discussion

There was no case in which the tip of Meyer’s loop locate outside of “45mm from the temporal tip”, that is recommended extent of resection for temporal lobectomy. This means usual method of temporal lobectomy cannot avoid risk of injuring a part of optic radiation. In addition, locations of Meyer’s loops varied large and it suggests that uniform determination of surgical extent is not proper. Position of optic radiation should be evaluated in each case using diffusion tensor tractography prior to surgery and tailored surgery should be made.

### Reference

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