Distance between Meyer's loop anterior tip and temporal pole in Southern Chinese measured with diffusion tensor tractography using BrainLAB and Philips FiberTrak software

Y. X. Wang [1], X. L. Zhu[2], M. Deng[1], Y. W. Siu[1], C. S. Leung[3], Q. Chan[4], T. M. Chan[2], and W. S. Poon[2]

[1]Department of Diagnostic Radiology and Organ Imaging, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, NT, Hong Kong, [2]Division of Neurosurgery, Department of Surgery, The Chinese University of Hong Kong, Prince of Wales Hospital, [3]Jockey Club Centre for Osteoporosis Care and Control, The Chinese University of Hong Kong, Prince of Wales Hospital, [4]Philips Healthcare, Hong Kong SAR, China

Introduction: Epilepsy is a common neurological condition. In up to 80% of patients with medial temporal lobe epilepsy associated with hippocampal sclerosis, seizures are refractory to treatment with antiepileptic medications. For this group of patients, anterior temporal lobe resection (ATLR) plus amygdalo-hippocampectomy is an effective means of treatment. However, this procedure can be complicated by a visual field deficit (VFD). This is caused by damage to the anterior portion of the optic radiation, also known as Meyer's loop. The reported incidence of postoperative VFDs varies from 68% to 100% of patients undergoing ATLRs (2). Several factors give rise to the variability in the figures reported in these studies, including the heterogeneity of methods used to assess VFDs, and differences in the nature and extent of surgery. Equally important, is the inter-individual variability in the anatomy and anterior extent of Meyer's loop (1). Using Diffusion tensor tractography (DTT), we investigated the relationship of Meyer's loop to temporal lobe in a group of Southern Chinese subjects. The purpose of this study is two-folds, first is to obtain the distance of anterior tip of Meyer's loop to temporal lobe pole (ML–TP distance) in Southern Chinese population, which will be valuable for ATLR surgical planning, second is to compare the results when different operators of different background and different DTT analysis software were involved.

Materials and methods: There were 16 Southern Chinese subjects undergone MRI studies. They included eight males and eight females (mean age: 46.7 yrs, range: 21-60 yrs). In addition to the standard anatomical examination of the brain, diffusion tensor images were obtained using the following protocol with a 3T MRI scanner (Achieva, Philips, Best, The Netherlands): a single-shot spin-echo echo planar imaging (EPI) sequence, EPI factor=47, TR=8848 ms, TE=60 ms, b=0 and 1000 sec/mm^2, 32-axis encoding, slice thickness=2 mm with no inter-slice gap, matrix = 112*109, actual resolution= 2.00*2.04mm^2, reconstructed resolution=0.88*0.88mm^2. Acquisition duration=6min25sec. Body coil was used for signal transmission and SENSE head coil was used for signal reception. In total 30 lobes with normal brain structure were analysed. Two trained operators carried out the DTT analysis. Operator A is a neurosurgeon who did the analysis using BrainLAB software (Feldkirchen, Germany). Operator B is a radiologist who did the analysis using Philips FiberTrak Software (Best, The Netherlands). ML–TP distance was measured from the anterior tip of the constructed anterior Meyer's loop fiber to temporal lobe anterior pole seen on B0 image.

Results: An example for ML–TP measurement using BrainLAB is shown in Fig 1. ML–TP distance data for the 30 lobes is shown in the table 1. The intraclass correlation coefficient (ICC) of the two operators' results was 0.67. According to Fleiss (3), this value reflects satisfactory agreement. Our data (table 1) also confirmed the recent discovery of a trend towards the left optic radiation extending more anteriorly compared to the right optic radiation (2).

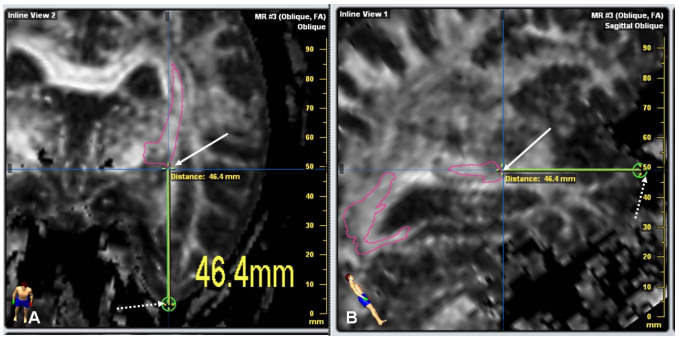

Fig 1: The distance between Meyer loop anterior tip (white arrow) and temporal lobe pole (white dotted arrow) is measured using BrainLAB software. A: view in oblique coronal plane. B: view in oblique sagittal plane.

Table 1 ML–TP distance measured by the two operators (unit in mm)

	Mean (R+L)	SD (R+L)	Range (R+L)	Mean R	Mean L
Operator A	36.1	5.6	29-51.6	37.4*	34.8*
Operator B	36.0	6.8	20.8-48.4	36.8	35.3

* denote significant difference in ML–TP distance between right and left lobes ($p<0.01$). R: right lobe, L: left lobe.

Discussion and Conclusion: Nilsson *et al.* (4) studied two patients undergoing temporal lobe surgery and seven controls. They reported that the ML-TP range was 34-51mm (mean 44 mm) in controls and 40-51mm (mean 45.5 mm) in patients. Therefore Nilsson *et al.* results placed Meyer's loop more posteriorly than reported in the current investigation. However, the results in the current study are similar to many recent tractography studies (2, 5-7). Yamamoto *et al.* (5) assessed five healthy controls, and reported an ML-TP range of 33-40mm (mean 37 mm). Our results demonstrated that a trained neurosurgeon and a trained radiologist using different DTT tools reached similar results on ML–TP distance. And these results are consistent with published data, suggesting both BrainLAB and Philips FiberTrak software are able to provide comparable DTT results. ML–TP distance from Southern Chinese population is similar to literature data of Caucasian and Japanese population. Our data also confirmed the recent discovery of a trend towards the left optic radiation extending more anteriorly compared to the right optic radiation.

# The first two authors contributed equally to the work.

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