

Characterizing the Course of Motor Tract Through Centrum Semiovale: Retrospective Analysis of MR Tractography Data in Normal Subjects

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Background and Purpose – Locating the motor tract at the level of centrum semiovale can be challenging since there is little, if any, landmark to identify its course. If we are able to set an arbitrary landmark, we may be able to locate this vital structure without using diffusion-tensor image (DTI) based tractography. Purpose of this study is to discover a reproducible anatomical landmark by retrospective analysis of tractography data.

Materials and Methods – Ten normal volunteers were scanned using a 1.5 tesla clinical MR unit (Gyrosan *Intera*, Philips Medical Systems, Best, Netherlands) to assess the trajectory of motor tract. PRIDE software was utilized to depict the tractography. Neuroanatomical characteristics of the motor tract were assessed on both axial and sagittal planes by a single rater. Assessments of the following points were done.

1. Do the motor tracts in normal subjects tend to have predictable straight course through the supratentorial brain on sagittal view?
2. Until what level does the motor tract course straight (where does it start to bend)?
3. What would be the battery of anatomical landmarks that allow us defining the trajectory of motor tract?

To characterize the shape of motor tract on sagittal images, the angle between motor tract and anterior commissure-posterior commissure (AC-PC) line was also measured.

Results – Majority of the motor tract depicted on tractography had nearly straight course at supratentorial brain on sagittal view. This straight trajectory starts from the motor cortex and reaches the level of basal ganglia where it starts to bend posteriorly. Most reproducible anatomical landmark to identify the course of motor tract was the midpoint between the AC and PC on sagittal view (Figure 1). On axial images, the motor tract was nearly always identified between the tips of right triangle and equilateral triangle that has its base at AC-PC line (Figure 2). Characteristics of the motor tract of 10 normal volunteers are summarized in table-1.

Conclusion – Course of the motor tract in normal subjects is predictable on both sagittal and axial planes, which can be readily used as a clinical landmark in our daily practice.

Table 1; Motor tract characteristics assessed by a single rater

Subject	age	sex		Straightness	Bending point (above/below AC-PC plane)	Landmark on sagittal image assigned to 5 segments of AC-PC	Landmark on axial image relative to ARTET*	Angle between AC-PC and supratentorial motor tract
1	31	M	R	straight	6mm below	3	2	20
			L	straight	3mm below	4	2	20
2	53	F	R	straight	3mm below	3	2	0
			L	straight	0mm below	4	2	5
3	32	M	R	largely straight	6mm below	3	2	10
			L	straight	6mm below	2	2	10
4	25	F	R	straight	0mm below	3	2	10
			L	straight	0mm below	3	2	15
5	40	M	R	straight	3mm below	4	2	10
			L	straight	0mm below	2	3	5
6	59	F	R	straight	0mm below	3	2	10
			L	straight	0mm below	3	2	10
7	27	M	R	largely straight	3mm above	3	2	15
			L	straight	3mm above	3	2	15
8	30	F	R	straight	3mm below	4	2	10
			L	straight	3mm below	3	2	15
9	20	M	R	straight	0mm below	4	2	20
			L	largely straight	0mm below	3	2	15
10	44	F	R	straight	0mm below	3	2	15
			L	straight	0mm below	3	2	10

AC-PC; anterior commissure posterior commissure

ARTET; AC-PC right triangle and equilateral triangle

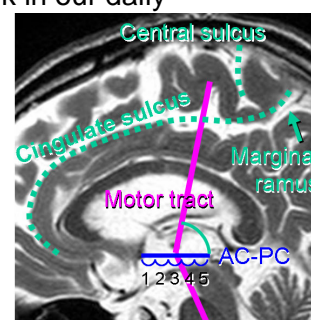


Figure 1 Schematic drawing of motor tract relative to the known anatomical landmarks.

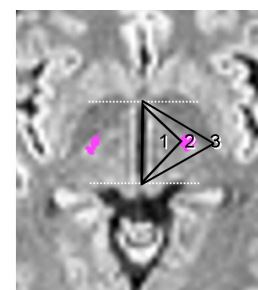


Figure 2 Location of motor tract relative to the equilateral and right triangle based at AC-PC line.