Εισαγωγή στην Ανατομία της Λευκής Ουσίας

Χρήστος Κουτσαρνάκης

Νευροχειρουργική Κλινική Νοσ. «ΕΥΑΓΓΕΛΙΣΜΟΣ»
Πειραματικο Εργαστήριο Νευροχειρουργικής Ανατομίας
Department Of Clinical Neurosciences – Edinburgh (UK)

Λευκή Ουσία (Εγκεφάλος)

- Προβλητικές Ίνες (Εγκ. Φλοιό – Θάλαμο, Στέλεχος, Ν.Μ)
- Συνδεσμικές ΄Ινες (ΑΡ-ΔΕ ημισφαίριο)
- Συνδετικές Ίνες (Περιοχές του ιδίου ημισφαιρίου)

Τεχνική "Διαχωρισμού Λευκής Ουσίας"
"White Matter Dissection Technique"

16-17ος αι. (Thomas Willis, Raymond Vieussens, Charles Bell, Christian Reil, Luigi Rolando, Freidrich Arnold, Karl Burdach, Achille Foville, Louis Pierre Gratiolet, Theodor Meynert, Joseph Dejerine ….)

- Joseph Klingler - Τεχνική «FREEZE – THAW»

Τεχνική Klingler (1935)

- Μονιμοποίηση Εγκεφάλων σε διάλυμα Φορμόλης πυκνότητας 10-15%.
- Προσεκτική αφαίρεση σκληράς- αραχνοειδούς μήνιγγας και αγγείων.
- *«Ψύξη»* παρασκευασμάτων σε θερμοκρασιές μεταξύ -10 C , -15 C για τουλάχιστον 15 ημέρες.
- Σταδιακή *«απόψυξη»* με καταιονισμό τρεχούμενου νερού.

ATLAS CEREBRI HUMANI

Der innere Bau des Gehirns
dargestellt auf Grund makroskopischer Präparate

The Inner Structure of the Brain
demonstrated on the basis of macroscopical preparations

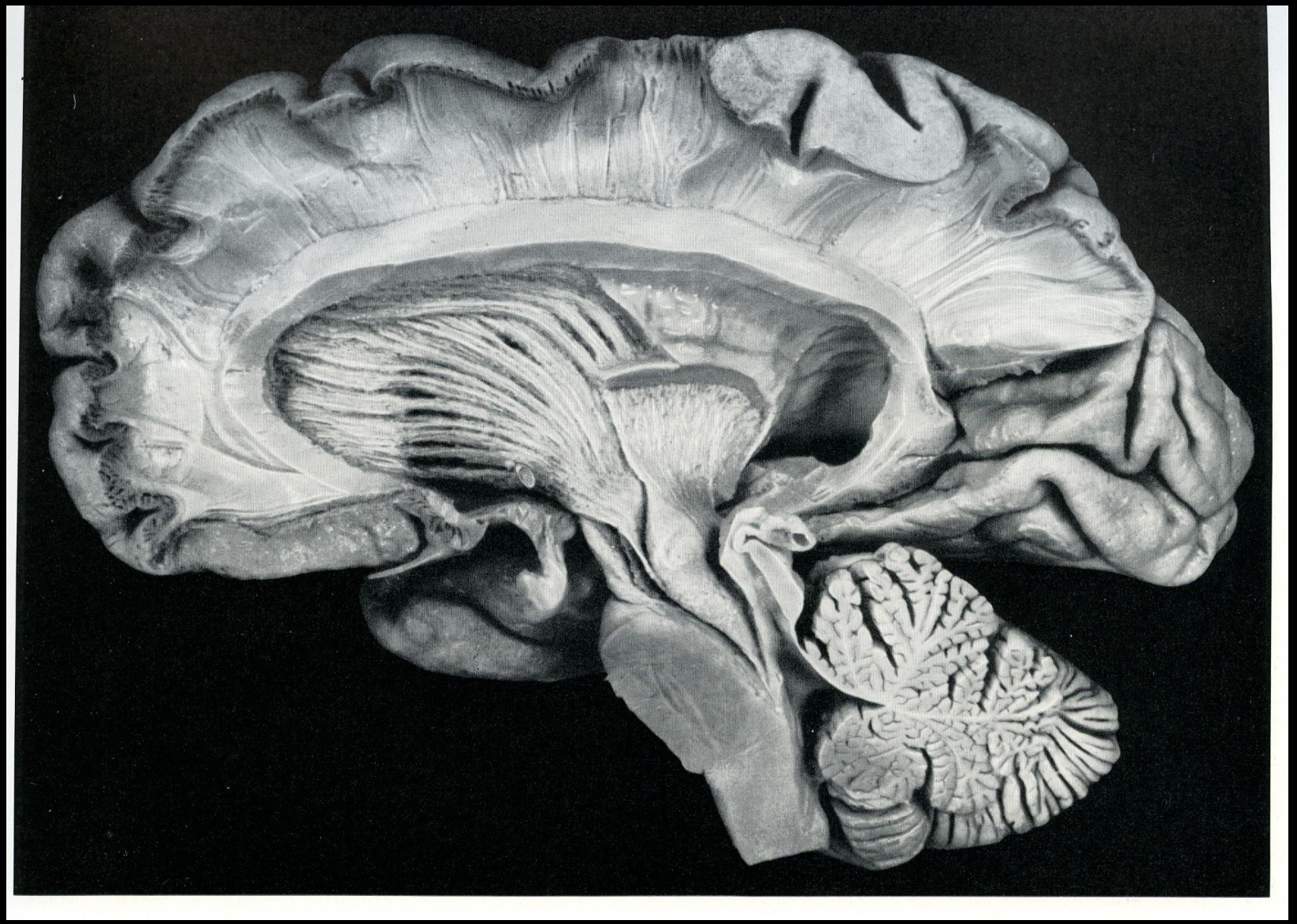
La structure interne du cerveau
démontrée sur des préparations macroscopiques

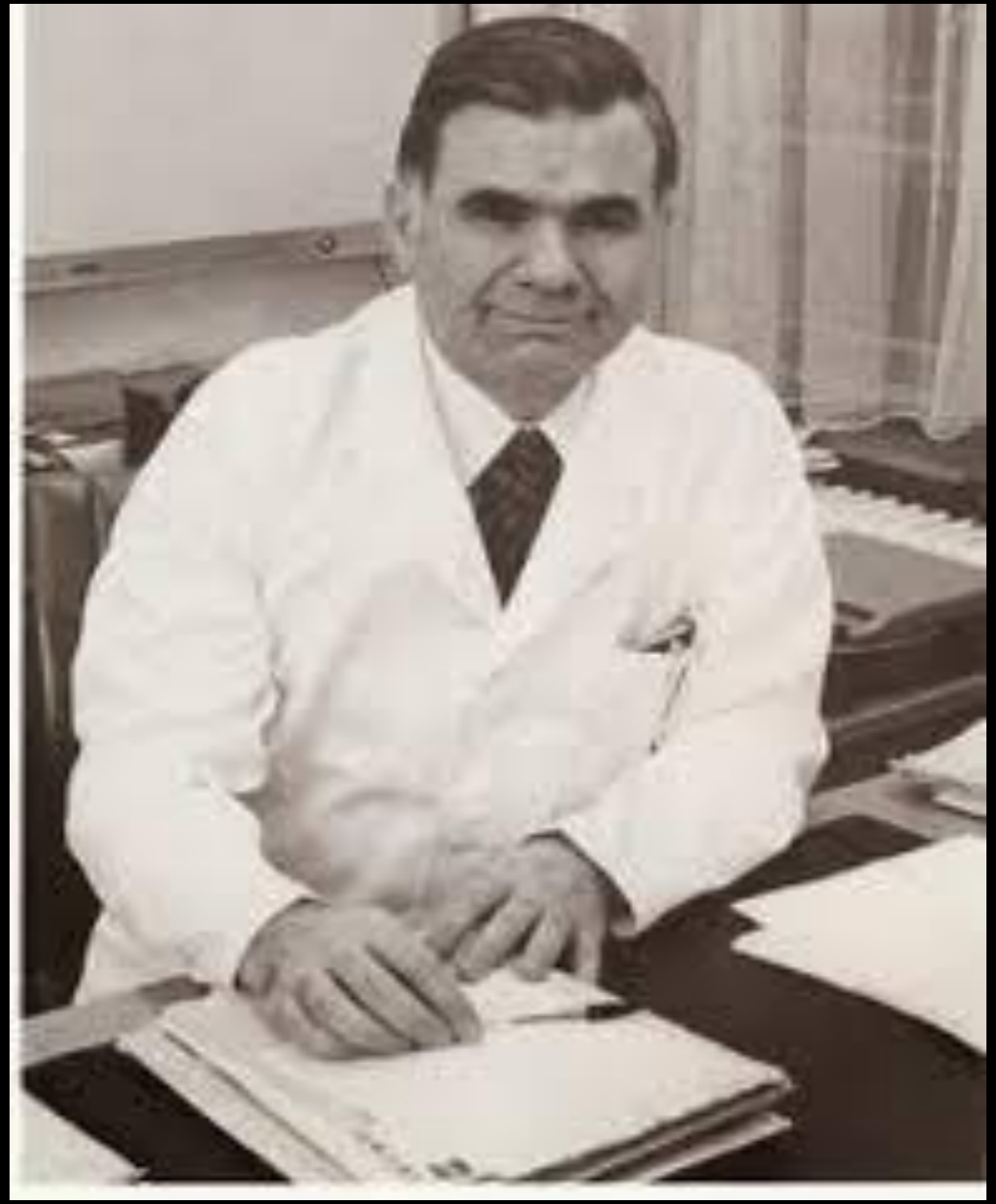
La arquitectura interna del cerebro
demostrada mediante preparaciones macroscópicas

E. LUDWIG J. KLINGLER
Anatomisches Institut der Universität Basel

19 56

BASEL (Schweiz) S. KARGER NEW YORK

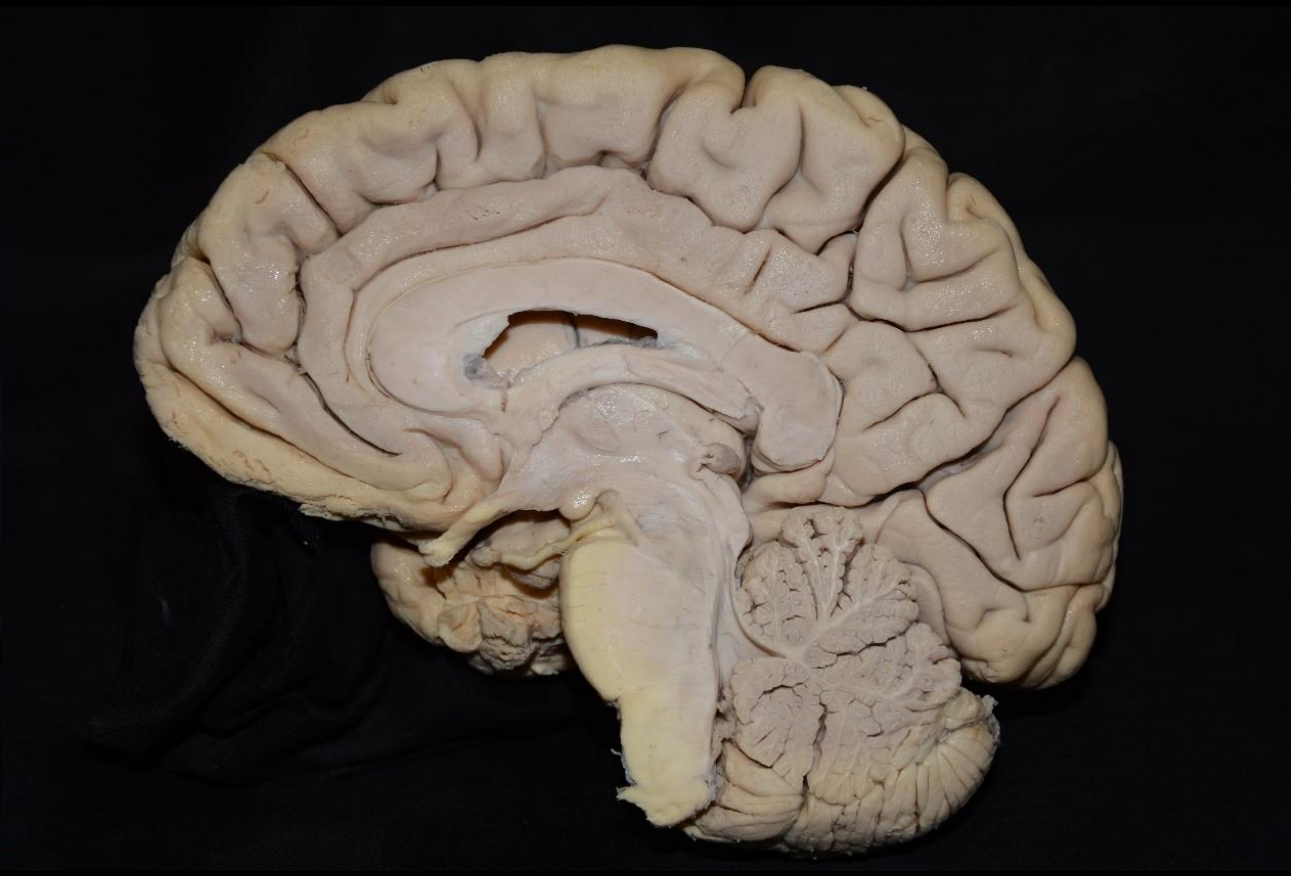




Neurosurgery 2000 Aug

Fiber dissection technique: lateral aspect of the brain.

Türe U, Yaşargil MG, Friedman AH, Al-Mefty O.

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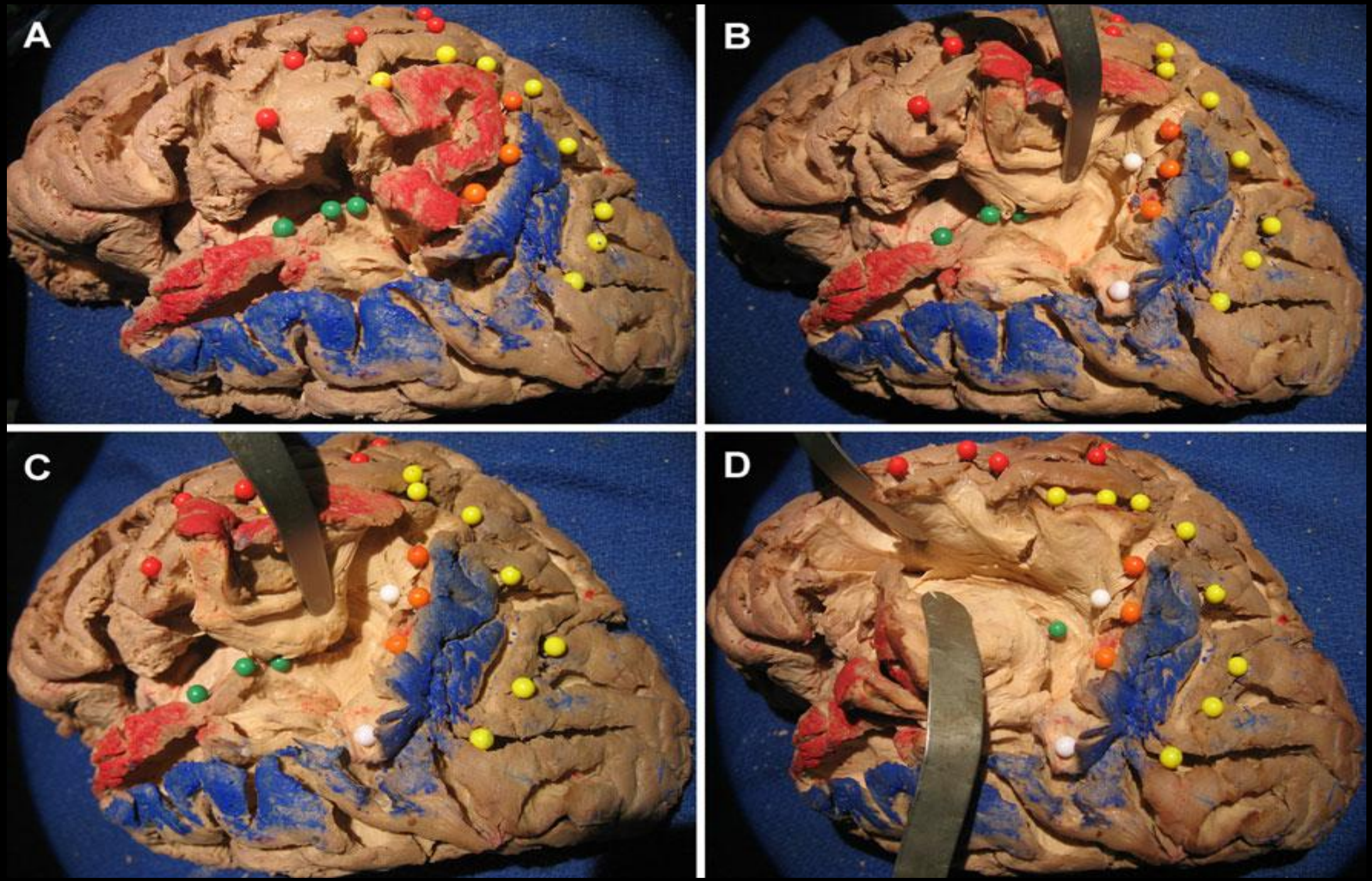
Journal of Anatomy 2011

Cortex-sparing fiber dissection: an improved method for the study of white matter anatomy in the human brain

Martino J, De Witt Hamer PC, Vergani F, Brogna C, de Lucas EM, Vazquez-Barquero A, Garcia-Porrero JA, Duffau H


A
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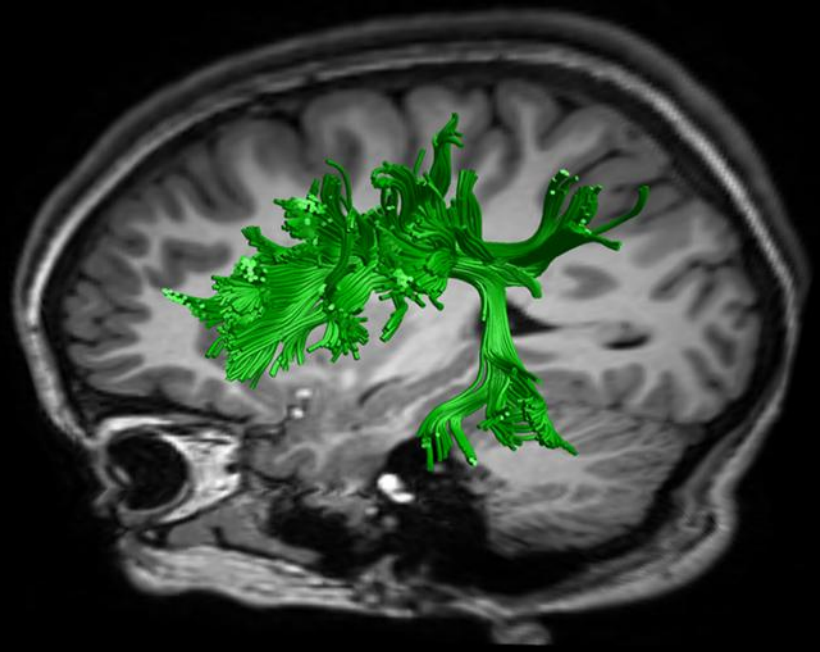
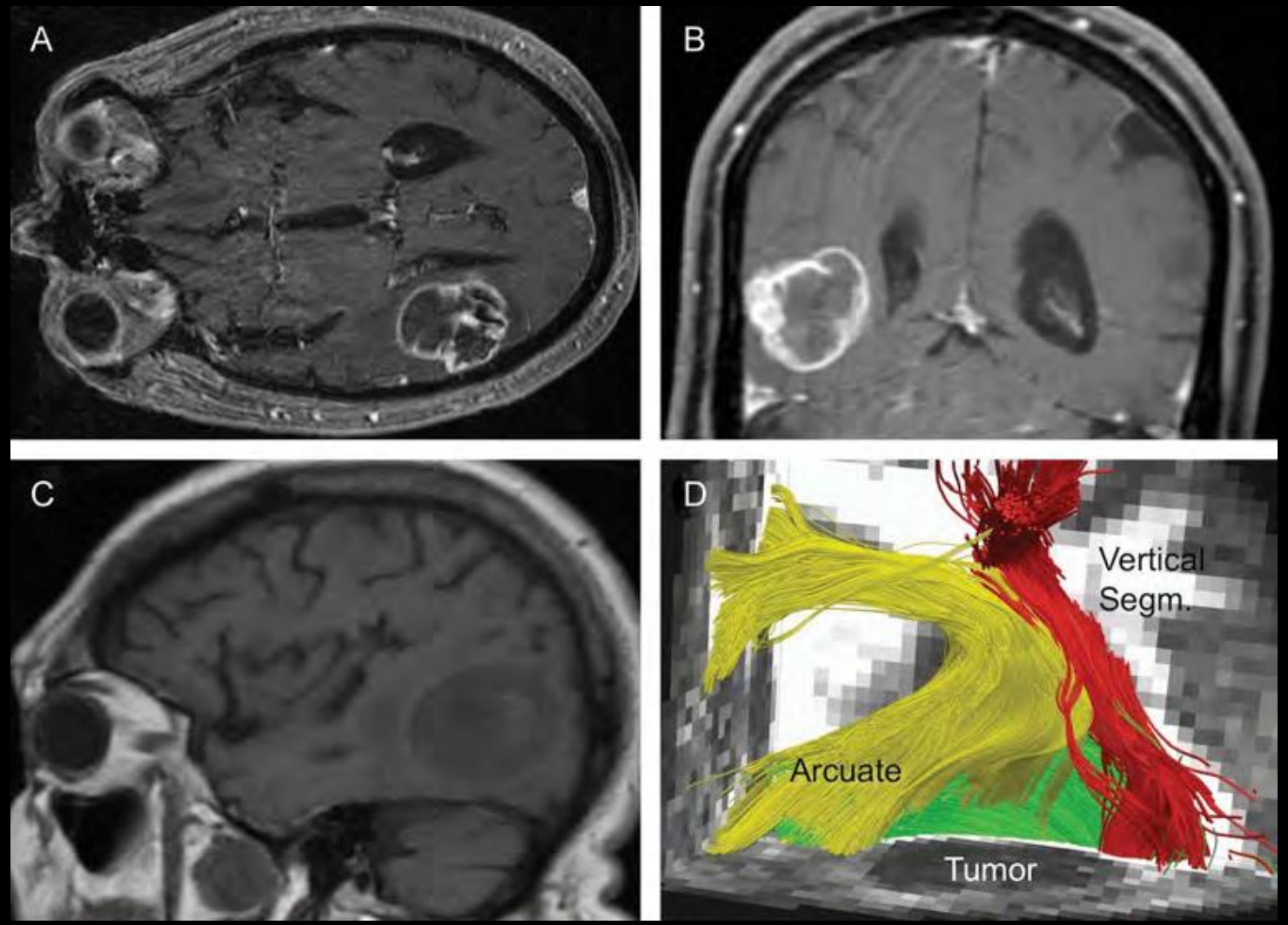
D

- **Fiber dissection VS DTI tractography**



Pros

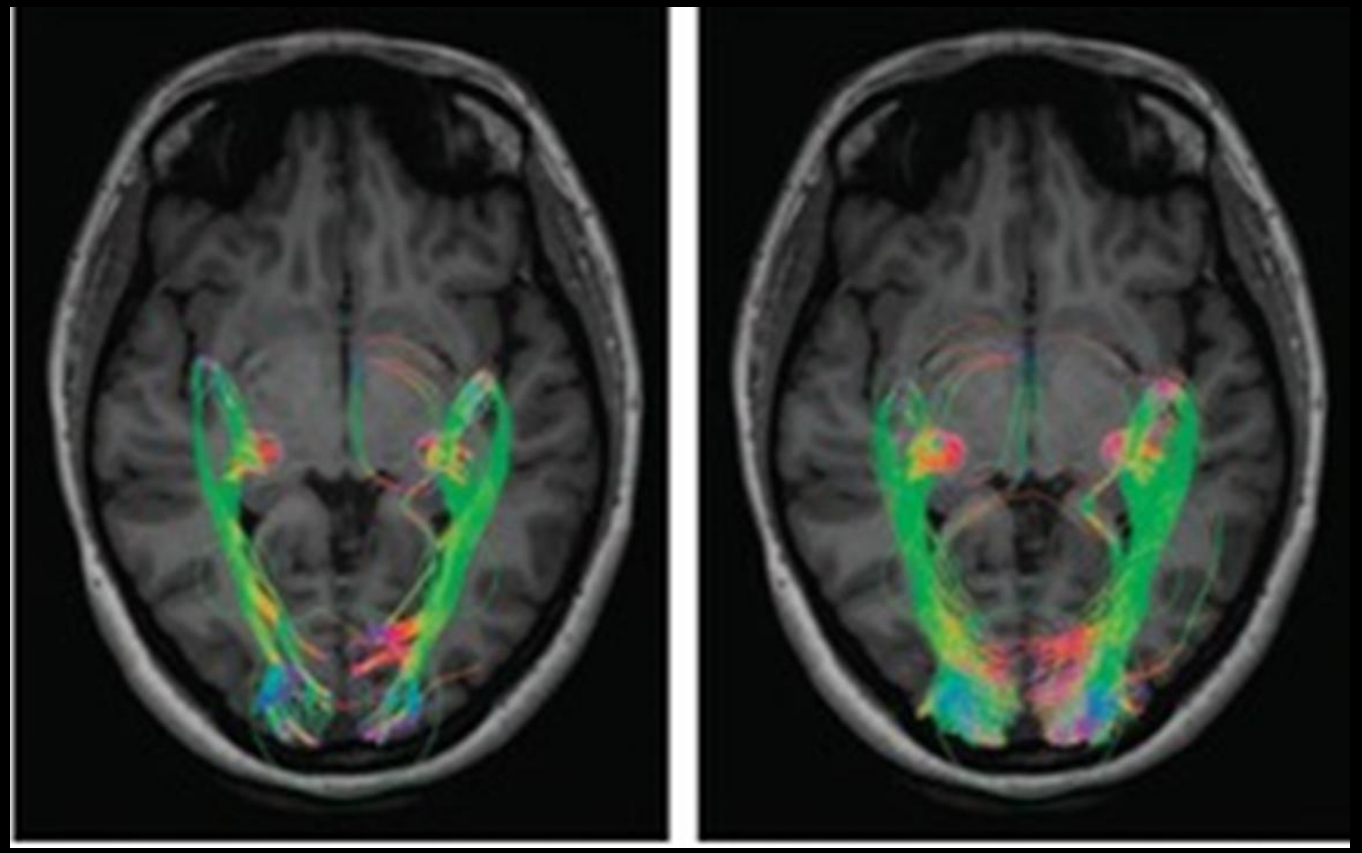
- In vivo anatomy
- Intraoperative use
- Less time consuming



DTI tractography

Cons

- Crossing, Kissing, Bending Fibers
- CSF/WM interface
- Small cerebral territories
- False tracts
- Probabilistic method

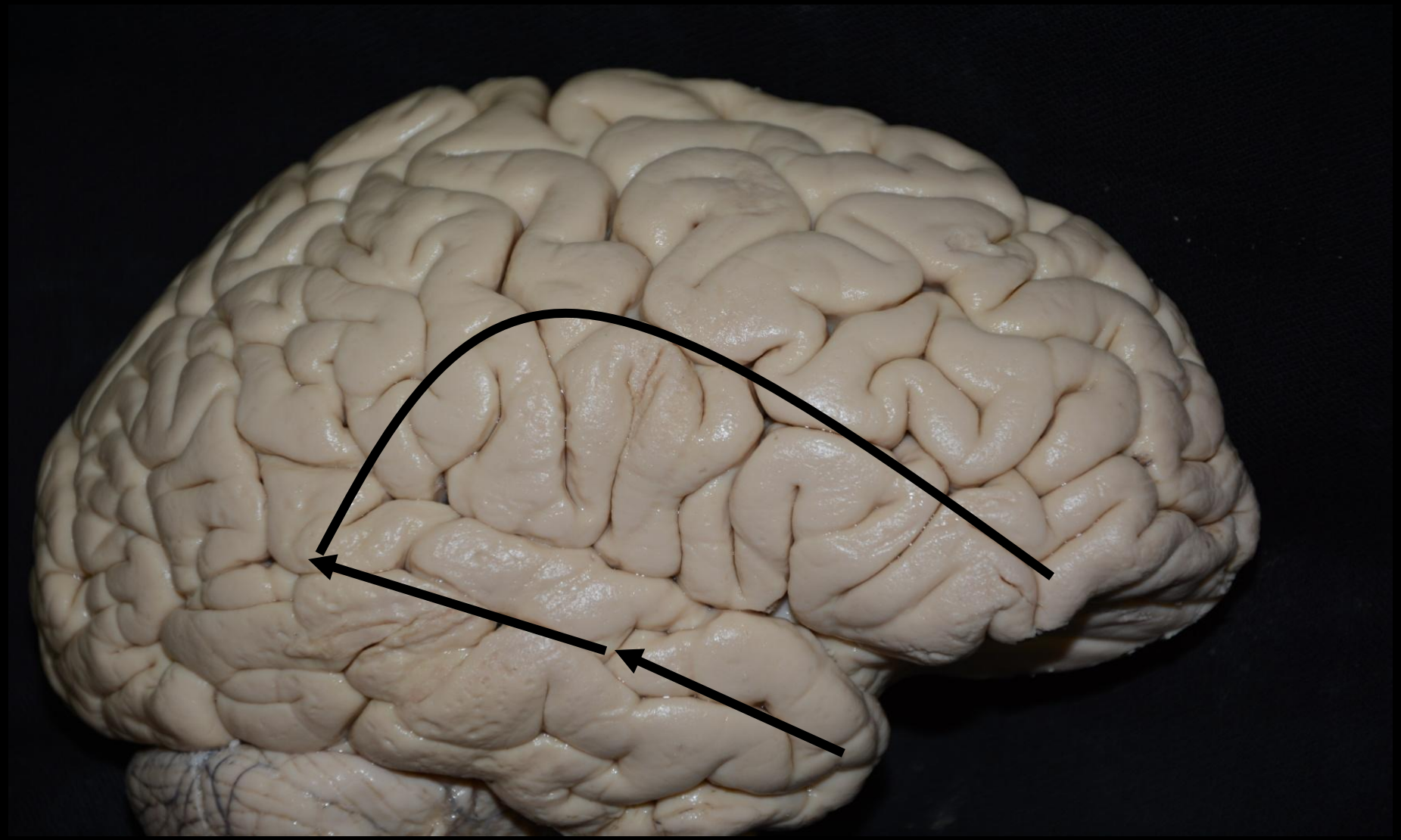


Fiber dissection technique

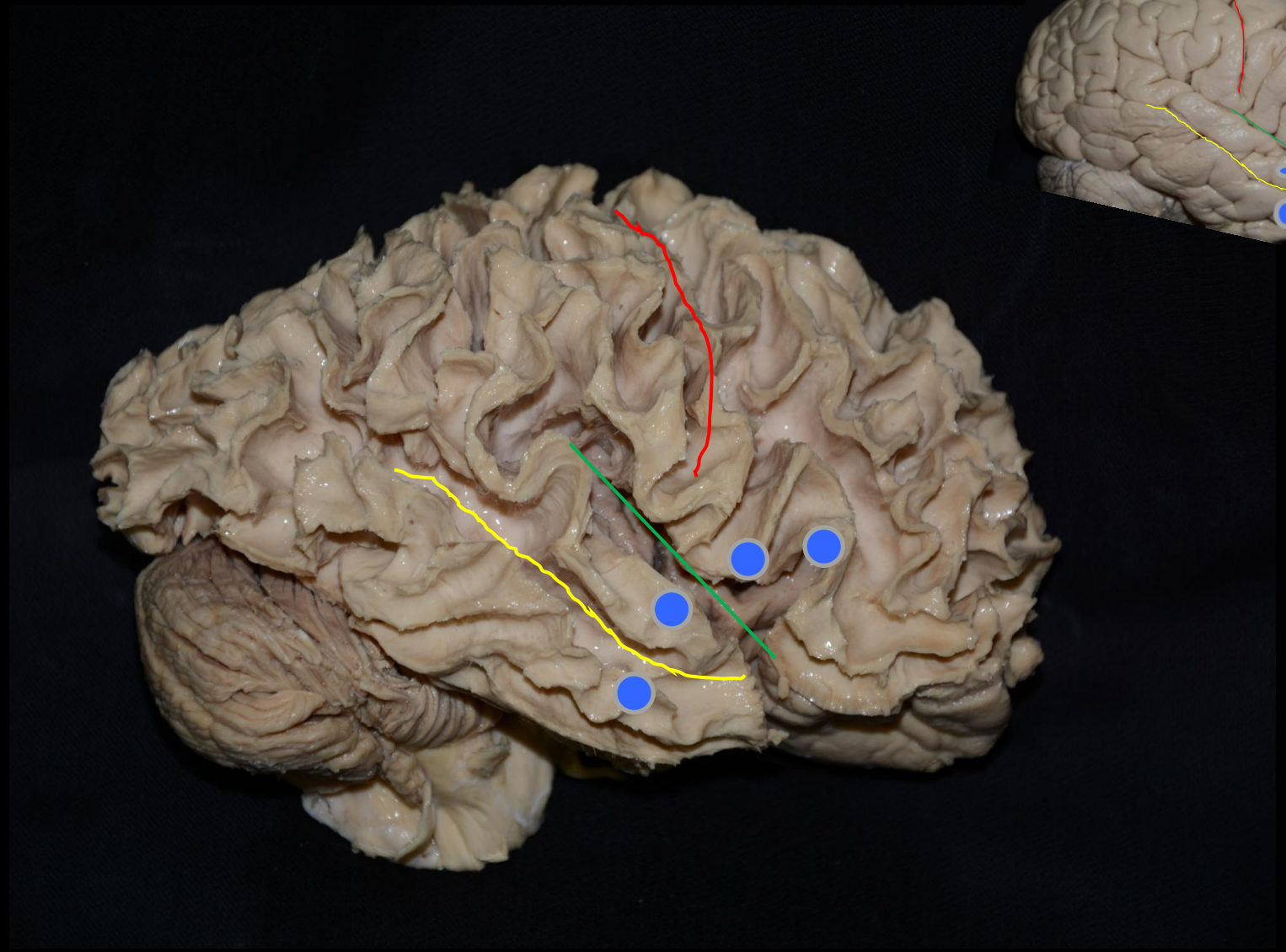
- In vitro anatomical study
- Time consuming
- Focused dissections
- Expensive

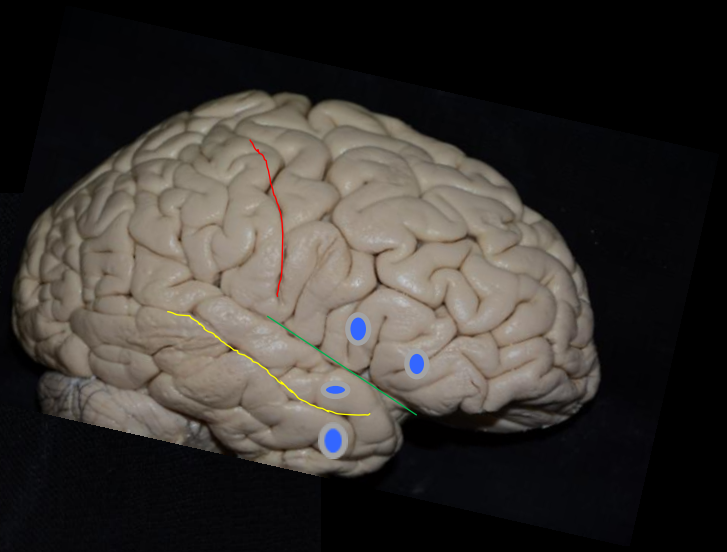
- 3-dimensional anatomy of grey and white matter
- **GOLD STANDARD TECHNIQUE FOR VALIDATION OF DTI**

2013-
> 120 ημισφαιρια



Τοξοειδείς Ίνες





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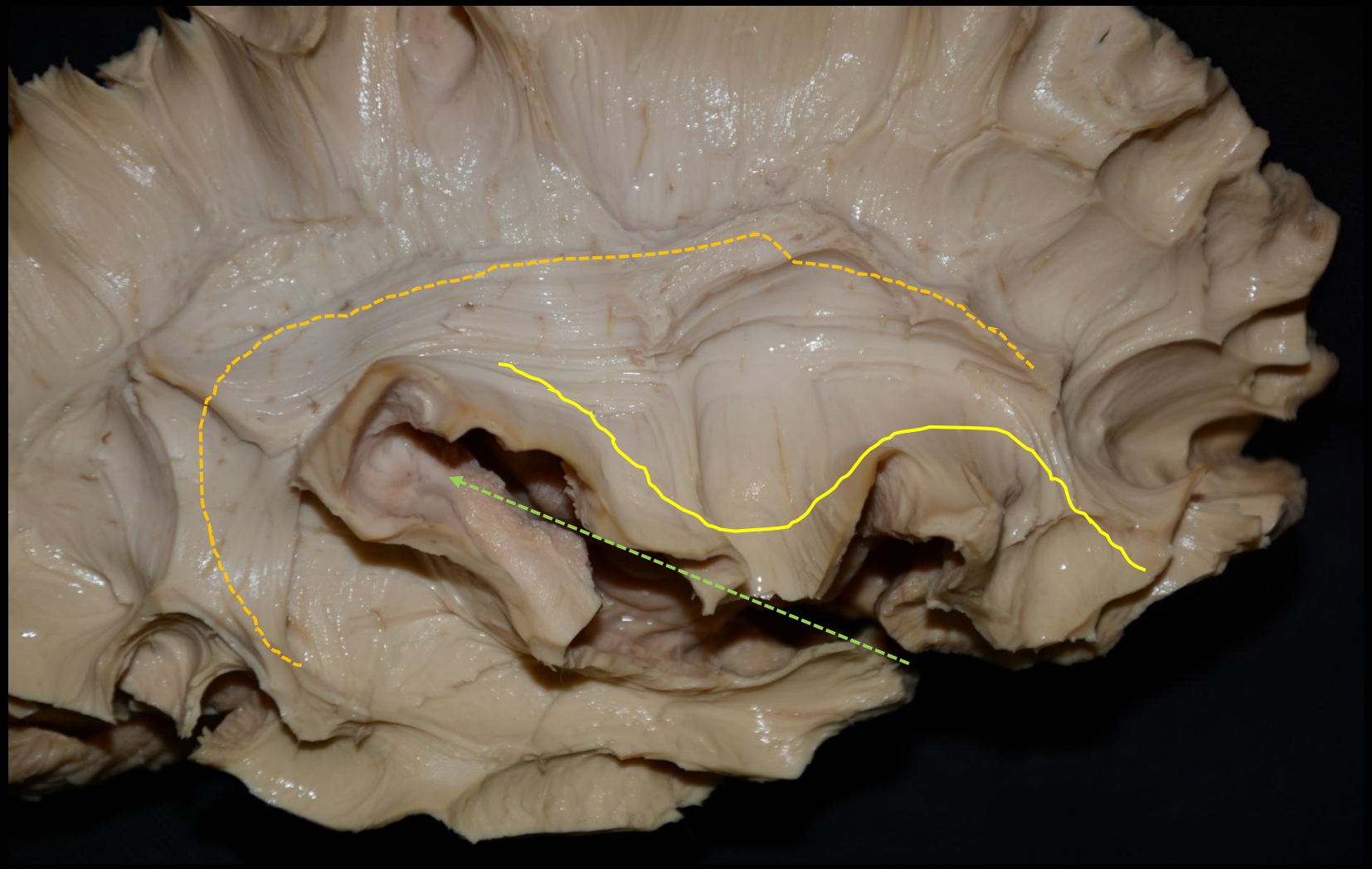

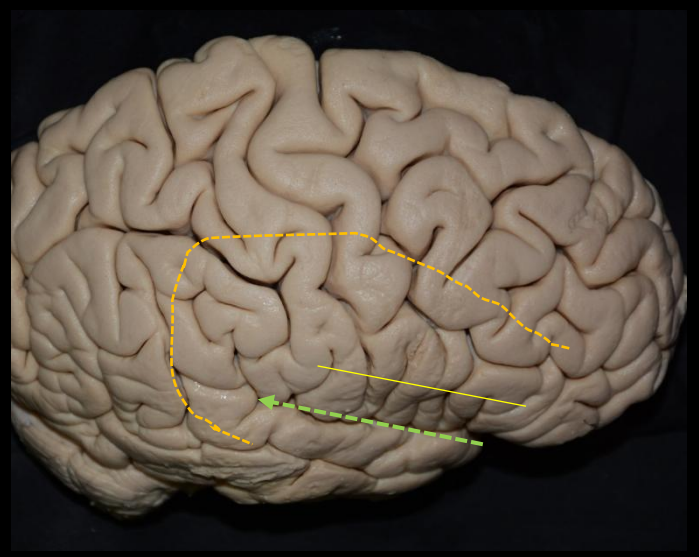

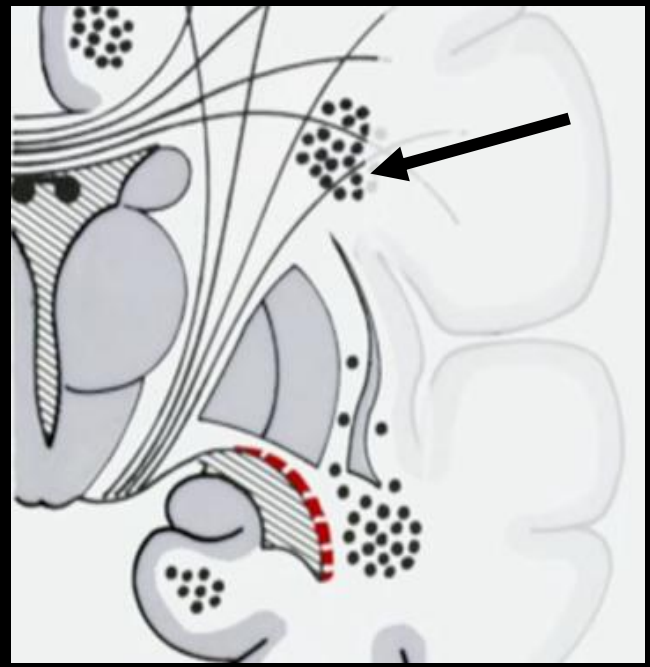

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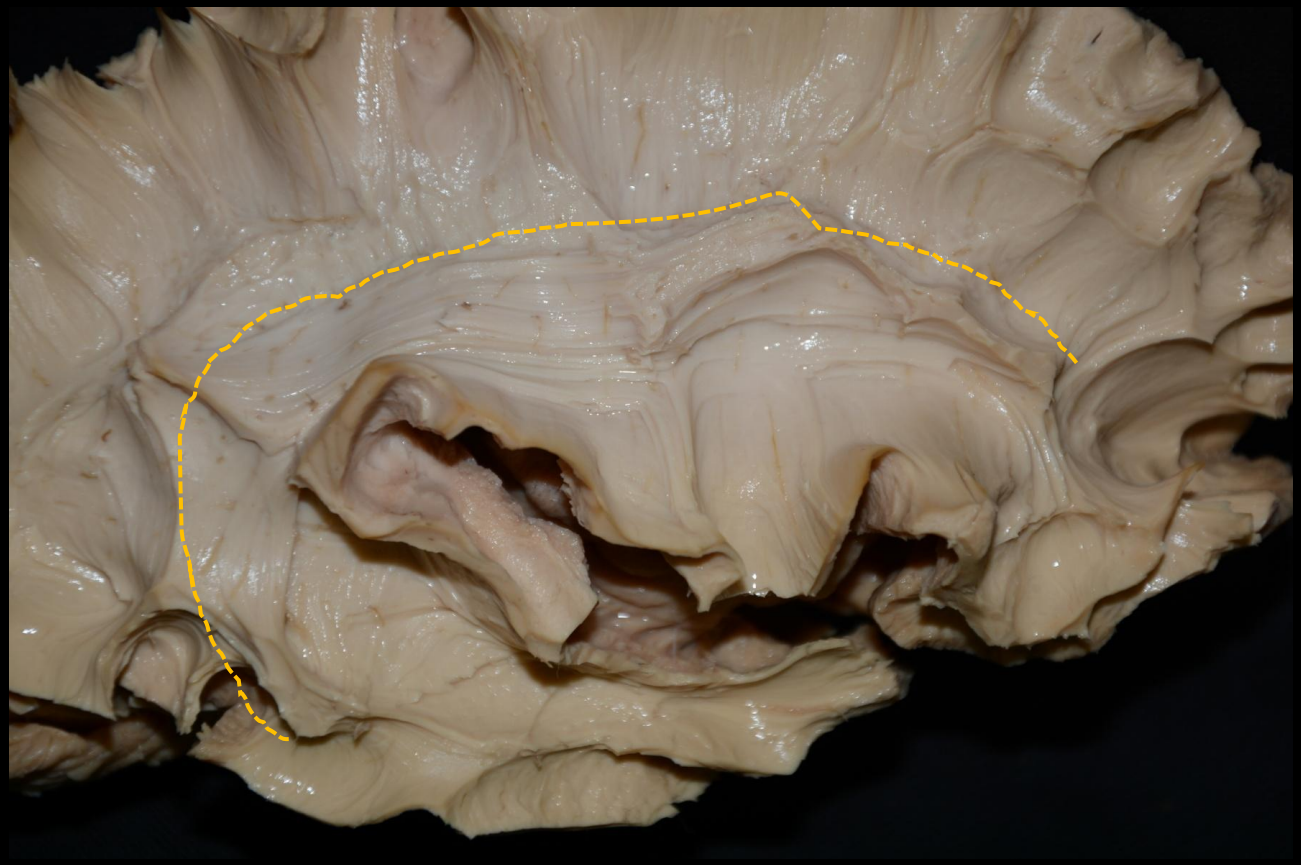
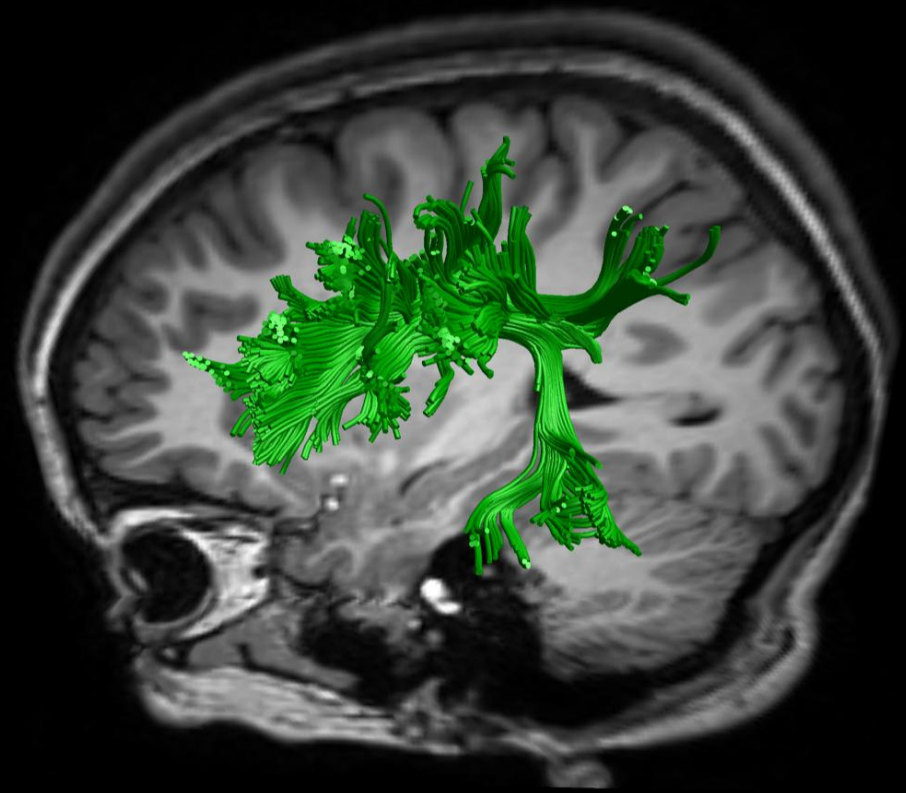
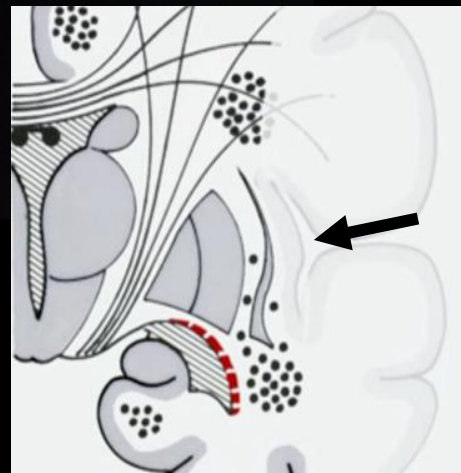
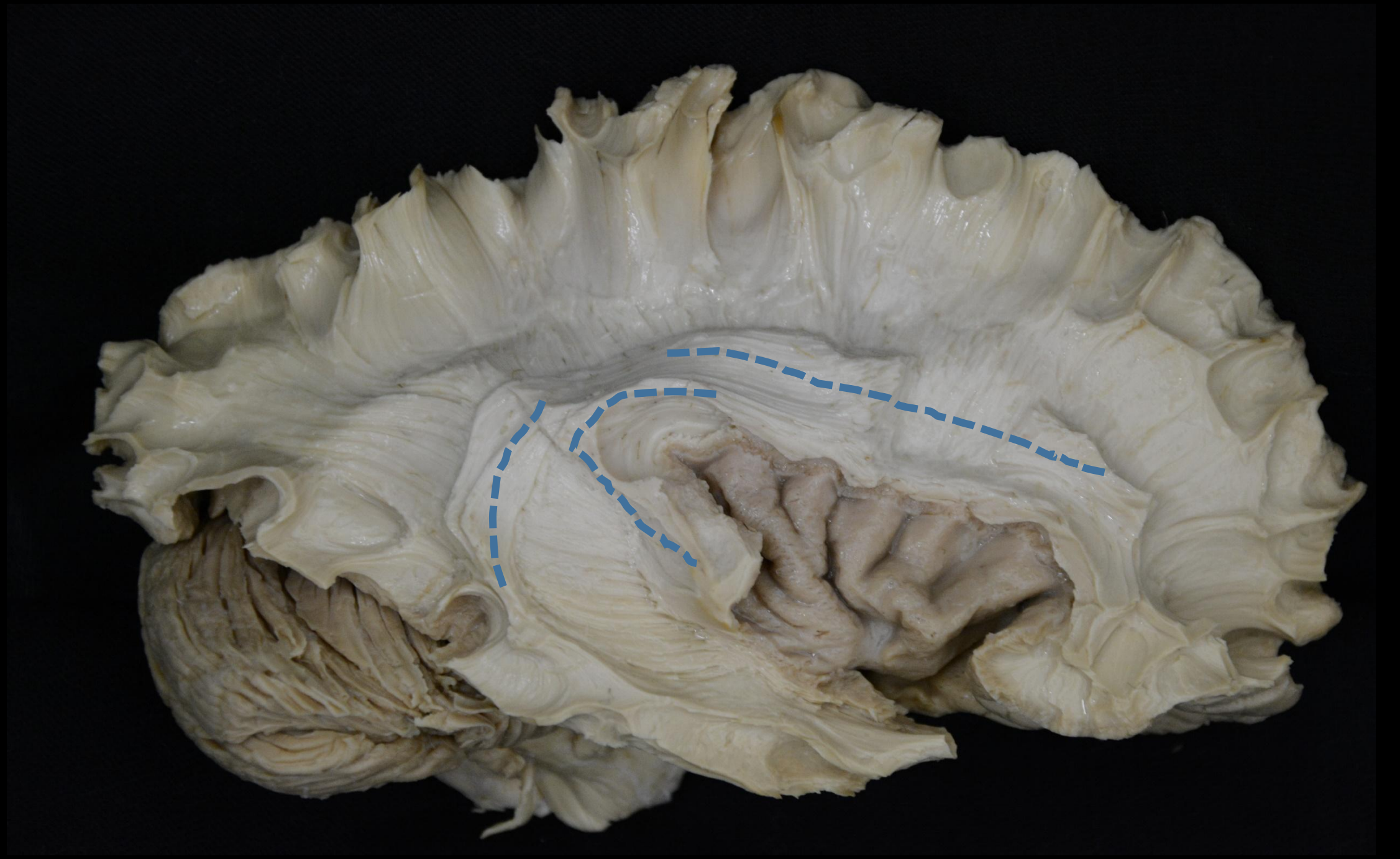
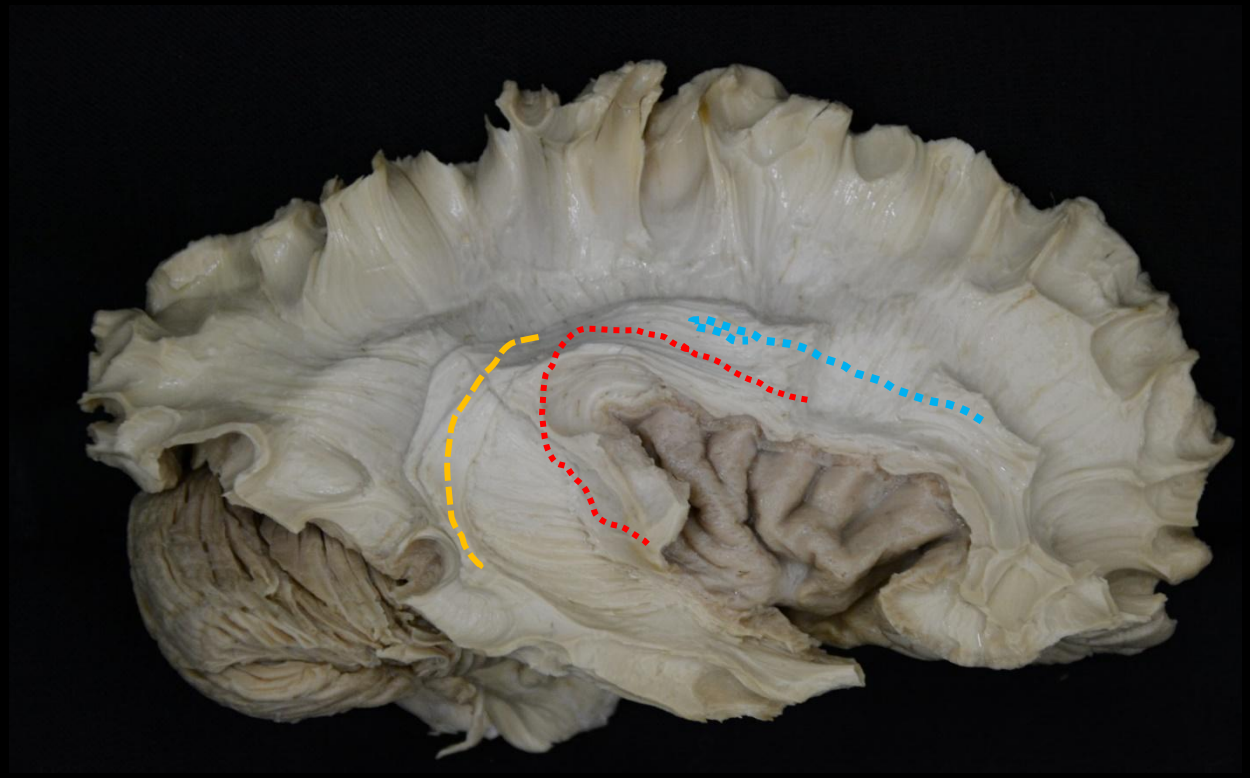


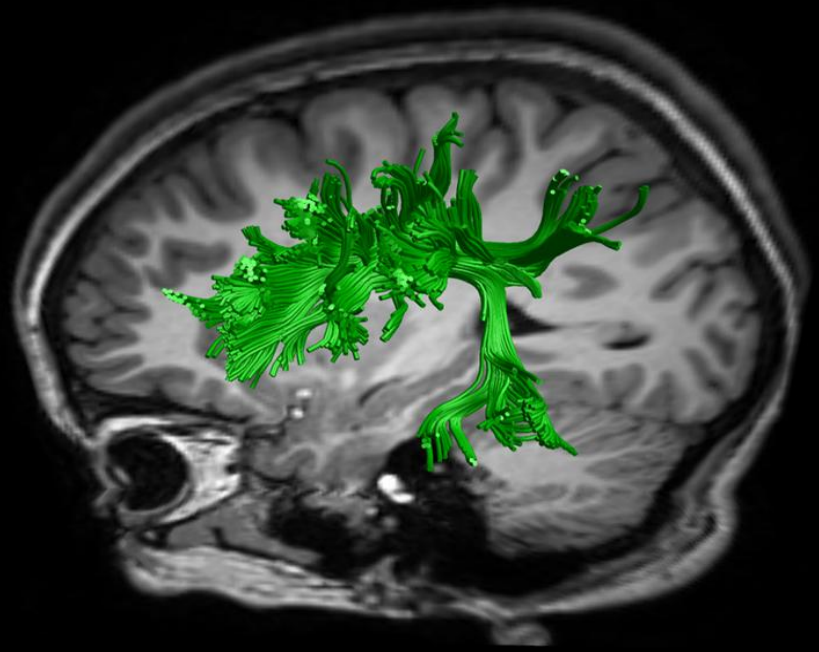


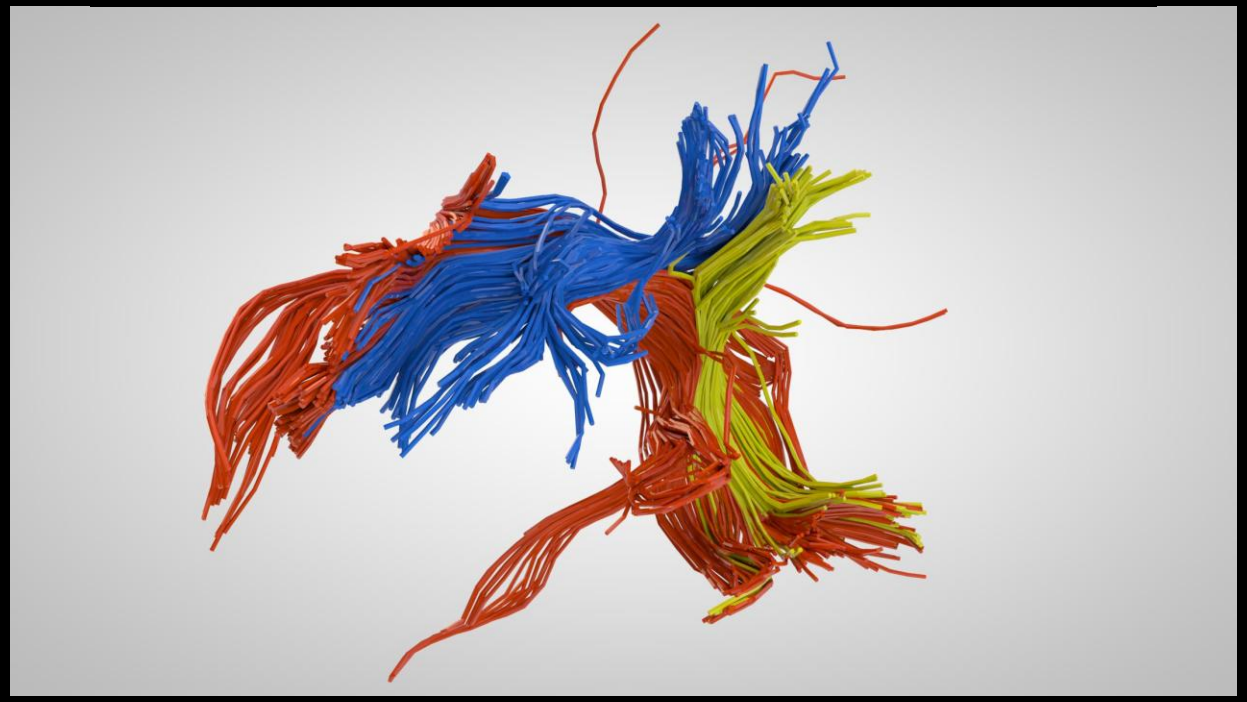
Τμήματα του Ανω Επιμηκους Δεματίου











ΑΝΩ ΕΠΙΜΗΚΕΣ ΔΕΜΑΤΙΟ

ΕΠΙΚΡΑΤΟΥΝ ΗΜΙΣΦΑΙΡΙΟ

ΟΡΙΖΟΝΤΙΟ ΤΜΗΜΑ - ARTICULATORY LOOP - ΕΚΦΩΝΗΣΗ ΤΟΥ ΛΟΓΟΥ

ΚΑΘΕΤΟ ΤΜΗΜΑ - ΚΑΤΑΝΟΗΣΗ ΤΟΥ ΛΟΓΟΥ (syllable discrimination – identification)

ΤΟΞΟΕΙΔΕΣ ΔΕΜΑΤΙΟ – ΦΩΝΟΛΟΓΙΚΗ ΕΚΦΟΡΑ ΛΟΓΟΥ

ΜΗ ΕΠΙΚΡΑΤΟΥΝ ΗΜΙΣΦΑΡΙΟ

ΟΡΙΖΟΝΤΙΟ ΤΜΗΜΑ - ΠΡΟΣΑΝΑΤΟΛΙΣΜΟΣ ΣΤΟ ΧΩΡΟ ΜΕ ΒΑΣΗ ΤΑ ΟΠΤΙΚΑ ΕΡΕΘΙΣΜΑΤΑ

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Επικρατουν ημισφαιριο

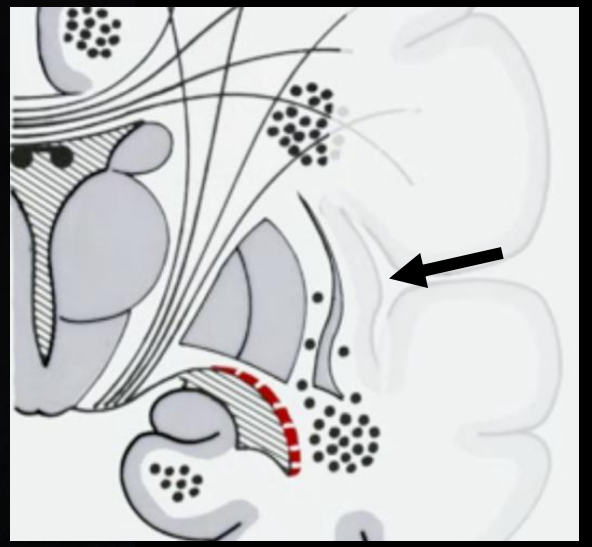
Οριζοντιο: δυσφασια εκπομπης- Broca’s type dysphasia

Καθετο: δυσφασια προσληψης-Wernicke’s type dysphasia

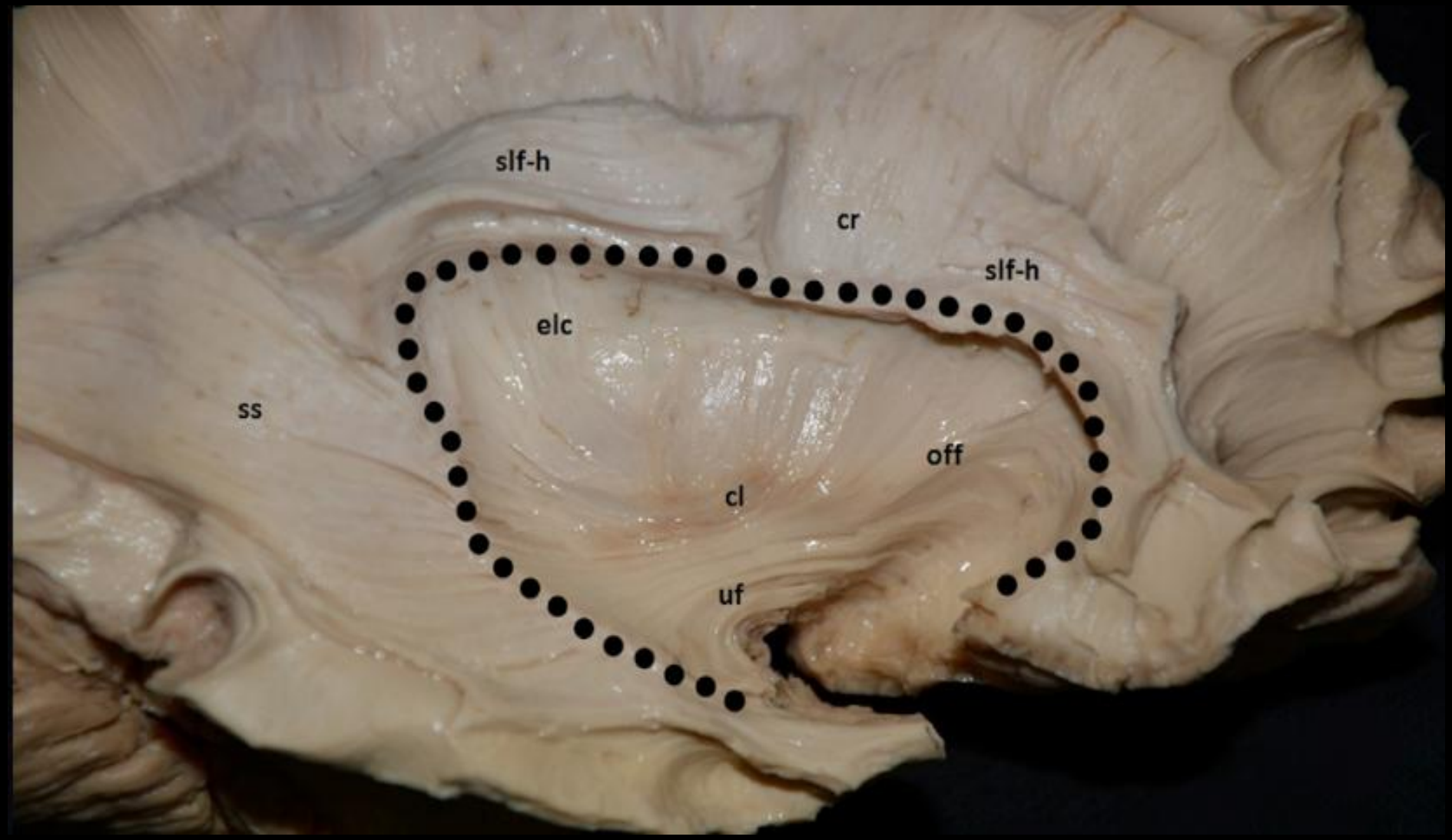
Τοξοειδες: δυσφασια αγωγης- Φωνολογικη παρα-αφασια, δυσκολια επαναληψης

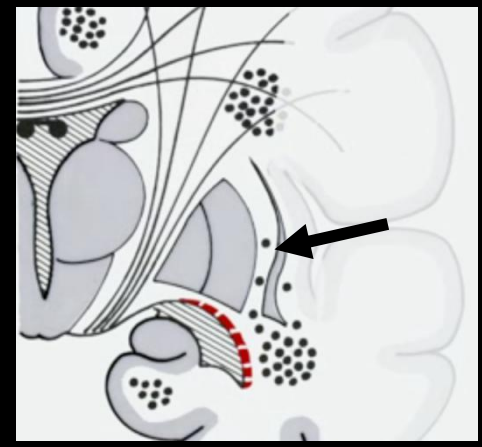
Μη επικρατουν ημισφαιριο

συνδρομο αντιπλευρης “ ημιαμελειας” – spatial neglect.

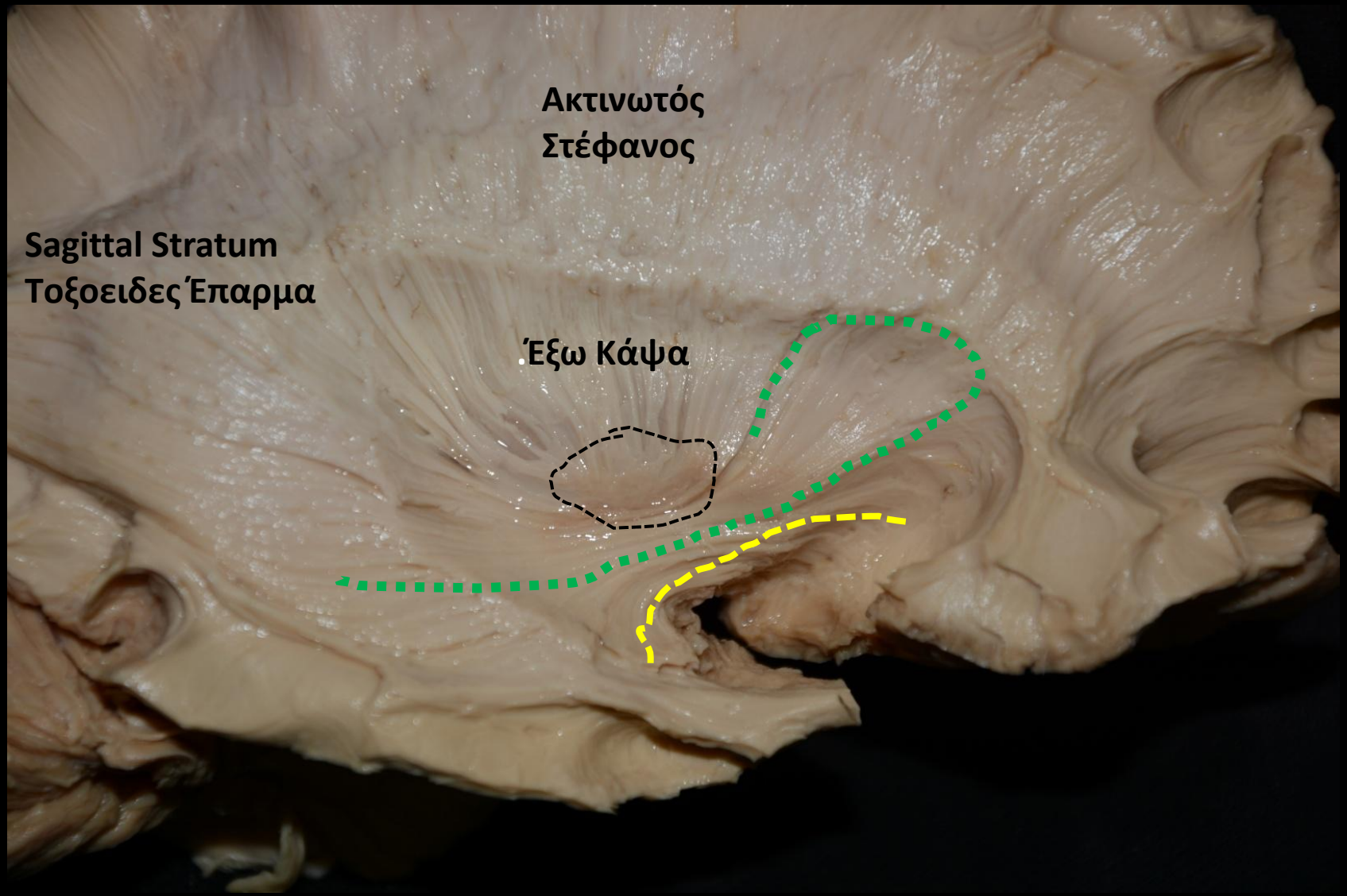


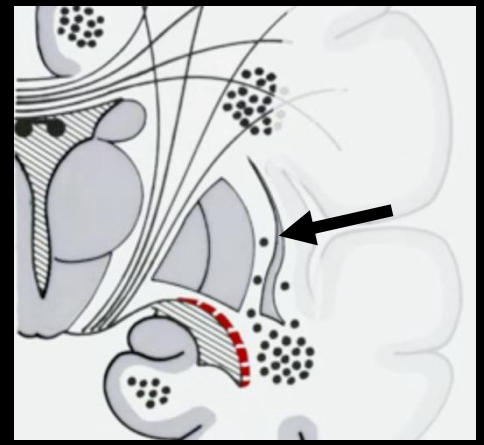
Αγκιστροειδές – Μετωποινιακό δεμ.

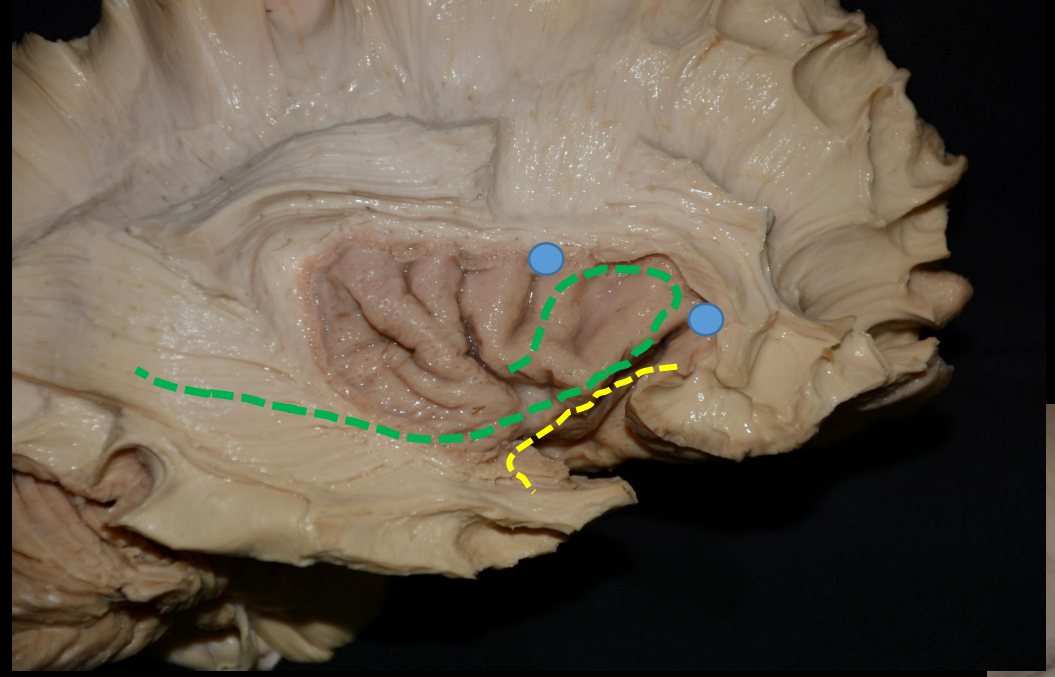


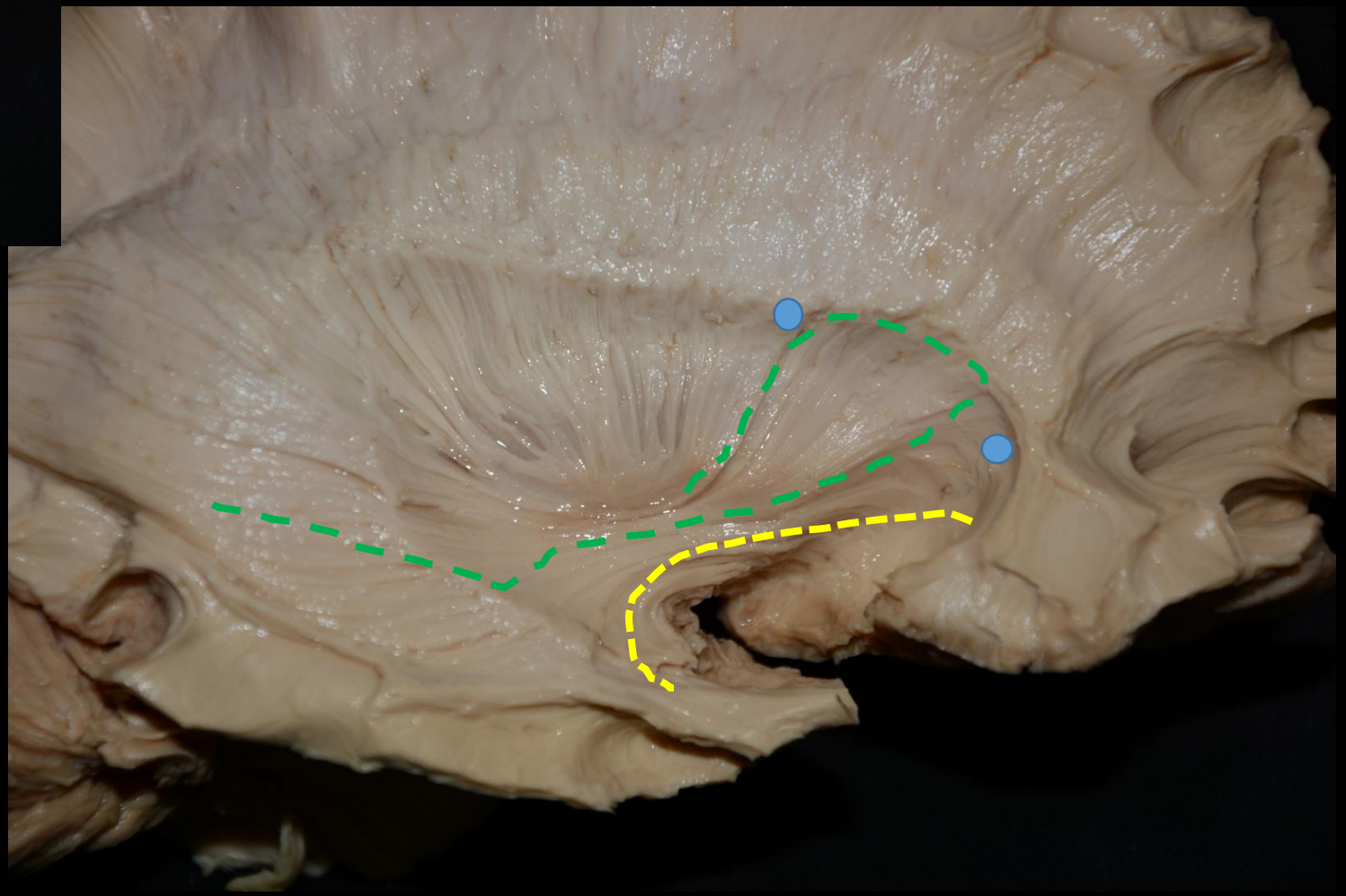


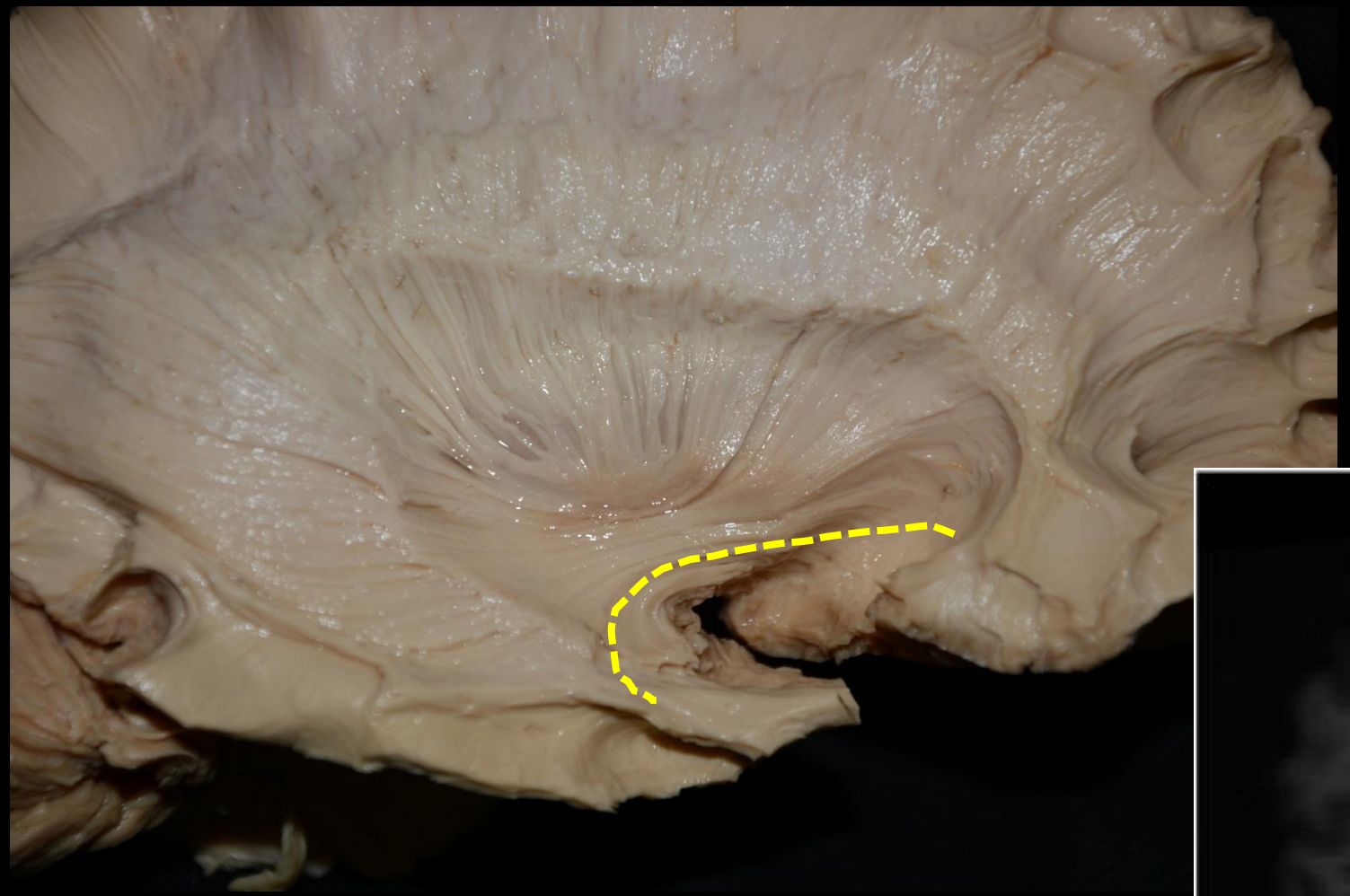
Αγκιστροειδές – Μετωποινιακό δεμ.

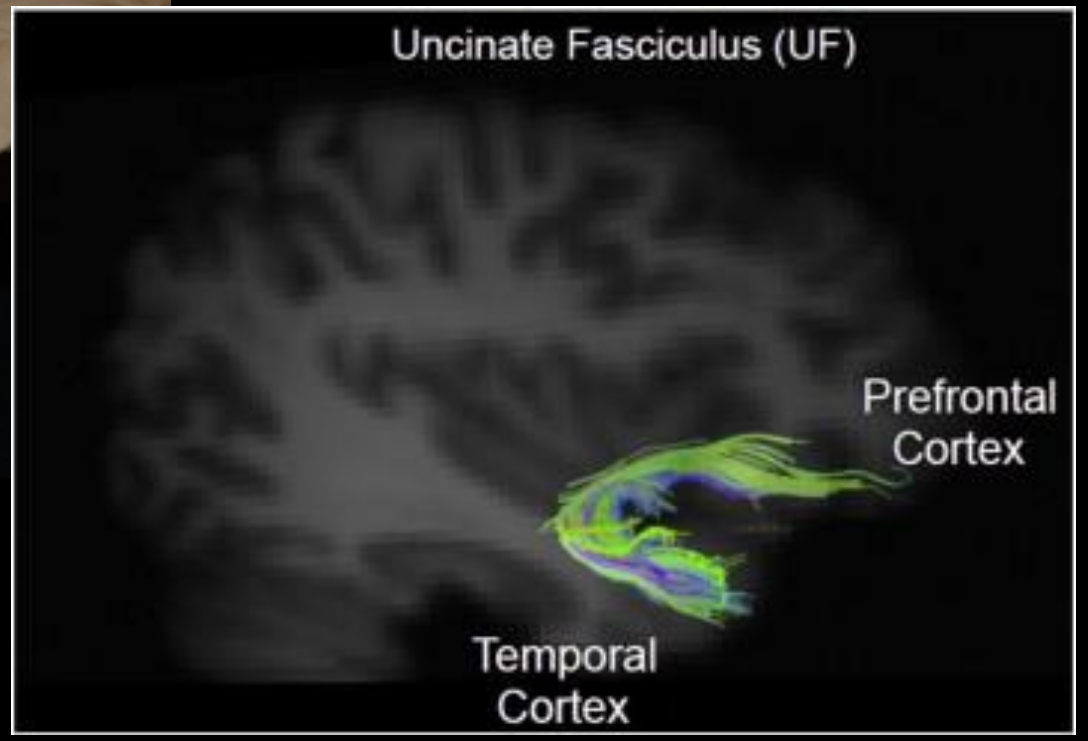


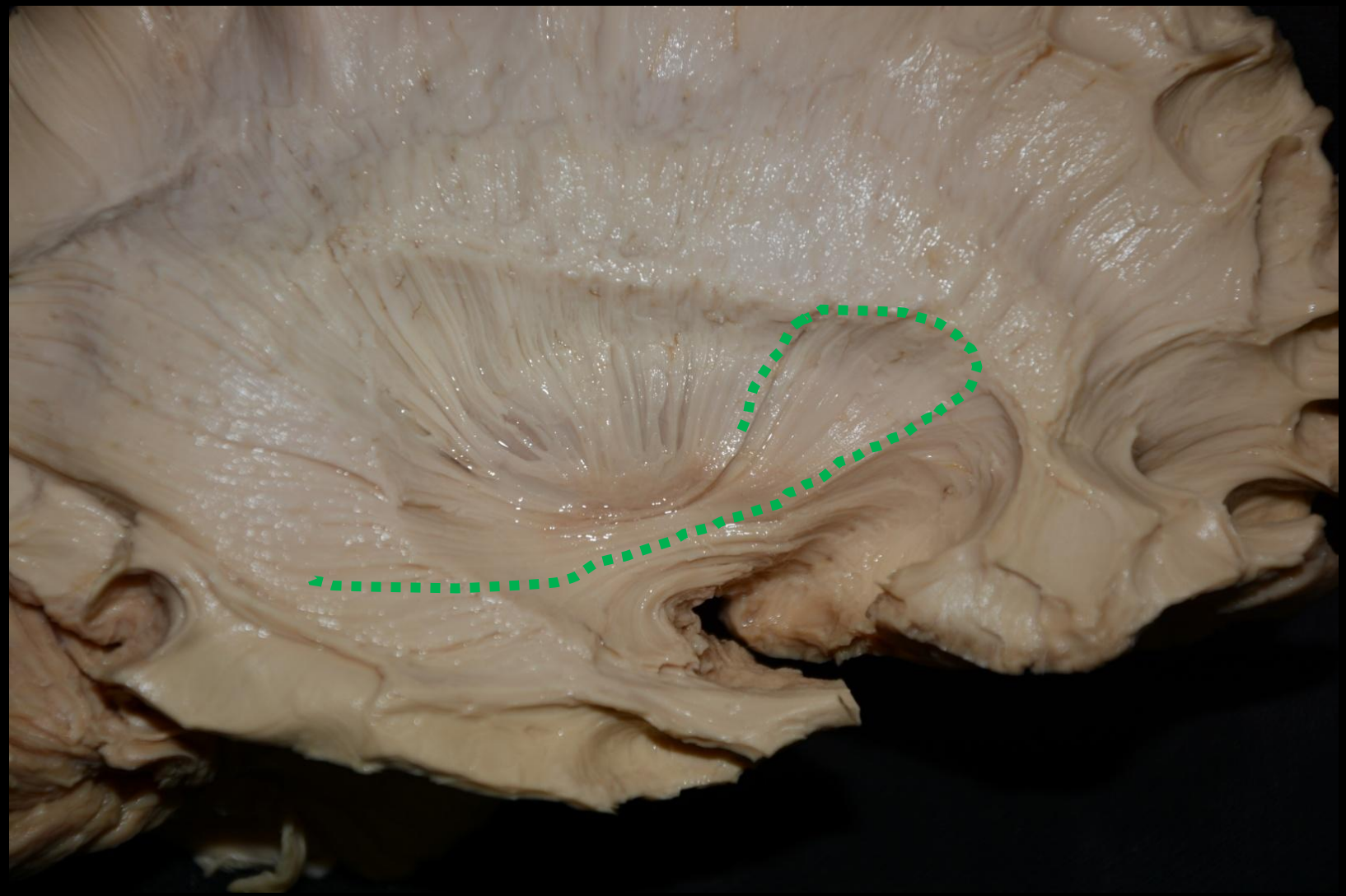


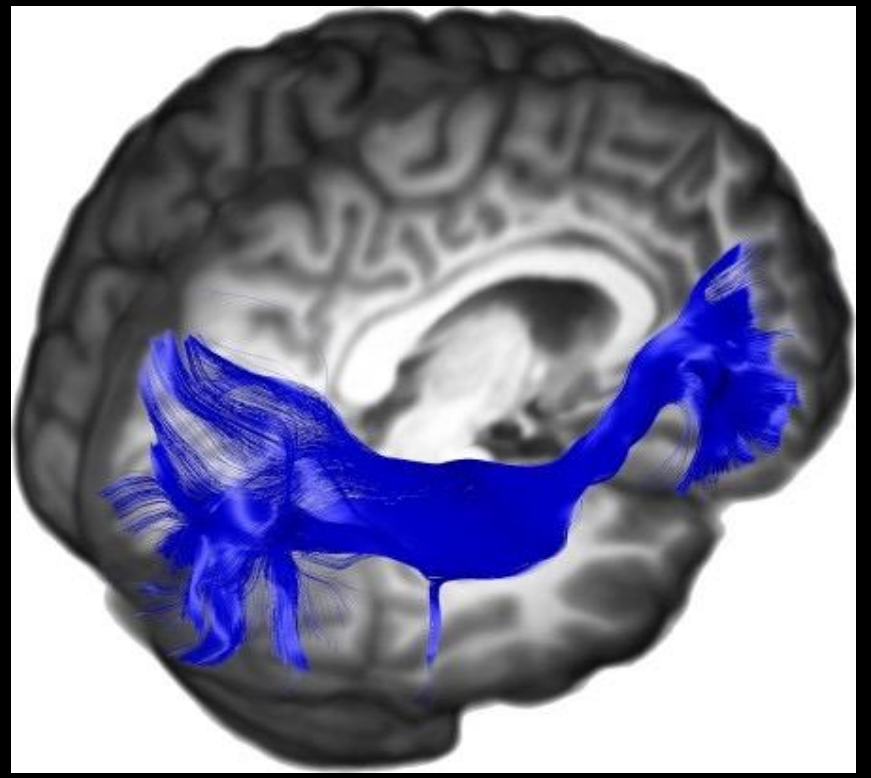


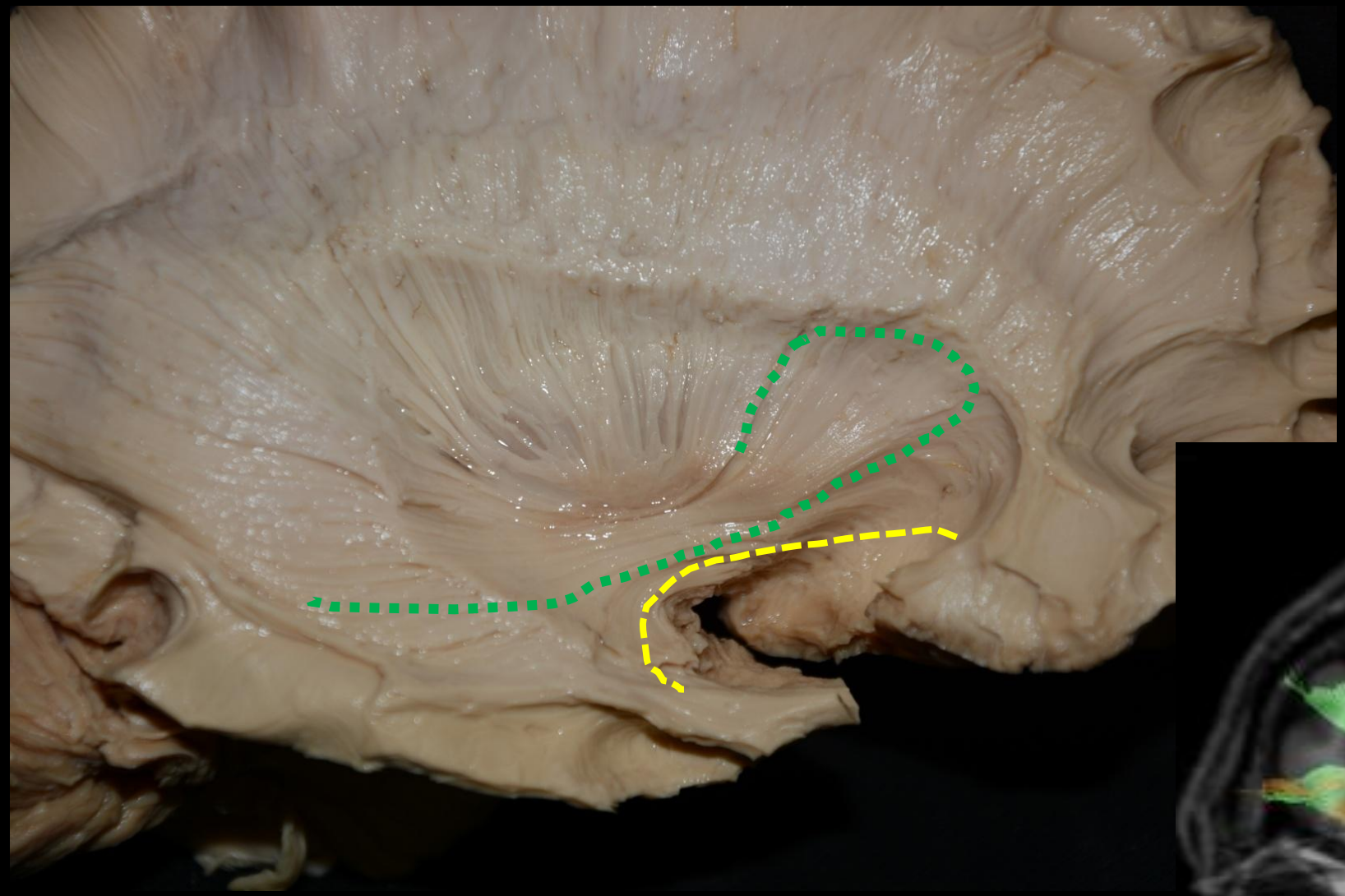


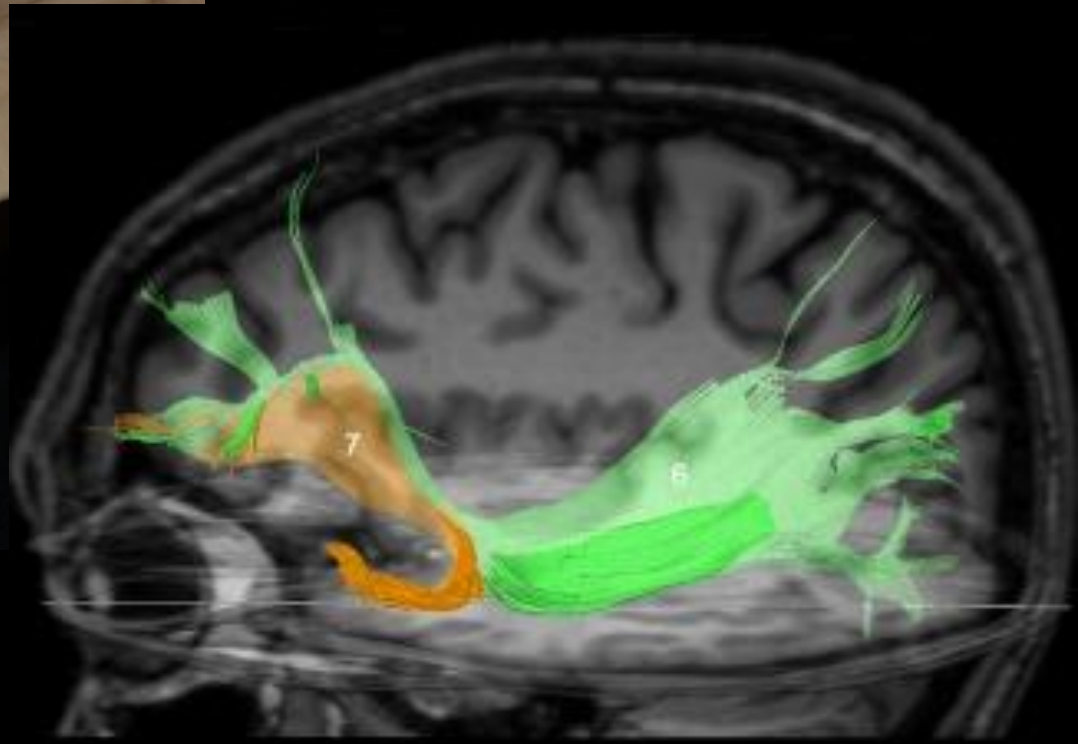



Uncinate Fasciculus (UF)
Prefrontal Cortex
Temporal Cortex





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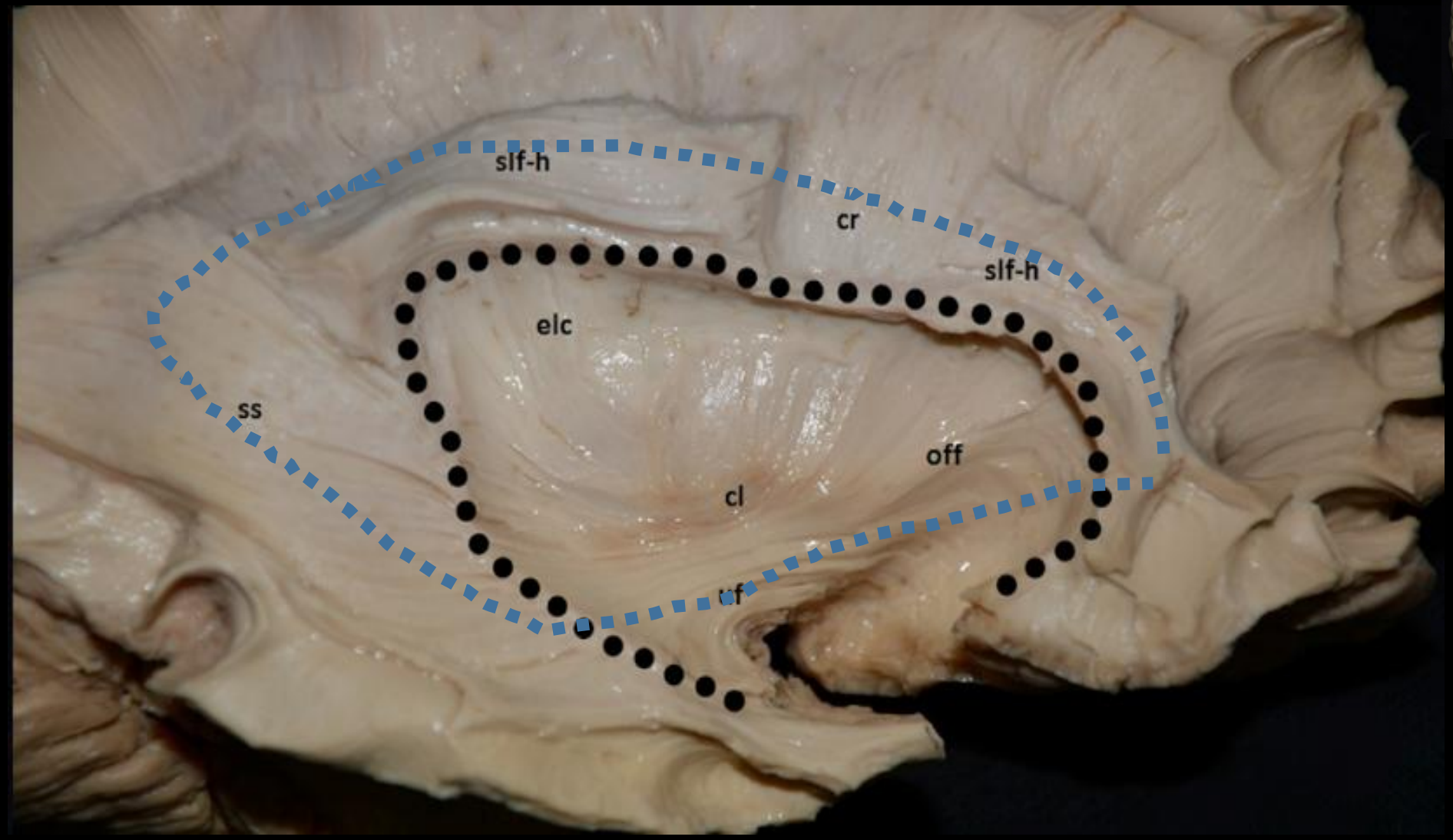
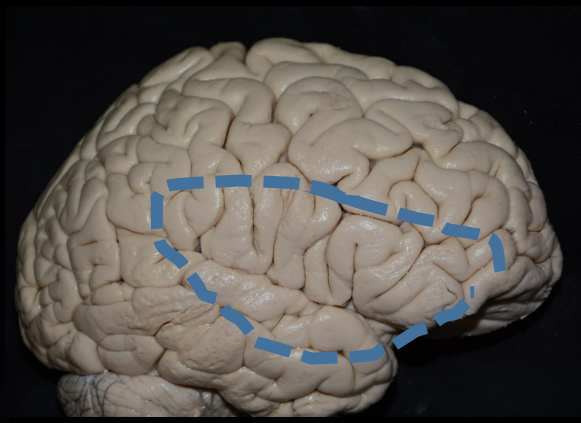
Αγκιστροειδες – Μετωποινιακο.

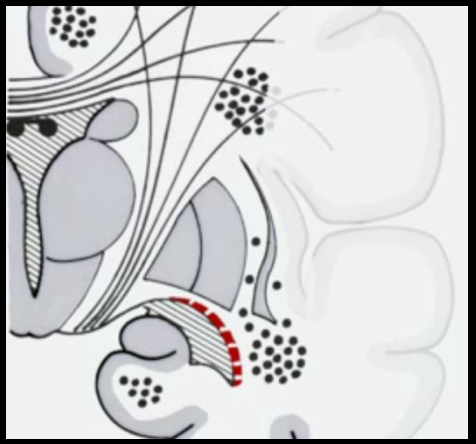
- Αγκιστροειδες : Limbic pathway, Μνημη, συμπεριφορα (reward – punishment based behaviors), ληψη αποφασεων.

- Μετωποινιακο : Ventral semantic pathway – κατανοηση του σημασιολογικου περιεχομενου του λογου- σημασιολογικες παρα-αφασιες.

Perisylvian Language pathways.







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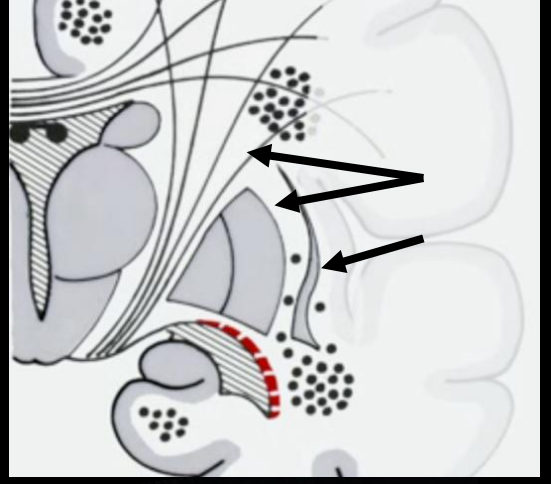


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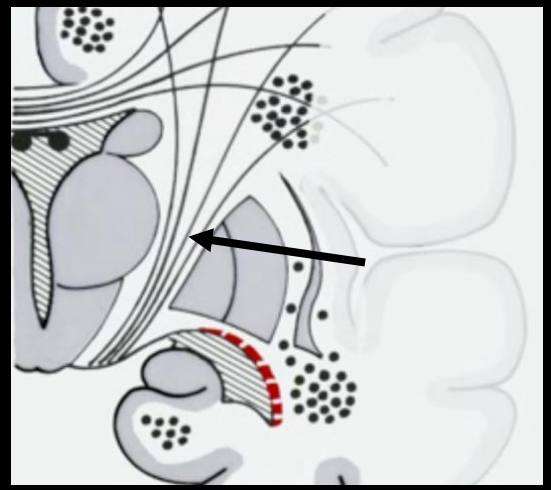

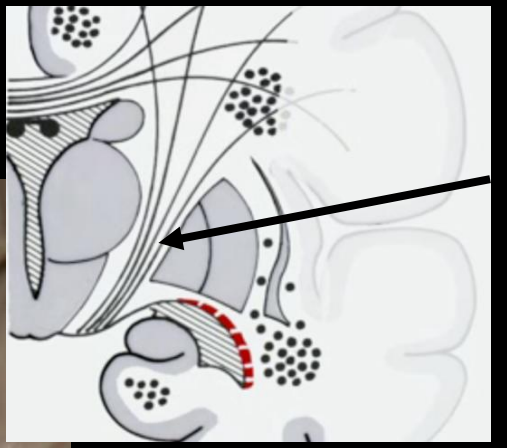

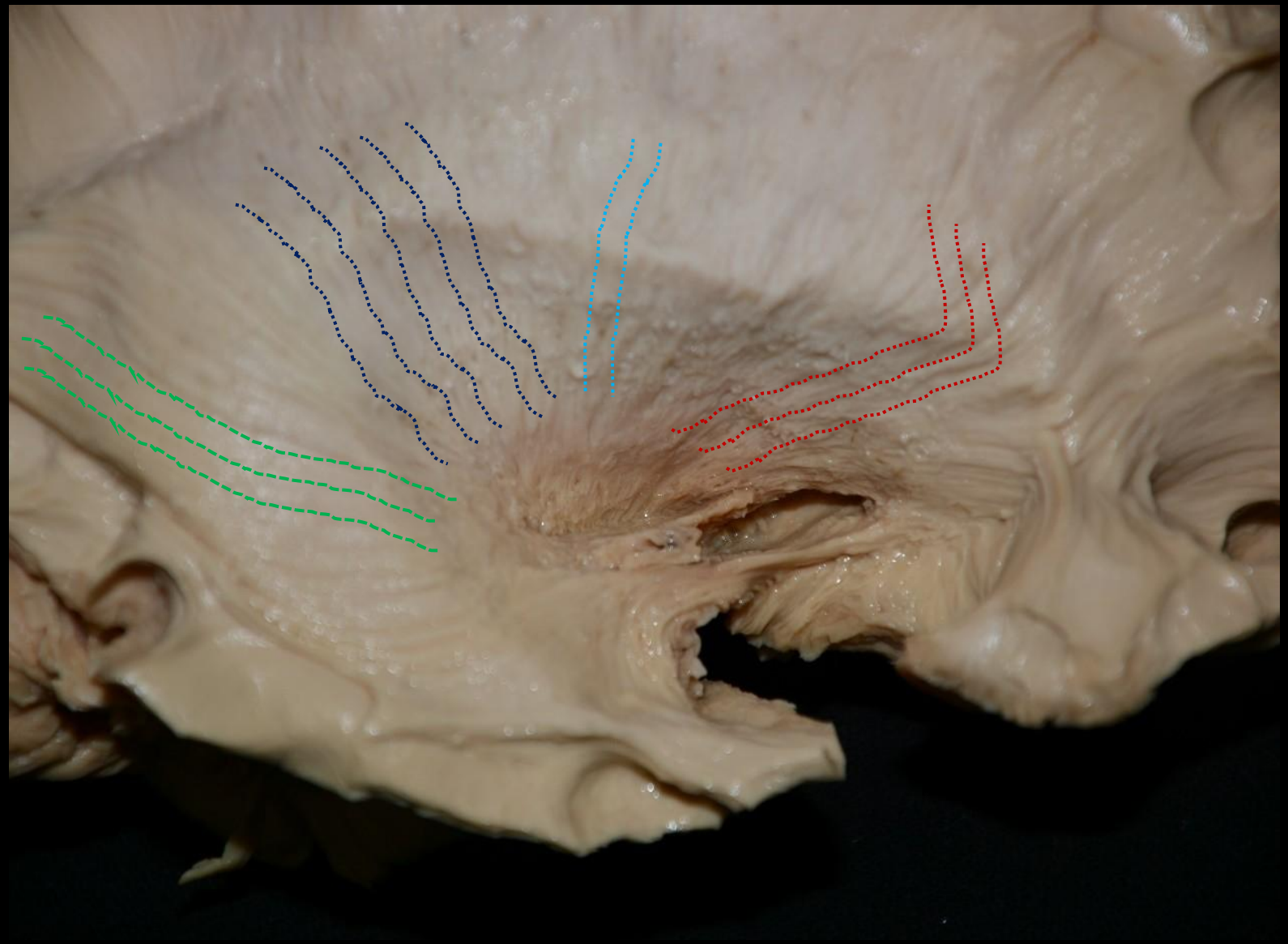

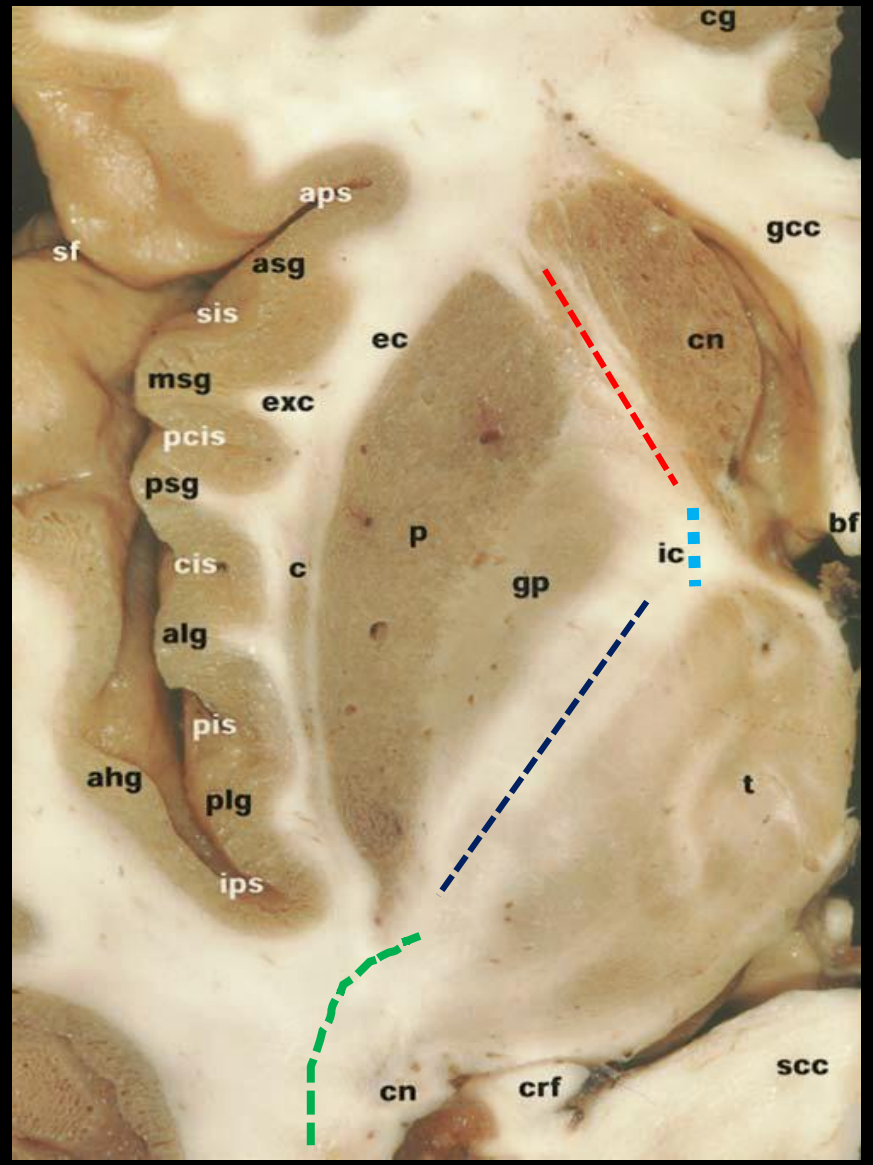
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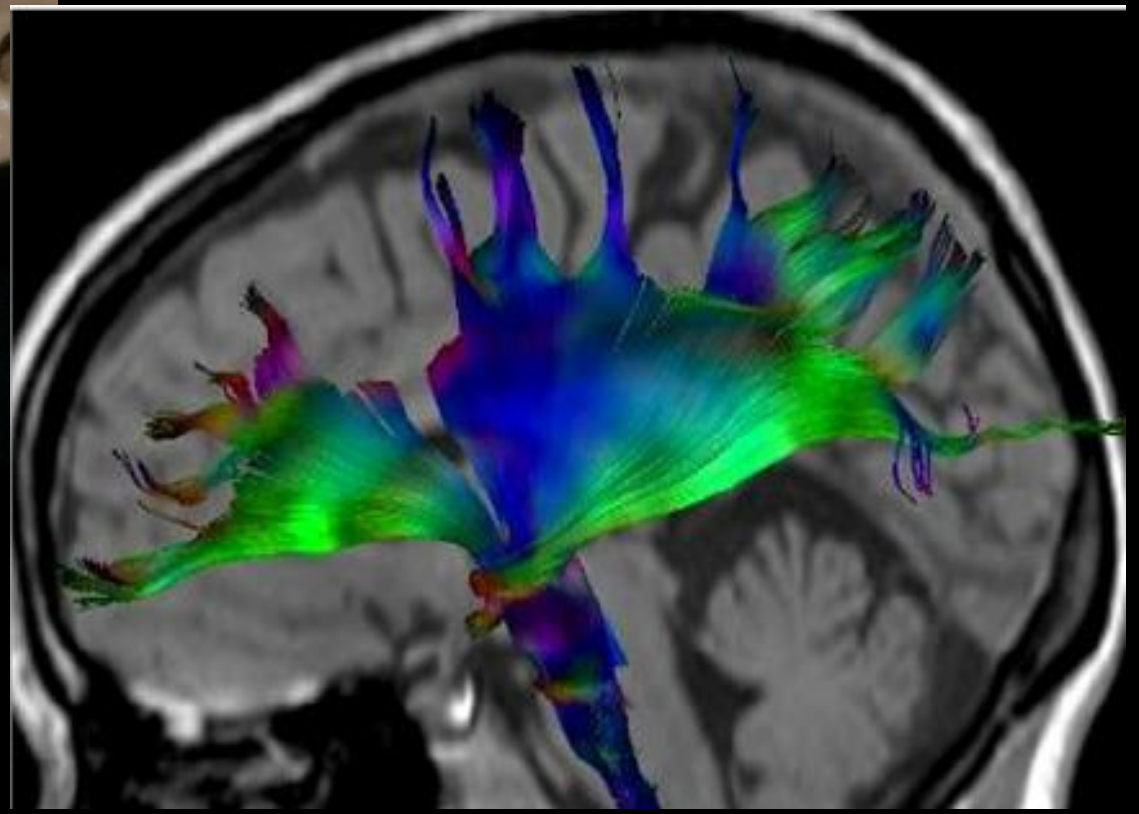
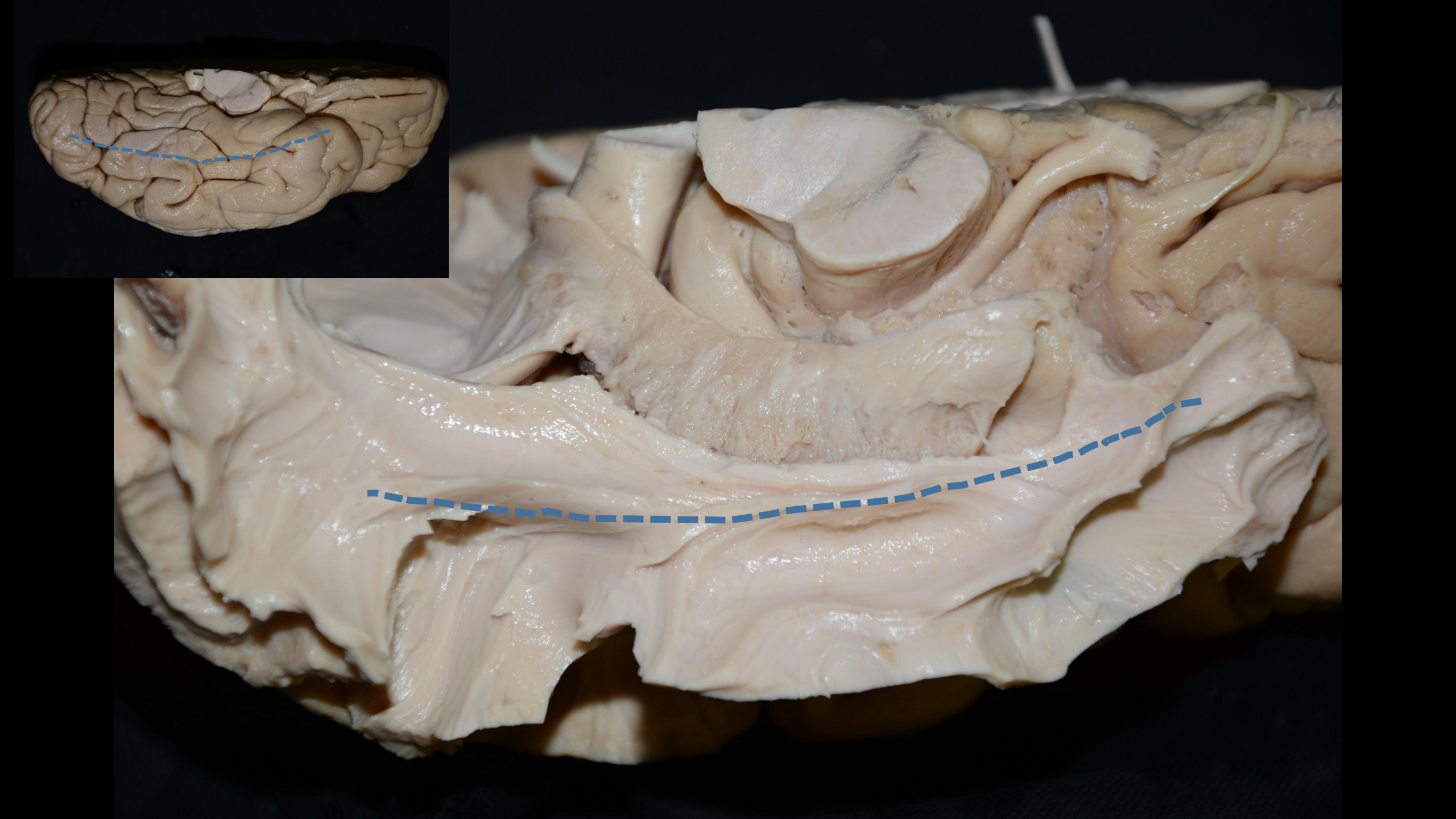
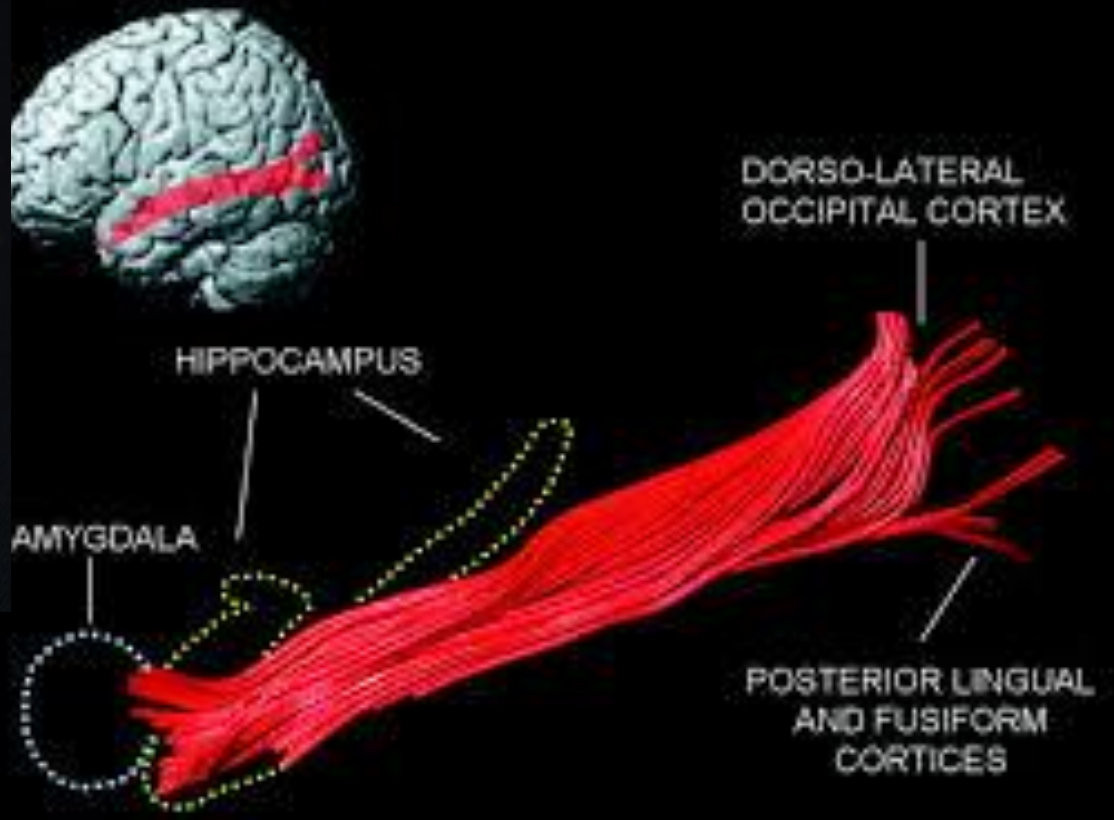


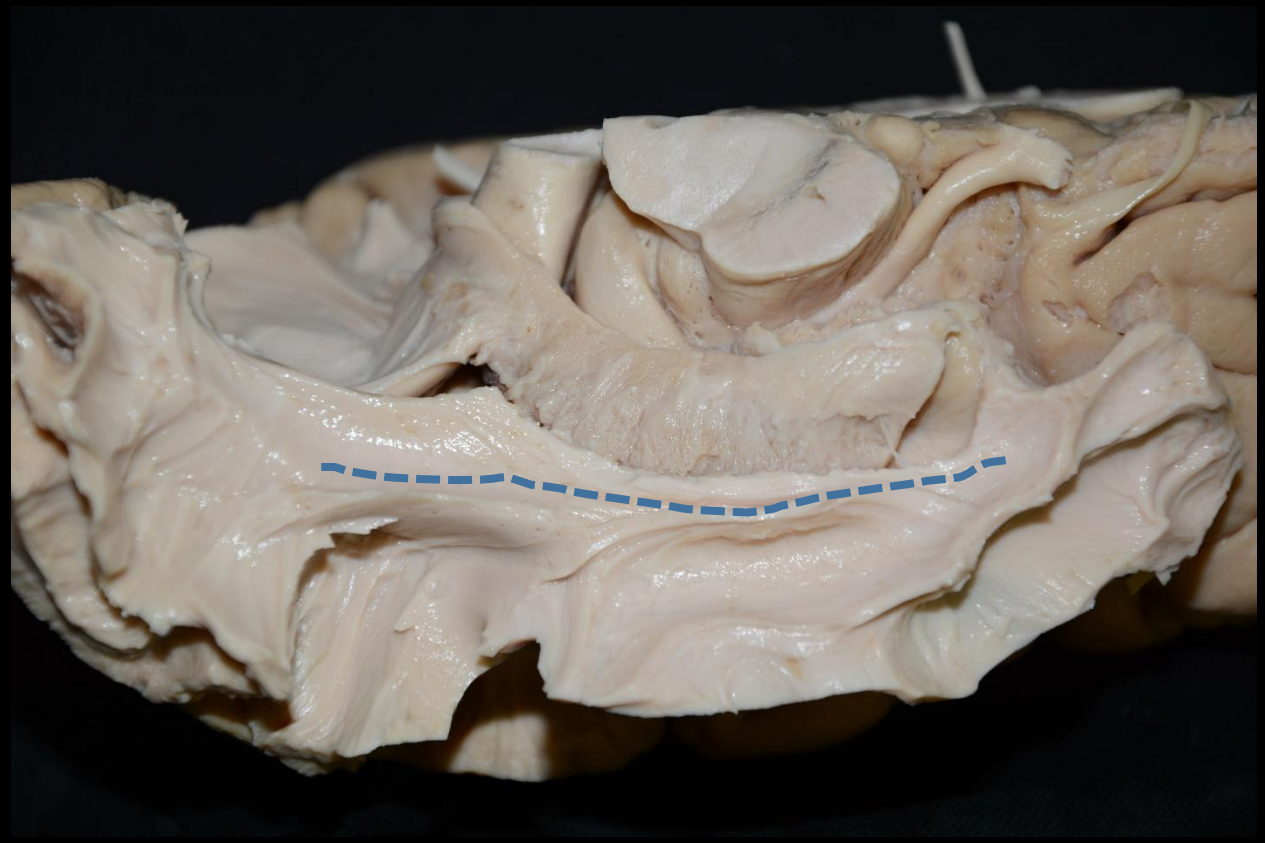
- ΕΣΩ ΚΑΨΑ

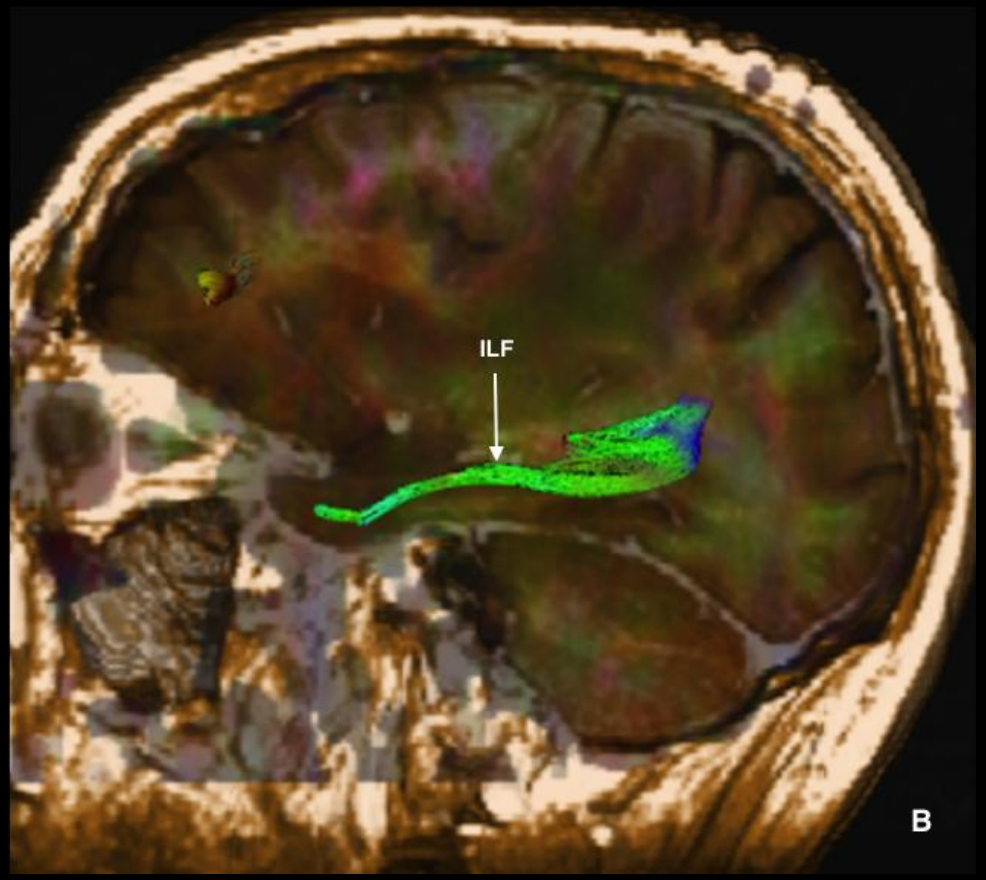
ΠΡΟΣΘΙΟ ΣΚΕΛΟΣ **	SET SHIFTING ABILITY
ΓΟΝΥ	ΚΑΤΑΠΟΣΗ, ΕΚΦΡΑΣΗ, ΠΡΟΣΩΠΟΥ,
ΟΠΙΣΘΙΟ ΣΚΕΛΟΣ	ΣΩΜΑΤΟΑΙΣΘΗΤΙΚΟΤΗΤΑ, ΚΙΝΗΣΗ ΑΝΤΙΠΛΕΥΡΟΥ ΗΜΙΜΟΡΙΟΥ

Κάτω επίμηκες δεμάτιο – Οπτική ακτινοβολία




DORSO-LATERAL
OCCIPITAL CORTEX
HIPPOCAMPUS
AMYGDALA
POSTERIOR LINGUAL
AND FUSIFORM
CORTICES

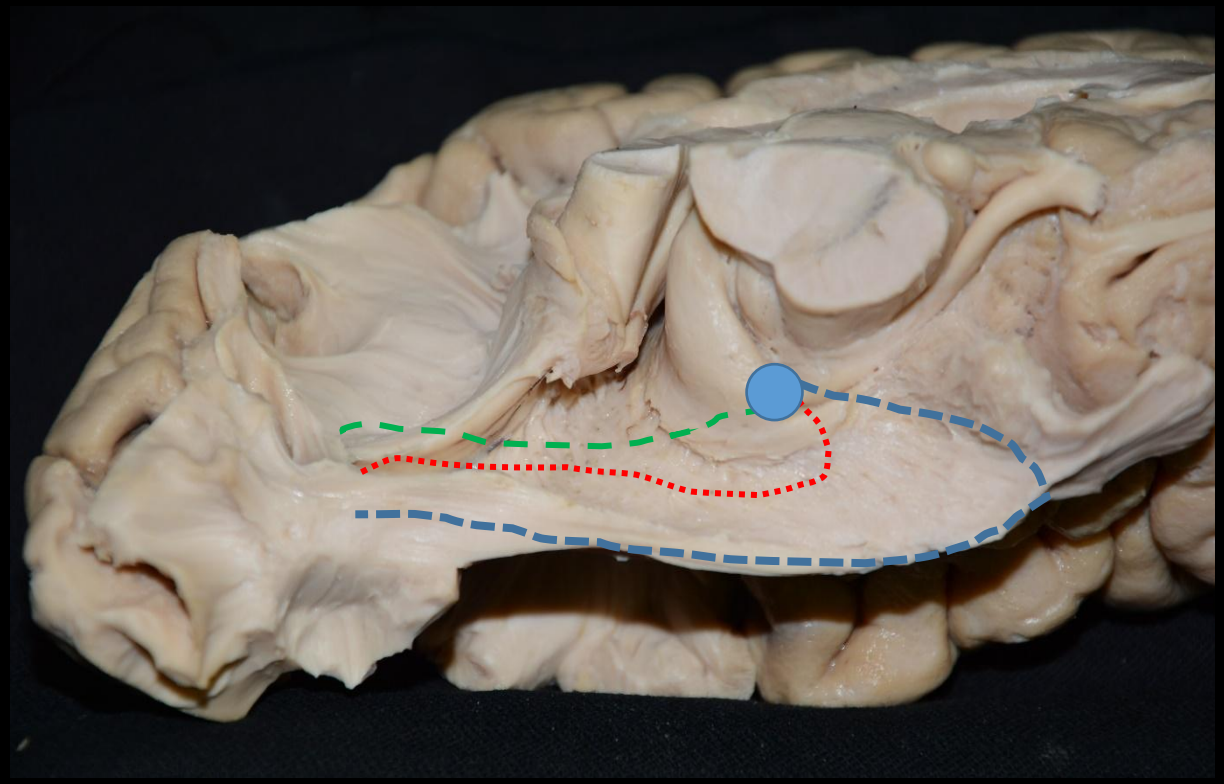


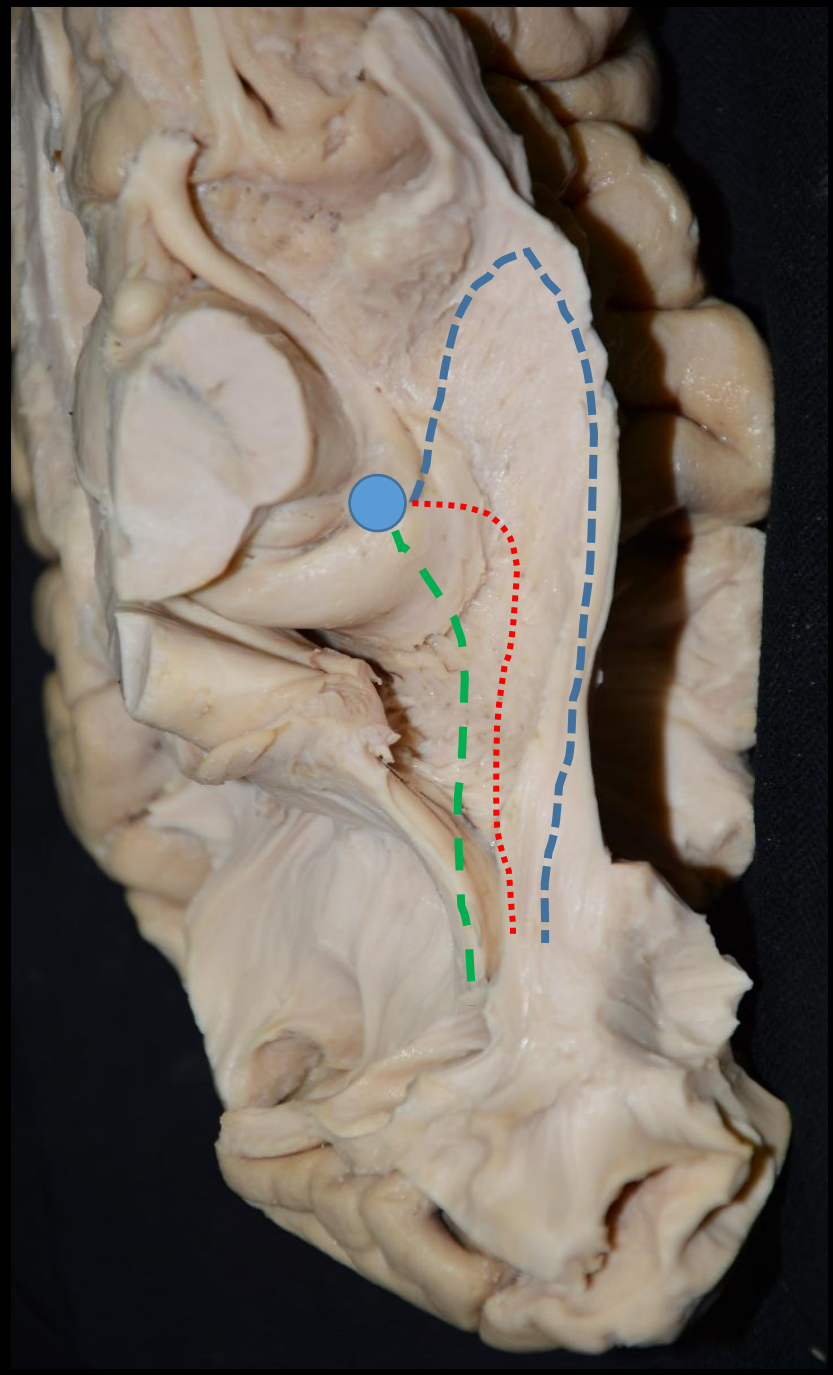

ILF
B

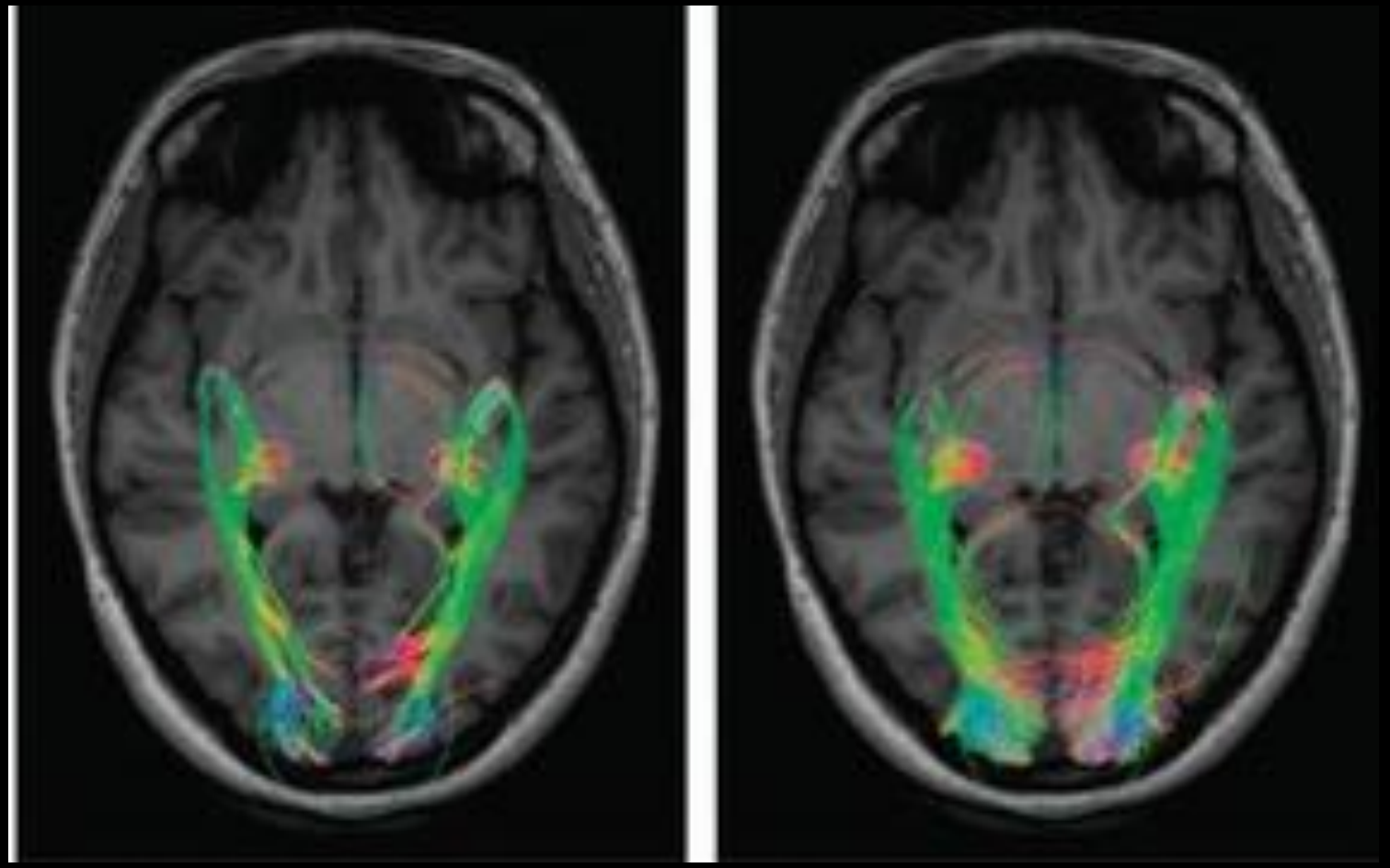
5. Κάτω επίμηκες δεμάτιο

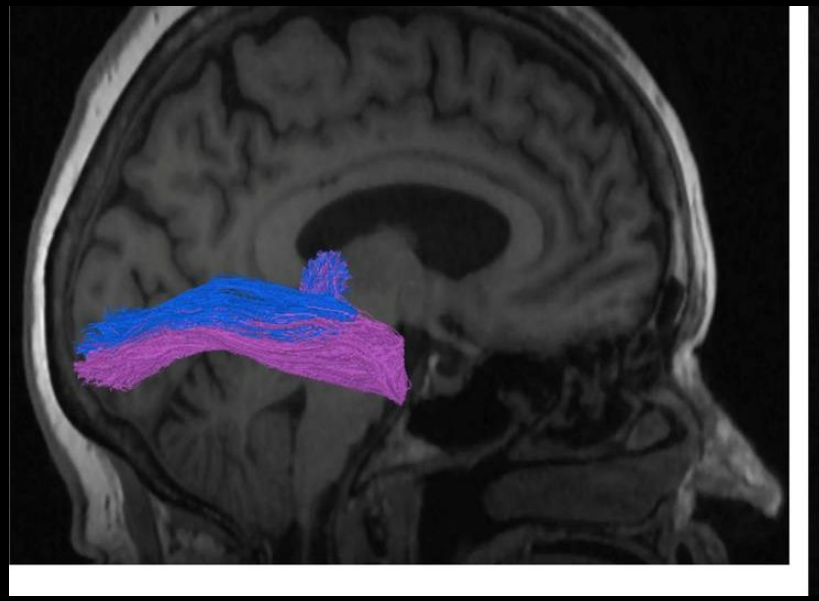
- Αναγνώριση αντικειμένων, γραμμάτων, λέξεων, τόπων - οπτική αγνωσία, αλεξία
- Αναγνώριση προσώπων - προσωπαγνωσία

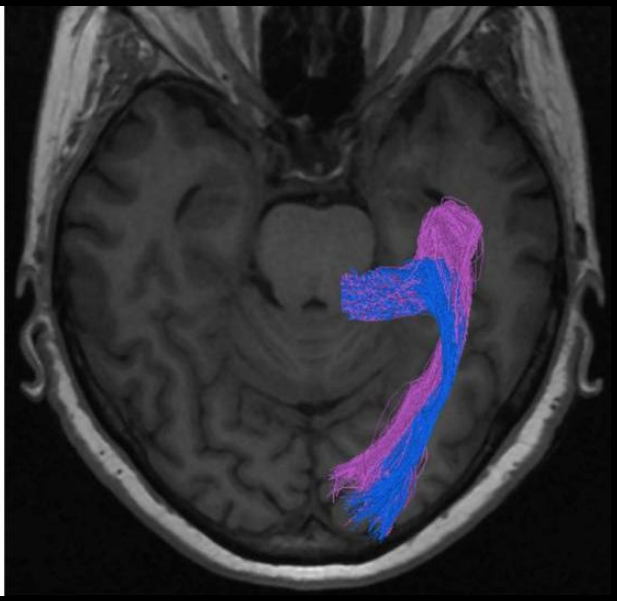
6.Οπτική ακτινοβολία











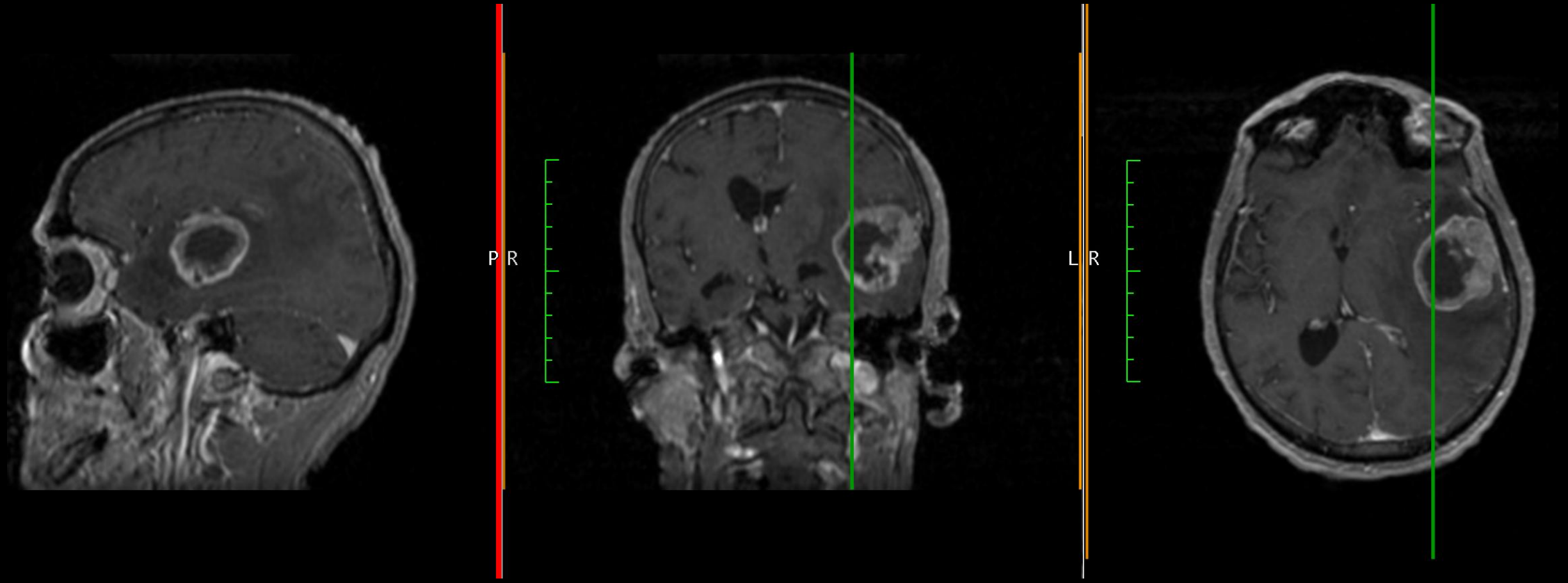
Οπτική ακτινοβολία

- Προσθιο δεματιο – Meyer’s loop : Ανω τεταρτοκυκλικη ημιανοψια
- Κεντρικο δεματιο – Central bundle: Κεντρικο σκοτωμα
- Οπισθιο δεματιο – Posterior bundle: Κατω τεταρτοκυκλικη ημιανοψια.

- FAT- Frontal aslant tract
- FST-Frontostriatal tract
- Sledge runner fasciculus
- Vertical occipital fasciculus
- Cingulum
- Major-minor forceps
- Mammilothalamic tract
- Anterior-posterior commisure
- Tapetum
- Thalamic peduncles
- ....

- **Applications**

Neurosurgery, Neuroradiology, Neurology, Neuropsychology, Psychiatry, Anatomy…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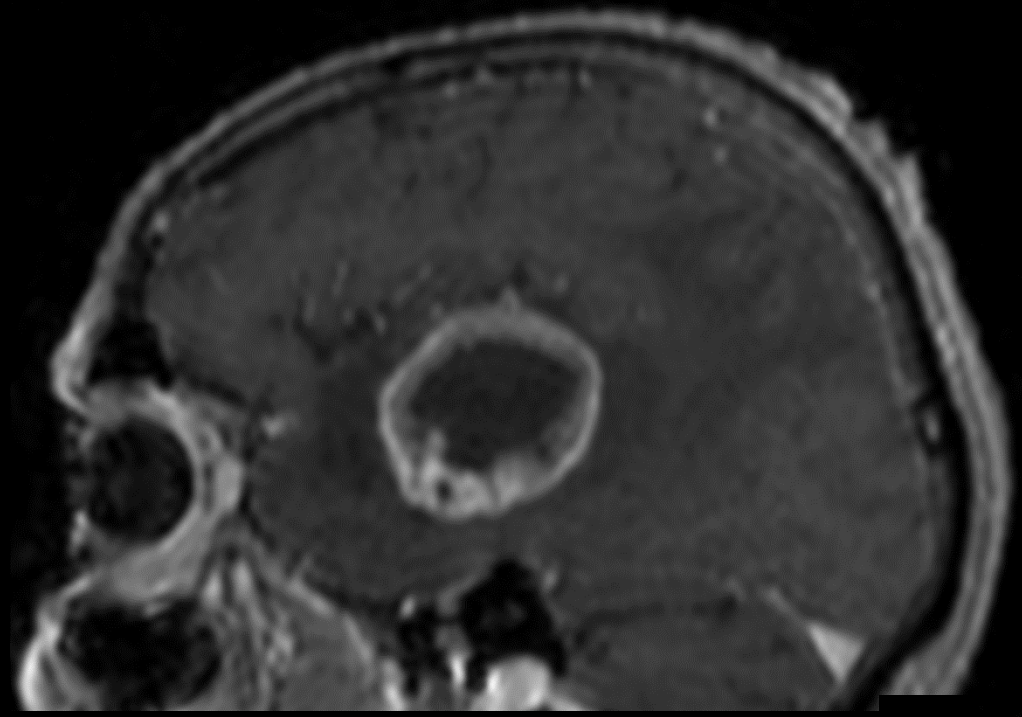

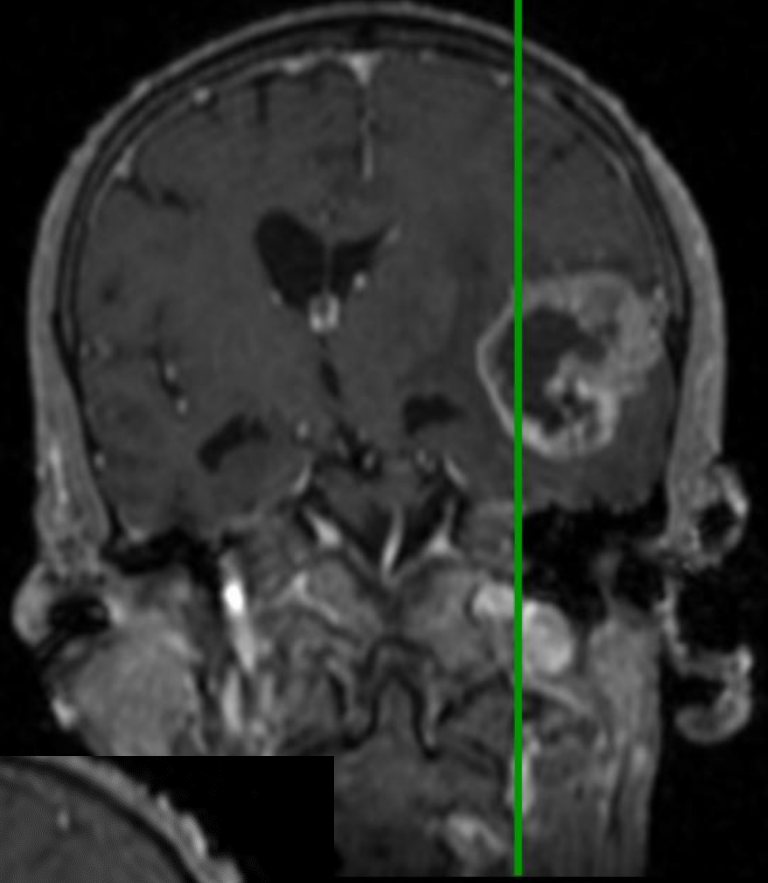

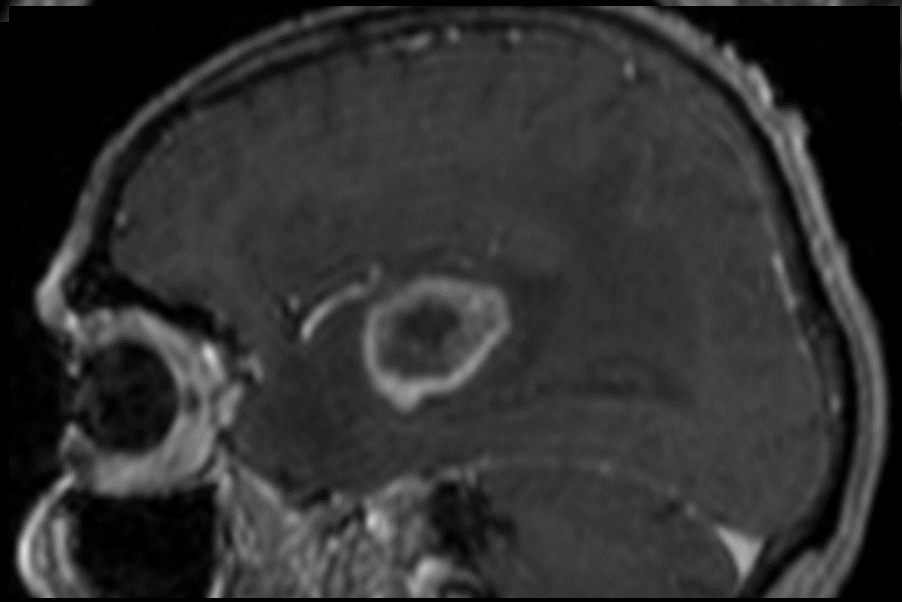

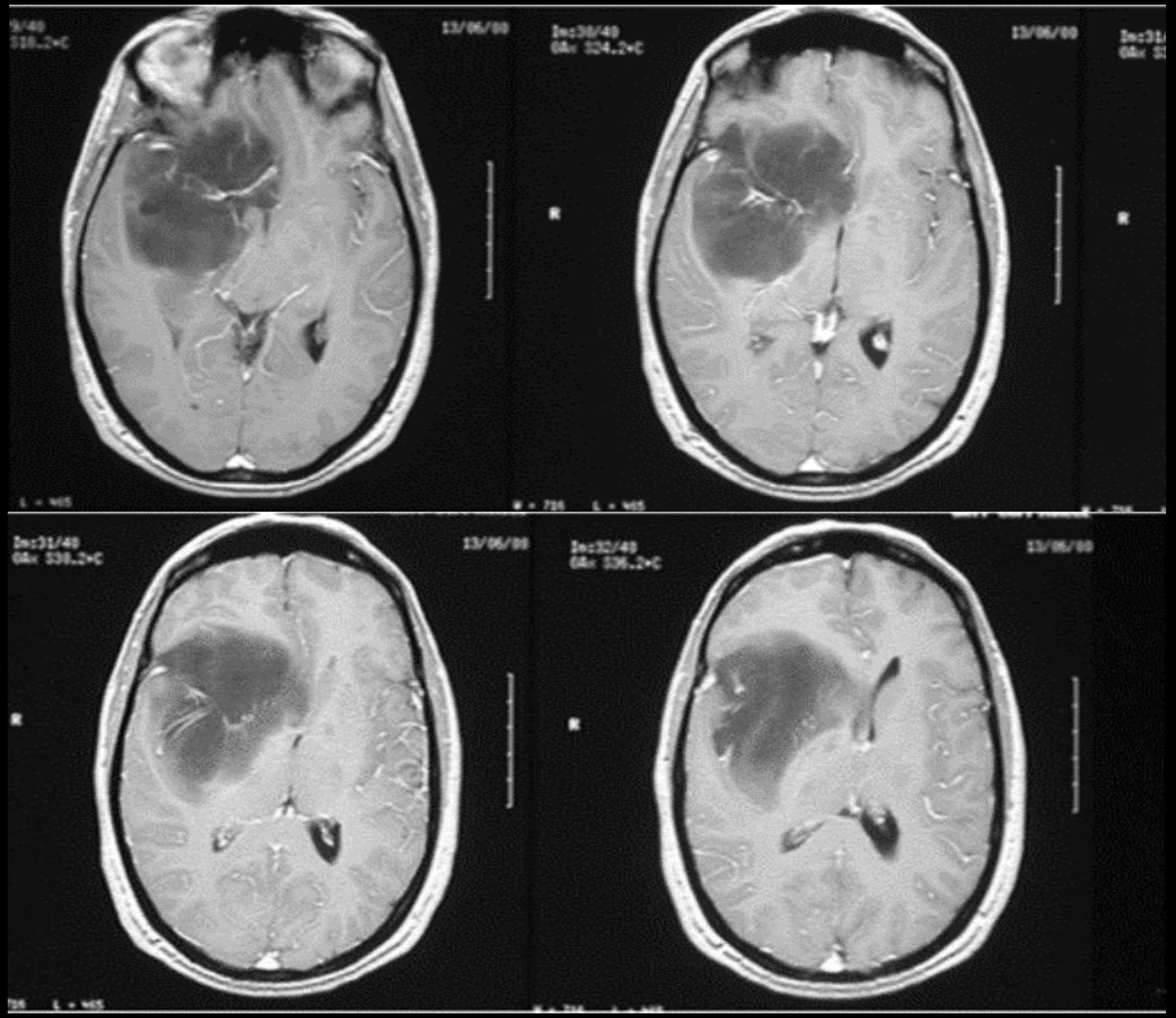
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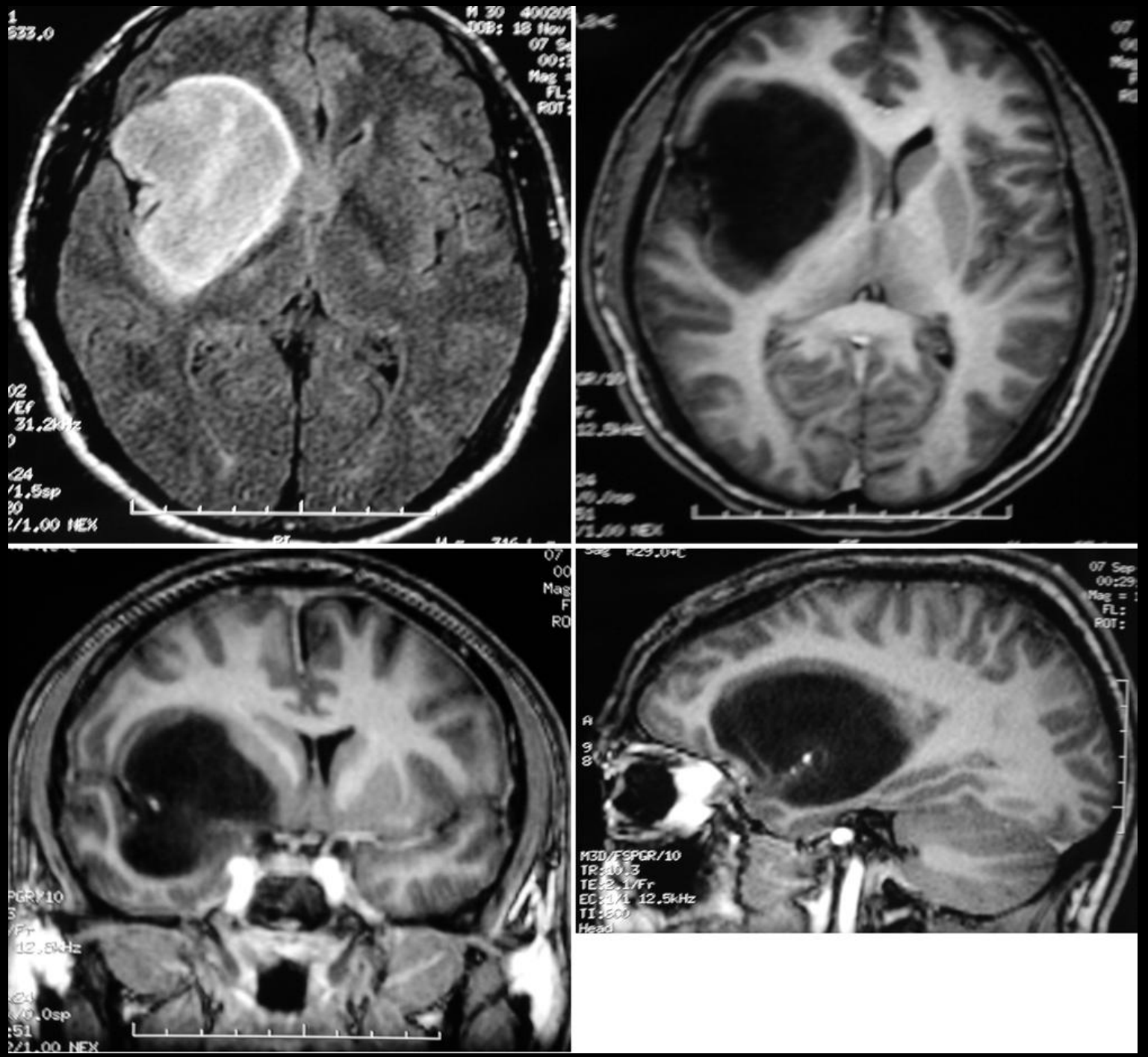
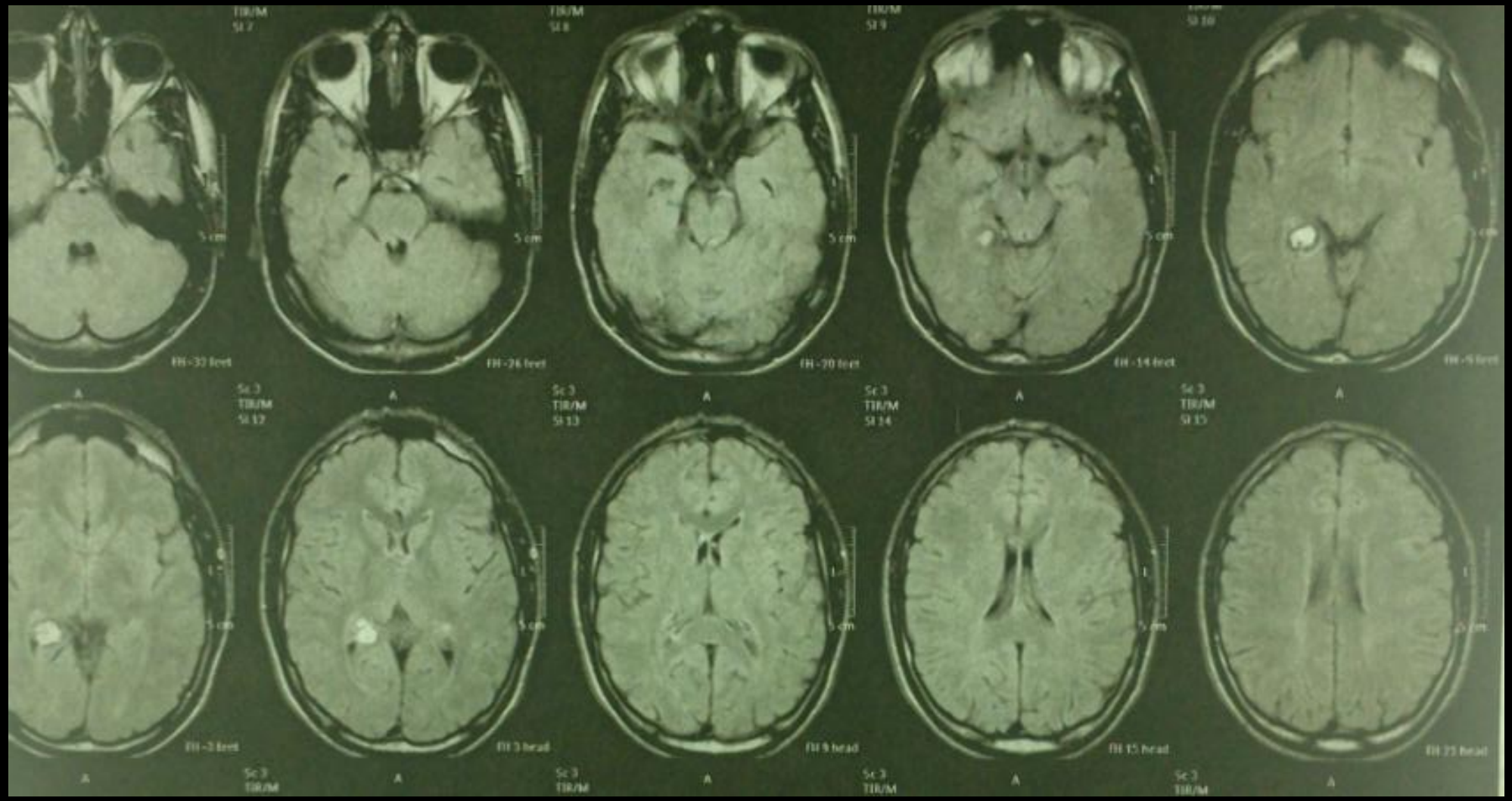
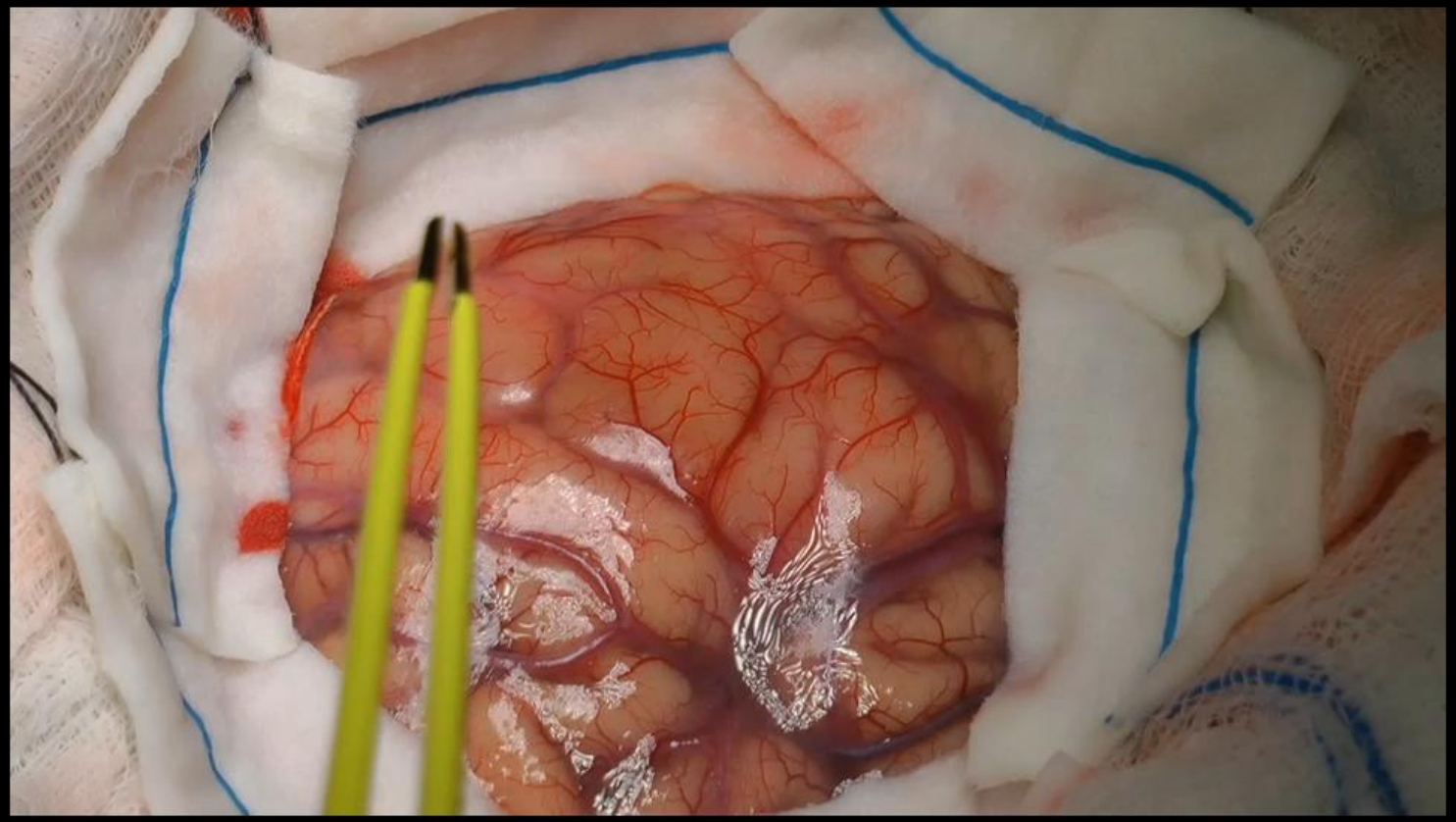
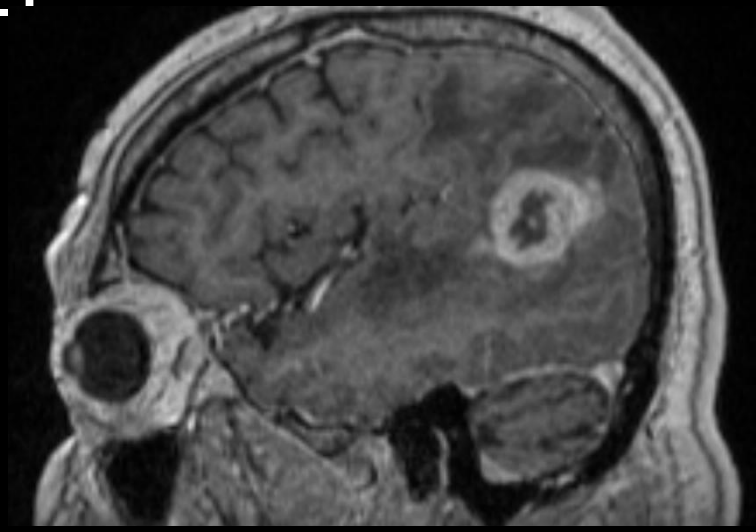




Χρησιμοποίηση των αυλάκων για ενδοπαρεγχυματικη χειρουργική.





J Neurosurg. (2016)

The cerebral isthmus: fiber tract anatomy, functional significance, and surgical considerations.

Koutsarnakis C, Liakos F, Liouta E, Themistoklis K, Sakas D, Stranjalis G.

J Neurosurg. (in press)

Defining the relationship of the optic radiation to the roof and floor of the ventricular atrium. A focused microanatomic study.

Koutsarnakis C, Kalyvas AV, Komaitis S, Liakos F, Skandalakis GP, Anagnostopoulos C, Stranjalis G.

Francis Crick
Nobel prize for the structure of DNA *(1962)*

"to interpret the activity of living human brains, their neuroanatomy must be known in detail".