

## The Sulci Variations of the Inferior Surface of the Temporal Lobe Ulas Cikla MD; Guner Menekse; Gabriel F. Neves; Abdullah Keles; Colin Liu; Mustafa Kemal Baskaya MD Department of Neusrological Surgery, University of Wisconsin, Madison/ WI/ USA



## Introduction

The sulci of the inferior surface of the temporal lobe show a significant and complex variability [1]. Improved adequate knowledge of the sulci anatomy and recognition of their several variations will allow the neurosurgeons to plan safer approaches to the pathologies of this region.

Typically, the inferior surface of the human temporal lobe is longitudinally traversed by three main sulci. The rhinal sulcus (RS) and collateral sulcus (CS) are both located on the medial part of the inferior surface and the occipitotemporal sulcus (OTS) is located in the lateral part of the inferior surface. The CS, one of the most constant cerebral sulci, courses between the parahippocampal and the occipitotemporal gyri [2]. The OTS separates the medial border of the inferior temporal gyrus and inferior occipital gyrus from the fusiform gyrus [3].

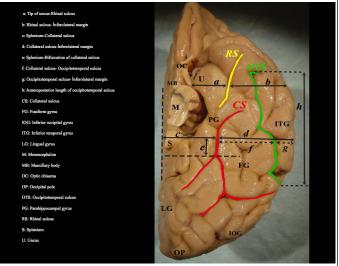
# Methods

35 brain specimens were obtained following autopsy of the donated cadavers of adult humans belonging to both sexes. The RS, CS and OTS were identified directly from the specimens and traced on drawings of the inferior temporal surface, with different colors on digital images using the Microsoft Paint program. The real length and depth of all sulci were measured by means of a fiber soft measuring tape ruler running along the gutter of the sulci and the anteroposterior (AP) lengths were measured by a digital caliper throughout the sagittal axis. (Mituyoyo Series 500, USA)

## **Learning Objectives**

To our knowledge, there are limited number of published cadaveric studies which have investigated the anatomy of the inferior temporal region and more studies are still required to understand this complex anatomy.

#### Relationship of the sulci of the inferior temporal lobe



Rhinal sulci, collateral sulci and occipitopariatal sulci

The patterns and the connections are various for RS, CS and OTS

## Conclusions

The aim of this study was to investigate the sulcal patterns of the inferior temporal region and to define the individual variations, their depths and their relationships with each other. Better understanding of the structural anatomy of the sulci and gyral variations of this region will provide valuable information to neurosurgeons for intraoperative interpretation.

#### Patterns and connections of the RS, CS and OTS

	Left hemisphere n (%)	Right hemisphere n (%)	Total n (%)
RS Patterns			
Type1; No side branches	27 (77.1%)	24 (68.5%)	51 (72.9%)
Type 2; Anteriorly directed side branch	3 (8.6%)	9 (25.7%)	12 (17.1%)
Type 3; Posteriorly directed side branch	3 (8.6%)	1 (2.9%)	4 (5.7%)
Type 4: Combined anteriorly and posteriorly directed side branch	2 (5.7%)	1 (2.9%)	3 (4.3%)
RS connection with the CS			
Type 1; The RS and CS separated on the surface and in-depth.	18 (51.5%)	22 (62.9%)	40 (57.1%)
Type IIa; The RS and CS share a sulcal bed, CS originates out of the lateral bank of the RS	6 (17.1%)	5 (14.2%)	11 (15.7%)
Type IIb: The RS and CS share a sulcal bed, CS originates out of the medial bank of the RS	1 (2.9%)	0 (0.0%)	1 (1.4%)
Type III; The RS and CS blend to form a single continuous sulcus	10 (28.5%)	8 (22.9%)	18 (25.7%)
RS connection with the OTS			
True connection	9 (25.7%)	3 (8.6%)	12 (17.1%)
Pseudo connection	3 (8.6%)	3 (8.6%)	6 (8.6%)
CS Patterns			
Type 1; Single segment (one uninterrupted)	1 (2.9 %)	3 (8.6%)	4 (5.7%)
Type 2; Double sulcus	5 (14.2 %)	3 (8.6%)	8 (11.4%)
Type 3; Bifurcated sulcus	22 (%62.9)	18 (51.4%)	40 (57.2%)
Type 4; Atypical shaped CS	7 (%20)	11 (31.4%)	18(25.7%)
CS connection with the RS and OTS			
Type I; Single-branch, unbroken CS connected with RS anteriorly	6 (17.2%)	9 (25.8%)	15(21.4%)
Type II; CS connected with OTS but separated from the RS	7 (20%)	6 (17.1%)	13 (18.6%)
Type III; CS separated from OTS and RS that are connected	0 (0%)	0 (0%)	0 (0%)
Type IV; CS, OTS and RS separated	11 (31.4%)	16 (45.7%)	27 (38.6%)
Type V (new); CS connected with both the RS and OTS anteriorly	11 (31.4%)	4 (11.4%)	15 (21.4%)
CS connection with the calcarine sulcus			
	3 (8.5%)	4 (11.4%)	7 (10.0%)
CS connection with the OTS posteriorly			
	6 (17.1%)	8 (22.8%)	14 (20.0%)
OTS patterns			
Continuous	6 (17.2%)	5 (14.3%)	11 (15.7%)
Interrupted to two segments	11 (31.4%)	17 (48.6%)	28 (40%)
Interrupted to three segments	14 (40%)	8 (22.9%)	22 (31.5%)
Interrupted to four segments	2 (5.7)%	3 (8.6%)	5 (7.1%)
Interrupted to five segments (new)	2 (5.7%)	1 (2.8%)	3 (4.3%)
Interrupted to six segments (new)	0 (0%)	1 (2.8%)	1 (1.4%)
OTS connection with the ITS			
	21 (60%)	26 (74.2%)	47 (67.1%)
OTS connection with the STS	5 (14.2%)	7 (20%)	12(17.1%)

### References

1.Ono M, Kubik S, Abernathey CD. Atlas of the cerebral sulci. Stuttgart: Thieme, 1990

2.Campero A, Troccoli G, Martins C, Fernandez-Miranda JC, Yasuda A, Rhoton AL Jr. Microsurgical approaches to the medial temporal region: an anatomical study. Neurosurgery 59, 2006

3. Kiernan JA. Anatomy of the temporal lobe. Epilepsy  $\mbox{Res Treat}, 2012$