



A STUDY OF MICROSURGICAL ANATOMY OF SUPRASylvIAN OPERCULUM AND LATERAL SYLVIAN FISSURE IN SOUTH INDIAN POPULATION.

Neurosurgery

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ABSTRACT

The sylvian fissure is the most identifiable feature of the superolateral brain surface and constitutes the main microneurosurgical corridor, given the high frequency of approachable intracranial lesions through this route. The sylvian fissure (or) lateral sulcus is a deep cleft on the inferior and lateral surfaces and has a short stem dividing into three rami. The sylvian fissure (SyF) is not merely a complex fissure that carries the middle cerebral artery and its branches from a neurosurgical viewpoint, the sylvian fissure can be considered a gateway connecting the surface to the depth of the anterior part of the brain's base. To study the morphoanatomic features of the distal sylvian fissure and the Suprasylvian Operculum and Radiological correlation of Opercular anatomy. 40 adult human brains, 20 on right side and 20 on left side both male and female were observed during surgery in Government Theni medical college and a study of morphoanatomy of ASyP, lateral fissure and frontoparietal opercula was done. The knowledge of these basic anatomical features and relationship can help us in locating the ASyP through an initial burr hole centred on ASqP intraoperatively. Also recognition of frontoparietal sulcal and gyral pattern becomes easy from the tridimensional understanding of the intracranial structures as emulated in this study. Preoperative planning can be done in advance with MR imaging. Intraoperatively it helps us in avoiding complications altering the course of the surgery if necessary with the above knowledge.

KEYWORDS

sylvian fissure, of frontoparietal sulcal, morphoanatomic features, microneurosurgical corridor

1.INTRODUCTION

The extensive spectrum of the neural and vascular structures within the reach of the transylvian approach includes the insula, basal ganglia, lateral ventricle, Middle Cerebral Artery (MCA), temporal operculum, uncus, orbit, anterior cranial fossa, optic nerve, internal carotid artery and its branches, lamina terminalis and interpeduncular fossa.

Various methods of opening the sylvian fissure have been proposed by various authors. The gold standard for sylvian fissure opening is that the arachnoid of SyF be opened on the frontal side of the veins distally so that the sacrifice of fronto orbital venous tributaries that cross the SyF to the frontal lobes is not needed^{1,7,13,14}. Few others open the SyF from the stem or by injecting water into the cisterns and then open up distally called water dissection technique of Toth (1987)^{7&19}.

The present study intends to define morphological anatomy and radiological features of the posterior sylvian fissure and the suprasylvian operculum in Indian population.

2.OBJECTIVES

1. To study the general features of the distal sylvian fissure and the Suprasylvian Operculum.
2. Radiological correlation of opercular anatomy.

3.MATERIALS AND METHODS

40 adult human brains both male and female were observed during surgery in Government Theni Medical College. Morphoanatomy of ASyP, lateral fissure and frontoparietal opercula was done in the following method. The following steps were followed. Exposure of pterion by the standard FTP Trauma flap incision. Standard FTP craniotomy opening of the skull and of dura mater and observing for ASyP relation to ASqP. Dissection of the arachnoidal membranes after making measurements of anterior sylvian point with surgical tapes under loupe magnification. Microscopic evaluation of the morphoanatomy of the opercula and the sylvian fissure was made along with measurements of distances.

4.RESULTS

40 adult human brains were studied 35 male and 5 female, age ranging from 20-73 years and the results of the study are as follows

I. Supra Sylvian Operculum

1. Pars Triangularis

It was always V shaped – and was delimited anteriorly by the horizontal and posteriorly by the anterior ascending ramus of sylvian fissure in all patients .

Table 1: Pars Triangularis

Pars Triangularis	R	L
V Shape	100%	100%
Bisecting IFS	85%	84.2%

Pars triangularis is retracted above and the sylvian fissure is wide at that place – referred as to the anterior sylvian point.

2. Pars Opercularis

The IFG opercular part always had a U shape defined by the anterior ascending ramus anteriorly and by the anterior subcentral ramus posteriorly. It was divided by the inferior segment of the precentral sulcus. The bottom of the U was inside or at or superior to sylvian fissure. (Table 2)

Table 2: Bottom Of U In Relation To SYF

Bottom of U in relation to SyF	R	L
Superior	9	7
At	2	2
Inside	9	11

The anterior sylvian point was anterior and inferior to the pars opercularis.

3. Rolandic Operculum

This is always seen as a "U" shaped, also called as the subcentral gyrus, delimited by the anterior and posterior subcentral ramii from the lateral fissure. The central sulcus bisects this gyrus and depending on the bottom of the U, the inferior extremity of central sulcus lies within or at or above the lateral fissure. (Table 3)

Table 3: Lower Extremity Of Central Sulcus In Relation To SYF

Lower extremity of Central Sulcus in relation to SyF	R	L
At or above	18	17
Inside	2	3

The inferior projection of the central sulcus over the lateral fissure is the inferior rolandic point.

4. Post central and Supramarginal gyrus connection

This connecting arm was always seen and is also U shaped. It contains the inferior segment of the post central sulcus. The bottom of the U may be at or above the sylvian fissure or within it. (TABLE 4)

Table 4: Post Central Sulcus In Relation Of SYF

Post Central Sulcus in relation of SyF	R	L
At or Above	14	13
Inside	6	7

The C shaped connecting arm between the supramarginal and the superior temporal gyrus was seen in all patients.

5. Magnetic Resonance Imaging Correlation of the frontoparietal opercular morphoanatomy In 25 of the patients excellent correlation of the opercular morphoanatomy was possible with the available preoperative MRI scans both axially and sagittally. (TABLE 5)

Table 5 Correlation Of Opercular Morphology To Brain MRI Scans

Correlation of opercular morphology to brain MRI scans	Number of patients	
	R	L
"V" Shape of pars triangularis	12	11
"U" of pars opercularis	11	11
"U" of subcentral gyrus	11	11
"V" of connecting arm	9	11
"C" of sypramarginal gyrus	12	13

4.DISCUSSION

Since the sylvian fissure and the sylvian cistern constitutes the most frequently used microsurgical corridor, given the high proportion of intracranial lesions that are accessible through the opening of the fissure. The present study also focuses on the opercular anatomy. The fronto parietal operculum extends from the anterior ascending ramus to the posterior ascending ramus. With the orbital part of the IFG anteriorly, the suprasylvian structures are a series of convolutions roughly averaged into a V shaped convolution, followed by 3 U shaped convolutions and 1 C shaped convolution. The bottoms of the 3 U shaped convolutions and their sulcal extremities can be situated either superior to the sylvian fissure or inside it.

Pars Triangularis

The V shaped convolution delimited by the horizontal and anterior ascending ramus is constituted by triangular part of IFG with the anterior sylvian point forming the vertex. In the present study the IFG contains a descending branch of the IFS in 85% of the population. Also it is retracted above from the sylvian fissure, though not as that of the western population as evidenced by the number of smaller diameter ASyP¹

Pars Opercularis

The most anterior U shaped convolution is the opercular part of IFG delimited anteriorly by the anterior ascending ramus and posteriorly by the anterior subcentral ramus. In agreement with Ebeling et al² the precentral sulcus ends inside the sylvian fissure in 50%. This convolution corresponds to the opercular part and posterior limb forms part of the precentral gyrus. Together the triangular and opercular part of the IFG constitute the motor speech area of Broca in the dominant hemisphere.

Surgical Implications-The intraoperative localisation can be done based on ASyP and the morphology of the pars triangularis and pars opercularis. This helps in avoiding post operative speech deficits.

Rolandic or Subcentral Operculum

The middle U shaped convolution is called the subcentral or Rolandic gyrus and it connects the precentral and postcentral gyrus. The location of subcentral gyrus in relation to sylvian fissure varied with the position of IRP. It could be found either inside in 12.5% or superior to SyF in the rest. The subcentral gyrus is limited by anterior and posterior rami of SyF. **Surgical Implications**-The central sulcus and the inferior extremity of the precentral and postcentral gyrus can be localised with the help of the above said morphoanatomic features thereby avoiding complications.

Connecting Arm of Postcentral to Supramarginal GyrusThe third U shaped convolution limited anteriorly by the posterior subcentral ramus and posteriorly by the posterior ascending ramus of the sylvian fissure, connects the postcentral and supramarginal gyrus. The inferior extremity of postcentral sulcus in relation to SyF in this study is inside the fissure in 32.5% and at or above in 67.5% as opposed to 39% inside and 61% superior in Rodrigues et al¹⁴. The C shaped connecting arm between the supramarginal and the superior temporal gyrus was seen in all the specimens in this study.

MRI Correlation of FP Operculum Morphoanatomy

In 25 of the patients studied, comparison was made with preoperative

MRI brain scans. There was excellent correlation between the various gyral patterns as proposed by Rodrigues et al¹⁴. and pre OP planning with axial and sagittal scans can help in avoidance of Broca's area, motor cortex and Wernicke's area.

5.CONCLUSION

In this study of 40 hemispheres and MRI correlation of 25 of these the following conclusions were arrived at. Together the V shaped pars triangularis and the first U shaped gyrus pars opercularis form the motor speech area on the dominant side and can be easily made out intraoperatively as well as radiologically by sagittal and axial magnetic resonance imaging (MRI), for preoperative planning and avoidance of complications. Though in Indian population the pars triangularis is not as retracted as that of the western population, it still is very well discernible. The second U shaped subcentral gyrus is also called the inferior frontoparietal Plis de passage of Broca. It contains the inferior pre and post central gyrus. The central sulcus ends inside the sylvian fissure in 12.5%. Along with this morphology and inferior rolandic point identified from ASyP by distance on the SyF the location of central sulcus and motor cortex can be made out radiologically and intraoperatively. The third U and C shaped convolution are formed by the supramarginal gyrus and its connecting arm. MRI also correlates very well with opercular anatomy both axially and sagittally. The knowledge of these basic anatomical features and relationship can help us in locating the ASyP through an initial burr hole centred on ASyP intraoperatively. Also recognition of frontoparietal sulcal and gyral pattern becomes easy from the tridimensional understanding of the intracranial structures as emulated in this study. Preoperative planning can be done in advance with MR imaging. Intraoperatively it helps us in avoiding complications altering the course of the surgery if necessary with the above knowledge

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