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Research Article

A STUDY TO COMPARE THE SYLVIAN FISSURE MORPHOMETRY IN FORMALIN FIXED CEREBRAL HEMISPHERES

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ABSTRACT

The sylvian fissure is not a simple longitudinal cleft as its name implies. It crosses both the basal and lateral cerebral surface and has a superficial and a deep part. The superficial part is visible on the surface of the brain and the deep part, referred as sylvian cistern, is hidden below the basal surface. The superficial part has a stem and three rami. The deep part is hidden. A study was therefore proposed to study the morphometry of sylvian fissure. The present study was conducted on 58 right and left formalin fixed human cadaveric cerebral hemispheres (29 Brains) that were obtained from the Department of Anatomy, Gandhi Medical College, Bhopal. Different parameters were studied like stem of sylvian fissure on inferior surface and lateral surface, posterior ramus of sylvian fissure, anterior rami of sylvian fissure and many more. These were statistically analysed. The mean of length of sylvian fissure on lateral surface was greater on the left hemisphere (71.79 ± 6.46 on the right and 75.15 ± 5.84 on the left). The mean of posterior ramus of sylvian fissure was greater on the left hemisphere (52.66± 4 on the right and 54.56 ± 3.24 on the left). More results and observations are mentioned along with the article. The results of many previous researches correlate with result of our study. It is very important for all anatomists and neurosurgeons to know about the sylvian fissure morphometry.

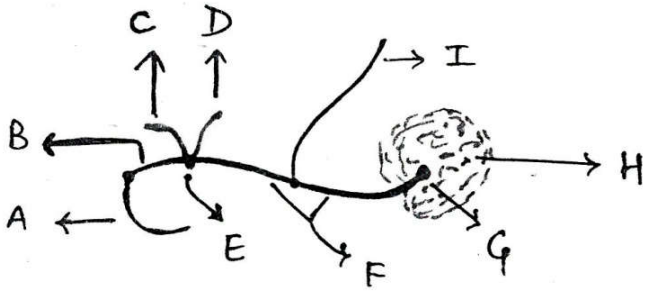
INTRODUCTION

The stem of sylvian fissure begins medially at the anterior clinoid process and extends laterally along the sphenoid ridge between the junction of the frontal and temporal lobes to the pterion where the stem divides into anterior horizontal, anterior ascending, and the posterior rami. The posterior ramus, the longest, represents the posterior continuation of the fissure. It is directed backward and upward and separates the frontal and parietal lobes above from the temporal lobe below. Its posterior end turns more sharply upward to terminate in the inferior parietal lobule, where the supramarginal gyrus wraps around its upturned posterior end.[1,2,3] The deep part of the sylvian fissure, hidden below the surface referred as the sylvian cistern. It is more complex than the superficial part and is divided into sphenoidal and operculoinsular compartments. The sphenoidal compartment extends laterally from the cistern around the internal carotid artery between the frontal and temporal lobes.[3]

MATERIAL AND METHOD

Sylvian Fissure

A.1 Stem of sylvian fissure (on inferior surface)
A.2 Stem of sylvian fissure (on lateral surface)
A.3 Stem of sylvian fissure (total length)
A.4 Posterior ramus of sylvian fissure
A.5 Sylvian fissure (lateral surface)
A.6 Sylvian fissure (total length)
A.7 Anterior rami of sylvian fissure



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All Segments of Sylvian Fissure

Segment A= stem of sylvian fissure (on inferior surface)
Segment B=stem of sylvian fissure (on lateral surface)
Segments A + B= stem of sylvian fissure (total length)
Segment between Point E to Point G= posterior ramus of sylvian fissure
Segment B + Segment between Point E to Point G =sylvian fissure (lateral surface)
{Segments A+ B}+{Segment between Point E to Point G} = sylvian fissure (total length)
Anterior rami of sylvian fissure {C=anterior horizontal limb and D=anterior ascending limb}
E=Anterior sylvian point
G=Posterior sylvian point
H=Supramarginal Gyrus

Sylvianfissure (morphometry)

Thread was placed over specific segment and then with the use of artery forcep it was placed on scale of digital vernier caliper. All lengths are measured in millimeters upto the 2 decimal points.

Stem of sylvian fissure (on inferior surface)

On the inferior surface of brain the length of stem was measured from anterior perforated substance to the anterior most point of sylvian fissure (of lateral surface). This was stem (inferior surface) length.

Stem of sylvian fissure (on lateral surface)

On the superolateral surface of brain thelength of stem wasmeasured from anterior most point of sylvian fissure to anterior sylvian point. This was Stem (lateralsurface) length.

Stem of sylvian fissure (total length)

Total length of stem was measured adding length of stem (inferior surface) and stem (lateral surface) length.

Sylvian Fissure (Morphometry)

Fig 1 Stem of Sylvian Fissure (Inferior Surface)

Fig 2 Posterior ramus of Sylvian Fissure (Lateral Surface)

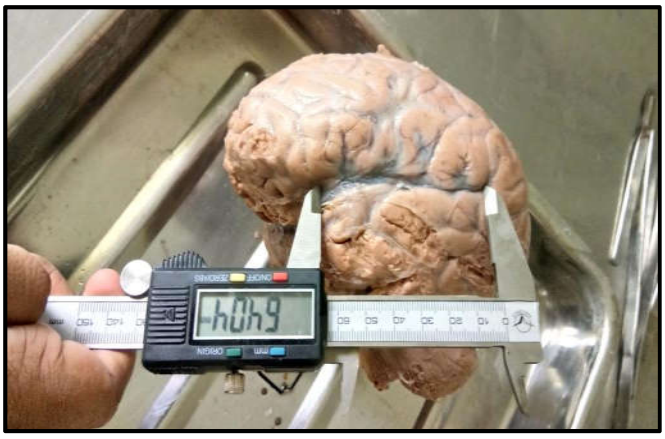


Fig 3 Sylvian Fissure (Lateral Surface)

Posterior ramus of sylvian fissure

Then from anterior sylvian point to posterior sylvian point the length of posterior ramus was recorded. Anterior sylvian point is the point where anterior horizontal limb and anterior ascending limb arises. Posterior sylvian point is the point where posterior ramus divides.

Sylvian fissure (lateral surface)

The length of sylvian fissure on lateral surface was measured adding length of stem (lateral surface) and posterior ramus.

Sylvian fissure (total length)

The total length of sylvian fissure was measured adding length of stem (total length) and posterior ramus.

Thus lengths of all segments of lateral sulcus in all the brains on both right and left side were measured.

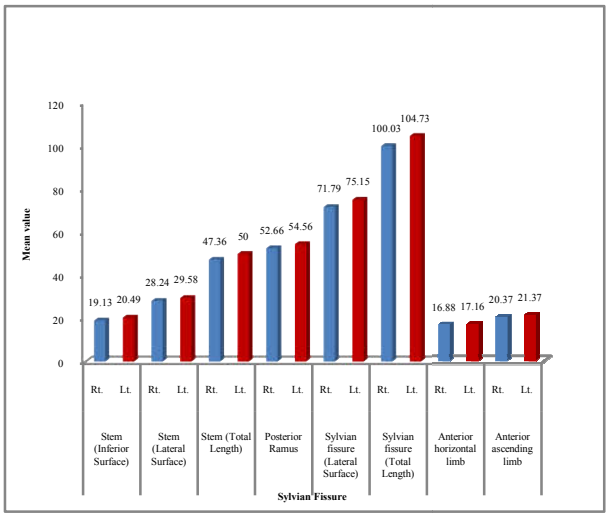
Anterior rami of sylvian fissure

The lengths of anterior horizontal and anterior ascending limbs of anterior rami were also recorded.

OBSERVATION AND RESULTS

Table 1 Sylvian Fissure –Morphometry

S.No.	Sylvian Fissure		Minimum	Maximum	Mean	SD
1	Stem (Inferior Surface)	Rt.	12.03	28.89	19.13	4.94
		Lt.	11.10	26.81	20.49	5.02
2	Stem (Lateral Surface)	Rt.	20.06	36.41	28.24	3.63
		Lt.	23.59	36.42	29.58	3.39
3	Stem (Total Length)	Rt.	34.80	64.34	47.36	6.50
		Lt.	39.69	63.23	50.00	6.05
4	Posterior Ramus	Rt.	46.83	62.32	52.66	4.00
		Lt.	48.81	61.60	54.56	3.24
5	Sylvian fissure (Lateral Surface)	Rt.	59.15	86.90	71.79	6.46
		Lt.	61.80	84.72	75.15	5.84
6	Sylvian fissure (Total Length)	Rt.	83.71	113.68	100.03	7.02
		Lt.	91.10	115.57	104.73	5.94
7	Anterior horizontal limb	Rt.	11.00	20.71	16.88	2.65
		Lt.	10.00	23.31	17.16	3.02
8	Anterior ascending limb	Rt.	14.32	29.90	20.37	3.35
		Lt.	16.50	28.00	21.37	2.91



Graph 1 Sylvian Fissure - Morphometry

Table 2 Sylvian Fissure-Morphometry (Statistics)

S.No.		p (value)	t (value)	SED
1	Stem(Inferior Surface)	0.3029	1.0399	1.308
2	Stem(Lateral Surface)	0.1518	1.4529	0.922
3	Stem(Total Length)	0.1150	1.6010	1.649
4	Posterior Ramus	0.0517	1.9877	0.956
5	Sylvian fissure (Lateral Surface)	0.0423	2.0778	1.617
6	Sylvian fissure(Total Length)	0.0080	2.7528	1.706
7	Anterior horizontal limb	0.7089	0.3753	0.746
8	Anterior ascending limb	0.2300	1.2136	0.824

The present study was conducted on 58 right and left formalin fixed human cadaveric cerebral hemispheres (29 Brains) that were obtained from the Department of Anatomy, Gandhi Medical College, Bhopal. In the present study morphometrical parameters were there to understand the normal gross anatomy with variations and asymmetry of sylvian fissure. All the parameters observed, recorded and were compared statistically and now are summarized below as $p > 0.05$, for comparing the lengths of stem (inferior surface, lateral surface, total length) on both right and left side. It indicates there is no significant difference between right and left lengths.

As $p = 0.05$, for comparing the lengths of posterior ramus on right and left side, the values are statistically significant. It indicates the mean of posterior ramus of sylvian fissure was greater on the left hemisphere.(52.66± 4 on the right and 54.56 ± 3.24 on the left.)

As $p < 0.05$, for comparing the lengths of sylvian fissure (on lateral surface, and total length) on both right and left side, the values are statistically significant. It indicates the mean of length of sylvian fissure on lateral surface was greater on the left hemisphere. (71.79 ± 6.46 on the right and 75.15 ± 5.84 on the left.) It indicates the mean of length of sylvian fissure (total length) was greater on the left hemisphere. (100.03 ± 7.02 on the right and 104.73 ± 5.94 on the left.)

As $p > 0.05$, for comparing the lengths of anterior horizontal limb and anterior ascending limb on both right and left side. It indicates there is no significant difference between right and left lengths As $p>0.05$, for comparing the length of allgyrion both right and left side. It indicates there is no significant difference between right and left lengths.

DISCUSSION

Olufemi Emmanuel *et al* (2014) studied sixty two adult cadaveric hemispheres were studied. The SF length on the right (mean=84.3mm median=88mm) was significantly shorter than that on the left (mean=89.4mm, median=92.0mm) (p=0.037). The mean length of sylvian fissure did not match with our study; however in our study also the sylvian fissure on right side was significantly shorter than the left[4]. According to Sudakshina *et al* (2015), the mean of the total length of the lateral sulcus on superolateral surface of brain on the left side was 8.48 cm. which was larger than the right side 8.39cm.The mean of the anterior horizontal rami on right side 1.97 cm. was greater than left side 1.96 cm. On the other hand the mean value of left anterior ascending ramus 2.41cm. Was greater than the mean value of right anterior ascending ramus 2.37cm.. The mean value of posterior limb of sylvian sulcus was also greater on the left side 6.43cm. Than on the right side 6.23cm. All measurements were in cms. The mean length of sylvian fissure did not match with our study; however in our study also the sylvian fissure on right side was significantly shorter than the left. The lengths of anterior ascending and anterior horizontal limb in our study matches with the above study [5].

Table 3 Comparison of Lengths Sylvian Fissure Morphometry (Sudakshina)

Sr. No.	Sylvian Fissure		According to Sudakshina et al., (2015)			Present study
			Minimum	Maximum	Mean	
1	Posterior Ramus	Rt.	3.91 cm.	7.97 cm.	6.23 cm.	52.66 ±4 mm
		Lt.	4 cm.	9.04 cm.	6.43 cm.	54.56 ±3.24 mm
2	Sylvian fissure (Lateral Surface)	Rt.	5.75 cm.	10.6 cm.	8.3 cm.	71.79 ±6.46 mm
		Lt.	5.65 cm.	11.2 cm.	8.4 cm.	75.15 ±5.84 mm
3	Anterior horizontal limb	Rt.	0.4 cm.	4.2 cm.	1.98 cm.	16.88 ±2.65 mm
		Lt.	1.1 cm.	3.6 cm.	1.96 cm.	17.16 ±3.02 mm
4	Anterior ascending limb	Rt.	0.9 cm.	4 cm.	2.37 cm.	20.37 ±3.35 mm
		Lt.	0.8 cm.	3.6 cm.	2.41 cm.	21.37 ± 2.91mm

Table 4 Comparison of Lengths of Sylvian Fissure Morphometry (Olufemi, Sudakshina & Boni [6])

S.No.	Research	Right side Mean & Range.	Left side Mean & Range.
1	Olufemi et al. (2014)	84.3 mm (30- 120 mm)	89.4 mm (37- 122 mm)
2	Sudakshina et al. (2015) Superolateral surface	8.39 cm (5.75 -10.6 cm)	8.48 cm (5.65 – 11.2 mm)
3	Boni et al. (2007)	65.11 mm	79.94 mm
4	Present Study(2017) Superolateral surface	71.79 mm (59.15 – 86.90 mm)	75.15 mm (61.80-84.72 mm)
5	Present Study (2017) Total length (Inferior surface ± Superolateral surf ace)	100.03 mm (83.71 – 113.68 mm)	104.73mm (91.10-115.57mm)

CONCLUSIONS

The measurements of stem of sylvian fissure on lateral surface and on inferior surface and stem of sylvian fissure (total length) were essential to calculate total length of sylvian fissure. In the present study, the average length of posterior ramus on left side is more than the average length of posterior ramus on right side. The average length of sylvian fissure (lateral surface) on left side is more than the average length of sylvian fissure (lateral surface) on right side. The average length of sylvian fissure (lateral surface) in the present study on left side is more than the average length of sylvian fissure (lateral surface) on right side.

The results of many previous researches correlate with result of our study. The left sylvian fissure was significantly longer than the right and both were positively correlated. In our study we conclude that anterior ascending limb is longer than anterior horizontal limb.

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