

# A Clinical Study of Anterior Sylvian Point and Use of Anterior Sylvian Point For Surface Mapping of Frontal Horn For Intraoperative Emergency Ventricular Tapping

A G Santhana Krishnan

HOD and Associate Professor, Department of Neurosurgery, Theni Medical College, Theni, Tamil Nadu, India

## Abstract

**Introduction:** Anterior sylvian point (ASyP) had a constant relationship with a point in the skull just posterior to the “H”-shaped pterion over the squamous suture called the anterior squamous point (ASqP).

**Objectives:** The objectives of this study were as follows: (1) To confirm and establish the cisternal nature of ASyP and its relationship to other important neural and sulcal structures along the sylvian fissure. (2) To confirm the relationship of the AntSyP (ASyP) with the external cranial landmark ASqP for surface mapping of frontal horn for emergency ventricular tapping.

**Materials and Methods:** Forty adult human brains (20 – right side and 20 – left side), both male and female, were observed during surgery in Government Theni Medical College. Reliability of frontal horn tapping using the apex of Paine’s triangle from ASyP as the entry point was analyzed using the following steps. Exposure of pterion by the standard FTP trauma flap incision. Standard FTP craniotomy opening of the skull and dura mater and observing for ASyP relation to ASqP. A catheter was introduced through the apex of the Paine’s triangle identified using the surgical tapes to form a 2.5 cm isosceles triangle from the ASyP. A study of the relationship of ASyP to the external cranial surface, middle cerebral artery (MCA) bifurcation, and frontal horn of ventricles was done.

**Conclusion:** It could be safely concluded that ASqP is a reliable external cranial landmark for ASyP. ASyP can be the reference point for Paine’s triangle and hence Paine’s point. Hence, Paine’s point could be used to tap the frontal horn in emergent situations. Furthermore, MCA bifurcation can be reached by ASyP cisternal dissection.

**Key words:** Anterior sylvian fissure, Anterior sylvian point, Paine’s point, Ventricular tapping

## INTRODUCTION

Historically Taylor and Haughton in their study of the topography of the convolutions and fissures of the brain published in 1900 were the first to use the term sylvian point, defining it as the point, where the main stem of the sylvian fissure (SyF) reaches the outer aspect of the hemisphere.<sup>[1]</sup>

Yasargil *et al.* (1975) described in detail this point in his later publications, in agreement with few other authors, as the point in the fissure beneath the triangular part of the inferior frontal gyrus (IFG) dividing the proximal from the distal segment of the SyF. Furthermore, the horizontal and anterior ascending rami start from this point.<sup>[2,3]</sup>

In a recent publication by Rodrigues *et al.*, (2005), a detailed study of anterior sylvian point (ASyP) was made, and the cisternal nature was observed.<sup>[4]</sup> The constant location and cisternal nature make this one of the best initial sites to open the SyF.

Furthermore, in the same study, it was proposed that the ASyP had a constant relationship with a point in the skull just posterior to the “H”-shaped pterion over the squamous

Access this article online



www.ijss-sn.com

Month of Submission : 06-2020  
Month of Peer Review : 06-2020  
Month of Acceptance : 07-2020  
Month of Publishing : 07-2020

**Corresponding Author:** A G Santhana Krishnan, A601 Golden Lotus Apartment, 1<sup>st</sup> Street Sambakulam, K. Pudur, Madurai - 625 007, Tamil Nadu, India.

suture called the anterior squamous point (ASqP).<sup>[4]</sup> In the same study, the frontoparietal operculum was mentioned as a series of convolutions roughly arranged as a V-shaped convolution with the vertex as the ASyP, three U-shaped convolutions, and one C-shaped convolution. Based on these morphoanatomical features, it was proposed to be easier to avoid eloquent areas of the brain such as Broca's motor speech area and precentral motor cortex.<sup>[4]</sup>

Dr. Paine and Badjer *et al.* (1988) proposed a point (pt) at the apex of a 2.5 cm right-angled isosceles triangle based on the SyF for a ventricular puncture at the frontal horn.<sup>[5]</sup>

The present study intends to define ASyP and Paine's point and their relation to external cranial landmarks, frontal horn, and its surgical implications in the Indian population.

**Objectives**

The objectives of this study were as follows:

1. To confirm and establish the cisternal nature of ASyP and its relationship to other important neural and sulcal structures along the SyF
2. To confirm the relationship of the AntSyP (ASyP) with the external cranial landmark ASqP for surface mapping of frontal horn for emergency ventricular tapping.

**MATERIALS AND METHODS**

Forty adult human brains (20 – right side and 20 – left side), both male and female, were observed during surgery in Government Theni Medical College.

A study of the relationship of ASyP to external cranial surface and ventricles was carried out in the following method.

The following steps were followed.

Exposure of pterion by the standard FTP trauma flap incision.

The location of ASqP from key burr hole is measured using surgical tapes. A craniotomy is completed and the dura is opened with base toward the midline. ASyP is identified, and the distance from key burr hole is measured. An analysis is made as to whether the ASqP overlaps the ASyP.

Morphoanatomy of ASyP is measured. The relationship of ASyP to bifurcation of the middle cerebral artery (MCA) was observed.

Paine's point is identified at the apex of a 2.5 cm right-angled isosceles triangle based on the SyF from ASyP.

The frontal horn of the ventricle is tapped using a ventricular cannula at Paine's point. The free flow of clear cerebrospinal fluid (CSF) is considered as successful tapping.

**RESULTS**

**ASyP**

The ASyP was located inferior to the pars triangularis and anteroinferior to opercular IFG in the SyF.

It is frequently enlarged and has a cisternal nature. The mean diameter of ASyP was 3.84 mm with a range of 1.8–5.1 mm [Table 1].

**ASyP to MCA Bifurcation**

The MCA was observed to bifurcate deeper in the sylvian cistern underneath the ASyP in most of the cases. In the rest, it was seen bifurcating immediately anterior to this point within the sylvian cistern [Table 2].

**ASqP Relationship with the ASyP**

The ASqP is defined as the point just posterior to the central bar of the pterional "H" on the most anterior segment of the squamous suture. It usually overlies the ASyP. The position of ASqP in relation to ASyP as measured from key burr hole is observed. Although there was minimal variation, it was largely within 0.5 cm and can be easily corrected for with a larger burr hole.

The following observations were made.

This confirms the finding of Rodrigues *et al.* that the ASqP can be used to identify and approach ASyP.

**Accuracy of Paine's Point in Ventricular Puncture**

This is a point at the apex of a right-angled 2.5 cm isosceles triangle with its anterior limb abutting the sphenoid ridge dura and the hypotenuse over the SyF.

Through the apex of the triangle, the ventricular puncture of frontal horn was attempted and verified by the free flow of clear CSF.

On an average in 77.5% of the patients, the ventricular puncture can be done through the Paine's point. Even in

**Table 1: Diameter of ant sylvian point**

Diameter of ant sylvian point	R	L
Less than or equal to 2 mm	1	1
2–3 mm	2	3
3–4 mm	6	8
4–5 mm	9	5
>5 mm	2	3

Average size of ASyP is 4 mm

**Table 2: Middle cerebral artery bifurcation in relation to ASyP**

Middle cerebral artery bifurcation in relation to ASyP	R	L
Directly below ASyP	16	15
Below and just anterior to ASyP	4	5

**Table 3: Ventricular puncture through Paine’s point**

Ventricular puncture through Paine’s point	R	L
Yes	16	14
No	4	6

**Table 4: Position of ASyP in relation to ASqP**

Position of ASyP in relation to ASqP	Horizontal	
	R	L
At	13	14
Anterior	4	4
Posterior	3	2

**Table 5: Position of AntSyP in relation to ASqP**

Position of AntSyP in relation to ASqP	Vertical	
	R	L
At	16	14
Superior	1	2
Inferior	3	4

the rest, the ventricular puncture was successful within 2 cm anterior to the anterior limb of the triangle at the apex.<sup>[6]</sup>

**DISCUSSION**

**ASyP**

ASyP mean diameter in this study is on an average 4 mm in accordance with Rodrigues *et al.*<sup>[7]</sup> study, and it has a cisternal nature.

As emphasized by Yasargil, the opening of SyF at this point is easy and provides immediate access to MCA bifurcation as well as to the suprasellar cisterns and lateral aspect of insula.<sup>[3,8]</sup>

Various methods of opening the SyF have been proposed by various authors. The gold standard for SyF 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.<sup>[9,10]</sup> 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 *et al.* (1987).<sup>[7]</sup>

The opening of SyF also needs to be tailored to the lesion concerned. In this context, the opening of SyF from sylvian point has been proposed by few authors.

**Paine’s Point**

The accuracy of Paine’s point<sup>[12]</sup> in ventricular puncture is 77.5%, contrary to Hyun *et al.* [Table 3].<sup>[13]</sup> Even otherwise, the ventricles can be accessed as proposed by the above authors within 2 cm anteriorly from the anterior limb of the triangle in all specimens [Tables 4 and 5].

**ASqP to ASyP Relation**

The ASqP corresponds to ASyP horizontally in 67.5% and vertically in >75%. The consistently short distance between ASqP and ASyP indicates that ASyP is related to the center of a 1.5 cm burr hole on the anterior segment of the squamous suture just behind pterion that is the ASqP.

**CONCLUSION**

In Indian population, the ASyP corresponds to the ASqP in 67.5% horizontally and 75% vertically. Furthermore, in the rest of the cases observed, the ASyP lies underneath the ASqP within 0.5 cm both vertically and horizontally. Hence, it can be corrected with a 1.5 cm burr hole easily.

The mean diameter of ASyP is 4mm. The range of ASyP diameter in the Indian population is 1.0–5.5 mm. Hence, it is safer to open at this point.

The Paine’s point also provides an approximate location for ventricular puncture in most of the cases. Even otherwise, the ventricle can be accessed within 2 cm from the anterior limb of the triangle in this study. Hence, ventricular puncture, by this way, may be used effectively to slacken the brain in the Indian population intraoperatively.

Since MCA bifurcation aneurysms are common during aneurysm clipping, ASyP offers a direct route to the underlying MCA bifurcation in most of the cases.

The knowledge of these basic anatomical features and relationship can help us in locating the ASyP through an initial burr hole centered on ASqP intraoperatively. Pre-operative 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.

**REFERENCES**

- Nagy L, Ishii K, Karatas A, Shen H, Vajda J, Niemelä M, *et al.* Water dissection techniques of toth for opening neurosurgical cleavage planes. *Surg Neurol* 1987;651:38-41.

## Krishnan: Study of Sylvian Point in Emergent Ventricular Tapping

2. Yasargil MG. *Microneurosurgery*. Vol. 4. Stuttgart: Georg Thieme; 1994.
3. Yasargil MG, Fox JL, Ray MW. *The Operative Approach: Advances and Technical Standards in Neurosurgery*. Vol. 2. Wien: Springer-Verlag; 1975. p. 114-70.
4. Steinmetz H, Ebeling U, Huang YX, Kahn T. Sulcus topography of the parieto opercular region: An anatomic and MR Study. *Brain Lang* 1990a;38:515-33.
5. Rhoton AL Jr. The supratentorial cranial space: Microsurgical anatomy and surgical approaches. *Neurosurgery* 2002;51 Suppl 4:S1-298.
6. Sekhar LN, Wright DC. Preauricular subtemporal and combined approaches to cranial base. *J Neurosurg* 1987;2:1655-66.
7. Rodrigues J, Ribas GC, Ribas EC. The anterior sylvian point and the suprasylvian operculum. *Neurosurg Focus* 2005;18:E2.
8. Yasargil MG. *Microneurosurgery*. Vol. 1. Stuttgart: Georg Thieme; 1984.
9. Aydin IH, Kadioglu HH, Tuzun Y, Kayaodu CR, Takci E. The variations of sylvian veins and cisterns. *Acta Neurochir (Wien)* 1996;138:1380-5.
10. Kamiyama K, Takizawa I, Gotoh S. Operative anatomy and classification of the sylvian veins for the distal transsylvian approach. *Neurol Med Chir (Tokyo)* 2003;43:427-33.
11. Türe U, Yasargil DC, Al-Mefty O, Yaşargil MG. Topographic anatomy of the insular region. *J Neurosurg* 1999;90:720-33.
12. Paine JT, Batjer HH, Samson D. Intraoperative ventricular puncture. *Neurosurgery* 1988;22:1107-9.
13. Hyun SJ, Suk JS, Kwon JT, Kim YB. Novel entry point for ventricular puncture during the transsylvian approach. *Acta Neurochir* 2007;149:1049-51.

**How to cite this article:** Krishnan AG. A Clinical Study of Anterior Sylvian Point and Use of Anterior Sylvian Point For Surface Mapping of Frontal Horn For Intraoperative Emergency Ventricular Tapping. *Int J Sci Stud* 2020;8(4):82-85.

**Source of Support:** Nil, **Conflicts of Interest:** None declared.