

## MORPHOMETRIC STUDY ON TYPES OF ASTERION IN DRY HUMAN SKULL OF NEPALESE ORIGIN

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**ABSTRACT****Introduction:** The asterion is important bony landmark of skull important for surgical approach to the posterior cranial fossa. The variation in type of asterion is due to presence or absence of lambdoidal suture, parietomastoid suture and occipitomastoid suture. Asterion is starry or triangular depression located 2.5cm behind the upper part of root of ear. Asterion is meeting point of lambdoidal suture, parietomastoid suture and occipitomastoid suture.**Materials and Methods:** Altogether 26 dry adult human skulls were collected from Department of Anatomy at School of Basic Sciences of Chitwan Medical College for research. Gender and ethnicity were undefined. All damaged skull and newborns are excluded. Both sides of skull were studied for location and type of asterion. The types of asterion were noted by observing the presence or absence of all three sutures. Photographs were taken and studied. Statistical analysis was done using SPSS 17.**Result:** Twenty-six human skulls of unknown gender were examined. Two types of asterion were observed. The type I asterion was 88.5 percent and type II asterion was 11.5 percent on both sides of skull.**Conclusion:** We believe that there are different types of asterion present in human skull. Asterion is the important surgical landmark. Thereby, the finding may be helpful in surgical approach and intervention.**Keywords:** Asterion; Lambdoidal suture; Parietomastoid suture; Occipitomastoid suture.**INTRODUCTION**

The skull, viewed from the side, can be subdivided into three zones: face (anterior), temporal region (middle) and occipital region (posterior). The temporal region can be divided into an upper temporal fossa and a lower infratemporal fossa, separated by the position of the zygomatic arch. The upper temporal fossa is bounded inferiorly by the zygomatic arch, superiorly and posteriorly by the temporal lines, and anteriorly by the frontal process of the zygomatic bone, and is continuous inferiorly with the infratemporal fossa deep to the zygomatic arch. The temporal lines often present anteriorly as distinct ridges but become much less prominent as they arch posteriorly across the parietal bone. The inferior temporal line becomes more

prominent as it curves down the posterior part of the squamous temporal bone, forming a supramastoid crest at the base of the mastoid process.

The mastoid process is an inferior projection of the temporal bone. It lies posteroinferior to the external acoustic meatus and is the site of attachment of sternocleidomastoid. It is in contact behind with the posteroinferior angle of the parietal bone at the parietomastoid suture and with the squamous part of the occipital bone at the occipitomastoid suture. These two sutures meet the lateral end of the lambdoid suture at the asterion. This coincides with the site of the posterolateral fontanelle or mastoid in the neonatal skull, which closes

during the second year.<sup>1</sup>

Asterion is the meeting point of lower end of lambdoid suture, parietomastoid suture and the occipitomastoid suture.<sup>2</sup> In infants, asterion is a site of mastoid fontanel or posterolateral fontanel. This closes by twelve months.<sup>3</sup> It is a depression 2.5cm behind the upper part of root of ear.<sup>4</sup>

It is triangular in shape. On the basis of presence or absence of suture, asterion can be classified as type I and type II. Type I asterion is one where all three sutures are present. Type II asterion is one where there is absence of all sutures; one or two of them. During surgical approaches asterion should be given consideration to the superficial anatomic reference points of the posterior cranial fossa. This allows the topographic location of the intracranial structures to avoid causing injury or accessing them.

The anatomic points of reference to analyse the topography of the posterolateral surface of the skull are asterion, external occipital protuberance, suprameatal crest, apex of the mastoid process, root of the zygomatic arch, Frankfurt horizontal plane, and the mastoid foramen. These reference points are of great importance in surgical procedures to locate the site where the initial trepanning will be carried out. The study of asterion morphology may be helpful to Neuro and ENT surgeon.

## MATERIALS AND METHODS

The study was conducted at Department of Anatomy in School of Basic Sciences of Chitwan Medical College. The observational, conventional and descriptive study was conducted on 26 dry adult skull bones available in Department of Anatomy of Chitwan Medical College.

The gender and ethnicity of skull were not defined. All damaged skulls and of newborns were excluded from the study. Both the sides of the skull were studied for the locations and types of the pterion. The shape and type of the pterion was noted by observing the articulation of the bones.

The photographs were taken as a document for all types of pterion on each side. Statistical analysis was done SPSS 17 and analyzed as frequency and distribution. The following criteria were observed to categorize the

different type of asterion among 26 adult skulls:

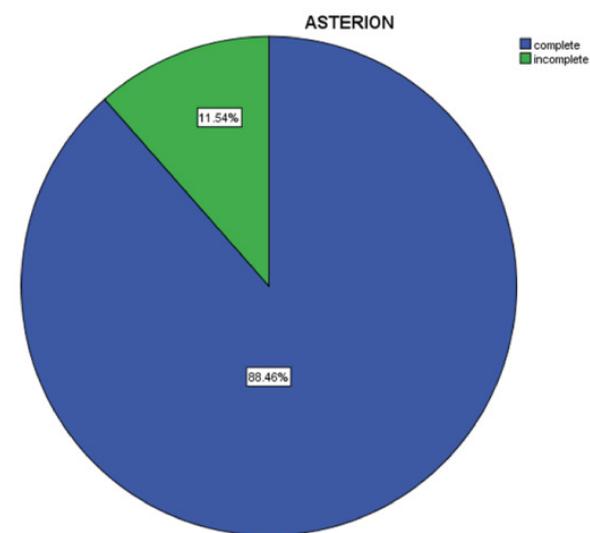
- Type I asterion is one where all three sutures are present.
- Type II asterion is one where there is absence of all sutures; one or two of them.

## RESULTS

Our observation showed that type I asterion was the most common type. The type I asterion was found in 88.5 percent of 26 dry human skull and remaining 11.5 % was type II asterion. On studying asterion, we found that type I asterion was found equally on both sides. Among 26 dry skulls, three lambdoid sutures are absent resulting type II asterion.

**Table no.1**

Type of asterion (N= 26)	Right side	Left side
Type I (N=23)	88.46%	88.46%
Type II ( N= 3)	11.54%	11.54%



**Figure 1. Pie chart showing type I (complete) and type II (incomplete) asterion.**



**Picture 1. Photograph of skull showing Type I (complete) Asterion.**



**Picture 2. Photograph of Skull Showing Type II (incomplete) Asterion.**

## DISCUSSION

The aim of present study is to determine the morphometric type of asterion in dry skull at Department of Anatomy in Basic Science Block of Chitwan Medical College. The research was oriented to determine the type of asterion of dry adult skull in Nepalese population. The type and its relation with surrounding bone is important. Such detailed information can only readily be obtained from observation of dry skull.

In present study, the type I asterion is commonest type. The type I asterion is found in 88.46 percent of and type II asterion in 11.54 percent of dry skull.

Wirakiat et al. (2021) conducted a study on forty dry human skulls at Anatomy program, Division of Healthcare and Applied Science, Hat Yai Songkala, Thailand. The results of study showed that type II asterion (61.2%) more common than type I asterion (38.8%). This difference in finding is due to difference in ethnicity and geography.<sup>5</sup>

Rajani Singh (2012) performed a study on forty dry skulls at Department of Anatomy, CSM Medical University, Luknow. The findings of research showed that type II asterion (83.64%) was more common than type I asterion (16.34%). The difference in finding may be due to dietary pattern, ethnicity and racial variation.<sup>6</sup>

Lucena et al. (2019) performed a study on thirty dry skulls at Human Anatomy laboratory of medical college of Nova Esperanca Northeast Brazil. The finding showed that type II asterion (68.33%) is more than the type I asterion (31.67%). This may be due to difference in geographical distribution, topography and racial variation.<sup>7</sup>

Mannu et al. (2018) performed a Study on fifty-five skulls at Department of Anatomy and Anatomy Museum of Saraswoti Institute of Medical Science, Hapur for five years period. It showed that only five percent of dry skull possesses type I asterion and remaining are type II asterion. The variation in finding may be due to stressful condition as well as imbalance in cranial changes in size and shape during osteogenesis.<sup>8</sup>

Hawaldar et al. (2015) conducted a study on two hundred fifty dry skulls from different regions and different college of south India. The finding showed that type II asterion is 80.8 percent and type I is 19.2 percent. The difference in finding could be due to being multicentric approach, large sample size and sample population.<sup>9</sup>

Karunakaran et al. (2021) studied forty dry skulls at Department of Anatomy of Saventha Dental College and Hospitals, Chennai. The outcome of study showed that type II asterion is common in both gender than type I asterion due to gender difference and ethnicity.<sup>10</sup>

Galido-de-leon et al. (2013) conducted a study on eighty-eight skulls at department of anatomy of school of medicine and dentistry of Universidad Anatomia de neuva, Mexico. The finding of study showed that type I

asterion (74.4%) is more common than type II asterion (25.6%). The similarity in finding may be due to similar dietary habits and geography.<sup>11</sup>

Dutta et al. (2017) studied seventy eight dry skull bones at Department of Anatomy, Ramaih Medical College, Bangalore. The findings showed that type II asterion is common than type I asterion due to presence of pathological influences like hydrocephalus and physiological processes that are genetically determined.<sup>12</sup>

Kumar S et al. (2021) conducted a study on hundred dry skulls at Department of Anatomy, Meenaski Medical College –Hospital. The study showed that type II asterion is common left side of skull than right side of skull. These variations may be due to ethnic population as well as genetic and environmental aspects.<sup>13</sup>

Modasiya P et al. (2018) conducted a study on hundred ten dry skulls at different medical colleges of Gujarat. The finding showed that type II asterion is common than the type I asterion. This may be due to environmental and genetic cause.<sup>14</sup>

**Table 2. Showing findings of past researches**

Serial no.	Country	Authors	Type I asterion	Type II asterion
1	Thailand	Wirakiat et al (2021)	38.8%	61.2%
2	India	Rajani Singh(2012)	16.36%	83.64%
3	Brazil	Lucena et al (2019)	31.67%	68.33%
4	India	Mannu et al (2018)	5 %	95%
5	India	Hawaladar et al (2015)	19.2%	80.8%
6	India	Kurunakaran et al (2021)	M:13.64% F:16.67%	M:83.36% F:83.33%
7	Mexico	Galido-de-leon et al (2013)	74.4%	25.6%
8	India	Dutta et al (2017)	13.46 %	86.54%
9	India	Kumar S et al (2021)	Right:30 % Left :24%	Right :70% Left : 76%
10	India	Modasiya et al (2018)	8.82%	91.18%
11	Present	Gulam Anwer Khan	88.46%	11.56%

## CONCLUSION

Type I asterion was common than type II asterion. The morphometry of asterion in Nepalese population is not similar to that of other population due to difference in ethnicity, geography, topography, dietary pattern and

genetic inheritance. These finding may be helpful in various surgical approaches in the field of Neuro and ENT surgery.

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