Sutural Morphology of Asterion in Dry Human Skulls

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ABSTRACT
Sutural bones are usually small, irregularly shaped bones, often found in sutures of the cranium. It is important to know about them as they may complicate the surgical orientation if present in the asterion. The study aims to observe the incidence of the sutural morphology of asterion in dry human skulls. Total 120 human adult dry skulls consisting of 80 male and 40 female skulls were analyzed for Type-I and Type-II asterions. out of 120 skulls, (n=240) Type-I asterion was observed in 36 (15%) skulls, and Type-II was observed in 204 (85%) skulls. Type-I was 28 (17.5%) in males, 8 (10.0%) in females and 36 (15.0%) in total skulls. Type-II was 132 (82.5%) in males, 72 (90.00%) in females and 204 (85.0%) in total skulls. In the present study, the incidence of Type-I asterion was found more in males than females. The study can be useful to neurosurgeons, forensic experts, anthropologists and radiologists.

MATERIALS AND METHODS
Total 120 human adult dry skulls consisting of 80 male and 40 female skulls were analyzed for Type-I and Type-II asterions. The skulls were retrieved from the Department of Anatomy, SGT medical college, Gurugram and PGIMS, Rohtak. Asterion on both sides of skulls was examined.

RESULTS
Type-I where a sutural bone was present.
Type-II is where the sutural bone was absent.
Both Type-I (Figure 1) and Type-II (Figure 2) of asterions were examined in male and female skulls. Both

INTRODUCTION
Asterion is the point where the parietal, temporal and occipital bones meet. It is the surgical landmark to the transverse sinus location, which is of immense importance in the surgical approaches to the posterior cranial fossa (Martinez et al., 2005). Sutural bones are usually small, irregularly shaped bones, often found in sutures of the cranium. These bones appear in addition to the usual centres of ossification of the cranium and are uncommonly seen (Ersoy et al., 2003). The sutural morphology was classified into two types: Type -I where a sutural bone was present and Type -II where the sutural bone was absent. It is imperative to know about these bones because they can mislead in the identification of fracture of skull bones in medico-legal cases and may confuse the surgical orientation if present in the asterion (Soames et al., 2004). Hence the study of sutural morphology of asterion was planned.
### Table 1: Incidence of Types of Asterion in Male and Female Skulls

| Gender       | Type-I     | Type-II    | Total      |
|--------------|------------|------------|------------|
| Male (n=160) | 28 (17.5%) | 132 (82.5%)| 160 (100%) |
| Female (n=80)| 8 (10%)    | 72 (90%)   | 80 (100%)  |
| Total (n=240)| 36 (15%)   | 204 (85%)  | 240 (100%) |

\[ \chi^2 = 2.353 \]

\[ p \text{ value} = 0.125 \]

### Table 2: Incidence of Types of Asterion in Males on Right and Left Sides

| Side       | Type-I     | Type-II    | Total      |
|------------|------------|------------|------------|
| Right (n=80)| 14 (17.5%) | 66 (82.5%) | 80 (100%)  |
| Left (n=80)| 14 (17.5%) | 66 (82.5%) | 80 (100%)  |
| Total (n=160)| 28 (17.5%)| 132 (82.5%)| 160 (100%)|

\[ \chi^2 = 0.000 \]

\[ p \text{-value} = 1.000 \]

### Table 3: Incidence of Types of Asterion in Females on Right and Left Sides

| Side       | Type-I     | Type-II    | Total      |
|------------|------------|------------|------------|
| Right (n=40)| 3 (7.5%)   | 37 (92.5%) | 40 (100%)  |
| Left (n=40)| 5 (12.5%)  | 35 (87.5%) | 40 (100%)  |
| Total (n=80)| 8 (10.0%) | 72 (90.0%) | 80 (100%)  |

\[ \chi^2 = 0.556 \]

\[ p \text{-value} = 0.456 \]

### Table 4: Comparative Analysis of Types of Asterion

| Author                     | Population    | No. of skulls | Type-I Asterion | Type-II Asterion |
|----------------------------|---------------|---------------|-----------------|------------------|
| (Carolineberry and Berry, 1967) | Americans     | 50            | 12%             | 88%              |
| (Gümüşburun et al., 1997)    | Turks         | 302           | 9.92%           | 90.08%           |
| (Singh, 2012)               | Indian        | 55            | 16.3%           | 83.6%            |
| (Mwachaka et al., 2009)      | Kenyan        | 79            | 20%             | 80%              |
| (Modasiya and Kanani, 2018)  | Gujarati      | 110           | 8.18%           | 91.12%           |
| Havaldar et al. (2015)       | South-Indian  | 250           | 19.2%           | 80.8%            |
| Present study               | Indian (Haryana) | 120       | 15%             | 85%              |
left and right side of the skulls were examined. Out of the total 120 skulls, Type-I asterion was observed in 36 (15%) skulls, and in 204 (85%) skulls Type-II was observed (Table 1). Out of 80 male skulls, Type-I asterion was observed in 14 (17.5%) on both right and left sides, whereas the incidence of Type-II was observed 132 (82.5%) on both left and right sides (Table 2). Out of 40 female skulls, 5 (12.5%) asterion of Type-I was found on the left side and 3 (7.5%) on the right side while on the left and right side the Type-II asterion was observed in 72 (90%) of total skulls (Table 3). In the present study, the incidence of Type-I asterion was found more in males than females.

DISCUSSION

In the present study, two types of asterion were observed, Type-I was 28 (17.5%) in males, 8 (10.0%) in females and 36 (15.0%) in total skulls. Type-II was 132 (82.5%) in males, 72 (90.00%) in females and 204 (85.0%) in total skulls. In North American skulls, Type-I was observed in 12% and Type-II in 88% skulls (Carolineberry and Berry, 1967). In another study in Turks, Type-I was observed in 9.92%, and Type-II was in 90.8% of skulls (Gümübürun et al., 1997). In the Indian population, it was reported 16.36% as Type-I and 83.64% as Type-II (Singh, 2012). In Kenyans, it was reported Type-I as 20% and Type-II as 80% Mwachaka et al. (2009) (Table 4). In the present study, the incidence of Type-I asterion was found more in males than females.

CONCLUSIONS

This study may be useful to neurosurgeons while performing surgery via craniometric point and to radiologists when interpreting radiological images of fractured skulls. It may also be useful to forensic experts and anthropologists in the identification of male and female skulls.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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