

## Overview of Anterior Nasal Spine in Cadavers and Dried Skulls: A Morphometric Study

R.D. Virupaxi<sup>1</sup>, B.P. Belaldavar<sup>2</sup>, S.M. Bhimalli<sup>3</sup>, D.P. Dixit<sup>3</sup>, S.P. Desai<sup>3</sup>

### Abstract

*Introduction:* Morphometric and morphological study of cranium can be helpful in sexual dimorphism. Cranium is the second to pelvis in determining the sexual dimorphism. Fractures of the skull bones are common. Among the fractures nasal bone fractures are more common. Then comes the maxilla and mandible. Various factors can influence the facial bone fractures. They are motor car accidents, sports injury and boxing. Many works have been done on skull bones. The contribution on the study of anterior nasal spine was very less. Only two such case reports have been reported. Considering all these factors an attempt is made to correlate the anterior nasal spine between male and female dried skulls as well as in cadavers. *Material and Methods:* The study was conducted on 32 dried skulls and in 18 cadavers. 20 male and 12 female dried skulls were segregated. The cadaveric dissection includes 13 male and 5 were female cadavers. The morphometric parameters like Vertical Length, Anteroposterior length and breadth were measured by ruler and Vernier calipers. All parameters were spastically analyzed. *Results:* All parameters were less in females as compared to males. *Conclusion:* It was observed that the mean values of vertical length(VL), breadth(BD) and anteroposterior length(AP) of nasal spine were greater than in males as compared to females which was statistically insignificant.

**Keywords:** Anterior Nasal Spine; Skull; Sexual Dimorphism.

### Introduction

For the identification of an individual, race and for the sexual dimorphism, the skull plays very crucial role. Anthropologically, the skull and its bones are second to the pelvic bones in identification of the individual [1]. Study of the skeleton using individual bones and parts of it, exhibiting sexual dimorphism has been reported among different populations [2]. Anthropological study and its knowledge of human skeleton is one of the important parameters in identification of the biological profile [3]. These include human

osteology; human growth and development including skeletal pathology. Sexual determination of the human skeletal remains has an important step in its identification. This skillful process is carried out by forensic and anatomy experts.

Krogman states that skull is the most dimorphic and easily sexed portion of skeleton after pelvis, providing up to 92% reliability [4]. Base of the skull is very thick and some bones of the skull are compactly arranged and protected. These areas of the skull tend to withstand both physical insults and inhumation more successfully than any other areas of cranium [5]. Skull bones especially facial bones are more prone to fractures [6]. Among these, nasal bone fractures are more common, and then come maxilla and mandible. The other bones involved in fractures are zygomatic and frontal bones. Facial bone fractures occur for a variety of reasons. These include motor car accidents, sports injuries, boxing and contact between players.

Many works have been done on skull bone. Very little contribution was found on the study of anterior nasal spine. Injuries to the anterior nasal spine are

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**Author's Affiliation:** <sup>1</sup>Professor and HOD <sup>3</sup>Professor, Department of Anatomy, Department of Anatomy, KLE University's J.N.Medical College, Belagavi. <sup>2</sup>Professor, Department of ENT, KLE University's J.N.Medical College, Belagavi.

**Corresponding Author:** R.D. Virupaxi, Professor and HOD, Department of Anatomy, KLE University's J.N.Medical College, Belagavi. 590010, Karnataka.  
E-mail: [rajendra.virupakshi@gmail.com](mailto:rajendra.virupakshi@gmail.com)

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also rare. Only two such case studies have been reported [7,8]. Considering all these scenario, an attempt is made to correlate the anterior nasal spine between male and female. This study would also be helpful to the otorhinolaryngologist, dental and plastic surgeons in evaluating some ailments involving the nasal spine and also in doing the operative corrections especially in cosmetic surgeries in relation to anterior nasal spine and its influencing effect on its attachment.

**Materials and Methods**

In the first part of the study, 18 adult cadavers were enrolled randomly from the department of Anatomy, J.N. Medical College, Belagavi. Among them 13 were male and 5 were female bodies. The anterior nasal spine was exposed after dissecting systematically. The columella of the nose and middle part of the upper lip including philtrum of the face were dissected. The soft tissues in the vicinity of the anterior nasal spine were teased out.

The anterior nasal spine was exposed. Nasal septum was retained and its position in relation to the nasal spine was noted.

In the second part of the study, dry skull bones were obtained from the department of Anatomy. Total of 32 dried skulls were selected randomly and they were segregated into male and female by studying the parameters like, superciliary arches, frontal eminences, weight of the skulls and muscular markings. Among them 20 were male and 12 female skulls and they were studied for the morphometry of anterior nasal spine.

Later, systematic chronological measurements of the anterior nasal spine were recorded as follows.

1. *Vertical Length (VL)*: This was taken from the tip of the anterior nasal spine to the margin of bony upper tooth socket.
2. *Breadth (BD)*: Maximum breadth which falls at the center of the anterior nasal spine.
3. *Anteroposterior Length (AP)*: From the incisive foramina to the apex of the anterior nasal spine.

**Observations**

**Table 1:** Anterior Nasal Spine Measurements in 18 cadavers (Male: 13 and Female: 5)

| S. No. | Male Measurements in mm |      |       | Nasal Septum      | Female Measurements in mm | Nasal Septum |         |      |         |
|--------|-------------------------|------|-------|-------------------|---------------------------|--------------|---------|------|---------|
|        | VL                      | BD   | AP    |                   |                           |              | Sr. No. | VL   | BD      |
| 1.     | 8.89                    | 5.91 | 6.69  | Midline.          | 1.                        | 8.94         | 3.31    | 9.87 | Midline |
| 2.     | 6.67                    | 6.55 | 7.43  | Midline           | 2.                        | 10.11        | 3.34    | 6.80 | Midline |
| 3.     | 9                       | 6.54 | 7.43  | To the left side. | 3.                        | 12.84        | 3.43    | 5.86 | Midline |
| 4.     | 12.03                   | 6.03 | 8.16  | Midline           | 4.                        | 7.95         | 5.48    | 6.63 | Midline |
| 5.     | 11.55                   | 5.53 | 10.57 | Midline           | 5.                        | 9.22         | 6.68    | 1.9  | Midline |
| 6.     | 16.81                   | 4.19 | 12.24 | Midline           | --                        | --           | --      | --   | --      |
| 7.     | 10.98                   | 4.89 | 7.76  | Midline           | --                        | --           | --      | --   | --      |
| 8.     | 10.41                   | 4.83 | 15    | To the left side  | --                        | --           | --      | --   | --      |
| 9.     | 10.98                   | 6.01 | 8.30  | Midline           | --                        | --           | --      | --   | --      |
| 10.    | 13.33                   | 5.52 | 6.51  | Midline           | --                        | --           | --      | --   | --      |
| 11.    | 15.43                   | 5.53 | 9.89  | Midline           | --                        | --           | --      | --   | --      |
| 12.    | 14.03                   | 6.53 | 6.65  | Midline           | --                        | --           | --      | --   | --      |
| 13.    | 14.44                   | 10   | 10    | Midline           | --                        | --           | --      | --   | --      |

**Table 2:** Measurement of anterior nasal spine in dried skulls. (Male:20 and Female:12)

| Sr. No. | Male Measurements in mm |    |    | Sr. No. | Female Measurements in mm |    |    |
|---------|-------------------------|----|----|---------|---------------------------|----|----|
|         | VL                      | BD | AP |         | VL                        | BD | AP |
| 1.      | 15                      | 6  | 15 | 1.      | 13                        | 5  | 18 |
| 2.      | 16                      | 4  | 12 | 2.      | 20                        | 8  | 16 |
| 3.      | 12                      | 8  | 15 | 3.      | 13                        | 8  | 12 |
| 4.      | 17                      | 4  | 17 | 4.      | 15                        | 8  | 9  |
| 5.      | 12                      | 9  | 18 | 5.      | 16                        | 9  | 12 |
| 6.      | 19                      | 6  | 16 | 6.      | 13                        | 10 | 10 |
| 7.      | 14                      | 9  | 17 | 7.      | 8                         | 6  | 7  |
| 8.      | 10                      | 7  | 12 | 8.      | 15                        | 8  | 10 |
| 9.      | 17                      | 7  | 12 | 9.      | 14                        | 8  | 13 |
| 10.     | 15                      | 9  | 12 | 10.     | 15                        | 9  | 12 |

|     |       |       |      |     |      |      |      |
|-----|-------|-------|------|-----|------|------|------|
| 11. | 12    | 7     | 13   | 11. | 8.96 | 3.40 | 9.90 |
| 12. | 15    | 8     | 13   | 12. | 7.97 | 5.50 | 6.65 |
| 13. | 14    | 6     | 16   |     | --   | --   | --   |
| 14. | 9.09  | 6.91  | 6.70 |     | --   | --   | --   |
| 15. | 10.9  | 6.02  | 8.31 |     | --   | --   | --   |
| 16. | 14.9  | 5.54  | 9.90 |     | --   | --   | --   |
| 17. | 14.04 | 6.54  | 8.98 |     | --   | --   | --   |
| 18. | 14.45 | 10.1  | 10.2 |     | --   | --   | --   |
| 19. | 13.09 | 6.54  | 6.65 |     | --   | --   | --   |
| 20. | 14.45 | 11.01 | 10.1 |     | --   | --   | --   |

## Results

### *Anterior Nasal Spine in Cadavers.*

*The following Results were Observed.*

The mean vertical length (VL) in male was  $11.9 \pm 2.86$  and that in female was  $9.8 \pm 1.86$ . The range in male and female was 6.67-16.81 and 7.95-12.84 respectively. The median obtained in both male and female was 9.7 and 8.84 respectively.

The mean breadth (BD) in male was  $6 \pm 1.39$  and in female was  $4.4 \pm 1.54$ . The range in male and female was 4.19- 10 and 3.31-6.68 respectively. The median obtained was 5.91 and 3.43 in male and females respectively.

The mean anteroposterior length (AP) in male was  $8.9 \pm 2.51$  and in female was  $6.2 \pm 2.85$ . The range in male and female was 6.51-15 and 1.9-9.87 respectively. The median obtained was 8.16 and 6.62 in both male and females respectively.

The p value in VL=0.156, BD=0.056 and in AP=0.061.

### *In Dried Skulls.*

The Following Results were Obtained.

The mean vertical length (VL) in male was  $13.9 \pm 2.44$  and that in female was  $13.2 \pm 3.52$ . The range in male and female was 9.09-19 and 7.97-20 respectively. The median obtained in both male and female was 14.24 and 13.5 respectively.

The mean breadth (BD) in male was  $7.1 \pm 1.837$  and in female was  $3 \pm 1.93$ . The range in male and female was 4-11.01 and 3.4-10 respectively. The median obtained was 6.95 and 8 in male and females respectively.

The mean anteroposterior length (AP) in male was  $12.4 \pm 3.44$  and in female was  $11.3 \pm 3.33$ . The range in male and female was 6.65-18 and 6.65-18 respectively. The median obtained was 12.1 and 11.1 in both male and females respectively.

The p value in VL=0.511, BD=0.780 and in AP=0.363.



(Antero posterior Length i.e.AP)



(Vertical Length i.e. VL)



(Breadth i.e.BD.)

**Fig. 1:** Measurement with caliper



Anterior nasal spine

Showing Anterior nasal spine



(Antero posterior Length i.e.AP).



(Vertical Length i.e. VL).



(Breadth i.e.BD.)

Fig. 2: Measurement with Scale or Ruler in dried skulls

## Discussion

It is a known fact that, the form and function of the nose are very much influenced by the arrangements of the architectural skeleton which are forming the nose. And it is also the reality that, the shape and arrangements of these are influenced by many factors including the developmental and acquired factors during the permanent formation of the skeleton. So it has becoming imperative to know some of the morphological measurements of the structures and to derive the possibilities and in turn, to have that knowledge in applied concepts, and also to extrapolate the same for clinical applications. Knowing the morphology of anterior nasal spine, helps clinician to know whether it is optimal or deviated from the normal and if so, the range of deviation.

It is undeniable fact and irony that the anterior nasal spine plays quite decisive and influencing role

to the clinicians especially while dealing with the diseases of the nose or the cosmetic surgeons like plastic, rhinoplasty and the faciomaxillary surgeons. As some of the destructive diseases especially the granulomatous diseases of the nose like the patients suffering from the lepromatous leprosy, there is high possibility of destruction of the anterior nasal spine. If the facial bones have sustained an impact injury because of fall or road traffic accidents, the anterior nasal spine may be fractured and displaced.

The position and various deviations of the anterior nasal spine influence the shape and position of the base of the columella and the attachments and direction of the nasal septum. It is going to define the projection, height and shape of the tip of the nose as well as the area of the nose gets compromised which is going to have tremendous influence on the function of the nose. Thus the cosmetic and functional problems will be challenging as well.

To correlate and correct these, one should know the fundamental appreciation of the exact position, size and shape of the anterior nasal spine so as to understand the dynamic influence of the same on the neighboring structures and to take remedial measures if possible. In this study, we have analyzed statistically the various morphometric measurements of the anterior nasal spine and these were compared in various variances in both fresh cadavers and dried skull bones. We also compared the same in the male and female cadavers and in dried skulls.

### Conclusion

It was observed that the mean values of vertical length (VL), breadth (BD) and anteroposterior length (AP) of anterior nasal spine were greater in males as compared females which was spastically insignificant. We would like to conclude that this study is going to thrust the insight into the various dimensions of the anterior nasal spine and in turn will significantly influence the understanding and application of the same in clinical scenario whenever needed. We also would like to mention that this is the unique rare study being done in this part of the country.

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