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Morphometric Analysis of Antegonial Notch and Posterior Ramus Flexure – its Clinical Significance

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ABSTRACT

Mandible bone is the largest and the strongest bone present in the human face. It is a lower jaw bone that is present beneath the maxilla. It holds the lower teeth. Mandible bone is formed from the first pharyngeal arch during its intrauterine life. This bone provides maximum attachment of muscle of mastication and facial expression. The body of the mandible has 2 borders. Ramus of the mandible is a prominent projecting back parts of the horse shoe shaped lower jaw bone. The antegonial notch is present in the inferior border of the mandible at the junction between the ramus and body of the mandible. At the level of the molar occlusal surface there is distinct angulation of the ramus of mandible in its posterior border. This type of angulation on the posterior border is known as posterior ramus flexure. The aim of this research is to morphologically analyse the antegonial notch and posterior ramus flexure and its clinical importance. Fifty-one dry adult human mandibles of unknown sex collected from the Department of Anatomy of Saveetha Dental College. For each mandible, detailed measurements of Antegonial notch and Posterior ramus flexure were taken. There is a presence of 3 types of Antegonial notch and 3 types of Posterior ramus flexure that were discovered and measured separately in fifty-one dry adult human mandibles of unknown sex. The shape, size and the position of the antegonial notch and posterior ramus flexure can be used as one of the tools as an indicator for Sexual Dimorphism. Other researchers have found many indicators for sexual dimorphism as a tool to identify the sex, age, race, etc. There is various evidence that represent and identifies the difference between sex, age and gender and many anatomical features supports it.

KEY WORDS: ANTIGONIAL NOTCH, POSTERIOR RAMUS FLEXURE, SEXUAL DIMORPHISM, MANDIBLE MEASUREMENTS.

INTRODUCTION

Mandible bone is the largest and the strongest bone present in the human face. It is a lower jaw bone that is present beneath the maxilla. It holds the lower teeth. Mandible bone is formed from the first pharyngeal arch during its intrauterine life. This bone provides maximum attachment to the muscle of mastication (Sella-Tunis et al., 2018). Ramus of the mandible is a prominent projecting back parts of the lower jaw bone (Raj and Ramesh, 2013). It has four sides, two surfaces, four borders and two processes. The two important processes are the coronoid and the condyloid process (Isaac and Holla, 2001). These two processes are separated by the mandibular notch. It is a deep semilunar depression. The mandibular ramus is almost vertical in adulthood but more oblique in old age (Vignesh, Babu and Mohanraj, 2018). The anterior part of the ramus can be used as the donor site for reconstruction of small bone defects in

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the Oral and maxillofacial region (Radlanski, Renz and Klarkowski, 2003). The mandible has two foramen, the mandibular and mental foramen. Males generally have a stronger and larger mandible than females (Loth and Henneberg, 2001).

When describing the mandible bone, various researchers have studied the importance of various anatomical structures that are present in the mandibles. The relationship of lingula to the inferior alveolar nerve, which enters the mandibular foramen and supplies the structures of the lower jaw is of clinical significance to the dental surgeons (Nirmale et al., 2012). The spatial relationship of the mandibular canal to the posterior teeth in dried human mandible (Denio, Torabinejad and Bakland, 1992). The remodeling process of the condylar processes a clinical sense that can be looked upon as restitutions in children and adjusting or functional in adults (Hollender and Lindahl, 1974). Position of the mandibular foramen is responsible for an occasional failure of block to the inferior alveolar nerve (Nicholson, 1985). The mental foramen is an important landmark when considering placing implants in the foraminal region (Greenstein and Tarnow, 2006).

Antegonial notch and Posterior ramus flexure are such anatomical structures that are present in the mandibles. The antegonial notch is located in the inferior border of the mandible at the junction between the ramus and body of the mandible (Kolodziej et al., 2002). The actions of elevators and depressors muscles that helps in the mastication process during growth causes the distinctive antegonial notching in the mandible (Madhavan, Dhanraj and Jain, 2018) (Singer, Mamandras and Hunter, 1987). At the level of the molar occlusal surface there is distinct angulation of the ramus of mandible in its posterior border. This type of angulation on the posterior border is known as posterior ramus flexure (Hill, 2000). With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration the aim of this study was to morphometrically analyse the antegonial notch and posterior ramus flexure of mandible and its clinical importance.

MATERIAL AND METHODS

Fifty-one dry adult human mandibles of unknown sex collected from the Department of Anatomy of Saveetha Dental College. For each mandible, detailed measurements of Antegonial notch and Posterior ramus flexure were taken. The sides are named separately. Due to the formation of the triangular shape that these sides form, they were classified under 3 different categories.

A) Three types of Antegonial Notch
Type 1 → Asymmetrical posterior notch
Type 2 → Symmetrical notch
Type 3 → Asymmetrical anterior notch

B) Three types of Posterior Ramus Flexure
Type 1 → Posterior ramus flexure is flexed at the level of the occlusal surface of the molars.
Type 2 → Posterior ramus flexure is straight juvenile shape.
Type 3 → Posterior ramus flexure is flexed above the occlusal level near the neck of the condyle.

All measurements and the frequency of occurring were tabulated and statistically analyzed.

RESULTS AND DISCUSSION

Both the Antigonial notch and posterior ramus flexure is measured and the frequency of occurring is made into a tabular column.

A) For Antegonial Notch

Table 1. Frequency of individual types of Antigonial notch in mandible observed on right and left side

	LEFT	RIGHT
TYPE 1	29 (56.86%)	24 (47.05%)
TYPE 2	18 (35.29%)	21 (41.17%)
TYPE 3	4 (7.84%)	6 (11.76%)
TOTAL	51 (100%)	51 (100%)

B) For Posterior Ramus Flexure

Table 2. Frequency of individual types of Posterior ramus flexure in mandible observed on right and left side

	LEFT	RIGHT
TYPE 1	27 (52.94%)	25 (49.01%)
TYPE 2	5 (9.80%)	8 (15.68%)
TYPE 3	19 (37.25%)	18 (35.29 %)
TOTAL	51 (100%)	51 (100%)

The antegonial notch is present in the inferior border of the mandible at the junction between the ramus and body of the mandible, immediately anterior to its angle knowledge about anatomy of the antegonial notch may be useful for surgeons during reconstructive and plastic surgery procedures on the body of the mandible. In one of the articles, titled as Typology of the antegonial notch in the human mandible, the authors viewed 251 human caucasian, european mandible, where Type - 3 has the highest frequency whereas Type - 1 has the lowest frequency and Type - 2 occurred more or less equal to Type - 3 (Porwolik et al., 2015). In our study we found more of Type 1 type.

At the level of the molar occlusal surface there is distinct angulation of the ramus of mandible in its posterior border (Balci, Yavuz and Cagdir, 2005). This type of angulation on the posterior border is known as posterior ramus flexure. This flexure appears as a male developmental trait because it is only manifest consistently after adolescence. In females the posterior border of the ramus retained a straight shape (Loth and Henneberg, 1996). In our observation most of the posterior ramus flexure occurs at the level of occlusal surface (Type 1) followed by flexure near the neck of mandible (Type 3) and straight juvenile type was found the least (Type 3).

Other researchers have found many indicators for sexual dimorphism as a tool to identify the sex, age, race, etc (Kumar and Babu, 2016). There is various evidence that represent and identifies the difference between sex, age and gender and many anatomical features supports it (G, Gowri S R and J, 2013). Therefore, this research proves that the shape, size and the position of the antegonial notch and posterior ramus flexure can be used to classify the mandible into 3 types.

CONCLUSIONS

It can be analyzed that both the Antigonial notch and the posterior ramus flexure can be used to classify the mandible further study using sexed mandible is recommended to use these features as an indicator for the sexual dimorphism. By viewing the shape and size of the human mandible parts, i.e. the curvature of the antigonial notch and the distinct angulation, various parameters like sex, age, race, etc can be estimated.

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Conflict of Interest: The author declares that there is no conflict of interest in the present study.

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