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ORIGINAL ARTICLE

Morphological Variations of Sigmoid Notch Using Orthopantomogram among Patient Reporting at Sandeman Provincial Hospital, Quetta

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ABSTRACT

Objective: To assess the Morphological variations of sigmoid notch using orthopantomogram in adult patients

Study design: Cross sectional study

Place and duration of study: Department of Orthodontics, Dental Section, Sandeman Provincial Hospital, Quetta, from June 2020 to December 2020.

Material and methods: All the adult patients who fulfilled inclusion criteria were included in this research project after screening according to selection criteria.200 candidates were included and underwent Orthopantomogram for evaluation of morphological variations of sigmoid notch. Reports were assessed and morphological variations were noted. Data was analyzed by using SPSS. ver.20.

Results: The mean age of candidates was 25.5 ± 5 years. There were 129 (64.5%) male candidates and 71 (35.5%) were female candidates. The males to female ratio was 1.8:1. Out of 200 candidates, left side was involved in 100 (50%) candidates and right side was involved in 100 (50%) candidates. Out of 200 cases, wide sigmoid notch was observed in 115 (57.5%) candidates, sloping sigmoid notch was observed in 59 (29.5%) candidates and round sigmoid notch was observed in 26 (13.0%) candidates.

Conclusion: In our study, we observed the most common sigmoid notch shape was observed to be wide type followed by sloping type.

Keywords: Morphology, Variations, Sigmoid notch, Orthopantomogram, Orthodontics

INTRODUCTION

Sigmoid notch is the deficiency between the coronoid and the condylar process. The shape of the notch depends on the shape of these processes. The margins and medial surface of coronoid process give attachment to temporalis muscle. Secondary accessory cartilage appears in the region of the coronoid process by about 10 to 14 weeks of intrauterine life. This secondary cartilage of coronoid process is believed to grow as a response to the developing temporalis muscle. The coronoid accessory cartilage becomes incorporated into the expanding intramembranous bone of the ramus and disappears after birth. [1, 2]The shape of the coronoid process and sigmoid notch is useful in anthropological studies and forensic dentistry. Literature review shows that the morphological variation in the shape of coronoid process and sigmoid notch may be due to hereditary or functional changes and have a correlation with the mode and degree of the attachment of temporalis muscle. [3]

Different morphological variations of the sigmoid notch (wide, round and sloping) have been documented in literature as indispensable aids in anthropological and forensic studies. These variations occur either due to the genetic background or due to functional changes that occur with the progression of growth. Till date most of these studies have been done using the dry mandibles obtained from the cadavers of the deceased individuals. [3-5]Morphologic variations are produced by corresponding developmental variations through hereditary determinants and functional changes that take place during the growth process. Muscle and bone may dynamically affect the function of each other and lead to change in the morphology of the bone involved. The variation in shape of the sigmoid notch depends upon the shape of the coronoid and condylar process.[6]

Various morphological shapes of the three selected entities has been illustrated and the most common shape of the coronoid process was observed to be triangular and that of sigmoid notch was the wider form. Whereas the condylar shape commonly observed among the males and females were angled and round shapes respectively. These variations when compared on both the sides had shown no statistical significance.[7] Radiographs play an essential role in forensic dentistry to uncover the hidden facts that cannot be easily noticed by regular physical examination. Maxillofacial radiography by means of orthopantamogram is used as a routine screening tool in the diagnosis and treatment planning in various fields of dentistry and is found to be less expensive when compared to other advanced imaging modalities like computed tomography, magnetic resonance imaging and core-beam computed tomography.[8]

This study was planned to assess the morphological variations of sigmoid notch using orthopantomogram in adults. Such research in future will help us to provide data about the application of orthopantomogram for determination of morphological variation of sigmoid notch in adults, as no study has been done in Pakistan before. By this study we will be able to see the most common type of sigmoid notch in local population which can be helpful in planning treatment protocols of local population in future.

Objective: To assess the morphological variations of sigmoid notch using orthopantomogram in adult patients.

MATERIALS & METHODS

This cross sectional study was done at Department of Orthodontics, Dental Section, Sandeman Provincial Hospital, Quetta for 6 months, from June 2020 to December 2020. Total sample size calculated 200 using WHO formula for sample size calculation, keeping the confidence interval at 95%, margin of error at 6%and percentage of round sigmoid notch as 24.3%. [9]Patients were included through Non probability consecutive sampling technique. The samples were from the population of Balochistan. The inclusion criteria followed the given characteristics involving both male and female patients 'age between 16-35 years; with non syndromic adult patient. The informed consent was taken and Orthopantomogram was applied.. Patients with fracture of sigmoid notch, head and neck carcinoma, previous surgery of sigmoid region, plastic surgery, developmental anomaly were excluded from the study. Then candidates underwent 2 - dimensional view Orthopantomogram by a single radiologist to evaluate the morphological variation in sigmoid notch. All reports were evaluated and discussed with consultant dentist. Type of sigmoid notch was assessed as round, sloping and wide. Data was analyzed using SPSS version 20.Numeric variables like age, was presented as mean and standard deviation while categorical

variables like gender and morphological variation in sigmoid notch were presented as frequency and percentage.

RESULTS

The mean age of candidates was 25.5 ± 5 years. There were 129 (64.5%) male candidates and 71 (35.5%) were female candidates. The male to female ratio was 1.8:1. Out of 200 candidates, left side was involved in 100 (50%) candidates and right side was involved in 100 (50%) candidates. Table 1

Out of 200 cases, wide sigmoid notch was observed in 115 (57.5%) candidates, sloping sigmoid notch was observed in 59 (29.5%) candidates and round sigmoid notch was observed in 26 (13.0%) candidates. Fig 1

Among males, wide sigmoid notch was observed in 72 cases, sloping sigmoid notch was observed in 38 cases while round sigmoid notch was observed in 19 cases. Among females, wide sigmoid notch was observed in 43 cases, sloping sigmoid notch was observed in 21 cases while round sigmoid notch was observed in 7 cases. The difference in both genders was insignificant (p-value > 0.05). Table 2

Among candidates with left side involved, wide sigmoid notch was observed in 69 cases, sloping sigmoid notch was observed in 21 cases while round sigmoid notch was observed in 10 cases. Among candidates with right side involved, wide sigmoid notch was observed in 46 cases, sloping sigmoid notch was observed in 38 cases while round sigmoid notch was observed in 16 cases. The difference in both genders was significant (p-value < 0.05). Table 3

Table 1: Baseline features of patients

N	200
Age (years)	25.5 ± 5
Gender	
Male	129 (64.5%)
Female	71 (35.5%)
Anatomical side	
Left	100 (50%)
Right	100 (50%)

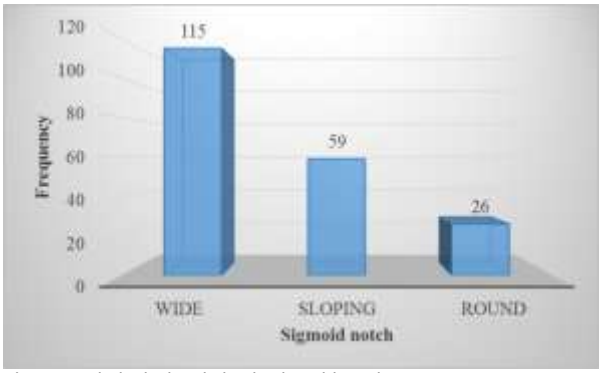

Fig 1: Morphological variation in sigmoid notch

Table 2: Difference in both genders for morphological variation in sigmoid notch

Variation	Male	Female	Total
Wide	72	43	115 (57.5%)
Sloping	38	21	59 (29.5%)
Round	19	7	26 (13.0%)
Total	129	71	200

Chi-square = 1.015, p-value = 0.6019

Table 3: Difference in lateral side for morphological variation in sigmoid notch

Variation	Left	Right	Total
Wide	69	46	115 (57.5%)
Sloping	21	38	59 (29.5%)
Round	10	16	26 (13.0%)
Total	100	100	200

Chi-square = 10.88, p-value = 0.0043

DISCUSSION

Mandibular condyle is a bony ellipsoid structure connected to ramus by narrow neck. It is approximately 20mm long medio-laterally and 8-10 mm thick antero-posterioly. Variations in the size and shape of condyle may be physiological or pathological. The superior aspect of condyle may be flattened, rounded or convex whereas mediolateral aspect is convex. Several studies have attempted to evaluate the morphology of the human condyles and coronoid process and sigmoid notch. [7, 10, 11]

In our study, we observed that out of 200 cases, wide sigmoid notch was observed in 115 (57.5%) candidates, sloping sigmoid notch was observed in 59 (29.5%) candidates and round sigmoid notch was observed in 26 (13.0%) candidates.

Ashwinirani et al., observed that out of 736 cases, wide sigmoid notch was observed in 308 (41.8%) candidates, sloping sigmoid notch was observed in 249 (33.8%) candidates and round sigmoid notch was observed in 179 (24.3%) candidates.[9] Bony morphological differences in the radial sigmoid notch affect the stress distribution pattern through the distal radioulnar joint.[12]

We compared both genders for distribution of type of morphological variations of sigmoid notch. We observed that among males, wide sigmoid notch was observed in 72 cases, sloping sigmoid notch was observed in 38 cases while round sigmoid notch was observed in 19 cases. Among females, wide sigmoid notch was observed in 43 cases, sloping sigmoid notch was observed in 21 cases while round sigmoid notch was observed in 7 cases. The difference in both genders was insignificant (p-value > 0.05) and both genders showed almost similar pattern of variation of sigmoid notch.

Ashwinirani et al., observed that the sigmoid notch most commonly observed was wide form followed by sloping and round form in both the gender. These variations when compared between gender and sides had shown no statistical significance differences.[9]

We compared both lateral sides underwent orthopantomogram for distribution of type of morphological variations of sigmoid notch. We observed that among candidates with left side involved, wide sigmoid notch was observed in 69 cases, sloping sigmoid notch was observed in 21 cases while round sigmoid notch was observed in 10 cases. Among candidates with right side involved, wide sigmoid notch was observed in 46 cases, sloping sigmoid notch was observed in 38 cases while round sigmoid notch was observed in 16 cases. The difference in both sides was significant (p-value < 0.05).

A suitable treatment plan requires an accurate diagnosis. The conventional imaging modalities used to assess the mandible includes various radiological methods like orthopantamogram, lateral & posterior-anterior cephalogram etc., to assess the macroscopic aspects.[13] These modalities assess changes in morphology of mandible however they allow only two-dimensional visualization of the mandible. More recently core-beam computed tomography has been proposed as promising radiographic technique in the field of temporomandibular joint imaging.[14, 15] In one study, orthopantamogram was not able to define the changes at the sigmoid notch, it was the cone-beam computed tomography finding which allowed the visualization of the sigmoid notch alterations. Thus, it signified the role of core-beam computed tomography in accurate diagnosis of bony morphology.[16]

Another study published by Nagaraj et al., concluded sloping type of sigmoid notch was the most common among Bengaluru population, which is in accordance with the present study.[10] The studies published by Sahithi et al., concluded that the most common variation of sigmoid notch was wider form followed by round and sloping form which was not in consonance with our study.[7] The morphological variations in sigmoid notch were not statistically significant among males and females in the present study, which was similar to the studies published by Nagaraj et al., and Sahithi et al.[7, 10]

Kanjani et al., observed that the sloping shape of the sigmoid notch was most commonly found (43%), followed by wide

(37.66%) and round shape (19.25%). The most common shape of condyle observed was round (46.12%), followed by angled (29.29%), convex (21.95%), and flat shape (2.62%). The distribution of sigmoid notch and condylar shape variations among right and left sides was not statistically significant.[17]

CONCLUSION

In our study, we observed the most common sigmoid notch shape was observed to be wide type followed by sloping type. The findings have shown that, due to its ready availability in many clinical environments, the variations in the morphology of the sigmoid notch on orthopantomogram can tentatively be used as a screening method.

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