



ORIGINAL ARTICLE

Reveal the concealed – Morphological variations of the coronoid process, condyle and sigmoid notch in personal identification



Dathar Sahithi*, Sudhakara Reddy, D.V. Divya Teja, Jyothirmai Koneru, Kotu Nagavenkata Sai Praveen, R. Sruthi

Department of Oral Medicine and Radiology, Vishnu Dental College, India

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KEYWORDS

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Abstract: *Objective of the study:* The study was conducted to evaluate different morphological variations of the coronoid process, the condyle and the sigmoid notch using panoramic radiographs for personal identification.

Materials and methods: The study was carried out using 200 digital orthopantomographs (OPGs) comprised of both sexes; and the different shapes of the coronoid process, condyle and the sigmoid notch were traced on projection sheets for both the right and left sides and the data obtained were subjected to statistical analysis.

Results: The current study has illustrated various morphological shapes of the three selected entities 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.

Conclusion: The present study has tried to unfold the unknown aspects pertaining to our ethnic group for identification of a person by means of panoramic radiographs. The results have exemplified that the variations in the morphology of the coronoid process, condyle and the sigmoid notch using panoramic radiography can tentatively be used as a screening tool in human identification owing to its ready availability in most of the hospital settings.

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* Corresponding author at: Department of Oral Medicine and Radiology, Vishnu Dental College and hospital, Bhimavaram, West Godavari District, Andhra Pradesh, India. Tel.: +91 9581319318.

E-mail addresses: sahithi.dathar9@gmail.com (D. Sahithi), sudhakareddyomr@gmail.com (S. Reddy), divyateja.dalli@gmail.com (D.V. Divya Teja), sp.kotubds@gmail.com (K.N. Sai Praveen), sruthi.rayapureddy@gmail.com (R. Sruthi).

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1. Introduction

Identification of an individual has always been a prerequisite not only to certify the death but also for various personal, civil and legal aspects pertaining to the individual's identity. For decades DNA matching, and fingerprint analysis have facilitated in identification of a person.¹ But human identification actually becomes difficult and challenging when the carcass is completely charred and skeletonised. In such circumstances anthropological and dental analyses play a key role in determining the individual's identity.⁴

The human mandible is considered as the largest and strongest bone in the face, it consists of two ascending rami one on either side that in turn bears the coronoid and condyle process. The coronoid process is a flat triangular plate that projects upwards and slightly forwards,² whereas the condyle is a rounded projection that articulates with the glenoid fossa of the temporal bone. The sigmoid notch; also called the mandibular notch is a deep notch separating the coronoid process and the condyle.²

Different morphological variations of the coronoid process (triangular, round, beak/hook and flat)³, condyle (angled, round, convex and flat)⁵ and the sigmoid notch (wide, round and sloping)³ 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.

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 orthopantomogram is used as a routine screening tool⁶ 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 CT, MRI and CBCT. In a panoramic image, different shapes of the coronoid process, condyle and sigmoid notch can often be appreciated and thus this radiographic data when available as ante mortem records and correlated with the post-mortem records can thereby aid in the identification of a person either living or dead. The need for this study was to accomplish more accessible means for personal identification by comparison of various morphological patterns of the coronoid process, condyle and sigmoid notch with the help of panoramic radiographs pertaining to our geographic area.

In this regard, the present study was undertaken to depict various morphological disparities of the coronoid process, condyle and sigmoid notch in our ethnic group so as to aid in personal identification.

2. Methodology

A retrospective study was carried out using 200 digital orthopantomograms (OPGs), which were obtained from the archives of the Department of Oral Medicine and Radiology, Vishnu Dental College and Hospital, Bhimavaram, Andhra Pradesh, India.

All the digital OPGs were taken by Orthoralix machine and PSP sensors (Digora) under standard exposure parameters as recommended by the manufacturer and the final images were

obtained by Digora software (Digora for Windows 2.7.103.437). The print outs of these images were taken and were traced over projection sheets with the help of the viewer box. All the OPGs recorded by correct means and appropriate techniques without any distortions were included in the study and those with the presence of any developmental defects of the mandible, trauma or any other diseases affecting the bone were excluded from the study. The radiographs thus obtained were subjected for the assessment of the various morphological shapes of the coronoid process, condyle and sigmoid notch (see Figs. 1–4).

The various shapes of the coronoid process and sigmoid notch were interpreted as given by Shakya et al.³ and those of the condyle were interpreted according to Hegde et al.⁵

These shapes were recorded for both right and left sides using each panoramic image including both the sexes. Thus a total of 400 sides were evaluated and compared for both sides and between both the sexes.

3. Results

Of 200 digital OPG images obtained, corresponding to 400 sides among which, 84(168 sides) were of males and 116(232 sides) were females. The mean age for the males was as 36.45 ± 15.2 and for females as 34.81 ± 15.93 .

Among all 200 panoramic images consisting of 400 sides, the most common shape for coronoid process was observed as triangular (215) which was distributed as 105(48.8%) on the right side and 110(51.2%) on the left side. The next shape was found to be the round (143), of which 75(52.4%) were on the right side and 68(47.6%) on the left side and then followed by the beak shape (34), of which 16(47.1%) were on the right side and 18 (52.9%) on the left side. The least common shape observed for the coronoid process was flat (8), which was equally distributed on both sides. The distribution of the shapes of the coronoid process among the right and left sides had shown no statistical significance (p value = 0.90) as illustrated in Table 1.

The shape of condyle frequently observed was round (157), of which 76(48.4%) were on the right and 81(51.6%) on the left side. The next observed shape was angled (142) that were equally seen on both the sides, followed by convex shape (85) which was more or less equally distributed on both sides. The flat shape (16) of the condyle was least observed with 10 (62.5%) and 6(37.5%) on the right and left sides respectively. The distribution of condylar shape among right and left sides had shown no statistical significance (p value = 0.76) as depicted in Table 2.

The shape of the sigmoid notch commonly observed was the wide form (174), distributed as 86(49.4%) on the right and 88(50.6%) on the left side. The next shape commonly observed was round (133) with almost equal distribution on both sides and lastly the sloping form (93) with 48(51.6%) and 45(48.4%) on the right and left sides respectively as shown in Table 3.

The most commonly observed shape of coronoid process among the males and females was found to be triangular (47 on the right side, 50 on the left side among the males; and 58 on the right side and 60 on the left among the females) followed by round (30 on the right side, 25 on the left side in males; and 45 on the right and 43 on the left in females) and beak shapes (7 on the right side and 9 on the left in males;

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