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COMPARISON OF CONVENTIONAL IMAGING TECHNIQUES VERSUS CONE BEAM COMPUTED TOMOGRAPHY (CBCT) IN THE MEASUREMENT OF GONIAL ANGLE IN NORMODIVERGENT INDIVIDUALS

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ABSTRACT

BACKGROUND : Conventional radiographic techniques have intrinsic shortcomings, as it is a two-dimensional (2D) projection of a three-dimensional (3D) structure that results in a distorted, enlarged image. Technical errors due to improper patient positioning and the X ray apparatus also contribute to image distortions. Additionally, an acute lack of data exists regarding standard population norms for 3D CBCT volumes. Patients therefore may be unnecessarily subjected to increased radiation exposure associated with conventional imaging techniques.[5]The possibility that 3D imaging techniques like Cone Beam Computed Tomography (CBCT) can supplement or replace conventional imaging modalities has not been examined, and the degree of agreement between the two methods has not been established.

OBJECTIVES :

(i) To determine the gonial angle (GoA) measured from the tangent to the posterior border of the ramus and tangent to the lower border of the mandible in adult normodivergent patients

(ii) Compare the value of gonial angle across Cone Beam Computed Tomography (CBCT), lateral cephalogram (LC) and orthopantomograph (OPG)

MATERIALS AND METHODS:

The sample group comprised of 24 healthy individuals aged 15-30 years visiting the Department of Orthodontics and Dentofacial Orthopedics, SDM Dental College, Dharwad, undertaking orthodontic treatment and requiring pre-treatment radiographic imaging in the

form of lateral cephalogram, orthopantomograms, intra oral periapical radiographs and Cone Beam Computed Tomography images of the jaws.

A written, informed consent was obtained from these individuals for their willingness to participate in the study. A series of imaging techniques comprising lateral cephalogram, orthopantomogram (OPG) and CBCT radiographic images were taken for each patient and evaluated to assess and compare values of gonial angle across the different imaging modalities.

RESULTS : The results of the current study indicated a high similarity in the quantitative mean value of Gonial angle . There was no statistically significant difference between the modalities as follows : 125.42° +/- 3.45 SD on lateral cephalogram, 125.26 °+/- 3.54 SD and 125.78° +/- 4.43 SD as the values of right and left gonial angles measured via OPG , and 125.82° +/- 4.18 SD and 125.85° +/- 4.59 for the right and left gonial angles as captured by 3D imaging, CBCT. The results revealed a significant correlation between the cephalometric, panoramic and CBCT reconstructed image values values which concludes that CBCT is as reliable as predicting Gonial angle as the commonly used LC and OPG.

CONCLUSION: A comparison of across the the two dimensional and three dimensional imaging modalities revealed no statistically significant differences in the quantitative value of the GoA as measured across the points articulare, menton and gonion. The standard norms as used for the conventional techniques like LC and OPG can thus be applied to the utilisation of CBCT reconstructed images in diagnosis for a homogenous population. However, studies on a diverse population range would provide more comprehensive data.

Clinical Relevance : With the rising popularity of three dimensional imaging in dentistry and orthodontics in particular, there exists a lack of information in the proper application and integration of 3D imaging modalities into routine practice. This study shows that a CBCT reconstructed image can thus be considered as an effective resource in the measurement of quantitative values like gonial angle, similar to that of the earlier used LC and OPG, when applied to a homogenous population, using similar standard norms and the presence of an exisiting CBCT volume in patient data. This can thus, minimise the need for additional conventional cephalograms.

Keywords : Gonial angle; Cone Beam Computed Tomography; Lateral cephalogram ; orthopantomogram; Three-dimensional radiographic imaging;mandible