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Original Article

COMPARISON OF SKELETAL AND ALVEOLAR MEASUREMENTS IN DIFFERENT SKELETAL PATTERNS USING PANOROMIC RADIOGRAPH AND LATERAL CEPHALOGRAM IN SOUTH RAJASTHAN POPULATION

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ABSTRACT:

Aim: The aim of this study is to determine the skeletal and alveolar measurement in different skeletal patterns using panaromic radiograph and lateral cephalogram

Objective: To find correlations between orthopantomographs and lateral cephalogram linear and angular measurements

To find significant difference between the values of horizontal ,vertical and average growth pattern

To check the possible application and reliability of OPG to determine treatment plan

Methodology:

The study was set up in Daswani Dental College & Research Centre, Ranpur, Kota. we included 90 untreated adults of south rajasthan population visiting the Department of Orthodontics And Dentofacial Orthopaedics will be included in the study as per the inclusion and exclusion criteria

Result:

There is a statistically significant relationship between opg and lateral cephalogram

Keyword: Skeletal and Alveolar,Skeletal Patterns,Panoromic Radiograph and Lateral Cephalogram

INTRODUCTION

The advent of lateral cephalogram in 1931 by Broadbent in United States and Hofrath in Germany provided both a clinical and a research tool to assess the underlying skeletal disproportions the discovery of panoramic technique by Paatero in 1952, dentists have used it in a variety of dental specialties. Panoramic radiography provides the clinician with a comprehensive view of maxillofacial complex with relatively reduced radiation exposure[1].despite the fact that newer techniques such as computed tomography(CT) and magnetic resonance imaging (MRI) can provide more accurate information ,panoramic radiography is more commonly performed,as it produces less radiation compared to CT and MRI[4].

Cephalograms and orthopantom ogram are routinely taken for every orthodontic patient. The goal of cephalometric analysis is to evaluate the horizontal and vertical relationship of 5 major functional components of the face: cranium and cranial base, skeletal maxilla, skeletal mandible, the maxillary dentition and alveolar process and the mandibular dentition and alveolar process.The vertical relationship of these structures is as important as the horizontal relations, as the treatment plan as well as the outcome is affected by the vertical relationships and the growth pattern of the patient. The gonial angle is an important angle of the craniofacial complex.[3]

To analyze morphology and treatment effects, the most commonly used radiographs are lateral and posteroanterior cephalograms, oblique mandibular radiographs, and orthopantomograms . The cephalometric analysis on a lateral cephalogram consists of a combination of distances and angles, constructed from craniofacial anatomical landmarks (Sekiguchi and Savara, 1972; Athanasiou, 1995; Trpkova et al., 1997).

There are three basic types of facial vertical growth pattern: hypo-divergent , normo-divergent , and hyper-divergent growth patterns.[6]The hyper-divergent pattern is typified by excessive vertical facial growth. It is usually associated (SN)–mandibular plane (MP) angle, gonial angle, and maxillary/mandibular planes angle. The hypo-divergent pattern is typified by reduced vertical growth. It is usually accompanied by deep anterior overbite, reduced facial heights, and reduced SN-MP angle.[8]Between the two types lays the normo-divergent facial

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growth pattern.with anterior open bite and an increased sella-nasion.

MATERIALS AND METHOD

SOURCE OF THE DATA

The study is set up in Daswani Dental College &Research Centre, Ranpur, Kota. This study included 90 untreated adults of south rajasthan population visiting the Department of Orthodontics And Dentofacial Orthopaedics as per inclusion criteria.

Total of 90 adults falling in the age group of 16-35 years old were taken respectively.

PATIENT SELECTION CRITERIA:

The selection criteria of this study includes:-

1. The subjects wereall from south rajasthan population
2. Well-nourished and free ofany known systemic disease.
3. None underwent neither previous orthodontic treatment nor extraction of any permanent teeth.
4. Normal growth and development.
5. No previous history of trauma or injury to theface regions.
6. The patients and parental consent was taken before taking radiographs.
7. Individuals between 16-35 years.

EXCLUSION CRITERIA

- Previous orthodontic treatment
- Edentulous spaces, history of extraction
- History of Facial trauma.

METHODOLOGY

- Lateral cephalogram and panoramic radiography tracing will be done to measure:
  - AFH (mm) Anterior face height (LCR): vertical distance between Gn and the H-line
  - AFH (mm) Anterior face height (PR): distance between Ht and m
  - PFH (mm) Posterior face height (LCR): vertical distance between Gò and the H-line PFH (mm) Posterior face height (PR): distance between Hv and Gò
  - ML/RL (degree) Gonial angle: angle between the reference lines ML and RL
  - ML/H (degree) Mandibular plane angle: angle between the reference lines ML and H
  - NL/H (degree) Maxillary plane angle: angle between the reference lines NL and H
  - ML/NL (degree) Interjaw-base angle: angle between the reference lines ML and NL
  - AHMx (mm) Anterior maxillary height (LCR): vertical distance between al-is and NL
  - AHMx (mm) Anterior maxillary height (PR): distance between al-is and Sp

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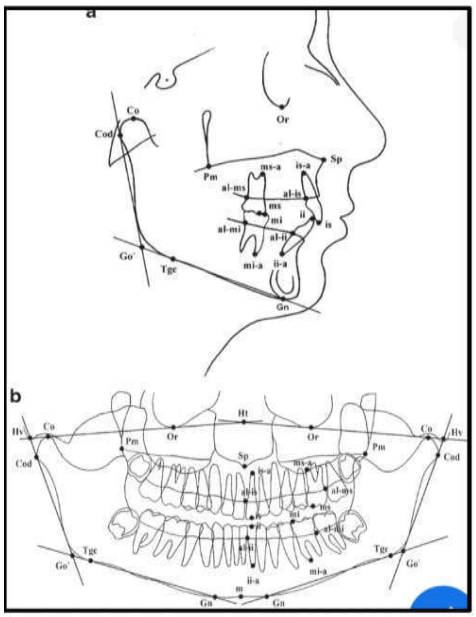
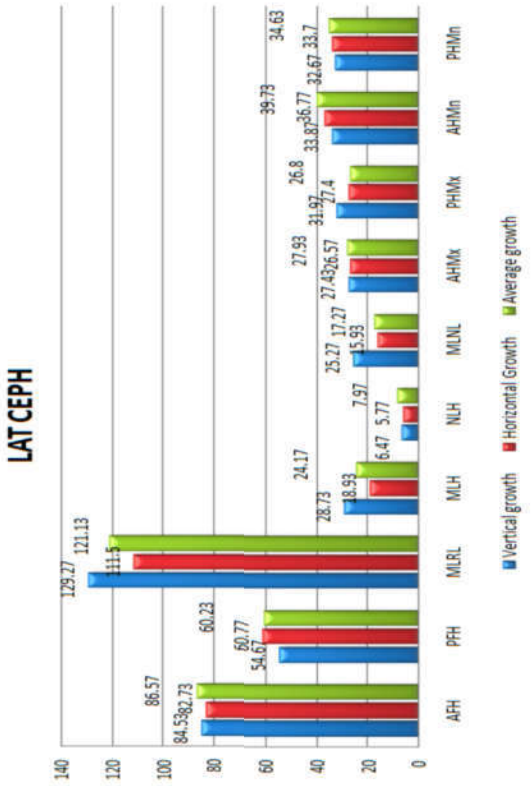
- PHMx (mm) Posterior maxillary height: vertical distance between al-ms and NL
- AHMn (mm) Anterior mandibular height (LCR): vertical distance between al-ii and ML AHMn (mm) Anterior mandibular height (PR): distance between al-ii and m
- PHMn (mm) Posterior mandibular height: vertical distance between al-mi and ML



- Statistical analysis done and results evaluated further to correlate skeletal and alveolar measurements .

RESULT:



ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
LAFH	Between Groups	220.689	2	110.344	2.860	.063
	Within Groups	3356.700	87	38.583		
	Total	3577.389	89			
LPFH	Between Groups	684.822	2	342.411	7.338	.001
	Within Groups	4059.400	87	46.660		
	Total	4744.222	89			
LMLRL	Between Groups	4746.067	2	2373.033	110.472	.000
	Within Groups	1868.833	87	21.481		
	Total	6614.900	89			
LMLH	Between Groups	1442.822	2	721.411	22.023	.000
	Within Groups	2849.900	87	32.757		
	Total	4292.722	89			
LNLH	Between Groups	75.800	2	37.900	1.662	.196
	Within Groups	1983.800	87	22.802		
	Total	2059.600	89			
LMLNL	Between Groups	1528.889	2	764.444	17.055	.000
	Within Groups	3899.600	87	44.823		
	Total	5428.489	89			
LAHMx	Between Groups	28.689	2	14.344	1.364	.261
	Within Groups	914.600	87	10.513		
	Total	943.289	89			
LPHMx	Between Groups	479.089	2	239.544	4.029	.021
	Within Groups	5172.967	87	59.459		
	Total	5652.056	89			
LAHMn	Between Groups	516.289	2	258.144	5.044	.008
	Within Groups	4452.700	87	51.180		
	Total	4968.989	89			
LPHMn	Between Groups	58.067	2	29.033	2.722	.071
	Within Groups	927.933	87	10.666		
	Total	986.000	89			

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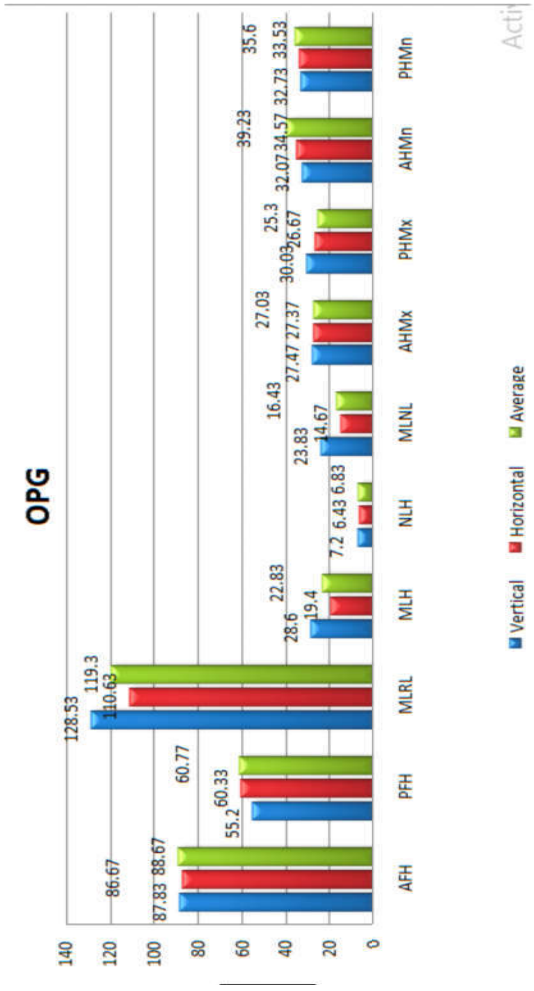
We can see that the significance value is which is below 0.05. and, therefore, there is a statistically significant difference in the mean of different growth on PFH, MLRL, MLH, MLNL, PHMS, AHMn on LAT CEPH.



ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
AFH	Between Groups	60.556	2	30.278	.654	.522
	Within Groups	4027.500	87	46.293		
	Total	4088.056	89			
PFH	Between Groups	575.267	2	287.633	6.546	.002
	Within Groups	3822.833	87	43.941		
	Total	4398.100	89			
MLRL	Between Groups	4807.756	2	2403.878	157.633	.000
	Within Groups	1326.733	87	15.250		
	Total	6134.489	89			
MLH	Between Groups	1296.822	2	648.411	24.020	.000
	Within Groups	2348.567	87	26.995		
	Total	3645.389	89			
NLH	Between Groups	8.822	2	4.411	.192	.825
	Within Groups	1996.333	87	22.946		
	Total	2005.156	89			
MLNL	Between Groups	1419.089	2	709.544	18.503	.000
	Within Groups	3336.200	87	38.347		
	Total	4755.289	89			
AHMx	Between Groups	3.089	2	1.544	.113	.893
	Within Groups	1189.400	87	13.671		
	Total	1192.489	89			
PHMx	Between Groups	356.067	2	178.033	3.605	.031
	Within Groups	4295.933	87	49.379		
	Total	4652.000	89			
AHMN	Between Groups	793.889	2	396.944	9.905	.000
	Within Groups	3486.600	87	40.076		
	Total	4280.489	89			
PHMN	Between Groups	131.289	2	65.644	7.691	.001
	Within Groups	742.533	87	8.535		
	Total	873.822	89			

We can see that the significance value is which is below 0.05. and, therefore, there is a statistically significant difference in the mean of different growth on PFH, MLRL, MLH, MLNL, PHMS, AHMn, PHMn on OPG.

DISCUSSION:

The goal of this study was to correlate linear and angular measurements of opg and lateral cephalogram determining its potential for evaluating craniofacial specifications. Even though there are too number of published articles on magnification and image distortion in panoramic radiographs, there are only few

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studies which involves use of panoramic radiographs in evaluating dentoskeletal specifications and gonial angle measurements. PR was recently proved to be a convenient tool for daignosing information on systemic diseases. It appears to be very useful for diagnosing osteoporosis [37-45]and for identifying and evaluating cervical anomalies [46-48]

Mattila et al.[24]They took measurements of gonial angle on cephalograms, OPG and dried skulls and concluded that the measurements on OPG for right and left gonial angles conform to the angles measured on dry skulls and concluded that means of the measurements made on cephalograms and OPG are more accurate. The present study shows the same In different growth patterns, it was seen that gonial angle and ramus height showed the highest correlation between the two radiographs.

Kurt et al.[51]used OPGs to evaluate mandibular asymmetry in Class II subdivision malocclusion patients by measuring condylar, ramal, condylar-ramal asymmetry index values and gonial angle measurements. They concluded that acceptable results can also be achieved with the help of panoramic radiographs. They added advantages of panoramic radiographs was , they are non-invasive, favorable cost-benefit relationship and we can expose subjects to a relatively low dose of radiations.

Ongkosuwito et al. (2009)[3] concluded that an OPG is as reliable as a lateral cephalogram for linear measurements of the mandible, i.e., condylion-gonion, gonion-menton and condylion-menton.

In this study lateral ceph shows that the significance value which is below 0.05 and there is a statistically significant difference in the mean of different growth on PFH,MLRL,MLH,MLNL,PHMS,AHMn

On comparing horizontal growth patient with vertical and average growth

-vertical growth patient shows significant difference on PFH,MLRL,MLH,MLNL,

-Average growth patient shows significant difference on MLRL,MLH,

On comparing vertical growth patient with horizontal and average growth

-horizontal growth patient shows significant difference on PFH,MLRL,MLH,MLNL,

-Average growth patient shows significant difference on PFH, MLNL, MLH, MLRL, PHMx, AHMn

On comparing average growth patient with horizontal and vertical growth

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-horizontal growth patient shows significant difference on MLRL,MLH,

-vertical growth patient shows significant difference on PFH, MLRL, MLH, MLNL, PHMx, AHMn

The Gonial Angle in PR is based on tomography, while the GA on LCR is a simple lateral view. Therefore, the GA on PR might not represent all data present on LCR. Thus, the LCR might provide a clearer GA angle. On PR, the form and thickness of cortical bone in the mandibular angle can affect the size of GA, and the inclination angle of the mandibular body affects the incident X-ray directly.

Shahabi et al.[31]compared the external gonial angle determined from the lateral cephalograms and panoramic radiographs in Class I patients from the obtained results, they concluded that panoramic radiography can be used to determine the gonial angle .

Studies have reported contradictory results for alveolar heights when comparing subjects with different vertical skeletal patterns. A major source of confusion might stem from the fact that several studies selected the sample based on the dental overbite and did not differentiate between overbite differences that result from habits or true skeletal discrepancies.

CONCLUSION:

1. There is a statistically significant relationship between facial type and alveolar height and thickness.
2. Dentoalveolar compensation mechanism acts in both high-angle and low-angle subjects by vertical lengthening of the maxillary and mandibular frontal alveolar process. No significant differences were found for the measurements of alveolar height in the posterior region
3. High-angle group presented thinner alveolus anteriorly in the maxilla and at almost all sites in the mandible. so subjects can be at increased risk of moving incisors beyond alveolar bone support .
4. Clinicians should always keep in mind that mandibular condyles can be asymmetric, so that possibility must be considered when using panoramic radiographs.
5. With standard exposure conditions and high image quality, panoramic radiographs can provide information on the vertical dimensions of craniofacial structures; however, they are not reliable enough to give acceptably accurate additional

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information compared with lateral cephalograms.

6.The vertical measurements were always magnified between approximately 18% and 21%. Small differences were observed even if the skull was tilted 15 ° posteriorly during one series of exposures. Not unexpectedly, the variation was greatest in the anterior region as reflected by the greater SD

7.Panoramic radiography can be used to determine the gonial angle . Furthermore, in panoramic radiography, the right and left gonial angle scan is measured easily without superimposition of anatomic landmarks, which occurs frequently in a lateral cephalogram.

8.The observations on the precision of vertical dimensions and gonial angle have encouraged us to continue the research with the panoramic machine.

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