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Completive Assessment and Estimation of Orthopantomogram and Lateral Cephalogram for Various Mandibular Dimensions: An Original Research Study

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KEYWORDS

OPG, Lateral Cephalogram, Gonial Angle, Ramus Length

ABSTRACT:

Aim: The aim of this retrospective study was to assess and estimate the usage of orthopantomogram (OPG) for evaluating craniofacial parameters like angular and linear extents and their further intricate comparisons with corresponding lateral cephalogram.

Materials & Methods: Total 80 patients were selected those reported to us for their orthodontic correction needs. 39 males and 41 females patients were studied in detail for preset objectives. For all 80 patients, standardised pre-treatment Orthopantomogram (OPG) and lateral cephalogram were obtained. All tracings were completed single handed individual to remove any possibility of variations or error. Any tracing with error or wrong markings were discarded immediately. Gonion-Menton was marked from particular point gonion to menton. Gonial angle was the angle made by the intersection of the tangent drawn to lower border of mandible and tangent drawn to ramus of mandible.

Results: The statistical analysis was completed by SPSS software wherein various fundamental parameters like age, angle and lengths were demonstrated as mean and standard deviation with their ranges. The mean OPG Left was calculated as 117.1 ± 4.6. P value was not significant here. The mean OPG Right was calculated as 116.1 ± 7.1. P value was significant here (0.020). The mean Lateral Cephalogram was calculated as 118.1 ± 4.2. P value was significant here (0.010). Comparison of OPG Left vs Lat Ceph showed the mean difference value of 2.23. P value was significant here (0.001). For Ramus length of mandible (mm) in OPG right and left side and lateral cephalogram, the calculated mean was 62.1 ± 2.4, 59.2 ± 1.1, 56.5 ± 3.8 respectively for OPG right (P value was significant here 0.020) and left side and lateral cephalogram (P value was significant here 0.010).

Conclusion: Within the limitations of the study authors concluded that the radio-graphical comparison showed non-significant outcomes for measured radiographic angle and length. Authors also expect other large scale studies to be performed that can further set up certain standard norms in these regards.

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Introduction

Lateral Cephalogram was originally developed by Van Loon for the usage in the diagnosis of different orthodontic therapies. Later on B. Holly Broadbent has comprehensively demonstrated the detailed explanation of Lateral Cephalogram and its precise indications in orthodontic treatments.[1-2] Lateral Cephalogram primarily evaluates the craniofacial and dental relationships during the treatment planning of various dentofacial deformities and growth abnormalities.[3-6] They also intimated the failure of Lateral Cephalogram in potential comparison of the right and left sides of the orofacial structures because of overlapping of the structures of both sides and overwhelming images. Amongst the most of the orthodontic patients, mandibular asymmetries are the most usual finding being noticed in terms of dilemmas in dimensional variations, in form, size, shape and volume of both sides of the mandible.[7-8] Orthopantomogram was developed by Paatero, in 1952. Orthopantomogram helped practitioners to effortlessly recognize position and calculate different structures of maxillary and mandibular region with considerably decreased radiation exposure.[9-10] The prime focus and sole intention of the present study was to assess and estimate the usage of orthopantomogram (OPG) for evaluating craniofacial parameters like angular and linear extents and their further intricate comparisons with corresponding lateral cephalogram.

Materials & Methods

Total 80 patients were selected from regular incoming patients wherein both male and female patients were included. The retrospective methodology was explained to all participating patients and informed consent was obtained accordingly. All selected patients were reported to us for their orthodontic correction needs. Systematic sampling method was utilized for precise sample selection. Randomization was also attempted for all 80 patients. Randomization ensured the absence of any possible bias in the selection of samples and also ensured high quality study data with preciseness. 39 males and 41 females patients were studied in detail for preset objectives. For all 80 patients, standardised pre-treatment Orthopantomogram (OPG) and lateral cephalogram were obtained. All 80 patients were in the age range of 20-30 years. The inclusion criteria for the radiographs were as follows: sufficient clarity and distinction of radiographs for high-quality revelation and recognition of the structures; no radiographic deformations; no history of previous orthodontic treatment. All radiographs must be attempted by identical equipment and individual. This was done to ensure the absence of inter-observer variations. All radiographs were made in natural head position (NHP). Radiographic tracing was completed manually on standard tracing sheets of regular size. All tracings were completed single handed individual to remove any possibility of variations or error. Any tracing with error or wrong markings were discarded immediately. Gonion (Go), Menton (Me) was traced and marked on all radiographs of 80 patients. Gonion-Menton was marked from particular point gonion to menton. It illustrated the body length of the mandible. Gonial angle was the angle made by the intersection of the tangent drawn to lower border of mandible and tangent drawn to ramus of mandible.

Figure 1: Standardised Pre-Treatment Lateral Cephalogram

Figure 2: Patient Head Positioning for Lateral Cephalogram

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Figure 3: Armamentarium for standard manual tracing of Lateral Cephalogram

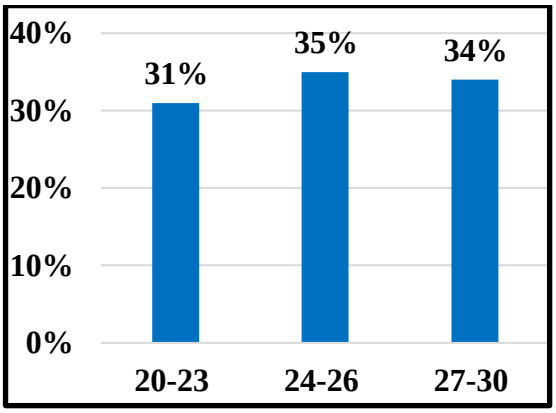
Statistical Analysis and Results

The data were cross checked for accuracy and analysed in SPSS software. The fundamental parameters like age, angle and lengths were demonstrated as mean and standard deviation with their ranges. The comparison between OPG right and left was completed by using Mann-Whitney U-test and comparison between OPG (right and left) and Lateral Cephalogram was attempted with similar test independently. p-value of <0.05 was considered statistically significant. Table 1 and graph 1 & 2 demonstrated about the Basic Demographic Details of all Patients including Age and Gender of the Participants. All participants were in the age range of 20-30 years and calculated Mean±SD was 22.3 ± 1.1 and outcomes were non significant here. Table 2 demonstrated about the fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for Gonial Angle at OPG Left, OPG Right, Lateral Cephalogram. The mean OPG Left was calculated as 117.1 ± 4.6. P value was not significant here. The mean OPG Right was calculated as 116.1 ± 7.1. P value was significant here (0.020). The mean Lateral Cephalogram was calculated as 118.1 ± 4.2. P value was significant here (0.010). Table 3 demonstrated about the fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for comparison of OPG Left vs Right. The mean difference after Comparison of OPG Left vs Right was calculated as 2.34. P value was not significant here (0. 324). Table 4 demonstrated about the Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for comparison of OPG Left vs Lat Ceph. Here Comparison of OPG Left vs Lat Ceph showed the mean difference value of 1.38. P value was not significant here (0. 341). Table 5 demonstrated about the fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for comparison of OPG Right vs Lat Ceph. Here Comparison of OPG Left vs Lat Ceph showed the mean difference value of 2.23. P value was significant here (0.001). Table 6 demonstrated about the Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for Ramus length of mandible (mm) in OPG right and left side and lateral cephalogram. The calculated mean was 62.1 ± 2.4, 59.2 ± 1.1, 56.5 ± 3.8 respectively for OPG right (P value was significant here 0.020) and left side and lateral cephalogram (P value was significant here 0.010).

Table 1: Basic Demographic Details of all Patients including Age and Gender of Participants

Basic Demographic Details of All Patients		**Values (N=80)**
Age in Years	Mean ± SD	22.3 ± 1.1
	Range	20 – 30
Age Group	20-23 years	25 (31%)
	24-26 years	28 (35%)
	27-30 years	27 (34%)
Gender	Male	39 (49%)
	Female	41 (51%)

Graph 1: Age group distribution of the participants in percentage



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Graph 2: Gender based allocation distribution of the participants in percentage

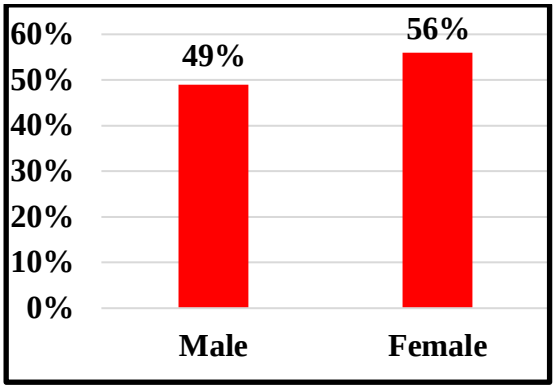

Table 2: Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for Gonial Angle at OPG Left, OPG Right, Lateral Cephalogram

Gonial Angle	Mean	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
OPG Left	117.1 ± 4.6	0.252	0.160	1.96	2.433	1.0	0.086
OPG Right	116.1 ± 7.1	0.264	0.000	1.96	2.242	2.0	0.020*
Lateral Cephalogram	118.1 ± 4.2	1.346	0.078	1.96	2.498	1.0	0.010*
*p<0.05 significant							

Table 3: Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for comparison of OPG Left vs Right

Radiograph	Mean Diff.	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Comparison of OPG Left vs Right	2.34	0.349	0.033	2.33	1.219	1.0	0.324
*p<0.05 significant							

Table 4: Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for comparison of OPG Left vs Lat Ceph

Radiograph	Mean Diff.	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Comparison of OPG Left vs Lat Ceph	1.38	0.132	0.016	1.96	1.231	1.0	0.341
*p<0.05 significant							

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Table 5: Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for comparison of OPG Right vs Lat Ceph

Radiograph	Mean Diff.	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
Comparison of OPG Right vs Lat Ceph	2.23	0.276	0.025	1.96	2.550	3.0	0.001*
*p<0.05 significant							

Table 6: Fundamental Statistical Description With Level Of Significance Evaluation Using Pearson Chi-Square Test for Ramus length of mandible (mm) in OPG right and left side and lateral cephalogram

Ramus Length	Mean	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
OPG Left	59.2 ± 1.1	0.152	0.160	1.96	2.433	1.0	0.076
OPG Right	62.1 ± 2.4	0.164	0.002	1.96	2.242	2.0	0.020*
Lateral Cephalogram	56.5 ± 3.8	1.316	0.078	1.96	2.498	1.0	0.010*
*p<0.05 significant							

Discussion

Fattahi and other researchers had evaluated the precision of panoramic radiography in dimensional measurements and mandibular steepness in relation to lateral cephalomerty. They also stressed out the potential significance of lateral cephalomerty in diagnostic orthodontics.[11] Juma and other co workers had experimented about the alternative use of a nonconventional orthopantomograms analysis technique for facial skeletal assessment. Their inferences were in accordance with our results and they were highly predictable also.[12] Tronje and associated pioneer workers have experimented about the Image Distortion in Rotational Panoramic Radiography and related Distortion Effects in Sliding Systems. Their inferences and recommendations were highly critical and had clinical applicability in different orthodontic therapies.[13] Kurt and other researchers have estimated about the Mandibular asymmetry in Class II subdivision malocclusion. Their findings were in agreement with our results and outcomes.[14] Akcam and colleagues have experimented about the Panoramic radiographs as a tool for investigating skeletal pattern. They also stressed that Panoramic radiographs are having high diagnostic value in the treatment planning of various orthodontic problems.[15] Kambylafkas and other co researchers have evaluate and assessed about the Mandibular asymmetry in adult patients with unilateral degenerative joint disease. Their inferences were highly predictable and significant.[16] Habets and other clinicians studied Orthopantomogram as an aid in diagnosis of temporomandibular joint problems.[18] Later on, Nohadani and other colleagues had assessed about the vertical facial and dentoalveolar changes using panoramic radiography. They also confirmed the imperative role of Orthopantomogram in different orthodontic treatments.[19]

Conclusion

Our study results outcomes undoubtedly illustrated about the usage of Orthopantomogram for angular and linear extents and their comparisons with corresponding lateral Cephalogram. Within the limitations of the study authors concluded that the radio-graphical comparison revealed non-significant outcomes for measured radiographic angle and length. It is therefore clinician's own judgment and choice to select either of the tested radiographic method for assessing the Gonial angle and

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Ramus Length in various orthodontic procedures and techniques. Our study results must be considered as suggestive for presuming clinical outcomes for such crucial circumstances. However, we expect some other large scale studies to be conducted that could further establish certain benchmark norms in these perspectives.

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