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Is it essential to recognize the gonial angle in orthodontics using panoramic radiography?

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***Abstract*---**Background: In orthodontic therapy as well as the craniofacial complex, the outside gonial Angle is a critical angle. Because lateral cephalometric radiographs show superimposed representations of anatomical structures, including gonial angle; The purpose of this research would have been to compare panoramic as well as lateral cephalometric radiographs in order to evaluate gonial angle within angle classifying. Materials and Methods: The current study included 64 individuals (29 males and 35 females) ranging in age from 15 to 30 years. The individuals have been chosen retrospectively from the dental and skeletal Classes I, II, as well as III malocclusion groups. Mandibular as well as Ramal planes have been drawn then based on these planes that used a lateral cephalometric radiograph. To calculate the gonial angle, two tangents had been derived from the mandible lower border, the condyle's posterior margins, in addition the ramus on individually sides of panoramic radiographs. The variations between the three angle groups have been examined using several pairwise comparisons (ANOVA). Results: There have been no significant variations in gonial angles evaluated using lateral cephalometric radiography as well as panoramic radiography between the Classes I, II, as well as III malocclusion groups (P>0.05). Conclusion: In all angle classes, panoramic radiograph outcomes have been made known to be equally dependable as lateral cephalometric radiograph outcomes. Panoramic radiography could be unitized to fix gonial angles in individuals presenting as an alternative to traditional radiography.

Keywords---Mandibular, radiographs, skeletal, therapy, angle

Introduction

Panoramic radiographs have been employed within orthodontic preparation to make available data on axial inclinations, maturation times, as well as the teeth's surrounding structures[1, 2]. Another radiographic approach, the lateral cephalogram, has been employed once cephalometric dimensions are taken[3].

Gonial angle is broadly unitized throughout cephalogram tracing. A hypothetical tangential line traced from mandible's lower border toward mandibular ramus's posterior border forms this angle[4].

Dentulous, as well as edentulous individuals, have different sizes and shapes of super-facial masseter muscle in gonion area. The findings indicated that after tooth extraction, mandibular bone undergoes chronic as well as gradual reabsorption of remnant ridge, in addition also a broadening of gonial angle[5, 6].

The gonial angle has been used in orthodontics to evaluate the revolution of mandible. Gonial angle is an important factor for determining a patient's growth pattern[7, 8]. In individuals with an increased gonial angle, the downward, as well as backward rotation, is referred to as a high angle. The upward and the forward motion of the mandible, on the other hand, is considered a low angle, and it appears to lower the gonial angle in individuals. That's one of the factors that govern tooth extraction in Class II individuals. In Class III individuals , the gonial angle could influence therapy options and assist determine whether surgery is necessary[9, 10].

While Kundi.et al. [11] claimed that panoramic radiography may detect gonial angle in place of truthfully as a lateral cephalogram, Shahabi.et al. [12] recommended foremost lateral cephalogram to estimate gonial angle. Additionally, several researchers discovered significant individual differences in gonial angle alteration, which had been influenced by age in addition of different forms of malocclusion[13, 14]. Within this group team understanding, not any research has been done on the relationship between gonial angle as well as overall malocclusions in orthodontics.

The focus of this research would have been to compare panoramic radiographs as well as lateral cephalograms to calculate the gonial angle under Angle classification.

Materials and Methods

The current study included 64 individuals (29 males and 35 females; ages 15–30 years) who came to our facility for orthodontic therapy. The participants in this study have been chosen retrospectively from individuals who showed Classes I, II, and III associations skeletally as well as dentally.

Individuals in the control group didn't initially receive orthodontic therapy, have Class I skeletal characteristics, and also have a perfect occlusion. The selected individuals' cephalometric data comprised SNA angle, SNB angle, ANB angle, as well as SN-GOGN angle dimensions, as shown in Table.1. Lateral cephalometric as well as panoramic radiographs have been among the radiographic data. The radiographs have all been taken on the same digital device.

The radiographs of the individuals would have to be of good quality as well as sharp, even though they had to be obtained using the same apparatus as well as technician, with the individuals in a natural head posture.

The participants have been skeletally characterized by analyzing cephalometric norms on lateral cephalograms in the sagittal plane, specifically the ANB angle. There have been no subgroups formed between many Class II malocclusion cases.

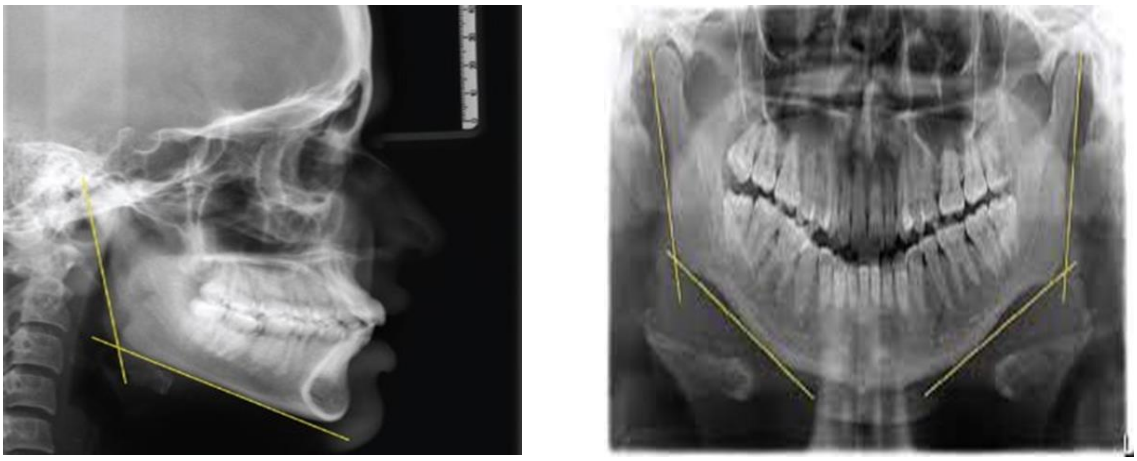
Mandibular as well as Ramal planes had been sketched on lateral cephalograms, in addition thus gonial angle had been calculated created on these planes. In panoramic radiography, the gonial angle had been computed by pinching 2 tangents from mandible lower border, the condyle's posterior margins, as well as the ramus. See Figures. (1.a) also (1.b).

Statistical Analysis

Aimed at respectively observation, statistical interpretations had been generated. Dataset had been typically dispersed, according to the analysis method (Kolmogorov–Smirnov). Analysis of variance tests (ANOVA) as well as Tukey tests have been performed to evaluate differences among as well as between four groups because the data set is usually distributed. SPSS had been used to examine all of the data.

Table.1: shows the participant's Maximal, Minimal Level, Least-Square Means, as well as Standard Deviation.

Dimensions	*Classes*	*Number*	*Age Mean*	*SD.*	*Mean*	*SD.*	*Min.*	*Max.*
SNA-Angle	I	22	16.48	2.87	78.10	2.022	74	82
	II	14	14.00	0.88	79.71	3.583	75	87
	III	14	18.00	4.67	77.86	3.394	72	84
	Total	**50**	**16.20**	**3.45**	**78.49**	**2.987**	**72**	**87**
SNB-Angle	I	22	16.48	2.87	75.81	2.118	72	80
	II	14	14.00	0.88	74.07	3.435	70	82
	III	14	18.00	4.67	80.39	4.063	73	88
	Total	**50**	**16.20**	**3.45**	**76.62**	**3.984**	**70**	**88**
ANB-Angle	I	22	16.48	2.87	2.14	1.014	1	4
	II	14	14.00	0.88	5.39	1.212	5	9
	III	14	18.00	4.67	-2.69	2.391	-9	0
	Total	**50**	**16.20**	**3.45**	**1.69**	**3.468**	**-9**	**9**
SN-GOGN-Angle	I	22	16.48	2.87	33.48	4.831	25	43
	II	14	14.00	0.88	34.18	7.505	23	43
	III	14	18.00	4.67	34.11	7.761	23	52
	Total	**50**	**16.20**	**3.45**	**33.86**	**6.435**	**23**	**52**
SF-GON-Angle	I	22	16.48	2.87	124.57	5.427	115	137
	II	14	14.00	0.88	123.64	6.547	112	135
	III	14	18.00	4.67	126.86	7.004	116	139
	Total	**50**	**16.20**	**3.45**	**124.96**	**6.228**	**112**	**139**



a b

Figure.1: (a) Gonial angle determination via Lateral Cephalometric; (b) Panoramic Radiography

Results

A research study included 64 individuals with varied malocclusions (29-Males, 35-Females); Mean Age was (17.37 ± 3.98) who had been classified into 4-subgroups founded via angle-based malocclusion.

Table.2 shows a mean of gonial angles via lateral cephalograms as well as panoramic radiographs thus according to malocclusion classes. The Tukey test is used to show differences in subgroups in Table 3. The standards of gonial angles measured through lateral cephalogram as well as panoramic radiograph did not differ significantly across the Classes I, II, also III groups.

Nevertheless, the study's findings revealed that gonial angle of a controller condition had been considerably different from those of malocclusions in Classes I, II, as well as III.

When using lateral cephalograms as well as panoramic radiographs to determine the gonial angle, there have been no meaningful alterations between male in addition female individuals. Females had a gonial angle of 124.40°, while males had a gonial angle of 123.34°, without statistically meaningful alterations between two genders.

A mean rate of right gonial angle had been (123 ± 6°) in addition indeed mean rate of left gonial angle had been (123 ± 5°) on panoramic radiography. In all groups, there has been no significant variation in panoramic dimensions between the right as well as left sides.

On a right side, the discrepancies in gonial dimension techniques in lateral cephalogram, as well as panoramic radiography, have been 0.04 and 0.02, respectively. There had been not at all statistically important differences between two radiography techniques.

Table.2: Significance levels linked with the gonial angle in lateral cephalometric as well as panoramic radiographs on the right in addition left sides, respectively, had been found using the analysis of variance (ANOVA).

Dimensions	*Classes*	*Number*	*Mean*	*SD*	*Significance levels - among groups*
Right Side-Panoramic Radiograph	I	22	125.95	6.72	0.422
	II	14	124.18	6.54	
	III	14	127.97	9.47	
Right Side-Lateral Cephalometric	I	22	125.75	7.11	0.219
	II	14	123.02	8.40	
	III	14	128.56	9.63	
Left Side-Panoramic Radiograph	I	22	125.40	6.59	0.834
	II	14	123.91	6.14	
	III	14	125.18	9.51	
Left Side-Lateral Cephalometric	I	22	124.91	6.98	0.928
	II	14	124.35	7.07	
	III	14	125.51	9.88	

Table.3 shows the differences in gonial degree in the Panoramic Radiograph on both sides.

Dimensions	*Classes*	*Number*	*Mean*	*SD*	*Significance levels*
Right Side-Panoramic Radiograph	I	22	-0.18	2.59	0.24
	II	14	-1.04	2.94	
	III	14	0.47	0.78	
Left Side-Panoramic Radiograph	I	22	-0.29	3.46	0.79
	II	14	0.28	2.81	
	III	14	0.23	1.17	

Discussion

Most orthodontists believe that now the lateral cephalogram is really the only method to gauge the gonial angle. According to different researches, panorama radiography could also be used to check the gonial angle[15]. As a result, the process has been created to assess changes in the gonial angle and allow for enhanced states. R Schulze et al.[16] focused solely on the accuracy of panoramic radiography in Angle Class I individuals.

In all Angle classes, we wanted to keep an eye on the gonial angle. This appears to be the first study to evaluate the assessment of gonial angle in differing orthodontic malocclusions using panoramic radiography as well as lateral cephalograms.

The controlled and experimental groups demonstrated equal outcomes in both radiography procedures, according to the findings of this research. The gonial angle within the control group had been substantially lower than in other

orthodontic malocclusion groups, according to this finding. In both kinds of methods, all of the malocclusion groups differed from the control group.

This result indicated that a panoramic radiograph may accurately determine gonial angle as well as lateral cephalogram. T.A.Larheim. et al.[16] agreed with our outcomes and suggested that panoramic radiographs rather than a lateral cephalogram be used to determine the gonial angle in Class-I individuals. The two radiographic approaches did not demonstrate significant variations in our findings.

Class-III individuals are crucial in orthodontics even though we frequently have to make decisions about whether or not to proceed with surgery. Guldane Magat et al.[16] discovered that an increase in gonial angle has been one of the criteria that requires conservative surgery in Class III individuals. After orthodontic therapy, the increase of this landmark revealed unsteady outcomes. Individuals who are followed up by orthodontic facilities, on either hand, may require a lateral cephalogram every year to assess this point. Obtaining solely panoramic radiographs from some of these individuals could reduce the amount of radiation applied and expenditures[12, 17].

These analyses indicated that almost not at all statistically noteworthy changes existed between two methods on individually sides, as indicated by Araujo, G. de Toledo Telles et al[18]. Fukuda et.al. [19], on the other hand, discovered a gonial angle on radiographic images that was 2.2°- 3.6° lower than lateral cephalograms, indicating a considerable difference between the two radiographies. The discrepancy in the outcomes, according to Hiraiwa et al.[20], could be due to the kind of malocclusion as well as the age of the individuals, as their investigation was conducted on adults having Class-I.

Gender has minimal impact on the amount of the gonial angle, according to Ulusoy, Ayca T. et.al[20]. As a result, it's possible that the consequence of gender in addition age on gonial angle had been consequently minor or else non-existent. According to the performance of the two procedures, gonial angle specifications experience success when used with panoramic radiography. It also helps in reducing doses of radiation for individuals before and during orthodontic therapy.

Conclusion

Throughout all angle classes, panoramic radiograph issues have been found to be as dependable as lateral cephalometric radiograph outcomes. Panoramic radiography would be used to examine gonial angles in individuals as an alternative to traditional radiography.

References

1. Dos Santos MAL, Couto GR, Sabey MJS, De Paula Ribeiro Borges D, Takeshita WM (2022) Can exposure to panoramic radiographs induce genotoxic effects on the oral epithelium? A systematic review with meta-analysis. Dentomaxillofacial Radiol. https://doi.org/10.1259/dmfr.20210149
2. Umer F, Habib S, Adnan N (2022) Application of deep learning in teeth

identification tasks on panoramic radiographs. Dentomaxillofacial Radiol. https://doi.org/10.1259/dmfr.20210504
3. Bruno G, De Stefani A, Barone M, Costa G, Saccomanno S, Gracco A (2022) The validity of panoramic radiograph as a diagnostic method for elongated styloid process: A systematic review. Cranio - J Craniomandib Pract 40:33–40
4. Marcello Scotti F, Stuepp RT, Leonardi Dutra-Horstmann K, Modolo F, Gusmão Paraiso Cavalcanti M (2022) Accuracy of MRI, CT, and Ultrasound imaging on thickness and depth of oral primary carcinomas invasion: a systematic review. Dentomaxillofacial Radiol. https://doi.org/10.1259/dmfr.20210291
5. Du H, Zhang D, Jin X (2022) Reduction Mandibuloplasty Along with Partial Masseter Muscle Resection: Masseter Muscle Response and Bone Regeneration. Aesthetic Plast Surg 46:310–318
6. Coban I, Yucel K, Pinar Y (2021) Topographic anatomical localization of the motor nerve entry points (MEPs) of the masseter muscle. Surg Radiol Anat 43:1859–1865
7. Pan Y, Wang Y, Li G, Chen S, Xu T (2022) Validity and reliability of masseter muscles segmentation from the transverse sections of Cone-Beam CT scans compared with MRI scans. Int J Comput Assist Radiol Surg 17:751–759
8. Pan Y, Chen S, Shen L, Pei Y, Zhang Y, Xu T (2020) Thickness change of masseter muscles and the surrounding soft tissues in female patients during orthodontic treatment: A retrospective study. BMC Oral Health 20:1–10
9. Anderson S, Alsufyani N, Isaac A, Gazzaz M, El-Hakim H (2018) Correlation between gonial angle and dynamic tongue collapse in children with snoring/sleep disordered breathing - An exploratory pilot study. J Otolaryngol - Head Neck Surg. https://doi.org/10.1186/s40463-018-0285-8
10. Jensen E, Palling M (1954) The gonial angle. A survey. Am J Orthod 40:120–133
11. Kundi I (2016) Accuracy of Assessment of Gonial Angle by Both Hemispheres of Panoramic Images and Its Comparison with Lateral Cephalometric Radiographic Measurements. J Dent Heal Oral Disord Ther. https://doi.org/10.15406/jdhodt.2016.04.00116
12. Shahabi M, Ramazanzadeh BA, Mokhber N (2009) Comparison between the external gonial angle in panoramic radiographs and lateral cephalograms of adult patients with Class I malocclusion. J Oral Sci 51:425–429
13. Ongkosuwito EM, Dieleman MMJ, Kuijpers-Jagtman AM, Mulder PGH, Van Neck JW (2009) Linear mandibular measurements: Comparison between orthopantomograms and lateral cephalograms. Cleft Palate-Craniofacial J 46:147–153
14. Srii R, Koju S, Mahanta SK, Marla V, Niroula D, Upadhyaya C, Murthy PS (2021) Digital radiographic study of gonial angle in forensic odontology in a tertiary care centre: A descriptive cross-sectional study. J Nepal Med Assoc 59:350–355
15. Pillai JP, Shah RJ, Darji B, Banker A, Pillai RJ (2018) Association of the gonial angle with age, gender, and dental status: A radiographic study using lateral cephalogram and orthopantomogram. J Forensic Radiol Imaging 15:8–13
16. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). The COVID-19 pandemic. International Journal of Health Sciences, 5(2), vi-ix. https://doi.org/10.53730/ijhs.v5n2.2937

17. Schulze R, Krummenauer F, Schalldach F, D'Hoedt B (2000) Precision and accuracy of measurements in digital panoramic radiography. Dentomaxillofacial Radiol 29:52–56
18. Ankolekar, Karjodkar F (2019) Journal of Indian Academy of Oral Medicine and Radiology (JIAOMR).
19. Araujo G de TT, Peralta-Mamani M, Silva A de FM da, Rubira CMF, Honório HM, Rubira-Bullen IRF (2019) Influence of cone beam computed tomography versus panoramic radiography on the surgical technique of third molar removal: a systematic review. Int J Oral Maxillofac Surg 48:1340–1347
20. Fukuda M, Inamoto K, Shibata N, Ariji Y, Yanashita Y, Kutsuna S, Nakata K, Katsumata A, Fujita H, Ariji E (2020) Evaluation of an artificial intelligence system for detecting vertical root fracture on panoramic radiography. Oral Radiol 36:337–343
21. Hiraiwa T, Ariji Y, Fukuda M, Kise Y, Nakata K, Katsumata A, Fujita H, Ariji E (2019) A deep-learning artificial intelligence system for assessment of root morphology of the mandibular first molar on panoramic radiography. Dentomaxillofacial Radiol. https://doi.org/10.1259/dmfr.20180218