

Gonial Angle as an Indicator for the Prediction of Growth Pattern

¹J Rubika, ²A Sumathi Felicita, ³V Sivambiga

ABSTRACT

Aim: To determine the gonial angle, upper gonial angle and lower gonial angle in patients with horizontal, vertical and average growth pattern belonging to the local Chennai population and determine if it can be used as a growth indicator.

Materials and methods: Gonial angle, upper gonial angle and lower gonial angle measurements were made on lateral cephalograms of 90 patients—44 males and 46 females.

Results: A one sample t-test was used to determine the mean values for average, horizontal and vertical growth pattern and to check their level of significance. All the values were statistically significant with a p-value = 0.000.

Conclusion: The upper gonial angle was the same irrespective of growth pattern. The gonial angle and lower gonial angle can be used as an indicator for growth.

Keywords: Gonial angle, Growth pattern, Lateral cephalograms.

How to cite this article: Rubika J, Felicita AS, Sivambiga V. Gonial Angle as an Indicator for the Prediction of Growth Pattern. *World J Dent* 2015;6(3):161-163.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

Gonial angle is widely used in orthodontic cephalogram tracing. It is a valuable indicator to diagnose the growth pattern of patients and also determines the rotation of the mandible. The gonial angle can also be a handy tool in age assessment in extreme situations like mass disaster, remains of human dead exhumed and murderous mutilations, missing individuals, etc.¹ The downward and backward rotation of the mandible is called as a high angle and these patients showed increased gonial angle. Contrary to this, upward and forward direction of mandible is called as a low angle and these patients showed a decrease in gonial angle.² Thus, it becomes one of the most important angles for determining orthodontic

or surgical plans in a patient. A few studies focused on the mandibular angle, its change throughout aging, and changing relation to dental status. This study was conducted on lateral cephalograms of a total of 90 subjects. The aim of this study was to evaluate the gonial angle as an indicator for the growth pattern.

MATERIALS AND METHODS

Lateral cephalograms of 90 patients which includes 44 males and 46 females belonging to the local Chennai population were obtained from the patient records of the department of orthodontics. The growth pattern were grouped into three groups namely vertical growth pattern, average growth pattern and horizontal growth pattern based on the clinical and cephalometric Frankfort-mandibular plane angle (FMA). The gonial angle was measured by taking the tangent to the posterior border of the ramus and tangent to the lower border of the mandible on lateral cephalogram (Fig. 1). Because of the superimpositions seen on lateral cephalograms, reliable measurement of the gonial angle becomes difficult. The gonial angle was measured on the lateral cephalometric radiograph using a mathematical protractor. The angle is recorded in degrees. Frankfort mandibular plane angle, gonial angle, upper gonial angle and lower gonial angle are measured. Frankfort mandibular plane angle is the angle formed between Frankfort horizontal plane (FHP) and mandibular plane (Tweeds, 1954).³ Gonial

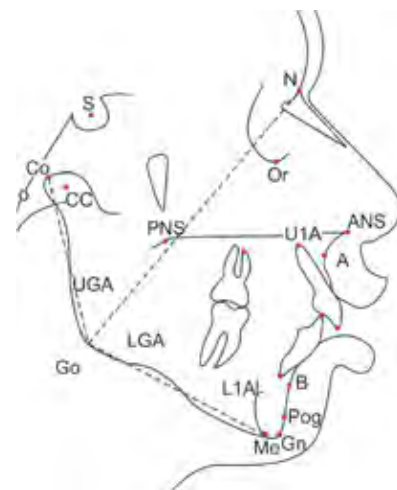


Fig. 1: The gonial angle (Ar-Go-Me), upper gonial angle (Ar-Go-N) and lower gonial angle (N-Go-Me) that have been measured in this study

¹Student, ²Reader, ³Postgraduate Student

¹⁻³Department of Orthodontics, Saveetha Dental College Chennai, Tamil Nadu, India

Corresponding Author: J Rubika, Student, Department of Orthodontics, Saveetha Dental College, Chennai, Tamil Nadu, India Phone: 9443266025, e-mail: rubymano2910@gmail.com

angle is the angle formed by the points articulare, gonion and menton. Upper gonial angle is the angle formed by the points articulare, gonion and nasion and lower gonial angle is the angle formed by the points nasion, gonion and menton.

The cephalograms were traced on matte acetate paper with 2H pencil under double illumination. Since only angular measurements were recorded magnification was not calculated. The values obtained were tabulated and subjected to statistical evaluation.

STATISTICAL ANALYSIS

A one sample t-test was done using statistical package for the social sciences (SPSS) 22 software to determine the mean values for average, horizontal and vertical growth pattern and to check their level of significance.

RESULTS

Table 1 and Graph 1 show the results obtained. In patients with horizontal growth pattern, the mean value for the FMA was $19.6^\circ \pm 0.45^\circ$ ($p = 0.000$). The mean value for the gonial angle was $122.43^\circ \pm 1.40^\circ$ ($p = 0.000$). Mean value for lower and upper gonial angle were $66.80^\circ \pm 0.01^\circ$ and $55.30^\circ \pm 0.99^\circ$ respectively with ($p = 0.000$). In patients with vertical growth pattern, the mean value for the FMA was $33.93^\circ \pm 1.32^\circ$ ($p = 0.000$). Mean value for gonial angle's was $130.20^\circ \pm 1.39^\circ$ ($p = 0.000$). Mean value for lower and upper gonial angle were $76.40^\circ \pm 1.39^\circ$ and $53.80^\circ \pm 1.15^\circ$ respectively with ($p = 0.000$). In the average growth pattern, the mean value for the FMA was $24.93^\circ \pm 0.26^\circ$ ($p = 0.000$). The mean value for gonial angle was

$127.03^\circ \pm 0.997^\circ$ ($p = 0.000$). Mean value for lower and upper gonial angle were $71.53^\circ \pm 0.9^\circ$ and $55.17^\circ \pm 1.07^\circ$ respectively ($p = 0.000$).

DISCUSSION

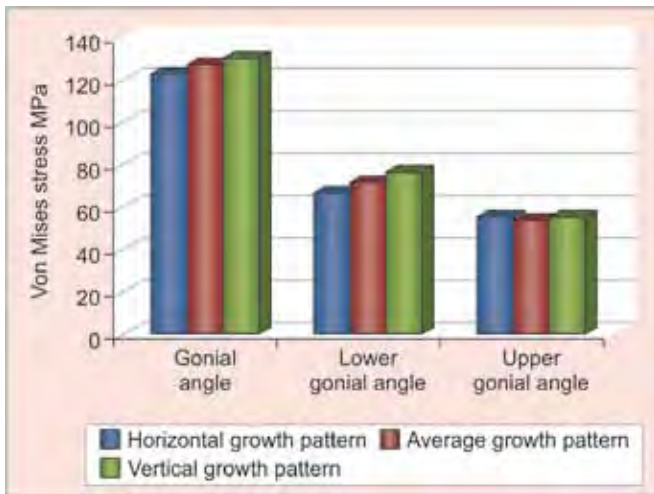
Evaluation of growth pattern plays a major role in diagnosis and treatment planning. There are various cephalometric parameters to evaluate growth pattern. Those commonly used are SN to mandibular plane, FHP angle and Jarabak's ratio. However, fault in the SN plane and FHP can produce erroneous results in growth pattern. The Jarabak's ratio is based on the posterior and anterior facial height and does not reflect the rotation of the mandible.

In the present study, the samples were grouped into horizontal, average and vertical growth pattern based on the clinical and cephalometric FMA. The mean value of FMA was determined for each group and was found to be $19.6^\circ \pm 0.45^\circ$, $24.93^\circ \pm 0.26^\circ$ and $33.93^\circ \pm 1.32^\circ$ for horizontal, average and vertical growth pattern and the values obtained were statistically significant with a p-value of 0.000 and confidence interval of 95%. The gonial angle ranged from 119.5749° to 125.2918° in horizontal growers, 127.5048° to 132.8952° in vertical growers and 124.9940° to 129.0726° in average growers. The lower gonial angle range from 64.7351° to 68.8649° in patients with horizontal growth pattern, 73.5518° to 79.2482° in average growth pattern and 69.6812° to 73.3855° in vertical growth pattern. The upper gonial angle ranged from 53.2568° to 57.3432° in horizontal growth pattern, 51.4518° to 56.1482° in vertical growth pattern and 52.9738° to 57.3596° in average

Table 1: One-sample test to determine the mean and level of significance of parameters used to evaluate horizontal, vertical and average growth pattern

	N	Mean	Sig. (2-tailed)	Std. error mean	95% confidence interval of the difference	
					Lower	Upper
<i>Horizontal growth pattern</i>						
FMA	30	19.63	0.00	0.45	18.71	20.56
Gonial angle	30	122.43	0.00	1.40	119.57	125.29
Lower gonial angle	30	66.80	0.00	1.01	64.74	68.86
Upper gonial angle	30	55.30	0.00	0.100	53.26	57.34
<i>Average growth pattern</i>						
FMA	30	24.93	0.00	0.26	24.41	25.46
Gonial angle	30	127.03	0.00	0.100	124.99	129.07
Lower gonial angle	30	71.53	0.00	0.91	69.68	73.39
Upper gonial angle	30	55.17	0.00	1.07	52.97	57.36
<i>Vertical growth pattern</i>						
FMA	30	33.93	0.00	1.32	32.02	35.85
Gonial angle	30	130.20	0.00	1.39	127.50	132.90
Lower gonial angle	30	76.40	0.00	1.39	73.55	79.25
Upper gonial angle	30	53.80	0.00	1.15	51.45	56.15





Graph 1: The comparison between gonial angle, upper gonial angle and lower gonial angle in average, horizontal and vertical growth pattern

growth pattern. It can be seen that the upper gonial angle is almost the same in horizontal, vertical and average growth pattern. The lower gonial angle on the contrary increased in the degree of angulation from horizontal, average and vertical growth pattern and can be used as an indicator for assessing growth pattern.

According to Rakosi,⁴ the norm value for gonial angle in Caucasians with average growth pattern ranged from $128^\circ \pm 7^\circ$ which was almost similar to our measurements $127.0333^\circ \pm 0.99710^\circ$ and ranged from 124.9940° to 129.0726° . The upper gonial angle in Caucasians with average growth pattern ranged from 52° to 55° but in our sample it had a mean value of $55.1667^\circ \pm 1.07220^\circ$ ranging from 52.9738° to 57.3596° . The lower gonial angle in

Caucasians was between 70° and 75° . In the present sample, the lower gonial angle ranged from 69.6812° to 73.3855° with a mean of $71.5333^\circ \pm 0.90558^\circ$. This value was less compared to the Caucasian population.

CONCLUSION

- The upper gonial angle was the same irrespective of growth pattern
- The lower gonial angle increases from horizontal, average and vertical growth pattern
- The lower gonial angle in the present sample is less compared to Caucasians
- The mean values in average growth in the local Chennai population were $127.03^\circ \pm 0.997^\circ$, $71.53^\circ \pm 0.9^\circ$ and $55.17^\circ \pm 1.07^\circ$ for gonial angle, lower gonial angle and upper gonial angle respectively.
- All the values were statistically significant with a p-value = 0.000
- The gonial angle and lower gonial angle can be used as an indicator for growth pattern.

REFERENCES

1. Shahabi M, Ramazanzadeh BA, Mokhber N. Comparison between the external gonial angle in panoramic radiographs and lateral cephalograms of adult patients with class I malocclusion. *J Oral Sci* 2009;51:4259.
2. Xiao D, Gao H, Ren Y. Craniofacial morphological characteristics of Chinese adults with normal occlusion and different skeletal divergence. *Eur J Orthod* 2011;33:198-204.
3. Tweed CH. The Frankfort-mandibular incisor angle (FMIA) in orthodontic diagnosis, treatment planning and prognosis. *Angle Orthod* 1954;24:121-169.
4. Rakosi T. An Atlas and manual of cephalometric radiography. Wolfe Medical Publications Ltd. p. 47-49.