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Original Research

Utility of gonial angle as an indicator for the growth pattern

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ABSTRACT:

Background: 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 present study was conducted to assess the utility of gonial angle as an indicator for the growth pattern. **Materials & Methods:** 80 subjects of both genders were included. The growth pattern was grouped into three groups ie. group I comprised of vertical growth pattern, group II had average growth pattern and group III had horizontal growth pattern based on the clinical and cephalometric Frankfort-mandibular plane angle (FMA). Frankfort mandibular plane angle, gonial angle, upper gonial angle and lower gonial angle were measured. All measurements were performed in degrees. **Results:** Out of 80 subjects, males comprised 35 (43.7%) and females 45 (56.3%). The mean FMA (degree) in group I was 19.3, in group II was 24.1 and in group III was 32.4. Gonial angle was 123.4, 126.5 and 130.7, upper gonial angle was 56.9, 55.4 and 53.7 and lower gonial angles was 67,5, 71.6 and 76,2 degrees in group I, II and III respectively. The difference was significant (P< 0.05). **Conclusion:** Gonial angle especially the lower gonial angle can be considered as an important parameter in assessing the direction of mandibular growth.

Key words: Gonial angle, growth pattern, Lateral cephalogram

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INTRODUCTION

The growth at the condyles usually does not occur in the direction of the ramus, as is commonly imagined, but slightly forward. Individual variations in the direction of growth at the condyles are large and, in the adolescent period, have been found to vary by almost 45 degrees, Growth is not always linear in direction but usually curves slightly forward or occasionally even backward.[1] The pattern of mandibular growth is thus generally characterized by an upward- and forward-curving growth at the condyles, while at the same time there is resorption on the lower aspect of the gonial angle and some apposition below the symphysis.[2] The mandibular canal is not remodelled to the same extent as the outer surface of the jaw, and the trabeculae related to the canal are therefore relatively stationary. The curvature of the mandibular canal, therefore, reflects the earlier shape of the mandible.[3]

Gonial angle is widely used in orthodontic cephalogram tracing.[4] 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.[5] 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.[6] The present study was conducted to assess the utility of gonial angle as an indicator for the growth pattern.

MATERIALS & METHODS

The study was carried out on lateral cephalograms by selecting 80 patients of both genders who had undergone fixed orthodontic treatment in the Post

Graduate Department of Orthodontics & Dentofacial Orthopaedics, Government Dental College & Hospital, Srinagar. Ethical approval for the study was obtained before starting the study.

Demographic data of each subject was recorded. The growth pattern was grouped into three groups ie. group I comprised of vertical growth pattern, group II had average growth pattern and group III had 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. All measurements were performed in degrees. Frankfort mandibular plane angle, gonial angle, upper gonial angle and lower gonial angle were measured. Frankfort mandibular plane angle is the angle formed between Frankfort horizontal plane (FHP) and mandibular plane. Gonial 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. Results thus found were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of subjects

Gender	Number	Percentage
Male	35	43.7%
Female	45	56.3%

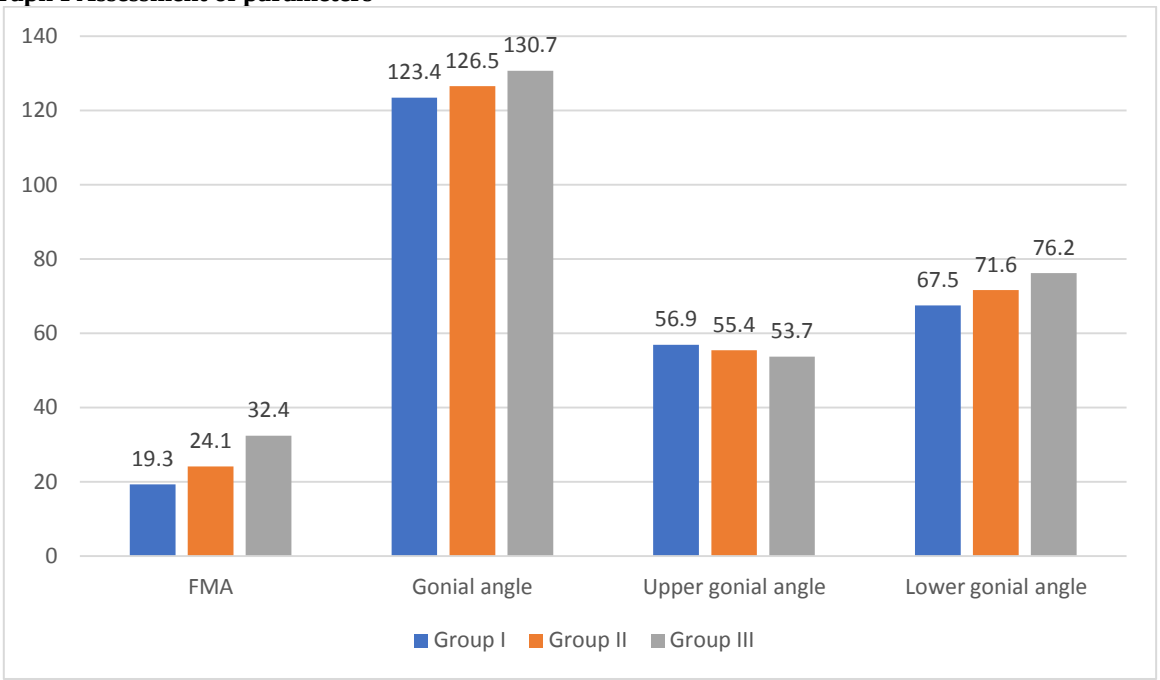
Table I shows that out of 80 subjects, males comprised 35 (43.7%) and females 45 (56.3%).

Table II Assessment of parameters

Parameters	Group I	Group II	Group III	P value
FMA	19.3	24.1	32.4	0.05
Gonial angle	123.4	126.5	130.7	0.03
Upper gonial angle	56.9	55.4	53.7	0.09
Lower gonial angle	67.5	71.6	76.2	0.05

Table II, graph I shows that mean FMA (degree) in group I was 19.3, in group II was 24.1 and in group III was 32.4. Gonial angle was 123.4, 126.5 and 130.7, upper gonial angle was 56.9, 55.4 and 53.7 and lower gonial angles was 67,5, 71.6 and 76,2 degrees in group I, II and III respectively. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

It has been confirmed by the implant technique that growth in length of the mandible in human occurs essentially at the condyles.[7] The anterior aspect of the chin is extremely stable, no growth having been found here except in a few cases of pathologic development. The thickening of the symphysis, therefore, normally takes place by apposition on its posterior surface.[8] On

its lower border there is likewise apposition, which contributes to the increase in height of the symphysis.[9] As the endosteal resorption in this area does not occur at the same rate as the apposition on the outer surface, a pronounced apposition will be reflected in an increase in the thickness of the cortical substance. The periosteal apposition below the symphysis is extended posteriorly, to the anterior part of the lower border of the mandible and when it is marked this area is characteristically rounded.[10] Below the angle of the mandible there is normally resorption, which may be very pronounced. In some cases there is, instead, apposition on the lower border at the angle of the jaw. These appositional and resorptive processes result in an individual shaping of the lower border of the mandible, which characterizes the type of growth.[11] The present study was conducted to assess the utility of gonial angle as an indicator for the growth pattern.

In present study, out of 80 subjects, males comprised 35 (43.7%) and females 45 (56.3%). Rubika et al[12] determined 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. Gonial angle, upper gonial angle and lower gonial angle measurements were made on lateral cephalograms of 90 patients—44 males and 46 females. It was found that all the values were statistically significant with a p-value = 0.000. 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.

We observed that mean FMA (degree) in group I was 19.3, in group II was 24.1 and in group III was 32.4. Gonial angle was 123.4, 126.5 and 130.7, upper gonial angle was 56.9, 55.4 and 53.7 and lower gonial angles was 67,5, 71.6 and 76,2 degrees in group I, II and III respectively. According to Rakosi[13], the norm value for gonial angle in Caucasians with average growth pattern ranged from 128° ± 7° which was almost similar to our measurements 127.0333° ± 0.99710° 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° ± 1.07220° 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° ± 0.90558°. This value was less compared to the Caucasian population.

Prediction by the longitudinal method, which is commonly used, consists of following the course of development in annual x-ray cephalometric films. In some cases, it may be useful to start the observation prior to treatment, but usually it is desirable to initiate treatment early and, in the meantime, to accumulate experience of the current type of growth to serve as a basis for planning the subsequent measures. It is for the subjects displaying the most pronounced changes in facial form that the diagnosis of the growth pattern is of prime clinical importance. In the period of most rapid growth this may be established within a year or two.[14] The longitudinal method has a general limitation in that the pattern of growth is not constant and the pattern recorded at a juvenile age may well have changed by adolescence.

CONCLUSION

Authors found that gonial angle especially the lower gonial angle can be considered as an important parameter in assessing the direction of mandibular growth.

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