

# Comparison of the gonial angle measurements on Lateral Cephalogram and both hemispheres of Orthopantomogram

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## Abstract

**Introduction:** Gonial angle is one of the most important values ascertained in lateral cephalogram (lat ceph) tracing. According to the literature, gonial angle can be measured from orthopantomogram (OPG). The objective of this study was to test the reliability of left and right hemispheres of OPG in measuring the gonial angle and to compare these values with lateral ceph measurements.

**Material and Methods:** A hospital based survey was conducted based on patients visiting Orthodontic Department, Peshawar Dental Hospital, Peshawar, from 1<sup>st</sup> January 2012 to 31<sup>st</sup> March 2015. The radiographs (OPG and lateral ceph) were advised and gonial angle traced to check their accuracy.

**Results:** The sample comprised of 80 patients with class I malocclusion. Mean value of gonial angle measured from lateral ceph was  $125.4 \pm 6.34$ , from left OPG was  $123.8 \pm 6.17$  and from right OPG was  $123.2 \pm 6.38$ .

**Conclusions:** The gonial angle measured from both sides (left and right) of OPG is equally reliable but significantly different than gonial angle measured from lateral ceph.

**Keywords:** Gonial angle; orthopantomogram; lateral cephalometric radiograph

## Introduction

The Orthopantomogram (OPG)<sup>1</sup> has been extensively used in dentistry for analysing the number and type of teeth present, caries, impacted teeth, root resorption, ankylosis, shape of the condyles,<sup>2</sup> temporomandibular joints, sinuses, fractures, cysts, tumors and alveolar bone levels.<sup>3,4</sup> OPG x-ray is obtained for all orthodontic patients including class I malocclusion.<sup>5</sup> The gonial angle is an important value for determination of growth pattern of patients,<sup>6</sup> extraction pattern in class II patients,<sup>7</sup> decision making whether to carry out surgery

in class III skeletal base patients<sup>8</sup> and age estimation in forensic medicine.<sup>9</sup> Recent studies have highlighted that, OPG can be used to calculate the gonial angle which is a key value in cephalometric diagnosis.<sup>10</sup> Larheim and Svanaes proved that measuring the gonial angle from a lateral cephalogram (lat ceph) is not reliable and is difficult because of superimposed images, on the other hand the calculation done on an OPG is the same as measured on dried human mandibles.<sup>11</sup> There are two methods of constructing the gonial angle on the lateral ceph. The first is to draw a tangent on the posterior border of the ramus of the mandible and join it with another line passing through the points gonion and gnathion.<sup>12</sup> The second method is to draw a tangent on the posterior border of the ramus and the lower border of the body of the mandible.<sup>13</sup> The OPG consists of two hemispheres i.e. left and right hence, it would be prudent to check whether both sides are equally reliable or not. Hence the objective of conducting the present study was to test the reliability of left and right

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hemispheres of OPG in measuring the gonial angle and to compare these values with lateral ceph tracings so as to determine whether it could assist in orthodontic treatment planning as well as age estimation in forensic medicine.

## Material and Methods

This cross-sectional study was carried out on the records of patients, treated in the Orthodontics Department from 1<sup>st</sup> January, 2012 to 31<sup>st</sup> March, 2015, Peshawar Dental College, after taking approval from the ethical committee of the institute. Every patient was given a serial number for confidentiality. The study was conducted on records of 80 patients having 95% confidence interval and 80% power. All radiographs were taken by the same operator using same x-ray machine (Plan Meca 2000, USA). Patients (40 males

and females) between ages of 15-25 years, Class I malocclusion with complete records, including radiographs of high quality were included while patients having history of trauma, previous facial / mandibular surgery, syndromes (affecting face/jaw) were excluded.

Radiographs were analysed by two experienced orthodontists who were not aware of the objective of the study to avoid bias. The tangents were drawn with a 2H pencil. The gonial angle was measured between two lines. One tangent was drawn to the distal border of the ascending ramus and condyle and the second to the lower border of the mandible on both OPG and lat ceph.

## Results

Paired T-test was used to analyse the values. Mean values of gonial angle measured from

**Table I :Corelation of Gonial Angle Measurements of OPG and Lateral Cephalogram**

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Lateral ceph - OPG Right	2.212	4.277	.478	1.261	3.164	4.626	79	.000
Pair 2	Lateral ceph - OPG Left	1.600	3.723	.416	.771	2.429	3.844	79	.000
Pair 3	OPG Right - OPG Left	-.612	4.510	.504	-1.616	.391	-	79	.228

**Table II: Mean, standard deviation and range of gonial angle measured on lateral cephalogram and orthopantomogram (left and right)**

	Lateral ceph	OPG Right	OPG Left
Mean	125.48	123.26	123.88
Std. Deviation	6.342	6.382	6.177
Range	34	33	31

lateral cephalometric radiograph was  $125.4 \pm 6.34$  degrees whereas when measured from Orthopantomogram, it was  $123.8 \pm 6.17$  and  $123.2 \pm 6.38$  degrees for left and right

respectively (Table II). Gonial angle measured on both right and left side of OPG were significantly different than lateral ceph measurements whereas difference between gonial angles of both sides of OPG was found to be non-significant (Table I).

## Discussion

Literature has contradicting evidence regarding Gonial angle values ascertained on lateral ceph tracing and OPG x-ray.<sup>14</sup> However, the present study is in agreement to the studies which describe the values of both sides of the OPG to be identical.<sup>15</sup> These

studies must be looked at with caution since radiological standardization, based on technical as well as human errors is prevalent in many clinical settings. This may also be the cause of difference in the reported results. Despite having such evidence, gonial angle measured on OPG has been proved to be closer to the value measured on dry human mandibles.<sup>11</sup> We might conclude that Gonial angle can be preferentially measured on OPG rather than lateral Ceph tracing.

## Conclusions

Gonial angle measured from OPG of the patient was significantly different than that of the lateral cephalogram measurement. This phenomenon must be further tested on a larger scale to establish the fact whether OPG can be used as a more reliable tool for the assessment of gonial angle instead of measuring the same on a lateral ceph.

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