

# Cephalometric comparison of cesarean and normal births

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## ABSTRACT

**Objective:** The aim of this study was to compare cephalometric variables of subjects with normal and cesarean births. **Materials and Methods:** Ninety age- and gender-matched patients, who were treated in Gaziantep University, Faculty of Dentistry Orthodontics Department were equally divided into normal and cesarean groups according to the birth methods reported by their mothers. To eliminate the negative effects of being different in terms of age and gender among parameters, control, and patient groups were matched in the present study. Pretreatment cephalometrics radiographs were used. Six measurements representing sagittal and vertical relationships were evaluated from pretreatment cephalograms using Dolphin Imaging Orthodontics Software was used in this issue by an orthodontist. Kolmogorov–Smirnov test, Student’s *t*-test, and Mann–Whitney U-test were used for statistical comparisons. **Results:** A point-nasion-B point angle (ANB) and Wits values were higher in the normal group, while sella-nasion-A point angle, sella-nasion-B point angle, Frankfort horizontal-mandibular plane angle, and gonion-gnathion-SN plane angle values were higher in the cesarean group. However, the groups showed no significant differences ( $P > 0.05$ ). ANB angle and Wits values showed high correlation. **Conclusions:** Within the study limitations, the results suggest that the birth method may not have a considerable effect on the development of the craniofacial skeletal system.

**Key words:** Cesarean section, orthodontics, vaginal birth

## INTRODUCTION

Malocclusion constitutes a high percentage of orofacial diseases. Regardless of its age of development, it can cause social and medical problems. The frequency of such malocclusions is 40–80% in modern societies, 43–79% in Nordic countries<sup>[1-4]</sup> and 89.9% in Turkish population.<sup>[5]</sup>

Some theories have been proposed regarding malocclusion in the deciduous dentition.<sup>[6,7]</sup> The most widely accepted theory is the functional matrix

hypothesis. It suggests that bone grows in response to changes in functional matrices.<sup>[8]</sup> Therefore, changes in facial musculature can give rise to skeletal irregularity. Facial remodeling and growth are also associated with neurocranial development. The majority of brain maturation happens in the first 2 years of life.<sup>[9]</sup> During this period, any unsuitable changes may have different outcomes. For example, growing individuals exposed to different climate conditions,<sup>[10]</sup> radiation<sup>[11]</sup>

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may develop disorders related to brain damage. This view implies that the birth method could also affect the craniofacial skeleton. In the literature, there are limited number of studies evaluating the effect of the different forceps procedures on the different dental malocclusion types including dental arch dimensions, height of the hard plate, maxillary unilateral or bilateral cross-bite, overjet, open bite, mandibular protrusion, and labiolingual spread.<sup>[12]</sup>

A few studies used angle's classification to evaluate the effects of birth trauma on dental malocclusion.<sup>[9,12]</sup> Since results of the study by Cattaneo *et al.*<sup>[9]</sup> include only descriptive statistic, they concluded that better understanding of the connections among osteopathic theory and the outcomes upon dental occlusion, more rigorous and meaningful evaluations are required. Although many studies have been made about this issue,<sup>[9,12-14]</sup> there are no studies on cephalometric evaluation of different birth types. So the theory of if patients born with cesarean and normal delivery might have different cephalometric values is still unclear. The objective of this study was to test the hypothesis that cephalometric variables of subjects with normal births are different from cesarean births.

## MATERIALS AND METHODS

Ninety patients were equally divided into normal and cesarean groups according to the birth method reported by their mothers. To eliminate the negative effects of age and gender, the groups were matched.<sup>[15]</sup> The Clinical Research Ethical Committee of Gaziantep University approved the study (November 5, 2013, approval number 364) and informed consent forms were taken from individuals.

Pretreatment cephalometric radiographs of both groups were used. Six measurements representing sagittal and vertical relationships were evaluated from pretreatment cephalograms in Dolphin Imaging Software version 10.5 (Dolphin Imaging and Management Solutions, Charsworth, CA, USA) by a single orthodontist (M.G.):

- Sella-nasion-A point angle (SNA): Anteroposterior relationship of the maxilla with the anterior cranial base
- SN-B point angle (SNB): Anteroposterior relationship of the mandible with the anterior cranial base
- A point-nasion-B point angle (ANB): Anteroposterior relationship of the mandible with the maxilla
- Gonion-gnathion-SN plane angle (GoGn-SN):

Inclination of the mandibular plane in relation to the anterior cranial base

- Frankfort horizontal-mandibular plane angle (FMA): Indicator of vertical growth. The increasing of this value indicates vertical growth pattern and also decreasing indicates horizontal growth pattern
- Wits value: Indicator of anteroposterior disharmony between the maxilla and the mandible.

SPSS version 11.5 for Windows (SPSS Inc., Chicago, IL) was used for all statistical analyses. Kolmogorov-Smirnov test was used for the continuous variables followed a normal distribution. Student's *t*-test and Mann-Whitney U-test were used for normally and abnormally distributed variables, respectively. Descriptive statistics are shown as frequency, percentage, or mean  $\pm$  standard deviation. Intraclass correlation coefficient (ICC) and 95% confidence interval were used to test harmony of values and intrarater reliability.

ICC ranged from 0 to 1, where 0 represented no agreement and 1 indicated perfect agreement.  $P < 0.05$  was considered significant. Finally, a regression analysis model was used.

## RESULTS

The mean age in both the groups was  $13.98 \pm 2.19$  years ( $P = 1.000$ ). Each group was composed of 21 (46.6%) female and 24 (53.4%) male ( $P = 1.000$ ) [Table 1].

ANB angle and Wits values were higher in the normal group, while SNA angle, SNB angle, FMA, and GoGn-SN angle values were higher in the cesarean group [Table 2]. However, the groups showed no significant differences [Table 2]. The ICC value of 0.855 suggested a high level of harmony between the ANB angle and the Wits values. The regression formula for this relationship was  $ANB = 3.04 + 0.663 \times \text{Wits value}$  (estimated success rate of ANB angle value = 0.796).

## DISCUSSION

The big dilemma for prospective mothers and gynecologist is the decision of normal delivery or

**Table 1: Age and gender characteristics of normal delivery and cesarean section groups**

	Normal delivery (n=45)	Cesarean section (n=45)	P
Age (years)	13.98 $\pm$ 2.19	13.98 $\pm$ 2.19	1.000
Gender (female/male)	21/24	21/24	1.000

**Table 2: Cephalometrics values according to groups**

	Normal birth (n=45)	Cesarean birth (n=45)	P
SNA (°)	80.09±3.22	80.30±3.47	0.761
SNB (°)	76.90±3.53	77.25±3.98	0.664
ANB (°)	3.18±3.36	2.87±4.38	0.821
GoGn-SN (°)	35.36±5.72	36.90±5.85	0.210
FMA (°)	27.94±6.04	29.49±6.01	0.225
Wits	0.81±4.99	-0.84±5.39	0.192

SNA: Sella-nasion-A point angle, SNB: Sella-nasion-B point angle, ANB: A point-nasion-B point angle, GoGn-SNL: Gonion-gnathion-SN plane, FMA: Frankfort horizontal-mandibular plane angle

cesarean section. When analyzing studies in the literature, it was observed that normal delivery and cesarean deliveries have some advantages and disadvantages. Some authors do not recommend normal vaginal delivery because of the possibility of intracranial hematoma,<sup>[16-18]</sup> whereas others do not advocate cesarean delivery because of delayed lung liquid absorption.<sup>[19-22]</sup> In addition, although there are many risks of these approaches, according to indications, both methods are routinely performed. Recently, even numbers of cesarean section, depending on patient and doctor preferences, are higher than normal delivery. According to the World Health Organization, the worldwide cesarean rate is 15%,<sup>[23,24]</sup> and even 35–45% in countries such as Australia, New Zealand, and Canada.<sup>[25-28]</sup> The Turkish Society of Obstetrics and Gynaecology reported the cesarean rate as 5.7% in 1988, 21% in 1998, and over 45% in 2010.<sup>[29]</sup> This remarkable rise may increase the incidence of malocclusion in our country.

Previous studies have shown important of age and sex matching to eliminate the negative effects of a wide range of variations in terms of age and gender among the parameters,<sup>[15,30]</sup> so the control and patient groups were also matched in this study.

It is impossible that dental malocclusion is related to only one reason. Factors strictly related to the causes of the malocclusion are several; finger sucking, biting or chewing foreign objects, cheek biting, prolonged pacifier sucking, traumas, genetic factors, dental hypodontia or hyperdontia, etc.<sup>[6-8]</sup> According to the functional matrix hypothesis, the neurocranium and tongue are primarily responsible for malocclusion by altered muscular dynamics. Season of birth, parental age, birth order, birth weight, characteristics of pregnancy, and type of delivery have been considered as secondary causes. Forceps delivery arising from natality variables may cause an assumable disorder in two ways: Alteration of cranial growth and alteration of suction-deglutition pattern.

Pirttiniemi *et al.*<sup>[12]</sup> studied the effects of difficult forceps delivery on dental arch dimensions and occlusal development of children using dental models and concluded that this procedure is associated with later asymmetric occlusion. Schoenwetter<sup>[13]</sup> examined a group of patients with crossbite and found a high incidence of this malocclusion among those who had a forceps-assisted birth. Contrarily, Janerich and Carlos<sup>[14]</sup> found no association between occlusal characteristics and complications of pregnancy or delivery, including forceps delivery. Although Cattaneo *et al.*,<sup>[9]</sup> who studied sagittal malocclusion and birth methods, stressed that none of their subjects with malocclusion had a normal birth, they did not examine the relationship between birth trauma and malocclusion cephalometrically, diminishing the clinical significance of the finding. This study did not reveal significant differences in cephalometric variables related to sagittal and vertical skeletal growth between the normal and the cesarean groups.

The pathogenesis of primary malocclusion is explained by Moss and Salentijn functional matrix theory.<sup>[8,9,31]</sup> The matrix changes cause differentiation in skeletal structures. It consists with this theory that pressure, which is occurred during delivery, may affect the craniofacial skeletal system. The hypothesis of this study based on this scientific fact. However, the results showed that there was no significant difference between different types of birth. So the hypothesis was rejected.

Wits and ANB angle values, used to determine sagittal malocclusion, sometimes show different results of the anteroposterior relationship of the jaws. ANB angle, defined by Riedel in 1952, was commonly used until Wits value was determined by Jacobson<sup>[32]</sup> in 1976. As the angle depends on cranial references points, it may give incorrect information in craniofacial anomalies or malformations.<sup>[33]</sup> Previous studies of the relationship between ANB angle and Wits value revealed varying results of their reliability. Oktay<sup>[34]</sup> found a high correlation but Zamora *et al.*<sup>[33]</sup> reported only a slight correlation. The present study showed a high correlation between these measurements.

The present study has several limitations, especially the method of classification, ignoring birth duration and forceps delivery. Further, the classification was based on maternal reports, and the sample size was small. Future controlled trials conducted with larger samples are needed to support and extend

the findings. This study seems to be the first-one to evaluate some cephalometric variables according to the birth method.

## CONCLUSIONS

According to results of this study; the birth method does not seem to have a considerable effect on the development of the craniofacial skeletal system. ANB angle and Wits value show high correlation.

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### Conflicts of interest

There are no conflicts of interest.

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