

The changes of horizontal distance of condyle to nasal septum after the twin-block treatment

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ABSTRACT

Introduction: Twin-block appliance is mostly used in the management of Class II malocclusion. It is a simple removable bite block that modify the occlusal inclined plane to guide the mandible protrusion. It will affect to the condyle and caused changing in size, volume, or position in long term. The aim of this study was to investigate the changes of horizontal distance from condyle to nasal septum after the Twin-block treatment on Class II division 1 with retrognathic mandible. **Methods:** There were total 5 samples of panoramic radiograph before Twin-block treatment and 5 samples after Twin-block treatment. The panoramic radiographs were traced to identify the changes of horizontal distance from condyle to nasal septum. The differences before and after the treatment were analyzed statistically. **Results:** The horizontal distance from the middle of nasal septum to the most superior surface of condyle head after the Twin-block treatment increased. The difference was slight ($p\text{-value} > 0.05$), which means no significant changes of condyle position before and after the treatment of Twin-block. **Conclusion:** There was no significant difference in horizontal distance from the most superior surface of condyle head to the middle of nasal septum before and after treatment of Twin-block.

Keywords: Condyle, nasal septum, Class II division 1, retrognathic mandible, twin-block.

INTRODUCTION

Class II malocclusion treatment is determined by the severity of the problem and the age of the patient. Three types of Class II malocclusion treatment are growth modification, orthodontic camouflage, and orthognathic surgery. Growth modification generally referred to as dentofascial orthopedics, is choice of treatment of skeletal discrepancy problem. The effectiveness of growth modification is depends on the age of the patients because forward growth of mandibular most likely occurs during the puberty stage of patients. In the

treatment of patients with Class II malocclusion with retrognathic mandible, many types of removable or fixed functional appliances have been used to stimulate the mandible growth to correct the skeletal discrepancy.¹

Among the functional appliances, Twin-block appliance is mostly used in the management of Class II malocclusion. Twin-block appliances are the simple removable bite block that modify the occlusal inclined plane to guide the mandible protrusion. The main function of the Twin-block is to maximize the mandibular protrusion growth to correct the Class II malocclusion. Hence, when the

patients are wearing the Twin-block appliances, the condyle will be forced to move forward in order to compensate with the mechanical force of the appliances. Then, this altered biomechanical environment will stimulate the growth of the secondary cartilage of condyle and will caused the condyle to change in size, volume or position the in long term.²

Panoramic radiograph has been an important dental diagnostic tools for over many years. It is more widespread and is often used by dentist to access the condition of teeth and its surrounding. The anatomy of condyle and nasal septum can be clearly seen in the panoramic radiograph. Lemos asymmetry analysis is a new analysis to produce mandibular asymmetry measurements from dental panoramic radiographs. Angular measurement and linear measurement can be performed using Lemos asymmetry analysis. A horizontal line was drawn from the point of taller condyle perpendicular to the median sagittal plane to detect the difference between the heights of the right and left condyle. This horizontal line is used as the modification of Lemos asymmetry analysis to measure the distance from the middle of nasal septum to the most superior surface of condyle head.³

There is still not sufficient evident to clarify that the changes of horizontal distance from condyle to nasal septum after the Twin-block treatment on Class II division 1 with retrognathic mandible. Therefore, based on the reason above, the researcher feels interested to carry out further investigation.

METHODS

The population of this research were young growing patients consist of males and females with complete Twin-block treatment at the Orthodontic Clinic of Universitas Padjadjaran Dental Hospital (Unpad Dental Hospital) from year 2010 to 2015. The secondary data of the research subject were choose based on the inclusive criteria: males or females, Class II division 1 malocclusion with retrognathic mandible, Patients receive completed Twin-block treatment, and the panoramic radiograph before and after treatment in good condition. The exclusive criteria of the population was patients with temporomandibular joint disorder.

Samples were obtained based on total sampling method, the data available from year 2010 to 2015 which fulfilled the inclusive criteria. Nasal septum, right-sided condyle head, left-sided condyle head, outline of mandible, molar teeth 36 and molar teeth 46 were traced on the acetate sheets for all studied samples of panoramic radiograph before and after Twin-block treatment. The widest mesiodistal crown length of teeth 46 (right region) and 36 (left region) were measured for calibration of measurement on panoramic radiograph for before and after treatment of Twin-block.⁴ Calibration equation for each sample of right and left region.

Calibration factor for right region of panoramic radiograph were calculated using widest mesiodistal crown length of teeth 46 and for left region of panoramic radiograph were calculated using widest mesiodistal crown length of teeth 36 before and after treatment of Twin-block. The calibration factor for all samples of left and right region were recorded. The traced acetate sheets were collected and were prepared for the measurement of the research.

A vertical medial line were drawn on the traced nasal septum. Right horizontal line (RHL) were drawn from most superior part of condyle to the medial line on nasal septum on the right region. Left horizontal line (LHL) were drawn from most superior part of condyle to the medial line on nasal septum on the left region.

The horizontal distance from the most superior part of condyle to the medial line of nasal septum on the right region were recorded as NS-RCo. The horizontal distance from the most superior part of condyle to the medial line of nasal

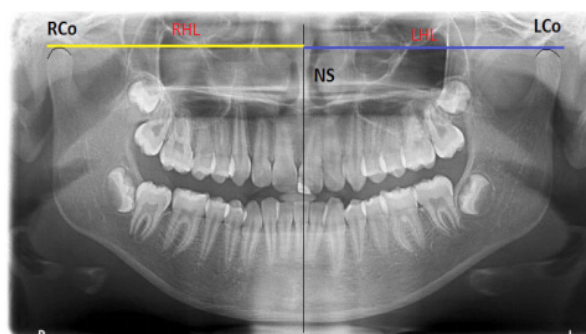


Figure 1. Landmarks used in the study: RCo= Right condyle head, NS=Nasal septum, LCo= Left Condyle head, RHL=Right horizontal line LHL=Left horizontal line.

Table 1. Comparison of NS-RCo before and after twin-block treatment

Variable	Treatment	Mean (Std. dev)	p-value	Conclusion
NS-RCo	Before	97.50 (14.56)	0.461	Not Significant
	After	101.04 (14.65)		

Table 2. Comparison of NS-LCo before and after twin-block treatment

Variable	Treatment	Mean (Std. Deviation)	p-value	Conclusion
NS-LCo	Before	92.80 (75.50)	0.043	Significant
	After	99.88 (76.64)		

Table 3. Comparison of NS-Co before and after twin-block treatment

Variable	Treatment	Mean (Std. Deviation)	p-value	Conclusion
NS-Co	Before	95.15 (12.52)	0.065	Not significant
	After	100.46 (13.31)		

Significant at $p < 0.05$; Not significant at $p > 0.05$, NS-Co= horizontal distance from the nasal septum to the condyle on the left region

septum on the left region were recorded as NS-LCo. NS-RCo and NS-LCo before Twin-block treatment were calibrated with each calibration factor. NS-RCo and NS-LCo after Twin-block treatment were calibrated with each calibration factor. Analyse the difference of NS-RCo and NS-LCo for before and after Twin-block treatment. The outcome of research were presented in statistical form.

RESULTS

This research was carried out at the Orthodontic Clinic of Unpad Dental Hospital, with total of 5 samples of panoramic radiograph before Twin-block treatment and 5 samples after Twin-block treatment. The result of this research is to determine the changes of horizontal distance from condyle to nasal septum on patients of Class II division 1 malocclusion with retrognathic mandible after treated with Twin-block treatment. The outcome of the research is analysed using paired t-test.

Based on table 1, the mean value of NS-RCo after treated with Twin-block treatment is greater than mean value of NS-RCo before treated with Twin-block treatment. The standard deviation for NS-RCo after received treatment is higher and the value is 14.65. The p-value calculated by paired t-test is greater than 0.05 which indicates that

there is no significant difference in horizontal distance from the most superior part of condyle to the medial line of nasal septum on the right region before and after treatment of Twin-block.

Based on Table 2, The mean value for variable NS-LCo before the treatment is 92.80 millimeters and the standard deviation value is 75.50. The variable NS-LCo after the treatment has higher value than NS-LCo before the treatment for both mean value and standard deviation value, which is 99.88 mm and 76.64. In this comparative analysis, wilcoxon test is used due to the data with not normal distribution. The p-value resulted from Wilcoxon test is 0.043, When the p-value is smaller than 0.05, therefore there is significant difference in horizontal distance from the most superior part of condyle to the medial line of nasal septum on the left region before and after treatment of Twin-block.

The outcome below is the comparison of differences in horizontal distance from the most superior part of condyle to the medial line of nasal septum before and after the Twin-block treatment. Based on table 3, the mean value of NS-Co after Twin-block treatment is 100.46 millimeters and it is higher than mean value of NS-Co before Twin-block treatment which is 95.15 millimeters. The standard deviation value of the NS-Co before Twin-block treatment is lower than

the NS-Co after Twin-block treatment. The p-value in this comparative analysis is 0.065 that is more than 0.05, so the p-value is not significant. In another words, there is no significant differences in horizontal distance from the most superior part of condyle to the medial line of nasal septum after the Twin-block treatment.

DISCUSSION

Among the samples in this research, there were panoramic radiographs for before and after the treatment of Twin-block from two different machine. A similar problem detected in Levandoski panoramic radiographic analysis. Several level of magnification and focal distances is very different from machine to machine, but the analysis focus on comparative values but not the absolute value. Therefore it is relative to use the values from the radiographic analysis. In order to solve the magnification problem in this research, teeth 36 and 46 was used as the guidance to calibrate the measurement for before and after the treatment. Mandibular first molar was choose as the calibration guidance because according to Puricelli⁴ the panoramic radiograph image distortions are smaller in the region between the molars and mandibular ramus.

The result of the research in Table 3 stated that there is no significant difference in horizontal distance from the most superior part of condyle to the medial line of nasal septum on the right region before and after treatment of Twin-block. The mean value of NS-RCo after treated with Twin-block treatment (101.04 millimeters) is greater than mean value of NS-RCo before treated with Twin-block treatment (97.50 millimeters). Although the difference in horizontal distance from the most superior part of condyle to the medial line of nasal septum on the right region before and after treatment of Twin-block is not significant, there is still increase in horizontal distance from the most superior part of condyle to the medial line of nasal septum on the right region after treatment of Twin-block.

Next, Table 2 showed the result of the research as there is significant difference in horizontal distance from the most superior part of condyle to the medial line of nasal septum on the left region before and after treatment of Twin-

block. The mean value of NS-LCo after treated with Twin-block treatment (99.88 mm) is higher than mean value of NS-LCo before treated with Twin-block treatment (92.80 mm). This result is supported by the scientific theory proposed by the author. Fareen *et al.*⁵ stated that condyle is able to growth in backward direction which caused the changes of horizontal distance from condyle to nasal septum after the treatment of Twin-block.

Several weakness of the research can be pointed out to explain the contradiction of the differences on the left and right region such as, the sample size is too small to represent the whole population and when the smaller the sample size, the percentage of errors is also increased. The condyle head is able to grow in upward and backward direction. However the growth response of each patients may be also differ. In growing period, the growth of craniofacial skeletal is still incomplete, the craniofacial bone such as mandible are able to increase in size, undergo bone remodelling, and bone displacement. Hence, the changes of horizontal distance from condyle to nasal septum after the Twin-block treatment may be not too significant due to the growth of the mandible bone.

Based on Table 3, it is statistically proven that there is no significant differences in horizontal distance from the most superior part of condyle to the medial line of nasal septum after the Twin-block treatment. The differences of horizontal distance from the most superior part of condyle to the medial line of nasal septum after the Twin-block treatment is too slight to prove the changes of horizontal distance from condyle to nasal septum after the Twin-block treatment. However, the overall mean value of NS-RCo after treated with Twin-block treatment is still greater than mean value of NS-RCo before treated with Twin-block treatment. The overall mean value of NS-Co after Twin-block treatment is 100.46 mm and the mean value of NS-Co before Twin-block treatment is 95.150 mm.

Therefore, there are still growth of condyle and changes of horizontal distance from condyle to nasal septum after the Twin-block treatment on Class II division 1 malocclusion with mandibular retrognathia but the growth of condyle is not enough to prove the statistical significant changes of condyle position based on nasal septum.

CONCLUSION

There was no significant difference in horizontal distance from the most superior surface of condyle head to the middle of nasal septum before and after treatment of Twin-block.

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