CHAPTER I

INTRODUCTION

1.1 Research Background

Dental malocclusion is a very common oral health problem currently. The Classification of Malocclusion by Edward Angle in 1899 represented the dental malocclusion into three classes of malocclusion. Class II malocclusion or distal occlusion occurred when the maxillary first molar occluded mesially to the mesiobuccal groove of mandibular first molar. Class II malocclusion was further classified into division 1 in which the maxillary incisors are protruding and division 2 in which the maxillary incisors are retruding (Bishara, 2001).

Class II division 1 malocclusion shows the highest malocclusion prevalence among young patients. This statement can be proven based on a research carried out among adolescents in Central Anatolia in 2007, the prevalence of malocclusion of the studied subjects had 10.1% of normal occlusions, 34.9% of Class I malocclusions, 40.0% of Class II division 1 malocclusions, 4.7% of Class II division 2 malocclusions and 10.3% of Class III malocclusions (Gelgor et al., 2007). One of the research showed that the most common traits in Class II division 1 malocclusions population are 60% of retrognathic mandible, 55.8% of maxillary prognathism and reduce vertical skeletal jaw relationship (Sidlauskas et al., 2006). The population of Class II division 1 malocclusion with retrognathic mandible often caused esthetic problems of young patients in the future. Therefore, it becomes a very important issue for orthodontic practitioners to concern about it.
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 orthonagtic surgery. Growth modification generally referred to as dentofacial orthopedics, is choice of treatment of skeletal discrepancy problem (Mahfouz, 2014). 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 (Mitchell, 2001). 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 (Yildirim et al., 2014).

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 (Clark, 2015). 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.

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 asymetry analysis is a new analysis to produce mandibular asymmetry measurements from dental panoramic radiographs. Angular measurement and linear measurement can be performed using Lemos asymetry 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 (Lemos et al., 2014). This horizontal line is used as the modification of Lemos asymetry analysis to measure the distance from the middle of nasal septum to the most superior surface of condyle head.

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.

1.2 Problem Identification

Is there any changes of horizontal distance from condyle to nasal septum after the Twin-block treatment on Class II division 1 malocclusion with retrognathic mandible.

1.3 Aim of Research

The aim of the research is to identify the changes of horizontal distance from condyle to nasal septum after the Twin-block treatment on Class II division 1 malocclusion with retrognathic mandible.
1.4 Research Benefits

The benefits of this research are categorized into scientific research benefits and practical research benefits.

1.4.1 Scientific Research Benefits

The theoretically benefit of this research is to provide more scientific information about the changes of horizontal distance from condyle to nasal septum after the Twin-block treatment on Class II division 1 malocclusion with retrognathic mandible in dentistry field.

1.4.2 Practical Research Benefits

The practically benefit of this research is to provide more information for the students and orthodontists about the relationship of skeletal discrepancy and growth modification especially the impact of the Twin-block treatment on the changes of horizontal distance from condyle to nasal septum.

1.5 Conceptual Framework

The three main components in the temporomandibular joint position are the mandible condyle, glenoid fossa, and articular disc. Temporomandibular joint is one of the most complex joints in the body. The area where the mandible articulated with the cranium, was composed by two bone with an articular disc (Okeson, 2008). At rest, the condyle is seated passively in the most inner part of glenoid fossa with the articular disc interposed at most superior and anterior position of the condyle.
Temporomandibular joints are connected with the muscle of mastication including masseter, medial pterygoid, lateral pterygoid, and temporalis muscles to perform mandibular opening, mandibular closing, and bite force. The digastric, geniohyoid, mylohyoid, stylohyoid, sternohyoid, omohyoid, sternothyroid muscles are involved in complex mandibular movement such as opening, closure, lateral excursion, protrusion and retraction (Herb et al., 2006).

Class II malocclusion is a common malocclusion and is categorized into Class II division 1 and Class II division 2. There were studies stated that in Class II division 1 patients the maxilla was more protrusive, and the mandible was normal in size and position. Another studies found that the maxilla was in a normal position but the mandible was retrusive. Other studies showed that in Class II division 1 patients there were both maxillary protrusion and mandibular retraction (Al-Khateeb and Al-Khateeb, 2009). They are three applicable management of Class II malocclusion are growth modification, orthodontic camouflage, and orthognathic surgery (Mitchell, 2001). In growth modification Class II division 1 which is maxilla normal and retrognathic mandible, twin-block is one of the most common removable functional appliances used in treatment of Class II malocclusion with retrognathic mandible. Twin-block is made up of acrylic with maxillary and mandible bite blocks. When the patients fully occluded their mouth, upper and lower block interlocked at 70 degree to create a forward mandibular posture. It is indicated to wear 24 hour per day to fully transmit all the functional forces including forces of mastication to the dentition and provide constant proprioceptive sensory stimuli to the temporomandibular joint areas (Clark, 2015).
Most of the functional appliances are indicated to displace the mandibular condylar downward and forward in the glenoid fossa. This forces of displacement are balanced by the upward and backward pull in the supporting muscle of the mandible. Then, adaptive remodelling on both articular surface of the temporomandibular joint surface occurred to compensate the position changed of mandible (Chavan et al., 2014). Theoretically, when the condyles displaced out of the glenoid fossa, the pressure around the active growing condylar cartilage has dropped, the muscle tension on the condyle has altered and endochondral growth of condyles has accelerated (Bishara, 2001).

The condylar cartilage of the temporomandibular joint can be categorized into four zones. The outer most layer of the condyle head consisted of fibrous connective tissue zone. Under the fibrous connective tissue zone, there are proliferation zone of undifferentiated connective tissue cells, which become differentiated to chondroblast. The hyaline cartilage zone with chondroblast and hypertrophied cells followed by endochondral ossification zone in which the cartilage is broke down and replaced by bone. In 1975, Petrovic stated that after the appliance has been worn for 4 weeks, the cell proliferation zone and the hyaline cartilage zone became wider in the anterior translation of the mandible (Rakosi et al., 1993). Hence, the researcher believed that the mechanical alterations in the biomechanical environment of temporomandibular joints will be able to stimulate the growth of the condyles.

Latest research claimed that the efficacy of Twin-block as functional appliances in the growing child based on several aspect. The results showed more sagittal
changes than vertical in which mandibular length increased, changed in the facial profile from convex to straight, decreased in overjet and improved in molar relationship. Effect on the soft tissues can be observed by protruded chin, increased in anterior facial height, increased lower lip length, and increased PAP (Pharyngeal Airway Passage) dimension. Twin-block appliance created some significant effect on temporomandibular joint. For example, increased in anteroposterior diameter and height of condyle, the condyle located more anteriorly and the articular disk located more posteriorly, the condyle grew in upward and backward direction (Fareen et al., 2015).

The outcome of the research showed Twin-block appliance increased condylar volume, mandibular length, and intercondylar distance by enhancing growth of condyle in upward and backward direction. Besides, Twin-block appliance increased SNB and decreased SNA and ANB but midfacial length was not affected (Yildirim et al., 2014).

Based on the theory above, a hypothesis can be made, there is a significant changes of horizontal distance from condyle to nasal septum after the Twin-block treatment on Class II division 1 malocclusion with retrognathic mandible.

1.6 Research Methodology

The research was designed as an observational analytical research where observation will be carry out to detect the changes of the studied subject. Data of the horizontal distance from condyle to nasal septum before and after the Twin-
block treatment were collected at the Clinic PPDGS Ortodonti Rumah Sakit Gigi dan Mulut Universitas Padjadjaran within 3 months by panoramic radiograph.

1.7 Place and Time of Research

The research was carried out at the Clinic PPDGS Ortodonti Rumah Sakit Gigi dan Mulut Universitas Padjadjaran from March to May 2016.