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Full mouth rehabilitation in anterior crossbite and posterior bite collapse patient – A case report

[1]Louisa Christy Lunardhi, [2]Sherman Salim, [3]Harry Laksono
[1]Resident of Prosthodontic Dentistry Department
[2]Staff of Prosthodontic Dentistry Department,
Faculty of Dental Medicine, Universitas Airlangga
Surabaya, Indonesia
Corresponding author: **Louisa Christy Lunardhi,** e-mail: **louisa.lunardhi@gmail.com**

ABSTRACT
Background: Esthetically and functionally successful full mouth rehabilitation requires careful attention and meticulous treatment planning. Successful restoration in a patient with anterior crossbite and a partially edentulous situation can be challenging especially when bilateral posterior segment teeth is missing. Combination restoration using attachment retained removable partial denture (RPD) and removable partial overdenture (RPO) is such kind of treatment modality in prosthodontics. **Purpose**: This study was to provide an overview of a case about full mouth rehabilitation in anterior crossbite and posterior bite collapse patient. **Case**: A 64-year-old female patient came to Prosthodontic Department of RSGMP Universitas Airlangga to have dentures replacing her missing teeth with aesthetic issue on her anterior teeth in order to eat well and be more confident. The patient wants to change her smile into new smile with acceptable aesthetic and function. **Management**: Diagnostic wax-up was made to capture the right occlusal vertical dimension (OVD) in centric relation (CR) that will be used in the first stage of full mouth rehabilitation, followed by management of the remaining teeth by endodontic and periodontal intervention by crown lengthening. Then, definitive restorations were made by maxillary attachment retained RPD with splint four anterior crowns and mandibular RPO with two single crowns on the lower teeth to correct anterior crossbite and posterior bite collapse. **Conclusion**: Patient had a satisfactoryly aesthetic and functional results with new occlusion using maxillary attachment retained RPD and mandibular RPO.
Keywords: full mouth rehabilitation, attachment, anterior crossbite, posterior bite collapse

INTRODUCTION

Esthetically and functionally successful full mouth rehabilitation requires careful attention and meticulous treatment planning. Rehabilitation of anterior crossbite with partially edentulous situation can be challenging especially when bilateral posterior segment teeth are missing.

Anterior crossbite is the term used to define an occlusal problem involving palatal positioning of the maxillary anterior teeth relative to the mandibular anterior teeth. Anterior crossbites can be either dental or skeletal in origin, whereas, anterior dental crossbites originating from the abnormal axial inclination of the maxillary anterior teeth. [1]

Anterior dental crossbite has a reported incidence of 4-5% and is usually the result of a palatal malposition of the maxillary incisors resulting from a lingual eruption path. Other etiological factors include trauma to the primary maxillary incisors resulting in lingual displacement of the permanent tooth buds, presence of supernumerary anterior teeth; crowding in the incisor region; a habit of biting the upper lip; an over-retained, necrotic or pulpless deciduous tooth or root; delayed exfoliation of the primary incisors; and odontomas.[1]

Posterior bite collapse is a sequale of advanced break down. The presence of periodontal inflammation and loss of osseous support can induce teeth migration in a direction partially imposed by occlusal forces. Posterior bite collapse often causes mesial drifting of the posterior teeth and flaring of the anterior segments. It may be aggravated by early loss of teeth that are not replaced, by malocclusion or by a neuromuscular disorder.[2]

Full mouth rehabilitation for patient with anterior crossbite and posterior bite collapse to capture the right OVD in CR is using attachment retained RPD and RPO. The right OVD in CR we can get from reorganized approach occlusion when a new occlusal scheme is established around a suitable condylar position which is the CR position. The patient's occlusion may be reorganized if the existing intercuspal position is unacceptable and needs to be changed or when extensive treatment is to be undertaken to optimize patient's occlusion.

Attachment retained RPD is the treatment therapy that can facilitate both functional and esthetic requirements of patients. The few retrospective studies available show a survival rate of 83.3% for 5 years, of 67.3% up to 15 years, and of 50% when extrapolated to 20 years. Primary indication of attachment retained partial denture is esthetics. When partial denture is essential for distal extension situations, the precision attachment

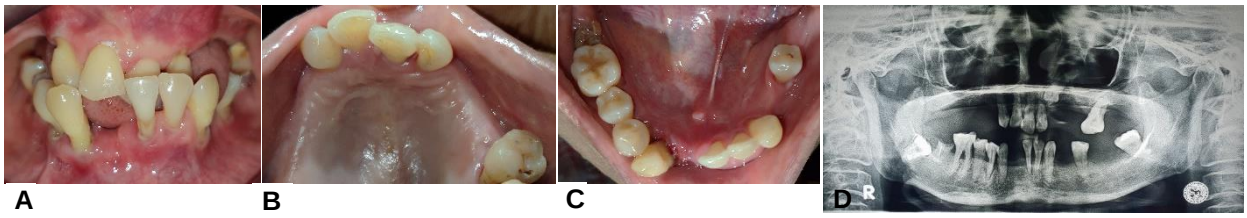

Figure 1 A, B, C Pre-operative patient's intraoral; **D** pre-operative radiograph

is most equitable and definite means of distributing stresses. Precision attachment partial dentures are not retained by clasps, hence, removes wedging effect of clasp and also favorable distribution of horizontal forces. Precision attachment virtually ties abutment teeth together, which limits excessive movement of abutment teeth. [3]

This study discussed full mouth rehabilitation in anterior crossbite and posterior bite collapse patient to regain aesthetic and function performance.

CASE

A 64-year-old female patient came to Prosthodontic Department of RSGMP Unair to have dentures of her missing teeth in order to eat well and be more confident.

She wants to change her smile into new smile with good aesthetic and function. The patient still used the old removable denture made 1 year ago, but it was broken 2 months ago. The medical history was non-contributory. The patient's intraoral condition and radiograph prior to treatment are shown in fig.1.

On extraoral examination, the temporomandibular joint (TMJ), eyes, nose, lips were normal, the face was symmetrical and oval. Vertical dimension of occlusion was 60 mm. On intraoral examination, missing teeth were 18, 17, 16, 15, 14, 12, 24, 25, 26, 28, 37, 36, 34, 41, 42; residual tooth was 47; movable teeth were 31, 43, 44; rotation teeth, supraposition tooth, redness of the gums. Dental calculus was slightly found in almost all region; occlusion was not presented, overjet -3 mm and overbite -4 mm.

At the same time, radiographic interpretation shows there were radiolucent diffuse below 17 tooth root, radiopaque in root canal of tooth 47, decreased alveolar bone in 13, 11, 21, 22, 27, 35, 33, 31, 43, 44, 45, 46; the lowest part of the upper left canine appears to be higher than the cervical line of the incisor and there is no limit between the sinus and the impacted tooth; the crown until the tooth root completely submerged in the ramus of the mandible and the occlusal plane of the tooth is hidden below the cervical line of the second molar in the 48.

Based on Kennedy's classification system and Applegate's rules, the maxillary arch was classified as class II modification 1 and mandibular arch as class III modification 2. In this case, the patient was diagnosed for full mouth rehabilitation using maxillary attachment retained RPD and mandibular RPO to correct anterior crossbite and posterior bite collapse.

MANAGEMENT

The initial treatment was done by removing dental calculus; extracting 31 and 47; endodontic treatment on 21, 22, 32, 33, 43, 44 by Conservative Department followed by periodontal treatment which was performed by crown lengthening on 21 and 22 (fig.2) by Periodontal Department. After completing the initial treatment, the patient was advised to report back for full mouth rehabilitation by Prosthodontic Department.

In prosthodontic phase, primary impressions were made for maxillary and mandibular arches. Master casts were fabricated, preliminary bite de-

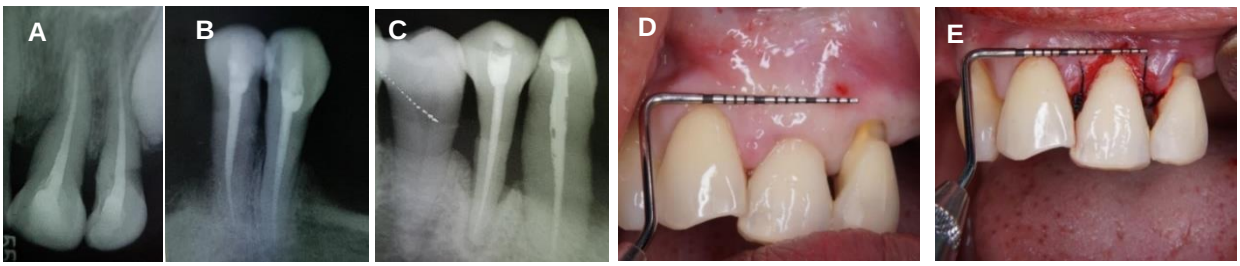

Figure 2 Endodontic treatment on **A** 21, 22; **B** 32, 33; **C** 43, 44, crown lengthening treatment on **D** 21 and **E** 22

Figure 3 A Diagnostic wax up and preliminary bite rim, **B** decapitation on 43 and 44, **C** single crown PFM on 32 and 33

Figure 4 A Try in metal frame, **B** try in wax denture, **C** insertion of RPO on lower jaw

termination with diagnostic wax up and bite rims were made (fig.3A). Using the maxillary bite rims and camper's plane as guide an occlusal plane was established and bite was taken using lower teeth to capture the right OVD in centric relation; 60 mm.

The lower part was done first because of the patient's willingness. Decapitation was done on 43 and 44 with a height of 1-2 mm from the gingival margin and dome-shaped shape (fig.3B,3C). Then, cover the surface of 43 and 44 with GIC Fuji 9. After that, 32 and 33 were prepared to change the inclination to more lingualized and we made a single crown PFM on 32 and 33. The next step, preparation mesial was rested on 37, 45 and distal rest on 35. Impression was done with double impression. Maxillary and mandibular working models with the diagnostic wax up on articulator was sent to dental laboratory for further process of metal frame.

On the following visit, the metal frame was tried in in patient's mouth and checked if the metal frame seated perfectly in patient's mouth, then tried the mandibular wax denture with tooth color A3 VITA shade guide. Evaluation was done to determine whether the condition and the occlusion are appropriate for the patient. The next step was processing the mandibular RPO in the laboratory (fig.4).

After the mandibular RPO, a putty index from diagnostic wax up of the maxillary arch was made. Then, 22, 21, 11, 12 were prepared as fixed splint based on the putty index and preparation mesial rest on 27 (figure 5). Gingival retraction using retraction cords that were applied to cervical on 22, 21, 11, 12, awaited 3 minutes.

Figure 5 Preparation fixed splint on 13, 12, 21, 22

Fixed splint porcelains were tried in at 22, 21, 11, 12. Note the cervical edge coping with the metal must be precise and close the cervical teeth tightly.

Metal frame RPD was tried on the patient. After that, the attachment of male and female parts was examined, and occlusion and stability of the metal frame RPD were checked.

Fixed splint 22, 21, 11, 12 was inserted, along with maxillary metal frame RPD. Fixed splint was cemented using luting cement (GIC type I). This cementing procedure was carried out simultaneously with a metal frame. Check occlusion and articulation of maxillary and mandibular dentures using articulating paper to see premature contact. After the insertion, the patient was taught how to remove and install the denture. Patient was also taught how to clean the dentures and how to store them. Then the patient was instructed to eat soft food first and control the next day.

Control I was carried one day after insertion. Control II was performed three days after control I. Control III was 7 days after control II. There were no complaints from the patients, there was no redness of the performed mucosa under the denture. Aesthetic, occlusion, retention, and stability of the denture were good. Patient was instructed to main-

Figure 6 Try in fixed splint attachment on 13, 12, 21, 22

Figure 7 A Post insertion of maxillary attachment retained RPD, patient's performance **B** before treatment, **C** after treatment

toothbrush and bath soap. Patient was instructed to improve oral hygiene and are allowed to chew delicate food for the next week. The patient was advised to have a regular control every 6 months for follow up.

DISCUSSION

Loosingsome of posterior teeth with anterior crossbite can disturb aesthetic and function. This is in accordance with Okeson that vertical pressure on the anterior causes the anterior teeth to move toward labial and loss of some posterior teeth support caused a greater load in the anterior region.[4]

A full-arch fixed prosthesis can be fabricated, if sufficient and properly situated abutments remain or sufficient number of implant can be placed. However, both extensive fixed dental prosthesis and implant-supported prosthesis can be financially burdensome to patient.[5] Since the patient was aversive to surgical procedure, implant supported prosthesis was not considered. FPD also was not indicated for this case because of some missing posterior teeth, so the abutment cannot afford the occlusal load.

Retainer selection for removable prosthesis mainly depends on the remaining tooth structure, the intra- and intermaxillary relationships, aesthetics, and financial aspects. While clasps potentially interfere with aesthetic demands in the anterior region, attachments were almost invisible in the labial region. Because of that, maxillary attachment retained RPD was chosen to rehabilitate anterior cross bite and correct the posterior bite collapse to get good aesthetic and functional.

Before making dentures, preliminary treatment and making diagnostic wax up on the anterior teeth, as well as setting the preliminary bite with a reorganized approach were performed. Then, mandibular RPO was made the first because patient wanted to immediately replace some missing teeth while waiting for the healing process of crown lengthening on the maxillary anterior teeth.

The treatment for maxillary teeth is carried out by preparation the four maxillary anterior teeth to make a fixed splint with retention of precision attachments on the distal anterior teeth with the aim of obtaining a good aesthetic because the does not want the clasps to be seen when smiling.

Precision attachment have two parts, namely the part of patrix or male, and matrix or female; both of which forms a very precise relationship. Patrix is usually placed in the distal part of the supporting tooth and the matrix is part of removable denture. [6]

The use of precision attachments has the advantage of being comfortable in its use, can improve aesthetics and has a better ability to distribute load to supporting teeth so as to maintain the health of periodontal tissues. But the disadvantage is that the cost is quite expensive and requires a long maintenance time.[7]

According to Sterngold,[8] the selection of resilient and non-resilient attachment designs is based on (1) bone support around the supporting teeth. Buf-

fer bones are categorized as good if bone loss reaches 0-20%, but if the teeth can be splinted, non-resilient attachments can be chosen, whereas if bone loss is 20-40%, the resilient type should be chosen; (2) ridge condition, if the alveolar resorption is small, the resilient and non-resilient types can be used, but if the alveolar undergoes considerable resorption the non-resilient type is recommended; (3) whether the condition of the antagonist jaw uses denture with a non-resilient or resilient attachment. Two resilient prostheses should not be the opposite because the two moving occlusal fields can interfere with the efficiency of mastication.[8]

The attachment used in this case is the type of non-resilient/rigid attachment, which is a stable attachment with very little movement at the time of function, because the bone around the maxillary supporting anterior teeth in the radiographic results still looks good, the maxillary anterior teeth can be strengthened by splinting, the ridge experiences a little resorption, the opponent's jaw is non-resilient denture, so it doesn't interfere with the efficiency of chewing.

In this case, periodontal support and residual ridge are still good, therefore rigid and resilient type precision attachments can be used. The use of extracoronal attachments in this case is preferred over intracoronal attachments reasoning that there is relatively little reduction in tooth tissue. Intracoronal attachments is not used here because more tooth reduction that can cause pulp perforation and at least 3 mm of height is needed.[9]

The use of extracoronal attachments can be advantageous because attachments do not associate dentures and supporting teeth, but are joints that can allow for multiple movements between the two components of RPD.[10] With the stress breaker component as a load breaker so that the chewing load is not received directly by the fixed tooth or fixed splint it will minimize the pressure received by the buffer teeth. Chewing load received by the metal frame of RPD will be channeled through precision attachments which are forwarded to the fixed splint.

Extracoronal attachment is chosen because of vertical height distance from the ridge crest to the occlusal surface of the antagonist is sufficient (7mm), mesiodistal space of the tooth structure where the attachment is narrow, some of the teeth for attachment are still vital, buccolingual distance from the attachment structure narrow.[7,8]

Staubly and Bagley stated that abutment teeth for extracoronal rigid attachments should use double abutments to get strong support from abutment teeth.[7] Therefore, in the upper jaw a fixed splint was made for teeth 13, 11, 21, 22 with extracoronal ball attachments on 13 and 23. This fixed splint also added milling on palate of the splint crown. This milling on fixed splint can function as a rest cingulum as indirect retainer. The use of this milling also made the denture more retentive, stabilize, and comfortable because of its shape in accordance with the contours of the palatal teeth.

It can be concluded that attachment retained maxillary RPD and mandibular RPO can be used alternative treatments for full mouth rehabilitation in anterior crossbite and posterior bite collapse patient to improve aesthetic and function

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Diagnosis of temporomandibular joint disorders in wind instrument players

Haifa Nabila Rosyidah, Erna Kurnikasari, Rasmi Rikmasari
Department of Prosthodontics
Faculty of Dentistry, Universitas Padjadjaran
Bandung, Indonesia
Correspondence author: **Rasmi Rikmasari**; e-mail: **rasmi.rikmasari@fkg.unpad.ac.id**

ABSTRACT
Introduction: Playing certain kinds of musical instruments may cause disturbances around the oral cavity. Blowing activity in wind players involves contractions of the muscles around the mouth. Continuous or repetitive muscle contraction can cause muscle fatigue that triggers the onset of symptoms of temporomandibular joint disorders (TMD). The aim of this study was to determine the description of diagnosis of TMD in wind players. **Method**: The research was conducted to 30 brass instrument players at *Gema Wibawa Mukti* Marching Band Community (22 boys, 8 girls) aged 13-27 who had been actively playing wind instruments in the last 6 months. The research method used was descriptive. Examination and diagnosis were based on physical examination category and the algorithm of DC-TMD Axis I revision of 2014. **Results**: The results showed that for 30 samples of wind players, the number of diagnose of Group Ie (arthralgia) was 4 players, Group IIa (disc displacement with reduction) was 8 players, and Group III (degenerative joint disease) was 4 players. **Conclusion**: The conclusion of this study was 43.33% of wind players at *Gema Wibawa Mukti* MBC suffered from temporomandibular joint disorders, in which the highest diagnosis was disc displacement with reduction, followed by arthralgia and degenerative joint disease.
Keywords: wind instrument, brass instruments, temporomandibular joint disorders, DC-TMD

INTRODUCTION

Playing musical instrument was a hobby for some people because it can give pleasure to the people who play it. Some people also make this activity as a profession. The habit of playing certain musical instrument for some people can cause problems later on.[1] An instrument that can cause abnormalities around mouth cavity is a wind instrument.[2]

Wind instruments are musical instruments played by blowing. One of the basic techniques in playing this instrument is embouchure which is how to put the position of the lips and the teeth on the tool that is called the mouthpiece.[1] This activity involves contracting the muscles around the oral cavity. Muscle contraction as a consequential continuous/repetitive activity can be an initiating factor to trigger an onset of symptoms of temporomandibular joint disorders (TMD).[3]

One of the etiological factors of TMD is trauma. There are two types of trauma, macrotrauma and microtrauma. Macrotrauma is the force that driving directly to TMJ that can cause changes in the structure. Microtrauma is trauma caused by a small force that is continuously applied to the joint.[4] Similar happens to players of wind instruments, their muscle contractions consequential continuously can cause microtrauma which may cause disorders of the TMJ.

According to the research in Japan to 210 students of junior high school following the music club, it is known that the prevalence of TMD in children who play wind instruments is greater than in children who not play; the prevalence is as much as 34.8%.[5] Other studies reveal that the players of wind instruments had a high incidence in disease progression of TMD, indicated by showing almost 100% morbidity related to the parafunction habit and periauricular muscle pain found in male adults who actively play wind instruments.[6]

TMD occurs in the masticatory system which is a very complex system, consisting's of bones, muscles, ligaments, and teeth. The masticatory system in the body is useful for speech, chewing, and ingestion which involve jaw movement.[4] Early diagnose is essential so that therapy and prevention can be done as early as possible, so it does not interfere with the productivity of the wind instrument performers. According to Yeo et al[1], some efforts can be performed by the wind instrument players to overcome the disorders of the TMJ of them by doing physical therapy, relaxation of facial muscles, and reduce frequency of playing. Based on the description above, this study examines the diagnosis of TMD in wind instrument players.

METHODS

This type of research was a descriptive study with primary data collection on wind instrument players. The population of this study was player of the wind instrument in the *Gema Wibawa Mukti* MBC in Bandung. The research sample must meet the population criteria: (1) registered as a permanent member of the MBC and actively playing wind

instruments in the last six months; (2) has never received treatment for TMD; (3) not experiencing symptoms similar to those of TMD; (4) not using fixed or removable orthodontic appliances; and (5) not having systemic disorders such as rheumatoid arthritis.[7]

Procedure

Research stages were as follows: (1) submitting research permits and ethical clearance from Ethics Committee of Universitas Padjadjaran; (2) collecting samples of data that meet the population criteria; (3) explanation and distribution of the informed consent form sheet; (3) completing a symptom questionnaire by the study subjects, then a physical examination of the TMD based on DC-TMD Axis I[7]; (4) physical examination includes confirmation of the location of pain and headache, incisal relationship, mouth opening pattern, vertical opening range of the jaw, lateral and protrusive jaw motion, joint sound when opening and closing the mouth, joint sound during lateral and protrusive motion, examination of pain in muscle and TMJ; (5) collection and analysis of the data results using DC-TMD Axis I algorithms.[7]

RESULTS

The study was conducted on 30 wind instrument players in the *Gema Wibawa Mukti* MBC Bandung consisting of 22 males and 8 females with an average age of 18.37 years, 8 high brass players, 7 middle brass players, and 14 low brass players. The research results are presented in Tables 1 and 2.

DISCUSSION

Based on Table 1, the distribution of TMD in brass instrument players was 43.33%. TMJ problems were more common in brass players because of their protrusive jaw's movement on the process of forming embouchure.[1] Mandibular protrusive movement and constant pressure on the

Table 1 Distribution of diagnosis of TMD in wind instrument players

Variable	**M**	**F**	**Total**
Suffer from TMD	11	2	13
Not suffer from TMD	11	6	17
Total	22	8	30
Based on DC-TMD Axis I			
Grup Ia (myalgia)			0
Grup Ib (local myalgia)			0
Grup Ic (myofacial pain)			0
Grup Id (reffered myofacial pain)			0
Grup Ie (arthralgia)			4
Grup If (headache associated with temporomandibular joint disorders)			0
Grup IIa (disc displacement with reduction)			8
Grup IIb (disc displacement with reduction with intermittent locking)			0
Grup IIc (disc displacement without reduction with limited mouth opening)			0
Grup IId (disc displacement without reduction without limited mouth opening)			0
Grup III (degenerative joint disease)			4
Total			16
Based on the number of diagnoses of TMD and gender			
Number of diagnosis	Male	Female	Total
One	9	1	10
Two	2	1	3
Total	11	2	13
Based on the type of music instrument	**Suffer of TMD**		**Not suffer of TMD**
High brass	8		0
Middle brass	2		6
Low brass	3		11
Total	13		17
Based on duration of playing	**Suffer of TMD**		**Not suffer of TMD**
6 month-1 year	5		10
>1-2 year	4		4
>2-3 year	0		2
>3-4 year	2		1
>4 year	2		0
Total	13		17

Table 2 Distribution of TMD examination

Incisal relationship		**Average value/mm**
Horisontal *overjet*		1.9
Vertical *overbite*		2.7
Opening movement		
Opening movement free of pain		34.63
maximum opening movement without assistant		45.30
maximum opening movement with assistant		48.23
Excursive movement		
Right lateral		5.68
Left lateral		5.73
Protrusive		4.39
Mouth opening pattern	**n**	**%**
Straight	23	76.67
Corrected Deviation	7	23.33
Not corrected Deviation	0	0
Clicking sound	**Right (%)**	**Left (%)**
Open mouth	5 (16.67)	3 (10)
Closed mouth	3 (10)	2 (6.67)
Muscle pain		
Temporalis	8	26.67
Masseter	10	33.33
Lateral pole	4	13.,33
Around lateral pole	3	10
Posterior mandibular	9	30
Submandibular	0	0
Lateral pterygoid	4	13.33
Temporalis Tendon	2	6.67

joints can be one of the factors causing TMD.[8] According to research by Yasuda *et al*.[5] prevalence of TMD in junior high school students who play wind instruments by 34.8%. These differences in numbers can occur because there are differences in the number of samples and the characteristics of the individuals examined.

Various literatures suggested that playing with wind instruments was a factor of initiation, perpetuation, and adverse effects of TMD.[5,9] There was no literature that explicitly stated that playing with a wind instrument directly causes TMD.

Differences in the shape of teeth and faces in wind players can affect the appearance of TMD. In some people who already have an ideal shape, it is not difficult for them to be able to form such an embouchure, unlike what happens to players who do not have this form they have to perform additional compensatory motion in the form of mandibular protrusive motion to be able to form a suitable embouchure formation.[1]

Another factor that may affect the occurrence of TMD in wind player is emotional stress. Emotional stress can lead to psychosocial problems which can lead to bruxism, muscular overuse and joint overload. Based on the results of interviews and objective examinations carried out during the study, at least 5 out of 30 (16.67 %) wind players were known to have parafunctional habits, such as clenching and grinding (bruxism). The existence of *bruxism* or *clenching* can cause microtrauma on the tissue involved (teeth, TMJ, or muscle) that can further cause TMD.[4]

This study cannot conclude that the TMD that arises is purely the result of the habit of playing with a wind instrument. The many factors that can influence TMD cause difficulty in determining which factor is the most important. But among the factors are of course independent from each other to cause symptoms of TMD.

Table 1 shows the distribution of TMD in wind instrument players consisting of arthralgia, disc displacement with reduction, and degenerative joint disease. The most diagnoses of this research is shifting the discus with a reduction of 26.67%, followed by arthralgia and degenerative joint disease of 13.33%. According to Isberg[10], the most common TMD is disc displacement, and in most cases disc dislocations occur in the anteromedial direction. The most common disc displacement is reduction of disc displacement.[11] None of the wind instrument players were diagnosed with myalgia, local myalgia, myofacial pain, referred myofacial pain, headache associated with TMD, disc dis-

placement with reduction with intermittent locking, disc displacement without reduction with limited mouth opening, and disc displacement without reduction without mouth opening limitations.

Wind players who do not have adequate orofacial structures for embossment formation require compensatory movement of the mandible as well as muscles of the neck and head. The compensatory motion that occurs is the protrusive motion of the mandible. In protrusive movement, condyle and disc move forward without down eminence articular (the bone surface is convex which is located on the anterior socket).[12]

The muscles involved in the protrusive motion of the jaw are the medial pterygoid, lateral (inferior) pterygoid, and superficial masseter muscles.[13] When blowing, the mandible moves forward and the protrusive muscles of the jaw contract. Repetitive muscle contraction can cause muscle tension, especially in the lateral pterygoid muscle which is the main muscle in protrusive motion, resulting in muscle hyperactivity. The superior and inferior lateral pterygoid muscles are directly attached to the articular disc and TMJ. In the long term, contraction of the lateral pterygoid muscle can pull on the TMJ and articular disc, causing stretching of the retrodiscal tissue, resulting in a change of the disc position towards the condyle and articular eminence.[11]

In conditions where there is an anterior displacement of the disc, the process of condyles movement when opening the mouth is inhibited. In order to open the mouth wide, the condyle must pass through the back and center of the disc, producing a clicking or popping sound. Upon closing the mouth, the condyle again slides out of the disc so that it is heard as another "click" or "pop" (reciprocal clicking). This condition is called reduction of disc displacement.[4,14]

In the later stages of disc displacement, the condyles can no longer pass through the disk, the condyles are behind the disk all the time, the clicking sounds disappear but the mouth opening becomes limited. This is the stage that most often causes symptoms. This condition causes the jaw to lock, so the patient cannot open his mouth wide. This condition it is referred to as disc displacement without reduction.[4,14]

At the time of disc moving forward, retrodiscal tissue experiencing stretching (elongation) and was piched between two bones (condyles and temporal). This can cause pain because the retrodiscal tissue directly adjacent to the posterior part of the disc is completely supplied by blood vessels and there are many nerve endings.[12]

The largest number of distribution of diagnoses is of two diagnoses. No wind player has more than two diagnoses of TMD. The number of types of disorders suffered depends on the condition of each individual. In this case in the wind player, the shape of the teeth and face can affect the type of disturbance that arises. In addition, everyone has different adaptability. In two different people, when the same force is applied to a certain structure, it can cause different responses. It may or may not cause interference.

Distribution of TMD occurred in the instrument player brass types of high brass (trumpet). Wind instruments classified as high brass are smaller in size compared to middle and low brass, but the resulting tone is higher, requiring more mouth effort. This difference indicates that the higher the resulting tone, the greater the force required to blow. This was in line with the Gotouda *et al*,[12] which stated that the activity of the mastication muscles involved when playing high tone is much greater than the activity of muscle contraction when tuning tone.

According to Yasuda et al,[5] in his study of 82 brass instrument players, the prevalence of TMD in wind player with small mouthpiece size was 31% and in wind player with large mouthpiece size was 12.5%. Small mouthpiece sizes are available in high brass (trumpet) types. Large mouthpiece sizes such as tuba, trombone, baritone are classified into the low brass group. The activity of the masseter, trapezius and sternocleidomastoid muscles in the small mouthpiece is greater than that of the muscle contraction when playing with a large mouthpiece.[5]

Total patients with TMJ are mostly found in the group of brass players who've been playing for 6 months-1 year. There were no disturbances in the blown players who had played for more than 2 years-3 years.

From the results of the incisal relationship examination, it is known that the mean value of overjet was 1.9 mm and overbite was 2.7 mm. The average overjet in wind players are slightly below the normal 2-3 mm overjet value.[15] When blowing on a brass instrument, the mouthpiece is placed on the lips extra orally so that there is pressure on the lips. According to Yeo et al,[1] the average value of the force exerted by brass players was 500 g. This figure was much greater than the optimal force required for tooth movement with orthodontics which is in the range of 35-60 g, so that this force has the potential to cause malocclusion if removed continuously and over a long period of time. The ave-

rage overbite for wind players were still in the normal range of 2-4 mm.[16]

From the results of examining the mouth opening pattern (Table 2) it was found that 76.67% of the wind players had a straight mouth opening pattern. Mandibular deviation when opening the mouth is directly related to impaired TMJ function. Osteoarthritis, dislocation of the disc anteriorly, and unilateral muscle spasm can cause mandibular deviation to the affected side.

Based on the results of the opening movement of the jaw obtained (Table 2) an average range of the maximum incisal opening in wind player were 40-50 mm. Closed locked occurs when the incisal opening ranges in the range of 25-30 mm.[4] In this study, none of the blow players had an incisal opening span of less than 41 mm.

Based on the examination of the jaw excursive movement (Table 2), the mean value of right lateral excursive movement was 5.68 mm and left lateral was 5.73 mm, and protrusive was 4.39 mm. These values were below the normal range for lateral movement of the jaw, which was 7 mm and protrusive was 6 mm.[14] Limitation of jaw excursive movement (lateral and protrusive) can occur in the condition of the disc displacement or fracture of unilateral subcondylaris.[4] This was related to the finding of 26.67% of wind players who experienced disc displacement with reduction in this study.

Based on the results of the joint sound examination, the clicking sound of the wind players when opening the mouth was 16.67% on the right side of the joint and 10% on the left side of the joint. According to Pampel et al,[6] sound clicking on wind players when opening the mouth by 13.5% on the right side of the joint, and 24.3% on the left. This differences occurred due to differences in sample size and sample categories, in Pampel et al,[6] apart from involving brass instrument players, it also involved woodwind instrument players. This study found that the sound of clicking when opening the mouth was 20% and when closing the mouth was 10%. This is in line with the research of Pampel et al,[6] which revealed that the clicking sound of wind musicians was found more when opening than when closing the mouth.

Based on the results of the examination of temporomandibular muscle and joint pain, the location of pain most experienced by brass instrument players was masseter muscle area (33.33%). According to Gotouda et al,[12] with electromyogram (EMG), the muscle activity level of the masseter when playing with the wind instruments is slightly greater than during rest. Maximum voluntary contraction of the masseter muscle brass instrument players with the little size of the mouthpiece was greater compared with musicians who do not play wind instruments.[5] In some of brass instrument players need protrusive movement of mandible as compensation movement in the formation of embouchure. The masseter is one of the muscles involved in the protrusive movement of the mandible.[13]

There was no joint *locking* during the examination. Joints/jaw locking is a common sign found in patients with TMD, namely disc displacement without reduction. This is evidenced by the results of the diagnosis obtained on wind instrument players, that none of the wind instrument players suffer from joint displacement without reduction.

Based on the research conducted, it can be concluded that almost half of the wind instrument players in *Gema Wibawa Mukti* MBC suffered from TMD. Based on DC-TMD Axis I, it was found that the most common diagnosis of joint disorders was disc displacement with reduction, followed by arthralgia and degenerative joint diseases.

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The importance of neutral zone in fully edentulous case with highly resorbed ridge

[1]Irvan Salim, [2]Agus Dahlan
[1]Prosthodontics Resident
[2]Prosthodontics Department
Faculty of Dental Medicine, Universitas Airlangga
Surabaya, Indonesia
Correspondence author: **Irvan Salim**, e-mail: **irvansalim@gmail.com**

ABSTRACT
Full edentulous is one of the most challenging cases for prosthodontist. One of the difficulties in treating that cases is the limitations in support and retention, especially in cases with highly resorbed ridge where the denture bearing area avalaible is minimum. One of the techniques to achieve the retention is by using the neutral zone technique. Neutral zone is the area where the displacing forces of the lips, cheeks, and tongue are in balance. It is in this zone that the natural dentitions lie and this is where the artificial teeth should be positioned. This area of minimal conflict may be located by using the neutral zone technique. The artificial teeth can then be set up in the correct positions. By using this concept it will be able to achieve retention, stability and support. This case report will share the usage of the neutral zone technique in treating fully edentulous ridge with highly resorbed ridge.
Keyword: fully edentulous, highly resorbed ridge, neutral zone, complete denture

INTRODUCTION
Achieving good retention and stability in complete denture is not an easy task. There are many factor that needs to be considered, especially in difficult cases such as highly resorbed ridges. In highly resorbed ridge the denture bearing area is limited; therefore, stabilization and retention is difficult to achieve, difficulties will also encountered in tooth arrangement phase where the ridges is often deformed into such a condition that makes difficult to position artificial teeth on the center of the ridges. Errors in this phase will create a displacement force from the cheek and tongue muscle which will decrease the retention and stabilization of our prosthesis. One of the techniques that can overcome difficulties in highly resorbed case is the neutral zone technique. Neutral zone (NZ) is the potential space between the lip and cheek on one side and the tongue on the other where the forces between the tongue and cheeks or lips are equal.[1-3]

Orofacial and tongue muscles play an important role in retaining and stabilizing complete dentures. This is accomplished by arrangement of the artificial teeth to occupy a NZ in the mouth so the teeth will occupy a space determined by the functional balance of the orofacial and tongue musculature.[2,4]

Despite the growing trend of implant treatment and its proposal as the standard of care for the edentulous population, conventional complete denture (CD) therapy remains a substantial and a more affordable treatment option for the majority of elderly edentulous patient, especially those with low social economic status. Although conventional dentures have been an effective treatment option for some patients, they are unsuccessful for others because of poor stability, compromised retention, inadequate facial support, poor aesthetic, inefficient tongue function/posture, poor mastication or speech, gagging and general discomfort, or the patient's inability to adapt.[5]

Neutral zone is especially useful in extreme geriatric and highly resorbed ridge cases where implant-supported dentures cannot be performed. Dental implants may provide stable mandibular CD for the atrophic mandible; however, there may be situations when it is not possible to provide implants on the grounds of medical, surgical or costs factors. The NZ technique is an alternative approach for these complex cases. The technique is not new but is one that is valuable yet not often practised.[6]

The concept of a NZ in the context of a keen understanding of patterns of alveolar ridge resorption enables the dentist to determine the arch form for the patient receiving treatment. Several techniques employ soft waxes, impression materials, and tissue conditioners as adjunctive efforts to func-tionally establish correct NZ for the arch form.[2]

This case report describes an extreme geriatric patient with highly resorbed ridge. So, the aim of this case is to rehabilitate fully edentulous jaw with NZ technique to improve the function of chewing, aesthetic and to maintain patient's oral health.

CASE
An 89-year-old female visited to Airlangga dental hospital to make a CD, patient directly came to

Figure 1A, B, C Intra oral view and **D** panoramic radiograph examination

prosthodontic department. Patient's last visit to dentist was more than 30 years ago. She got fully edentulous more than 25 years and has no experience with denture. In order to eat well and get more confidence she wanted to make a CD to change her smile into a new smile with proper aesthetic and function.

MANAGEMENT

The first stage when the patient came for a consultation was taking X-ray. From the radiograph, the edentulous jaw classification was determined. Maxilla in anterior considered Class V flat ridge form, which is inadequate in height and width. Both posterior sides are considered Class VI depressed ridge form, with some basalar loss evident. Mandibula in anterior is considered Class VI depressed ridge form, with some basalar loss evident, and in both posterior sides are considered Class V flat ridge form, which is inadequate in height and width (Fig 1).[7]

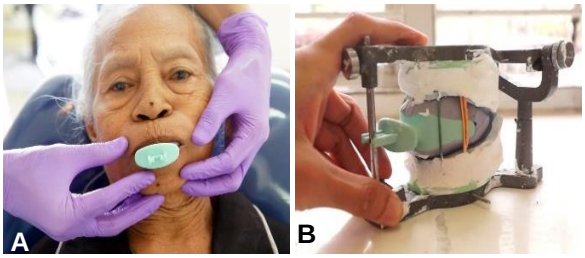

Figure 2A Determinating OVD; **B** Articulator mounting

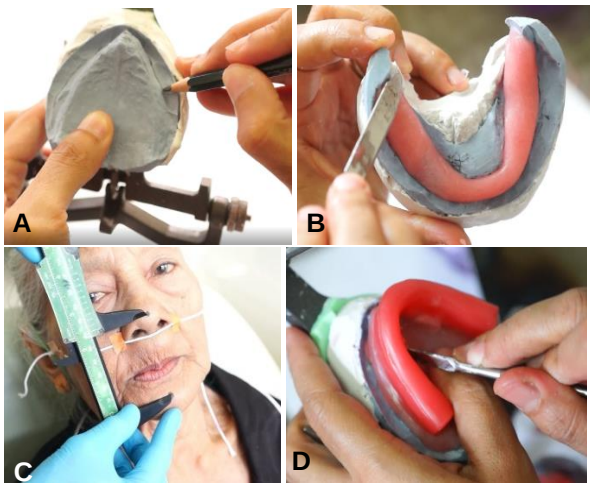

Fig 3A Drawing the outline, **B** baseplate making, **C** fabricating bite rim, **D** bite rim try in

Then, an initial impression using fabricated stock tray with impression material (GC, Aroma Fine Plus, Japan) was taken to obtain the anatomical model of the patient. This cast would be made for patients individual tray. After initial impression the OVD was determined using centric tray (Ivoclar Vivadent, Centric Tray, Liechtenstein) with the putty (Heraeus Kulzer, Variotime, Easy Putty, Germany) and the Niswonger technique. Centric tray makes it easy to determine the vertical relation between the patient's upper and lower jaw (Fig 2).

Draw a denture outline on cast model, then make baseplate using self-curing acrylic (S.Court Limited, Hillon, England) and make bite rim using wax (Cavex, Set up wax Regular, Netherlands). The baseplate bite rim was also used later as individual tray. Bite rim was inserted on patient and wax rims were contoured for lip support, future incisal edge position, occlusal plane, occlusal vertical dimension and midline. Bite registration was performed at correct vertical dimension (Fig.3)

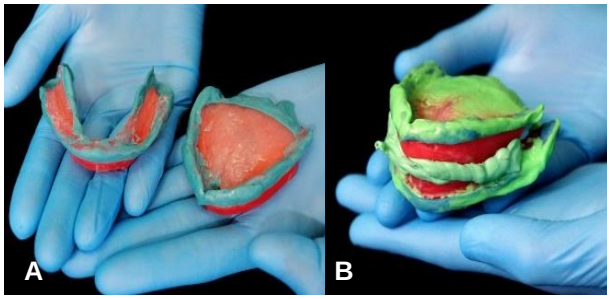

Fig 4A Moulding and **B** close mouth impression

Cover the acrylic baseplate edge with tray adhesive (DMG, Tray Adhesive, USA), then continued to border molding which gives compound material (DMG, Honigum Pro-Mono, USA) on the edge of individual tray to get the form of pheripheal seal which is useful for denture's retention. Impression with closed mouth technique was used with putty (Heraeus Kulzer, Variotime, Light Flow, Germany) because the patient had highly resorbed upper and lower ridge. Close mouth technique was also indicated for this patient as this patient can't open her mouth for a long time. After impression procedure, bite registration (Dentkist, Bite Fast-Charm Flex, South Korea) was used to stick upper and lower tray (Fig.4).

Fig 5A Rope wax sealing, **B** boxing processing, **C** impression compound wax (Hoffman's, Germany), **D** mounting cast on articulator.

Utility wax rope was used to seal around periphery at least 1-2 mm below the borders of impression, pour using dental stone and wait until completely set. Then continue with boxing processing and then mount the cast model on articulator.

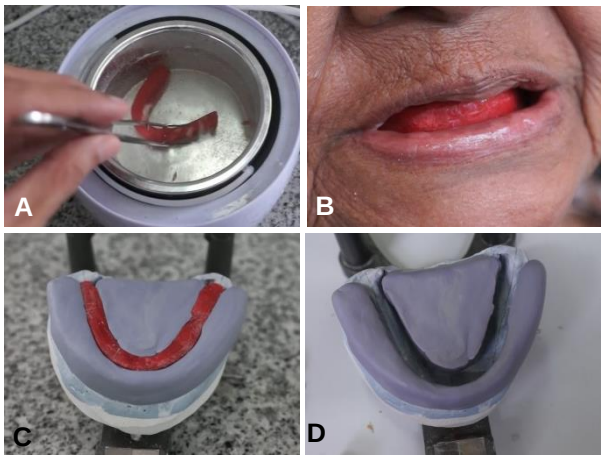

Figure 6A Modeling plastic impression compound occlusal rim immersed in a warm water bath set at 140° F, **B** muscle trimming and swallowing motion with rim inside **C** matrices; **D** lower jaw NZ obtained.

A modeling plastic impression compound occlusal rim (Hoffman's, Abdruckmasse Rot, Germany) should be fabricated prior to the record appointment to accomplish the procedure in a timely manner. The mandibular record base with the modeling plastic impression compound occlusal rim is immersed in a warm water bath set at a temperature of 140°F (Figure 6A). Once the modeling plastic impression compound is uniformly softened and removed from the water bath and quickly placed in the patient's mouth. A maxillary record base is not used for this procedure because eliminating the maxillary record base eliminates the compressive forces that may arise during the recording of the NZ.

The patient was given a cup of warm water and was asked to swallow, then sip warm water and swallow again. Suggested actions include asking the patient to smile, grin, pout/purse lips, talk aloud, pronounce the vowels, sip water, swallow, slightly protrude the tongue and lick the lips. These actions were repeated several times until the rim has completely set (Figure 6B). The thermoplastic plastic impression compound was molded through the action of muscles. This action resulted in muscles of the cheeks and lips functioning inward and muscles of the tongue expand-ing outward thereby forming the NZ registration.

When the modeling plastic impression compound has been hardened, the NZ record was removed rim from the mouth and evaluated for accuracy. If necessary, the procedure is repeated to achieve a proper recording of the NZ area. Next the NZ record was seated on the mandibular definitive cast and indexed lingual and facial index are developed around the NZ record using putty (Heraeus Kulzer, Variotime, Easy Putty, Germany). This index was used for potensial teeth space and guidance in teeth setting. With this has, hardened zone was recorded and tooth can set exactly in the NZ (Fig.6C &6D).

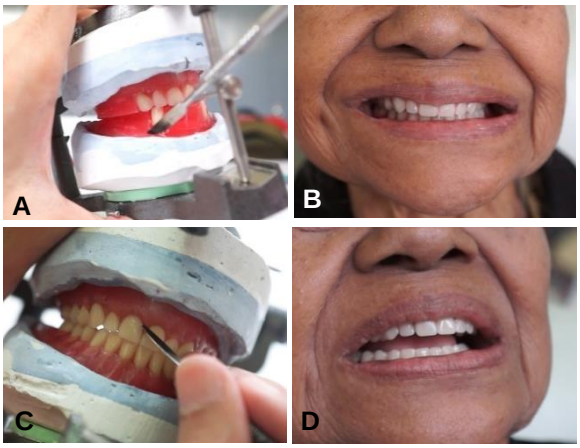

Figure 7A Set the artificial teeth, **B** wax denture try in **C** Festooning; **D** Denture try in

Shade guide (Ivoclar Vivadent, AD shade guide, Liechtenstein) was used to match artificial teeth shades. Then the teeth (Union Dental, OrtoLux top, Spain) were set up in the desired occlusal scheme, asssuring proper form and function. During the setting up of the teeth their position can be checked by putting the index together around the wax try-in. Most of the information necessary for the selection of teeth should be gathered during the diagnosis and the treatment planning stage. The shade selection, mold selection, and positioning and arrangement for maxillary anterior teeth may

be based on the age, sex, and personality of the patient. After finishing the setting of the artificial teeth, countinue with wax denture try in, it for evaluate accuracy of mounting, occlusal vertical dimension, esthetics and phonetics. Perform modifications as necessary.

If the wax denture try-in stage has no problem, the festooning stage was proceeded; carving the denture base to simulate the contour of natural tissues that are being replaced by the denture, after festooning send to laboratory or flasking. Denture was processed by laboratory with heat-cure acrylic resin, but during processing wax to acrylic, certain dimensional changes occurred. To fix this kind of problem, remount the model and denture to articulator and do selective grinding on articulator until the vertical pin touching the table.

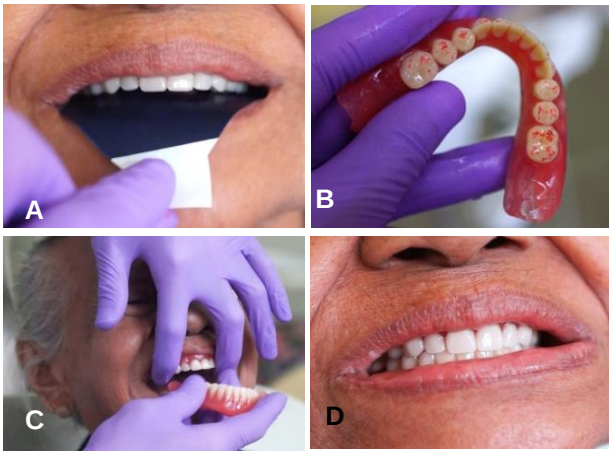

Figure 8A, B Selective grinding, **C** insertion, **D** follow up and after care

Selective grinding was performed to correct occlusion. To maintain vertical dimension, occlusal interferences must be corrected by carefully determining specific areas to be grounded to attain a mechanically balanced occlusion.

Following selective grinding, the denture must be polished and smoothed with polishing mops and paste to create a natural-looking luster before insertion. After polishing and inserting the denture, the patient was told that a follow-up may be needed first and three days after insertion then a week and a month after insertion. She was quite satisfied with retention stability and esthetics of the new set of denture.

Figure 9 Intra oral view after inserted with CD

DISCUSSION

The success of a CD relies on the principles of retention, stability and support. The prosthodontist's skill lies in applying these principles efficiently in critical situations. Severely resorbed

Figure 10 Extra oral view before and after inserted with the CD

edentulous ridges that are narrow and constricted with increased inter ridge space provide decreasing support, retention and stability. Extensive volume of the denture base material in prosthesis due to increasing inter-arch space results in a very heavy prosthesis. Retaining such prosthesis requires additional efforts to be made. Various methods have been recommended and selecting the appropriate method is dominated by the existing clinical situation[8].

The mandibular denture commonly presents the most difficulties with pain and looseness being the most common complaint. This is because the mandible atrophies at a greater rate than the maxilla and has less residual ridge for retention and support. The NZ is an alternative technique for the construction of lower CDs on highly atrophic ridge. It is especially useful in cases where dental implants are not possible and the copy technique would be inappropriate. The aim of the NZ is to construct a denture in muscle balance, as muscular control will be the main stabilising and retentive factor during function. The technique is relatively simple but there are increasing chair time and laboratory costs.[6]

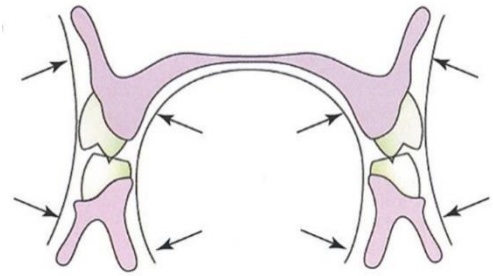

Figure 11 The neutral zone (Source: Zarb GA, Hobkirk JA, Eckert SE. Prosthodontic treatment for edentulous patients. 13th ed. St.Louis: Mosby El-sevier; 2013.[2]

The NZ was first discribed by Wilfred Fish, who indicated that the denture's polished surface should be contoured so that it approximates the moveable muscles of the lips, cheek, and tongue. In addition to simply replacing missing oral tissues, CDs serve to structurally redefines true spaces and potential spaces within the oral cavity. To provide CDs that reside within the theoretically stabilizing boundary conditions of the NZ, careful attention must be given to the dynamic physiologic and functional nature of the edentulous oral cavity.[9]

Clinicians must understand, NZ registration identify, induce, and record the neuromuscular dynamics of the functioning oral tissues using a single static registration. Once accomplished, this information can then be applied to the 3D construction of the definitive prosthesis. One procedure for registering the NZ is using modeling plastic impression compound. The thermoplastic plastic impression compound allow to mold through the action of muscles and forming the NZ registration. The NZ record helps establishing the contour of the mandibular prosthesis arch form, defining the width of the occlusal surfaces, and facilitating optimal selection of the size and position of the mandibular posterior teeth. The information carried by the NZ record should be maintained by developing an index, which subsequently serves as a guide for developing the wax trial denture.[9]

Speech capacity was in fact closer to normal in patient with CD made with NZ technique than that with conventional ones. Speech is the most accurate and fastest mechanism of the body, and its clarity has been directly related to patient's adaptability. Even a small change in tooth position may affect the pronunciation of some phonemes. Because the NZ represents the most physiological position, it allowed the participants to adapt faster and speak more clearly with their CD made with NZ technique. Moreover, the tongue plays an intricate role in the formation of vowels and consonant sounds. Positioning teeth in the NZ of equilibrium and the harmonious relationship between the denture and the tongue improve speech clarity.[10–12]

Masticatory ability was also significantly higher with CD made with NZ technique for all types of food. Wright reported that the tongue, teeth, and medial roll of the buccinator muscle are the main structures of importance for mastication. The premolar buccal surface forms a point of fixation for the medial roll of the buccinator. This helps to keep food and saliva inside the mouth during mastication and provides the buccinator with sufficient leverage so that, with the aid of the tongue, it creates a peristaltic movement essential to mastication. The second premolar assists in food mastication while the first molar initiates mastication. He concluded that a harmonious relationship between these 3 structures is essential for receiving and the subsequent mastication of food. Positioning teeth in the NZ achieved this harmonious relationship. Furthermore, the enhanced retention and stability of the denture may also have been influential in the participants' masticatory efficiency.[5,11]

As retention increases, EMG amplitudes of masticatory muscles increase, indicating an increase in muscle force which is usually reflected

in improved masticatory efficiency. Likewise, enhanced stability decreases denture movements during function, allowing the full power of the masticatory muscles to be directed toward crushing and grinding the food rather than partly masticating and stabilizing the denture.[5] Generally, patient is more satisfied with CD made with NZ technique. However, satisfaction with dental prostheses is multifactorial involving technical, patient-dentist interactions and patient-related variables, such as age, sex, educational level, patient adaptability, and period of denture use.[5]

Complete denture made with neutral zone technique offers significantly higher patient satisfaction levels in all functional aspects (retention, stability, masticatory ability, and speaking) as well as in comfort levels and appearance than conventionally fabricated dentures.

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Temporomandibular disorder among metamphetamine user

[1]Septyana Happysari, [2]Ira Tanti
[1]Prosthodontic Residency Program
[2]Prosthodontic Department
Faculty of Dentistry, Universitas Indonesia
Jakarta, Indonesia
Corresponding author: **Ira Tanti**, Email: **iratanti@ymail.com**

ABSTRACT
Cystalline metamphetamine or often called "shabu shabu" is a type of amphetamine which is the most often abused in Indonesia. Cinical symptoms of temporomandibular disorder (TMD) were found in 84.2% of 152 among amphetamine users. This case analysis aims to evaluate the treatment of TMD of muscular origin, with myofacial pain diagnosis. The chosen treatments are maximizing etiology-related education and supportive care that aims to reduce muscle mastication activities such as physical self-regulation, assisted muscle stretching, warm compresses, and administration of analgesics to reduce pain that patients often experience.
Keywords: temporomandibular disorder, metamphetamine, muscle

INTRODUCTION

Temporomandibular disorder (TMD) is a combination of joint and muscle dysfunction in the cranio-orofacial region, with clinical characteristics such as joints with or without muscle pain, sounds in the temporomandibular joints (TMJ), and limited motion of the mandibular jaw.[1] The etiology of TMD is multifactorial and complex, such as disharmony of occlusion, parafunction, trauma, deep pain input and stress. Activities that increase and give continuous pressure on the TMJ and masticatory muscles can cause TMD. Drug users are prone to this condition so that they have a higher prevalence of TMD than nonusers[2]

Cystalline metamphetamine or often called "shabu shabu" is a type of amphetamine which is the most often abused in Indonesia, other than 3,4-methylenedioxymethamphetamine (MDMA) or ecstasy. Based on Indonesian national data, 2.18% of the population aged 10-59 years are narcotics users. It is estimated that there were 1.2 million individual users of *cystalline methamphetamine* and 950,000 individuals using ecstasy during 2014 in Indonesia.[3]

Cystalline metamphetamine can be consumed by the way of per oral, intranasal, inhaled, or injected. The direct effect of using metamphetamine is increasing energy, a sense of euphoria; increasing attention and alertness; being more talkative; increasing heart rate, respiration and body temperature; decreasing appetite; tooth clenching and grinding; nausea, vomiting, dry mouth, nervousness, anxiety, and paranoia.[4]

Oral health is one of the most common problems (41.3%) among methamphetamine users.[5] Based on research conducted by Paramitha et al 2019, TMD was found in 84.2% of 152 amphetamine users in Indonesia with range of age 18-45 years. Clinical symptoms that founded among the users were clicking joints sound (74.2%), tooth wear (72.4%), bad habits such as biting foreign objects, nails, lips, grinding and clenching (60.5%), and bruxism (56.6%). It was also found that there was a significant relationship between duration of use, jaw play, chewing gum habit, and clenching during the day among narcotics users.[5]

'Met mouth' is the term used for the clinical characteristic of the oral cavity that is often seen among metamphetamine users, such as caries lesions, xerostomia, widespread attrition, and trismus.[7] Shetty et al evaluated that 301 adult users of metamphetamine had lost one or more teeth (60%), tooth erosion (22.3%), carious lesions (30.9%), complaints in the TMJ (8%), and oral mucosal lesions (4.3%).[8] In addition, Rommel et al found that metamphetamine users also experienced xerostomia (72%) and jaw clenching (68%), and pain around the TMJ (47%).[6] When consuming metamphetamine the endocrine glands will release chemicals such as serotonin, dopamine, and norepinephrine which cause episodes of jaw clenching. These chemicals cause muscle spasm so that the user will clench his teeth unconsciously. This clenching results in pain to the jaw joint, caries, pain in the tongue and lesions of the cheek mucosa.[7]

Shetty et al also compared the dental and oral health conditions of metamphetamine users both by intravenous, intranasal and smoking. Where the results showed that intravenous use of metamphetamine has a higher risk of having oral and dental disease compared to intranasal or cigarette use.[8] Research by Robbins states that intranasal metamphetamine use increases the risk of tooth

wear on maxillary anterior teeth, compared to intravenous metamphetamine users or cigarettes.[9]

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This case analysis aims to evaluate the treatment of TMD of muscular origin, with myofacial pain diagnosis with maximizing etiology-related education and supportive care that aims to reduce muscle mastication activities such as physical self-regulation, assisted muscle stretching, warm compresses, and administration of analgesics to reduce pain that patients often experience.

CASE

A 37-year-old male patient came to RSKGM UI and complained the discomfort he had suffered since 1 year ago. The patient is difficult to open the mouth wide, hears the ringing in the ears, feels the discomfort in the temples, cheeks, in front of the ears and when trying to open the mouth wide, the right neck area feels tense and uncomfortable which causes headache.

The patient was a former drug addict since 5 years ago, but has not consumed it as of August 2019. When consuming narcotics, the patient will unconsciously bring his upper and lower teeth together. Patients often feel discomfort in the area of the temples, cheeks, in front of the ears. In addition, patients often experience headaches that cause vertigo since May 2019, which then undergo physiotherapy treatment. The patient said that after physiotherapy (TENS), the vertigo got better but until now he still experiences ringing in his ears and difficulty opening his mouth wide.

Extra oral examination

Facial shape is oval. Convex profile, pupils are not level, and nose is symmetrical. Exhalation through the nose is smoothly. Upper lip normal is thin, symmetrical, short. Lower lip is normal, thick, symmetrical. All lymph nodes are painless and cannot be felt. The jaw joint sounds when opening the mouth and painful. Mouth opening does not deviate.

Intra oral examination

Oral hygiene is moderate. Abfraction of the maxillary anterior tooth 13-23. There's calculus and stain. Radix teeth 33 and 34. Tongue is normal in size, wright class I position, normal mobility. High gag reflex. Healthy oral mucosa. Occlusion is stable. Overlapping 5 mm and a bite distance of 4 mm. There are no open bites and cross bites. Orthognathic jaw relationships. Premature articulation and contacts cannot be checked. Moderate occlusal wear. No slide in centric. There are bad habits such as often bringing the upper and lower teeth together during the day, especially when working, and chewing on one side.

Clinical examination

The left and right joint is painful during palpation. Joint sound (+) when opening the mouth on the left and right. No crepitus. Joint movement is limited. There are no subluxations or locks. Palpation is on the right and left temporal muscle (+). Palpation is on right and left Masetter (+). Palpation is on the right and left of lateral pterygoid muscle (+). Palpation is on the tongue (-). Open a maximum of 30 mm with pain (+), accompanied by pain and stiffness in the right sternocleidomastoid muscle which causes a headache. Maximum 1 mm right and left lateral is accompanied by pain (+). Cannot perform protrusive motion. Overlapping 5 mm and a bite distance of 4 mm. There are no open or cross bites. There is no deviation during mouth opening and closing.

The indexes

According to the Helkimo Index, it is classified as Ai1 which is mild symtoms like clicking sound, catching and weary sensation on joint. Clinical Dysfunction Index classified him as Di3 which severe disfunction. Occlusal Dysfunction Index clas-

Figure 1 Intraoral views

sified the patient as Oi1 which is moderate disfunction, while acoording the ID-TMD, score ≥ 3, total score 12.

Bad habit questioner

Patient often does certain bad habit such as, chewing gums, sleep on one side, jaw play, breathing through his mouth, snoring while sleeping, clenching at day and night, and grinding. This bad habit answered with score "2".

Other habits such as bite on one side of the mouth, and feel sleepy during the day is answered with score "1" which means it is rarely be done by the patient. The total score of bad habit questioner is 16.

Emotional stress questioner

Patient often feels sad, weak and imbalanced, excessive worry, is lack of energy and deteriorating nervous, confused, depressed, mad, self-worthless which answered the question with score 2. Patient rarely blames himself, feels lonely and unattracted with anything else, feels not having future, feels like unable to control the important thing in life, feels emptiness, finds himself can't overcome things, feels ill and guilty, and answered those question with score 1. The total score of emotional stress questioner are 24.

Diagnostic criteria for TMD symptom questionnaire

Patient ever had feel pain in jaw, temple, ear, and in front of ear in both sides since 2 years ago (since 2017). In the last 30 days, those pain felt come and go. Activity such as opening mouth, moving jar forward and to other side, clenching, grinding, chewing gum, and yawning increase level of pain. In the last 30 days, patient felt headache on the temple area which began 2 years ago. Activities such as opening mouth, moving jar forward and to other side, clenching, grinding, chewing gum, and yawning increase level of headache. In the last 30 days, patient had joint noises when using his jaw at left and right joint. Patient had no history of close and open lock.

Diagnostic criteria for TMD examination form

In the last 30 days, patient felt pain on right and left temporalis, TMJ, and master muscle. Patient also felt pain headache on the right and left temporal. Patient overbite 4 mm dan overjet 5 mm. Pain free mouth was opening 23 mm. Maximum unassisted mouth opening 30 mm with pain on right side of temporalis, TMJ, masseter, other mastication muscle, and non-mastication muscle; also felt familiar pain on right side of temporalis, TMJ, masseter, other mastication muscle, and non-mastication muscle with familiar headache. Maximum assisted was opening 30 mm with pain on left side of temporalis, TMJ, and masseter; also felt familiar pain on right side of temporalis, TMJ, and masseter with familiar headache. Right lateral jaw movement was 1 mm; Left lateral jaw movement was 1 mm; and cannot do protrusion motion.

Clicking during open movement was noticed by examiner and patient on both sides of TMJ with no paint and no familiar pain. There was no clicking during close movement, and no crepitus. Also there was no TMJ noises during lateral and protrusive movement. There was no history of joint locking.

Patient felt pain, familiar pain with familiar headache during muscle palpation, on both sides temporalis middle, masseter origin, masseter body. Patient felt familiar pain with no referred pain on both side lateral pole and around lateral pole of TMJ. Other familiar pain was felt on lateral pterygoid area, and temporalis tendon on both side.

Radiograph examination

Interpretation of the panoramic is radix teeth 33 dan 34 with periapical radiolucency. Radiopacity with well define border is at mesial root teeth 37.

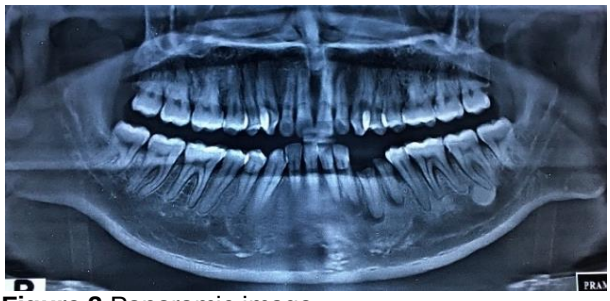

Figure 2 Panoramic image

Intepretation of transcranial right joint examination are 1) open position shows grade 1 which means limited mobility of the condyles; 2) rilex position - the condyle is in the inferior posteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4; 3) bite position - the condyle is in the inferior posteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4.

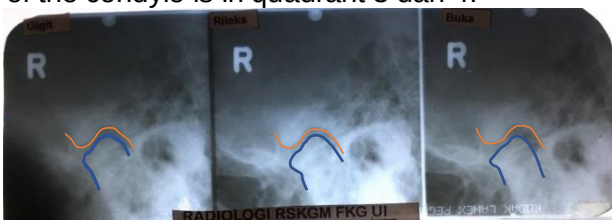

Figure 3 Transcranial image of right joint

Table 1 Temporomandibular disorder and muscle diagnosis

	Left	Right
Diagnosis		
TMJ	• Disc displacement with reduction • Arthralgya	• Disc displacement with reduction • Arthralgya
MUSCLE	• Myofacial pain	• Myofacial pain
Differential Diagnosis		
MUSCLE	• Local myalgia	• Local myalgia

Interpretation of transcranial left joint examination are 1) open position shows grade 1, which means limited mobility of the condyles; 2) rilex position - the condyle is in the inferior anteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4; 3) bite position - the condyle is in the inferior anteriorly from articular eminence, most of the condyle is in quadrant 3 dan 4.

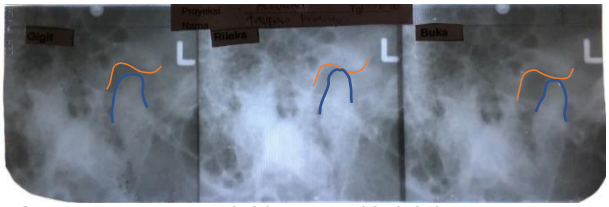

Figure 4 Transcranial image of left joint

Summary of subjective and objective findings

The summary of TMJ are the left and right joints are painful during palpation, clicking during opening on both joints.

Muscles are palpated on the right and left temporal muscle (+). Palpation on right and left masseter (+). Palpation on the right and left of lateral pterygoid muscle (+). Palpation on the right sternocleidomastoid (+).

Jaw movement are maximum mouth opening is 30 with pain, maximum mouth opening is 23 without pain.

There are parafunctions, including the chewing on one side, clench while working or in an emotional stress.

Psychosocial state is in an emotional stress.

Diagnose and differential diagnose

Based on DC/TMD: decision tree, pain-retalted TMD and headache, the diagnosis of muscle is myofacial pain with spreading, and the diagnosis of TMJ is arthralgia with headache attributed to TMD.

Based on DC/TMD: decision tree, intra-articular join disorder. We need to investigate other diagnosis for both intra-articular joint disorders and degenerative joint disorder.

Diagnoses of this case is showed in Table 1.

MANAGEMENT

After decide the treatment plan, the dentists gave some education including side effect of metamphetamine abused, total rehabilitation related to drug addiction, management of oral hygiene, soft diet, and management of bad habit; clenching, jaw play, chewing and sleeping on one side.

The action as supportive treatments to eliminate the limited mouth opening are physical self-regulation, assisted muscle stretching, moist heat, analgesic, paracetamol for 10 days, and transcutaneous electrical nerve simulations (TENS).

Pre-prosthetic procedures

The procedures including extraction radix teeth 33 and 34, and conservative treatment of anterior maxilla teeth.

The pre-prosthetic procedure was performed one month after the patient followed the educational advice and supportive treatment. If there are improvements such as normal openings, no tinnitus, no clicking and no pain reported, then a pre-prosthetic treatment is performed without making stabilisation appliance. If there is improvement in the form of mouth opening that has reached normal openings, but one of the complaints such as tinnitus, clicking, and pain is still reported by the patient, then the only pre-prosthetic treatment that is performed is conservative treatment in the cervical area of the anterior teeth which is then followed by making stablising appliance. It is not recommended to perform the extraction if the patient still complains of pain during functional movements. If there is no improvement, a stabilization appliance (SA) is made followed by a pre-prosthetic procedure.

Stabilization appliance

Stabilization appliance will be made at the maxilla, and used at night and during the day (because patients often complained of clenching during the day and cause pain). In addition, SA is also expected to be a therapy for the patient's tinnitus condition. First control appointment was performed 3 weeks after insertion. If there is an improve-

ment stabilization appliance will only be used at night. If there is no improvement, it is necessary to re-evaluate the patient's bad habits. After SA treatment, denture is made for teeth 33 and 34.

DISCUSSION

Methamphetamine is a central nervous system stimulant that became popular in the 1990s. Originally used as a nasal decongestant and bronchial inhaler, methamphetamine has the same effects as amphetamine such as increasing activity and speech, decreasing appetite, and stimulating self-confidence. However, when compared with the use of the same dose of amphetamine, methamphetamine is a stronger stimulant, provides a longer effect, and is more dangerous to the central nervous system. Methamphetamine works by changing the levels of neurotransmitters in the central nervous system, stimulates the endocrine glands to release chemicals such as serotonin, dopamine, and norepinephrine.[9]

Serotonin is a neurotransmitter that stimulates feelings of happiness. Users will feel euphoric and tend to talk more. Meanwhile, norepinephrine causes an increase in neuromuscular activity so that users will unknowingly bring their teeth together or often called as a clenching episode. Continuous clenching can result painful jaw joint, caries, pain in the tongue and lesions on the cheek mucosa. However, there are many methamphetamine users who do not experience clenching episodes, this is related to the dose and duration of use of this type of narcotic.[7]

Meth mouth is a general term used to describe the clinical characteristic of the teeth of methamphetamine users where the clinical picture is similar to the rampant caries that occurs in children under five. The lesions were localized on all cervical surfaces of the buccal and proximal anterior teeth of both the maxilla and the mandible. Metamphetamine users also often experience xerostomia, periodontal disease, clenching and bruxism which contribute to tooth wear and caries. The increase of caries lesion is exacerbated by poor oral hygiene and the habit of consuming high-carbohydrate drinks. This occurs due to metamphetamine changing levels of other neurotransmitter in the central nervous system such as serotonin, acetylcholine and glutamate, which results in an increase of the need for ATP, hence to compensate this user need more carbohydrate.[6,10]

In this case the patient consumed metamphetamina intranasally and also there was abfraction in all of his maxillary anterior teeth. Robbins et al. explained that there was a relationship between intranasal metamphetamine and tooth wear on the maxillary anterior teeth. This is related to the circulatory anatomy system in which the blood vessels in the anterior maxillary teeth originate from the anterior superior alveolar branch of the infraorbital artery, which is a branch of the external carotid artery that also circulates blood to the nasal mucosa. Vasoconstriction of blood vessels in these arteries is due to intranasal ingestion of metamphetamine can cause ischemia in maxillary anterior tooth bleeding. This can continuously weaken the tooth structure and cause tooth wear.[9]

Winocur et al reported the high prevalence of TMD symptoms such as nocturnal clenching and diurnal clenching among metamphetamine users.[2] As we know that the patient has been using metamphetamine for 5 years, and the anamnesis tells us that the patients often experience clenching episodes after taking metamphetamina. Other parafunctions such as such as chewing gum and chewing only on one side result in the hyperactivity of the masticatory muscles. If this condition occurs continuously, it can be called as deep pain input so that it is one of the etiological factor of TMD. In addition, other etiologies that contribute is emotional stress experienced by patients, in which increasing emotional stress can affect the function of the hypothalamus, reticular system, and in particular the limbic system which plays an important role in the emotional state of an individual. These centers influence muscle activity in many ways, one of them is via the efferent gamma pathway. Stress affects the body by activating the hypothalamus-pituitary-adrenal (HPA), which in turn prepares the body to respond (via the autonomic nervous system). HPA, via complex neural pathways, increases efferent gamma activity, which causes the muscle spindles to contract.[11]

The diagnosis of TMD in this case is myofacial pain or also known as myofascial triggers point pain, characterized by hypersensitivity of muscle tissue with localized pain. In this case, the sternocleidomastoid muscle trigger headache in the temporalis area. The etiology that causes myofacial pain in patients is the presence of deep pain input due to clenching, increased emotional stress and other bad habits such as jaw play, chewing gum, chewing and sleeping on one side. As a result, the patient is difficult to open the mouth wide, complains tinnitus and pain in the temporalis, masseter muscles, the area around the TMJ, and the right side of the neck which then caused headaches.

Based on the DC/TMD diagnostic chart for intra-articular joint disorders starts on the SQ9 chart where the patient does not have history of locking the jaw in the closed mouth position, then the chart continues on statements SQ8, E6, and E7 where the patient has a history of joint sounds i.e. clicking and clicking can be felt by the patient at clinical examination. The chart continues in statements E6 and E7 where clicking on the patient only occurs when opening the mouth and does not occur when clicking on eccentric movements. It can be concluded that the diagnosis of joint disorders based on DC/TMD is absent, whereas based on Okeson the diagnosis of joint disorders is disc displacement with reduction. This difference in diagnosis is due to differences in clicking characteristics, where in DC/TMD single clicking must be found together with clicking during eccentric movements to get a diagnosis of disc displacement with reduction, and based on Okeson's characteristics, clicking on disc displacement with reduction can be single or reciprocal clicking.

Tinnitus can be described as a subjective sound in the ear or head without an external sound source, some patients may complain of hearing changes as a result of a protective co-contraction of the tensor tympani. When this muscle contracts, the eardrum flexes and tightens. The tympani tensor, like the tensor palati, is innervated by the trigeminal nerve, so that the pain that occurs in the structures that are innervated by the trigeminal nerve can affect ear function and cause be a buzzing sensation.[11] Tullberg et al reported that diurnal bruxism and pain in the jaw may bassociated with fluctuations in tinnitus, vertigo, and hyperacusis, whereas the prevalence of tinnitus and vertigo was more common in TMD patients than in controls who were healthy subjects.[12]

In this case the treatment plan is to optimize education and supportive therapy, because the primary problem that occurs in this patient is a disorder of the mastication muscle. The education provided was to explain that the complaints he suffered were the result of disturbances in the mastication muscles. One of the causes of muscle mastication disorders is the side effect of using metamphetamine for 5 years. Metamphetamine stimulates the nervous system to release a chemical that causes the muscles to contract involuntarily. In addition, bad habits such as chewing and sleeping on one side, frequent chewing gum, clenching while working or being in an emotional state result in hyperactivity of the masticatory muscles. The supportive therapy such as PSR and training to open and close the mouth slowly and warm compresses have been suggested. Decreased blood flow to muscle tissue causes local myalgia, while warm compresses cause vasodilation of muscle tissue which can reduce muscle stiffness and pain. In addition, TENS (transacutaneous electrical nerve stimulation) supportive therapy can be done because this treatment has been carried out by the patient before and has proven to be effective in reducing patient complaints. TENS is used by utilizing electrical activities to reduce pain perception. If the electrical intensity is increased, TENS can cause muscle relaxation.

Education and supportive therapy will be carried out for approximately 1 month after which a re-evaluation will be carried out. If there is no improvement, a stabilization appliance (SA) is made followed by a pre-prosthetic procedure. However, if there is an improvement in the form of mouth opening that has reached normal openings, no tinnitus, no clicking and no pain, then the treatment is continued with pre-prosthetic action without using stabilization appliance. If there is an improvement in the form of mouth opening that has reached normal openings, but tinnitus, clicking, or pain is still complained by the patient when opening the mouth, then a pre-prosthetic treatment is carried out in the form of filling in the maxillary anterior teeth which is then carried out making stabilization appliance. It is not recommended to perform the extraction if the patient still complains of pain during functional movements.

Stabilization appliance is an appliance that can be used to treat muscle pain relief, the use of stabilization appliance has been shown to reduce parafunctional activities accompanied by emotional stress. Patients with a diagnosis of myofascial pain can be treated with stabilization appliance which will help minimize pressure that can damage muscle tissue so that the healing process can occur.[11] In addition, the stabilization appliance is also expected to reduce other complaints of patients such as tinnitus, where the stabilization appliance plays a role in reducing the hyperactivity of the masticatory muscles around the tensor tympani and tensor veli palatine.[12]

It was concluded that the side effects of using methamphetamine that occurred in this case were clenching and meth mouth, which are the etiology of myofascial pain. In addition, other etiologies that contribute to this case are the existence of other bad habits such as chewing and sleeping on one side, frequent chewing gum, clenching while work-

ing or when the patient is in an emotional state, and emotional stress that is being experienced. The chosen treatments are maximizing etiology-related education and supportive care that aim to reduce muscle mastication activities such as physical self-regulation, assisted muscle stretching, warm compresses, and administration of analgesics to reduce pain that patients often experience. Definitive treatment by making stabilization appliance will be carried out if after 1 month of education and supportive care does patient complaints do not reduce, or if there has been improvement but one of the complaints such as tinnitus, clicking, or pain is still complained.

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Considerations in occlusal vertical dimension rehabilitation

Mariska Juanita, Eri Hendra Jubhari
Department of Prosthodontics
Faculty of Dentistry, Hasanuddin University
Makassar, Indonesia
Correspondence author: **Mariska Juanita**, E-mail: **mariskajuanita@gmail.com**

ABSTRACT
The vertical dimension is one of the important aspects that affect facial appearance, because it is related in facial height ratio. The vertical occlusal dimension is the height of the lower face measured from two points (infra-nasal and gnation points) when the maxillary and mandibular teeth were occlusion in the maximum intercuspal position. In complex cases, tooth wear can result in a decrease in facial height because the predominant wear on the anterior teeth encourages downward movement of the condyles when the intercuspal is maximum so that the vertical dimension decreases. In addition, factors that cause a decrease in the vertical dimension are loss of posterior teeth accompanied by skeletal disharmony or accompanied by tooth abrasion and migration. The purpose of this paper is to explain how to restore the decreased occlusal vertical dimensions. Things that need to be considered are divided into two, extraorally and intraorally. Extraoral considerations are in the form of a large reduction in OVD, facial esthetics and conditions of the temporomandibular joint. The parameters considered intraoral were the remaining tooth structure and occlusion. It was concluded that tooth wear due to functional and parafunctional activities can result in dimensional changes in facial morphology as well as a decrease in the occlusal vertical dimension. Correct OVD rehabilitation is an important factor in the success of rehabilitation treatment.
Keyword: occlusal vertical dimension, tooth wear, occlusal vertical dimension rehabilitation

INTRODUCTION

The vertical dimension (VD) is defined as the distance between two selected anatomical landmarks, usually one on the tip of the nose and the other upon the chin.[1] The VD is one of the important aspects that affect facial appearance, because it is related to facial height ratio. The occlusal vertical dimension (OVD) is the vertical dimension measured when mandibular teeth are occluded with the maxillary teeth.[2]

Loss of tooth structure due to functional activities or tooth wear is a physiological process that will occur over time. Attrition, abrasion, erosion and parafunctional habits that occurs excessively will damage the occlusal surface.[3,4] Basically, mastication system will adapt to tooth wear due to functional activity through the dentoalveolar compensatory mechanism, which is the formation of eruptive pressure that encourages vertical movement of the teeth and alveolar until it reaches a resistance equal to the eruptive pressure.[5,6]

This vertical movement will trigger a constant change in muscle contraction and affect the temporomandibular joint (TMJ), rotational movement of the condyles from the horizontal axis to the maximum intercuspal position decrease OVD.[6] The decreasing of OVD affect facial appereance due to shortened height in the lower third of the face, lip intrusion, decreased nasolabial angle and also phonetic and mastication dysfunction.[3]

The determination of the treatment plan is strongly influenced by an understanding of the physiology and biomechanics of the vertical dimension. Lack of understanding can lead to iatrogenic damage to the teeth as well as undiagnosed TMD.[6]

In decreased VD cases involving excessive loss of tooth structure and massively affect teeth in the arch, it is necessary to consider restoring the OVD by adding it because it can create space for fixed restorative, improve anterior tooth relations, restore physiological VD as well as minimize invasive procedures such as crown lengthening surgery.[5]

The purpose of this paper is to find out how to restore the decreased OVD and consideration in determining the treatment plan.

LITERATURE REVIEW

The Glossary of Prosthodontic Terms defines the vertical dimension as distance between the two anatomical marks, one point on the upper half facial height and the other one in the lower half facial part. The first anatomical landmark is located on the tip of the nose and the other upon the chin, where one of the points is on movable tissue and the other is on fixed tissue.[1]

The OVD is the height of the lower face measured from two points (infra-nasal and gnation points) when the maxillary and mandibular teeth are occluded in the maximum intercuspal position. Threst vertical dimension (RVD) is the VD measured when the mandible is in a rest position. The interoclusal distance when the maxilla and mandible in rest position or the difference between RVD and OVD is called free way space (FWS).[7]

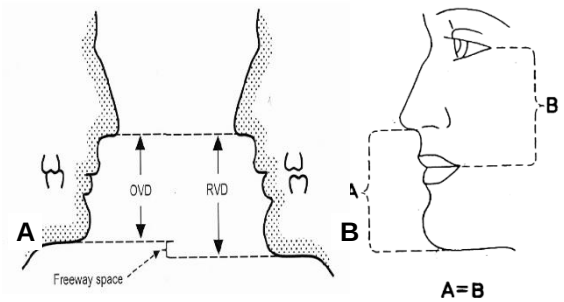

Figure 1A Schematic of the OVD, RVD and FWS; **B** Schematic comparison of distances between craniofacial landmarks (Source: Raj N, Meshram A, Mulay S. Review on methods of recording vertical relations. Evolution Med Dent Sci 2013; 2 (12): 1779–84.[8]

Mandibular resting position is defined as the mandibular position when the head is in upright position and the masticatory muscles are in a tonic contraction state and the condyles are in a neutral position. The value of the OVD is obtained by subtracting 2-4 mm from the obtained rest position value. The value of the resting position is measured from two anatomical points on the face (two dots), the tip of all the nose and chin, using measuring instruments such as the Willis gauge, calipers, rulers (mm) and digital calipers.[9]

The method for getting the mandible in a resting position is that the patient is instructed to say "M" and the lips are relaxed. In addition to this method, the patient can also be instructed to swallow when position the mandible in a relaxed manner. The disadvantage of measuring vertical dimensions based on mandibular resting position is that the position of the mandible can be influenced by many factors such as functional habits, head position, lip activity, anxiety and fear and other disorders involving the mandibular motor complex.[8,9]

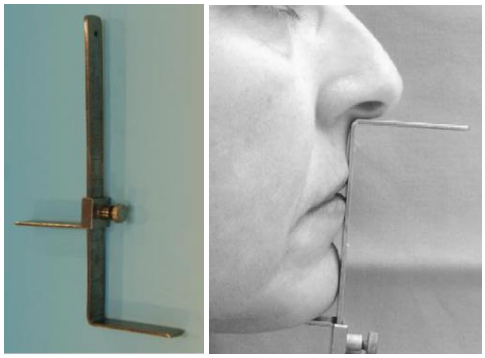

Figure 2 Willis bite gauge (Source: Raj N, Meshram A, Mulay S. Review on methods of recording vertical relations. Evolution Med Dent Sci 2013; 2 (12): 1779–84.[8]

Craniofacial parameters can be used to estimate the height of the lower third of the face, the distance between nasal septum (Sn) to the base of the chin (Me) and the distance from the tip of the nose (N) and the tip of the chin (Gn) is the distance used to determine the OVD. Comparing the distance formed between craniofacial landmarks makes it possible to detect if there is a decrease in OVD. Nagpal et al evaluated the reliability of this measurement and concluded that the distance from the outer eye corner to the lip corner and the distance from the outer eye corner to the tragus had a significant correlation with the N-distance. Gn so that this can be a parameter if there is a change in the OVD by comparing the two distances.[8,9]

Evaluation of OVD based on facial esthetics is seen from the balance ratio of the lower third of the face. The ideal OVD shows a face that is not taut with the lips slightly exposed. The appearance of the face becomes more tense, facial elongation is often accompanied by incompetent lips indicating increased OVD. A lowered mouth angle and a lower vermilion rim are associated with decreased OVD.[2,10] This method is effective for use in patients who are young to middle age because the facial tone is still in good condition. The reliability of this method is reduced when applied to patients whose facial tone is weakening and lips are incompetent.[9]

This method utilizes anatomical points on the skeletal via cephalometric tracing to determine the VD and maxillomandibular relations. This method is accurate but requires adequate radiographs and the radiation generated makes the application of this method limited. Electromyography (EMG) can also be used to determine VD, this tool will record muscle activity, the value of minimal muscle activity indicates the mandible is in a resting position.[2,9]

The VD is basically influenced by the maxillomandibular relation which is formed from the repetitive contraction mechanism of the mandibular elevator muscle, so that the teeth will erupt at a distance formed from the maxillomandibular relation.[6]

Teeth have eruptive pressure that pushes the tooth to erupt until it reaches the same pressure resistance. If the resistance is greater than the eruptive pressure, the tooth will intrude, and vice versa if the eruptive pressure of the tooth is greater than the resistance of the mandibular elevation muscle, the tooth will extrude until it reaches the same resistive pressure.[6]

This maxillomandibular relationship is consistent because it is controlled by contraction of the mandibular elevator muscle so that there is a compensatory mechanism of the alveolar bone to maintain the maxillomandibular relationship in the event of tooth wear due to parafunctional habits,

bruxism and clenching (Fig.3).[6] In complex cases, teeth can result in a decrease in facial height because the predominant wear on the anterior teeth encourages downward movement of the condyles when the intercuspal is maximum which leads to the VD decreases. In addition, factors that cause a decrease in the VD are loss of posterior teeth accompanied by skeletal disharmony or accompanied by tooth abrasion and migration (Fig.4).[6,7]

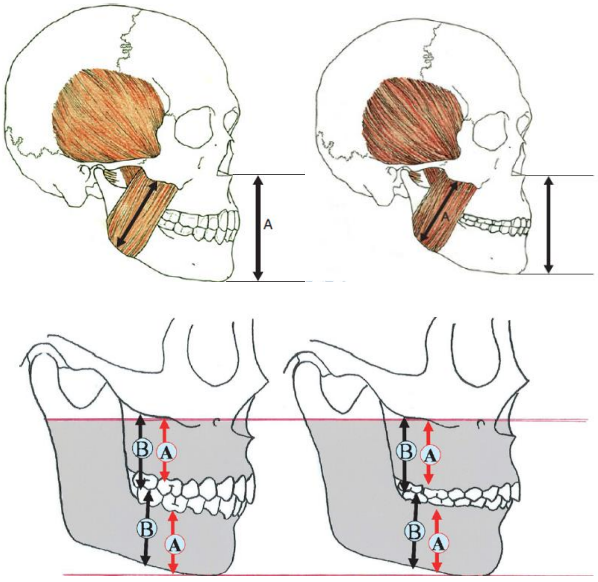

Figure 3 Compensation mechanism of alveolar bone against tooth wear (right) due to abrasion, showing consistent length of mandibular elevator muscle during repetitive contraction (Source: Dawson PE. Functional occlusion-from TMJ to smile design. Missouri: Mosby; 2008. p33-56).[6]

In Fig.5A, the decrease in OVD is due to the rotation of the mandible in the anterior region with the axis at the condyles, while the loss of occlusion support in the posterior region causes movement of the mandible (rotation) with the axis at the most distal side of the remaining tooth.[6]

Changes in the VD that occur tend to encourage patients to feel insecure because they reduce

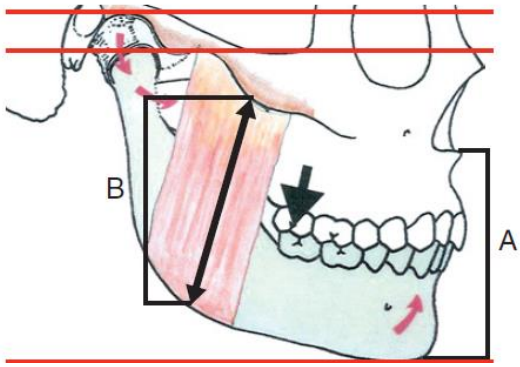

Figure 4 Decrease in the VD due to changes in condyle position (Source:Dawson PE.Functional occlusion-from TMJ to smile design. Missouri: Mosby; 2008. p.33-56).[6]

the aesthetic value of the face, in addition to that in the case of decreasing VD it results in facial disharmony, disruption of the TMJ that triggers lesions such as angular cheilitis.[10] Determination of a good treatment plan is necessary because errors in the treatment approach can affect the condition of the TMJ and the stomatognathic system.[6]

Excessive increase in VD can lead to pain in muscles and joints, functional disorders in the form of tense speech, difficulty swallowing, and chewing. Changes in the VD are made if you want to improve the occlusal relationship and prepare space for permanent restoration.[6,12]

Things that need to be considered are divided into two, extraorally and intraorally. Extraoral considerations are in the form of a large reduction in OVD, facial esthetics and conditions of the TMJ. The parameters considered intraoral were the remaining tooth structure and occlusion.[2]

Measurement of the decreased OVD

Evaluation is by measuring the interocclusal rest space (IORS), which is the reduction in the VD when the mandible is in a resting position and to the VD when the mandible is occluded. This

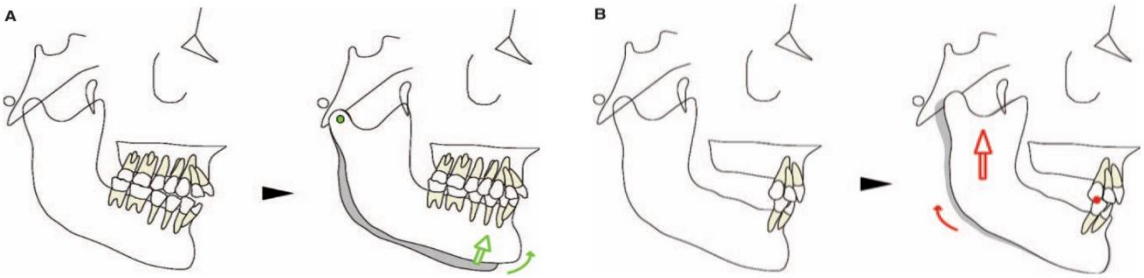

Figure 5A Decrease in OVD due to condyle rotation; **B** due to loss of posterior occlusion support (Source: Dawson PE. Functional occlusion-from TMJ to smile design. Missouri: Mosby; 2008. p33-56).[6]

This aims to determine the amount of additional VD that will be made. Physiologically, the IORS value is 2 mm, so if a value greater than 2 mm is obtained, it indicates a decrease in OVD and can be added safely.[2,5]

Facial aesthetics

The determinants of facial esthetics are the sagittal profile, facial appearance, lip morphology and appearance of the teeth. Examination of the sagittal profile may reveal pseudoprognathy which is a sign of decreased OVD and mandibular overclosure. The results of cephalometry showed that the worn teeth caused a reduction in arch width and gonial angle, thus showing a pseudoprognathic appearance.[2]

The state of the TMJ

Examination of TMJ before returning the VD is important in the form of examination of joint pain, mandibular movement and whether or not clicking. Comprehensive examination and treatment approaches need to be carried out, especially in patients with TMJ disorders, because the symptoms of TMJ neglect often detected because they are masked by the patient's discomfort during the adaptation period. Patients with TMJ disorders are treated with removable occlusal devices that function to stabilize the TMJ and increase the OVD prior to permanent restoration.[2]

The remaining tooth structure

The prognosis of the restoration depends on the amount of remaining tooth structure, measured by the VD between the edges of the preparation and the occlusal-axial angle line. The height of the preparation is a determinant of the retention and resistance of the restoration, the minimum recommended restoration height is 3-4 mm. If the clinical crown height of the tooth is inadequate, an alternative treatment, crown legthening surgery (CLS), can be performed.[2]

Occlusion

In the case of worn anterior teeth, the mandible tends to be in a more anterior position, by noting the horizontal position of the mandible when the centric and intercuspal relationships are maximum, adequate interinsisal distance can be obtained for the restoration of the worn anterior tooth. Loss of posterior tooth support is also one of the main causes of decreased OVD. The clinical implication of this is that there is excess chewing pressure on the remaining anterior teeth, resulting in potential wear. Decreased clinical crown height tends to render the incisal relationship edge to edge. This impairs esthetics and causes loss of anterior guidance. This condition requires the addition of a OVD in order to re-establish overjet and overbite and restore anterior guidance.[2,5]

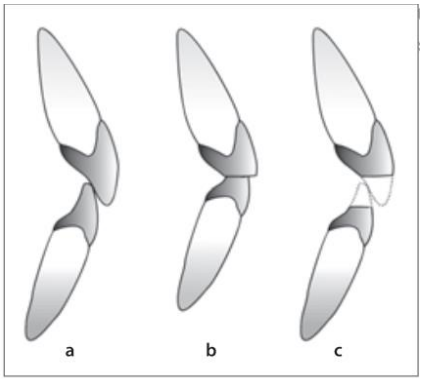

Figure 6 The consequences of worn teeth on the anterior relations (a) normal relations of the anterior teeth; (b) wearing of the anterior teeth makes the anterior relation edge to edge; (c) improvement of the anterior relation by increasing the OVD (Source: Abduo J. Safety of increasing vertical dimension of occlusion: a systematic review. Quintessence Int [Internet]. 2012; 43: 369-80. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22536588 (Accessed on 15 Sept 2020).[5]

DISCUSSION

Rehabilitation of patients with worn tooth in the occlusal area is a complex treatment and a challenge in the field of dentistry. Teeth are prone to be worn and torn due to functional activity. But this condition can be worsened in cases of posterior tooth loss because the chewing load will be concentrated on the remaining anterior teeth resulting in occlusion disorders and parafunctional habits such as bruxism.

Bruxism is a parafunctional habit of grinding teeth, or a habit of unconsciously grinding, grinding teeth in addition to chewing movements of the mandible, thus triggering occlusal trauma. The cause of bruxism has not been specifically known with certainty, but several factors that influence, namely morphological factors such as dental occlusion, psychosocial factors such as stress and certain personality characteristics, pathophysiological factors (disease, trauma, genetics, smoking, alcohol, caffeine consumption, drugs) and sleep disorders (sleep apnea and snoring).[3,6]

When the mandible alternately moves laterally, the teeth will be subjected to large horizontal stresses, increasing the likelihood of breaking the tooth structure to the periodontal tissue. Bruxism also occurs in an eccentric position, resulting in an

uneven distribution of pressure but only on a few teeth, in contrast to performing functional activities where the mandible is in a centric position for occlusion. Worn tooth due to parafunctional habits were associated with the development of tooth sensitivity, a decrease in the height of the clinical crown and the possibility of a change in OVD. Loss of tooth structure does not directly result in loss of VD, so to determine whether there is a change in OVD, various aspects need to be be considered such as how the occlusion of the posterior teeth, the level of tooth wear, phonetic evaluation of hissed sounds, interocclusal distance and facial appearance. The increase in OVD causes the teeth to contact when making a hissing sound, difficulty in closing the lips and difficulty in swallowing accompanied by pain, whereas if the OVD decreases, it shows excessive closure during occlusion, which disturbs the TMJ, excessive lip contact and angular cheilitis.[3]

The initial stage in the case of tooth wear in the anterior region, namely the return of the OVD, is performed to restore the height of the lower third of the face and establish an interoclusal distance to allow occlusal reconstruction, anterior and canine guidance. Several techniques can be used to measure OVD, but in this case using the Willis Method which states that the distance between the base of the nose to the chin (lower third of face) is equal to the distance from the corner of the lips to the commissure of the eye (middle third of face) when the teeth are in the maximum intercuspal position. Tools developed are shaped like the letter "L" since 1930 to facilitate this measurement. This method is the right technique, accurate and practical because it does not require expensive equipment and the use of the tool is easily understood by the operator.[2,3,8]

Restoration treatment still should not precede the return stage of OVD because it will be difficult for patients to adapt to the new OVD. Return of the OVD is done incrementally to allow movement of the condyles back to the centric position and to increase the OVD in the anterior region without increasing contraction of the mandibular elevator muscle.[3.11] Gough and Setchell[3] stated that OVD returns with fixed interim dentures are more comfortable and provide better results than removable dentures.

The removable denture tends to make it difficult for patient to speak, is less aesthetically pleasing and causes symptoms that stem from the use of the removable denture, not because of an increase in OVD. The use of the OVD return method with fixed dentures can reduce cases involving parafunctional habits such as grinding and clenching, and become visible within 1-2 weeks of use.[5]

The period of adaptation of the patient to the new OVD is not definite, but the minimum interval period of 4 weeks will be evaluated for TMJ disorders, mastication, swallowing, speech and aesthetics. This is in line with Carisson et al[3] who stated that there was a decrease in muscle activity detected by EMG in the adaptation period of 1 month. Permanent restoration can be performed after the patient has adapted to the new OVD. It is necessary to return the OVD in patients with the habit of grinding teeth even though they are not accompanied by pain symptoms because this parafunctional habit can interfere with the aesthetics and function of the masticatory system.[3]

It was concluded that worn teeth due to functional and parafunctional activities can result in dimensional changes in facial morphology as well as a decrease in the OVD. Correct OVD rehabilitation is an important factor in the success of rehabilitation treatment, because decreasing OVD lead to tooth decay, muscle disorders, TMJ, ingestion, and phonetics disfunction. The VD rehabilitation currently tends to use fixed dentures because they have better aesthetics, adaptation and functional enhancement in patients. The use of removable dentures shows a complaint that is often misinterpreted because the complaints arising from the use of removable dentures are similar as complaints after the new OVD adaptation so that it becomes a complicating factor in evaluating patients during the adaptation period.

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The difference of surface roughness in acrylic resin self-cured with addition of zirconium dioxide particles as a denture repaired materials

Vivin Ariestania, Paulus Budi Teguh, Dedy Yusuf
Department of Prosthodontics
Faculty of Dentistry, Hang Tuah University
Surabaya, Indonesia
Coresponden: **Vivin Ariestania**, E-mail: **vivinariestaniadrg@gmail.com**

ABSTRACT
Background: Tooth loss is one of the effects of periodontal disease and dental caries. Tooth loss can be resolved by making a denture prosthesis. Several factors that influence society on denture use include aesthetic, social, functional, educational, and cultural factors. The large number of lost teeth will certainly increase the demand or desire to manufacture dentures to restore the function of the missing teeth. One of the materials that are often used in dentures is acrylic resin. Acrylic resins frequently used for denture base materials are cold polymerized acrylic resin and hot polymerized acrylic resin. Cold polymerized acrylic resin uses chemical activation, and this type of resin is often used for denture repair materials. Denture repair aims to repair prostheses that have many fractures in the midline area. Chemical polymerization acrylic resin is often used as a repair material because it is easy to apply and can be done directly on the patient. This resin has a disadvantage because it often leaves residual monomer in the polymerization process, so it impacts porosity. This problem can be overcome by modifying the resin's chemical structure using polyethylene glycol or by adding ZrO_2. **Objective**: This study aims to determine the effect of adding 3%, 5%, and 10% of zirconium dioxide (ZrO_2) nanoparticles to the surface roughness of self-cured acrylic resin as a denture repair material. **Methods**: Four sample groups, each consisting of 10 samples, were divided into the control group (K), the treatment group with ZrO_2 addition 3% (P1), the treatment group with the addition of ZrO2 5% (P2), and the treatment group with the addition of ZrO_2 10% (P3). The results of all treatments and controls were tested for surface roughness using the MST-301 surface roughness test profilometer. **Results**: Based on the results of the descriptive test, the mean of group K = 0.395 ± 0.161, group P1 = 0.813 ± 0.525, group P2 = 1.284 ± 0.336 and group P3 = 1.093 ± 0.558. In the Kruskal-Wallis test, there were significant differences in all groups. **Conclusion**: The self-cured acrylic resin with the addition of 3% concentration of ZrO_2 has the lowest surface roughness compared to the other groups, and the roughness is almost similar to the surface roughness of the control group.
Keyword: resin akrilik self cured, zirconia dioksida, kekasaran permukan

INTRODUCTION

Based on the results of primary health research (RISKESDAS) in 2013, the prevalence rate of dental and oral diseases was 25.9%. The national tooth loss percentage at the age of 35-44 years is 0.4%, and it increased at the age of 65 years and over to 17.6%.[1] Several factors that influence society on denture use include aesthetic, social, functional, educational, and cultural factors. The large number of teeth lost will undoubtedly increase dentures' demand to restore the missing teeth' function.[2]

One component of the dentures is the denture base, which can be made of metal or alloys, and polymers.[3] The denture's basic function here is to replace the lost alveolar bone, improve facial aesthetics, and deliver occlusal pressure to the tooth-supporting tissue and the residual alveolar ridge.[2] Acrylic resin is one of the selected materials in the manufacture of removable denture bases to date. This material is often used in dentistry because it has various advantages such as biocompatibility, satisfactory elastic quality, low water absorption, good thermal conductivity, and easy processing and repairing.[4]

This study used acrylic resin; specifically, it was a chemical polymerized resin.[3] This material is commonly used for restoration materials, removable orthodontic tools, denture repair, and the manufacture of special printing spoons.[5]

Polymethyl methacrylate (PMMA) resin has low mechanical properties, so it often experiences denture base fractures.[6] Fractures in the denture base can occur either outside the mouth due to hard impact, accidentally falling during cleaning, or inside the mouth caused by small but repetitive occlusal loads. A very small, one-time load does not appear to have any visible impact on components. However, this creates tiny cracks that can only be seen microscopically. With similar events continuing, these tiny cracks will coalesce into gaps that weaken the material.[7] Other statistical data shows that fractures frequently occur in the midline of removable dentures, which is 35% of the total 320 samples where fractures in the midline of the maxillary dentures are more common than those of the mandible.[8]

Chemical polymerized acrylic resins have low-

er transverse strength than hot polymerized acrylic resins.[9] Chemical polymerized acrylic resins also have large porosity due to the air in the monomers that are insoluble in the polymer at room temperature. The rheological properties of chemical polymerization acrylic resin materials are also lower than hot polymerized acrylic resin. Therefore, chemical polymerization acrylic resin tends to be used in small-scale prosthodontics applications, such as in denture repair, ortho devices, and many more.[3]

The problem of mechanical properties of acrylic resin can be minimized by increasing the strength of the resin. Several ways have been done to increase acrylic resin's strength, for example, by adding 3%, 5%, and 10% ZrO_2 nanoparticles.[10] To obtain good biocompatibility of the materials, the surface roughness of the material must be minimized.[11] Surface roughness is critical in determining restoration success because a rough and porous surface can result in developing microorganisms' preference conditions.[12] One of the requirements for fine acrylic resin materials for use in the oral cavity is a well-polished surface of the resulting resin material to reduce organic debris retention. Therefore, surface roughness is one of the considered characteristics.[13] Clinically, the threshold value for denture base surface roughness is 0.2 μm.[14] The best addition of ZrO_2 nanoparticles with concentrations 2%, 3%, 5%, and 7% on the acrylic resin in increasing the impact of strength and transversal is a concentration of 5%.[15] Zirconium dioxide has a high strength and hardness, is resistant to abrasion, non-toxic, biocompatible, low thermal conductivity, better thermal strength than aluminia, and has corrosion resistance.[16] The addition of zirconium dioxide (ZrO_2) nanoparticles as a coating on PMMA has been suggested to improve PMMA properties.[17]

Silane is a linking material used to make bonds between organic and inorganic materials simultaneously. Silane is used to modify the surface of inorganic materials to increase the adhesion between organic and inorganic materials.[18]

This study aims to determine the effect of adding ZrO_2 nanoparticles to the surface roughness of self-cured acrylic as a denture repair material.

METHODS

This research was a true experimental research with a post-test only control group design. The sample used was blocks with a size of 15x15 x1.5 mm as many as 40 pieces, made of self-cured acrylic resin added with ZrO_2, which was divided into four groups, where the chosen criteria were smooth and flat, non-porous surfaces, shape, and size according to the criteria.[19]

This research was started from the manufacture of the main model with a size 50x20x3 mm which was planted in the cuvette. Cold mold seal applied to the hard cast surface on the lower and upper cuvettes and left for a few minutes. Stir the polymer and self-cured acrylic monomer with a ratio of 3 g:4.5 g in a porcelain pot to the dough stage, then put it in the bottom cuvette mold. Cellophane plastic is placed between the top and bottom cuvettes, close the cuvette, and pressed with a hydraulic press with a pressure of 1000 psi. Open the cuvette and excess cut acrylic with a *lecron* mass, then close the cuvette again. Press the second with a pressure of 2200 psi, then install the bolts. Remove the sample, and the excess acrylic is also removed with a *fraser* bur and smoothed with waterproof sandpaper and number the sample using a marker. In the polymerization procedure, mix the self-cured acrylic resin material without the addition of ZrO_2 with the polymer and monomer ratio according to the factory dosage, then wait for the set time. The next group was given the silanization of ZrO_2 nanoparticles, which increased adhesion between the ZrO_2 nanoparticles and the resin matrix. To increase the adhesion of the material, a ZrO_2 silanization process is needed to place 30 g of ZrO_2 nanoparticles into an erlenmeyer tube containing 200 mL of pure ethanol, which was used as a solvent. Then the erlenmeyer tube was put into the sonicator at room temperature for 20 minutes. Then, vibrate it for 20 minutes at room temperature using a magnetic stirrer so that the ZrO_2 nanoparticles and ethanol were mixed homogeneously. After that, the solution was added to the silane coupling agent as much as 1.5 mL (3%, 5%, 10% of the ZrO_2 nanoparticles) into the ZrO_2 nanoparticle mixture and ethanol using a sterile syringe and then vibrated with vibration of 250 rpm for 60 minutes.

Pour the mixture in a closed container and left for two days at room temperature so that the substance dissolved by the silane coupling agent can completely absorb at the ZrO_2 surface. The ethanol mixed in the ZrO_2 nanoparticles was evaporated using a rotary evaporator with a temperature of 60°C and a speed of 150 rpm for 30 minutes to separate the ethanol solvent and the silane coupling agent mixture that had been fused with ZrO_2.

Remove the remaining ethanol and silane coupling agent using a vacuum buffer tool. Then, the silanized ZrO_2 nanoparticles were dried in an oven at 60°C for 20 hours, then removed from the

oven. Next, ZrO_2 nanoparticles were processed using a sonicator at a speed of 250 rpm for three minutes to break down clumped particles, then sonicate again for three minutes to mix the monomer and ZrO_2 to become nanoparticles again.

Mixing of self-cured acrylic resin was done by the addition of ZrO_2 nanoparticles with a concentration of 3%, 5%, 10%. The ZrO_2 nanoparticles that had been silanated were weighed as much as 0.54 g for one cuvette consisting of 3 impact strength samples. The calculation was equivalent to 3%, 5%, 7% of the polymer, and monomer's total weight. The ratio of ZrO_2:polymer:monomer for filling mold compressive strength was 0.54 g: 11.46 g: 6 mL. Stir the nanoparticles, polymer, and monomer in the capsule until they were homogeneous.

Surface roughness measurements used a profilometer, which was calibrated in advance. The sample was placed in the space provided (table 1) so that the measuring device can move freely to the surface of the sample being measured for surface roughness. To control whether the tool had touched properly or been too pressing can be seen on the monitor screen. When the start button was pressed, the tool will move at a 1 mm/second speed. After that, the results were recorded.

RESULT

The data obtained were tabulated, and statistical analysis was carried out to obtain a description of the distribution and summarization of the data to clarify the results' presentation. Hypothesis testing was carried out using analytical statistics with a significance level of 95% (p=0.05) and processed with the program SPSS version 24.

Table 1 The results of the mean calculation of the surface roughness test (surface roughness)

Group	Mean±Std.Deviasi
K	0.3950 ± 0.1609
P1	0.8130 ± 0.5254
P2	1.2840 ± 0.3364
P3	1.0930 ± 0.5588

Table 1 shows that the highest mean value of surface roughness was found in group P2 (1.284 ±0.3364), while the lowest surface roughness was found in group K (0.395 ± 0.1609). The results of this study indicate that the concentration of self-curved acrylic with the addition of ZrO_2 results in the P2> K> P1 group, which means that P2 is more effective than K and P1.

The normality test results using the Shapiro-Wilk test showed that the P1 and P2 groups were normally distributed, while the P3 groups were not normally distributed. The data results were known not to be normally distributed; therefore, the test was continued using Kruskal-Wallis.

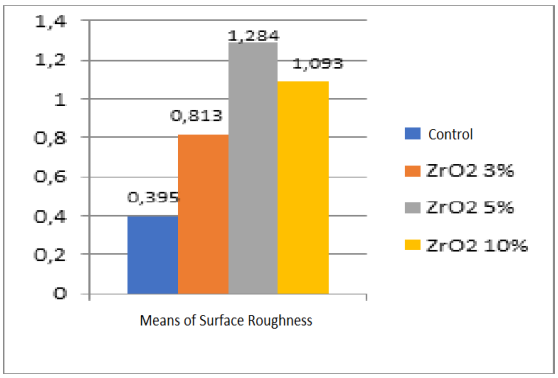

Figure 1 Diagram of means and std.deviation surface roughness in self-cured acrylic

The Kruskal-Wallis test results showed a significance value of p=0.000 (p<0.05), so there was a significant difference in each group. From the results of the Kruskal-Wallis test, the Mann-Whitney test was continued to see the difference in surface roughness between each group.

DISCUSSION

This research was conducted to determine the effect of 3%, 5%, and 10% of ZrO_2 nanoparticles on the self-cured acrylic denture repair material. Self-cured acrylic resin is an acrylic resin whose chemically activated-polymerization.[20] Zirconium dioxide is zirconium oxide stabilized in the tetragonal phase (t-ZrO_2), primarily as a core or framework for dentures.[3]

According to the research results, there was a change in surface roughness on the self-cured acrylic resin plate, which was added with zirconia dioxide filler. The greater the concentration of the addition of zirconia filler to self-cured acrylic, the more changes in surface roughness will occur. It was evidenced by the significant difference between group K and group 5% and 10%.

This difference is due to the addition of ZrO_2, which has a very small particle size that easily spreads into the self-cured acrylic resin. This characteristic of zirconia makes these zirconia particles enter between the linear polymer chains and increased surface roughness, but the higher the concentration of ZrO_2 added to the self-cured acrylic resin, the color of the acrylic resin plate turns whitish, thus disturbing the aesthetics. The reason for choosing zirconia as a self-cure acrylic resin filler is because zirconia material has good mechanical properties and high compressive strength.[21] Good mechanical strength is very supportive of

denture plate repair materials. The addition of zirconia filler can stabilize the transformation of the crystal structure due to the heating process.[22]

In mixing zirconia as a filler in self-cured acrylic resin, less temperature is used as the initiator during its polymerization. The greater the concentration of zirconia added, so the greater the surface roughness obtained because the heating temperature required during the acrylic polymerization process has not reached the best maximum temperature to obtain the mechanical strength of the properties of the zirconia material. Therefore, the maximum concentration of ZrO_2, which can meet surface excitation requirements while having mechanical strength, is obtained at a 3%.

The results also stated that in the group, the addition of 5% zirconia compared to the addition of 10% zirconia, there appeared to be no significant difference; this was because at a concentration of 10% there was a slight error during the polymerization process and the sample polishing process. Errors in the polishing process affect to surface roughness of the sample.

It was concluded that self-cured acrylic resin with the addition of ZrO_2 3% has the smallest surface roughness and the mechanical strength of the self-cured acrylic resin material achieves the strength expected of the denture repair material.

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Nutrition education and mastication improvement through social services provision in Ketapang sub-district, Probolinggo

Utari Kresnoadi, Michael Josef Kridanto Kamadjaja, Muhammad Dimas Aditya Ari
Department of Prosthodontics
Faculty of Dentistry, Universitas Airlangga
Surabaya, Indonesia
Correspondence author: **Utari Kresnoadi**, e-mail: **ut.kres@yahoo.com**

ABSTRACT
Introduction: A community-based exercise was implemented with the specific theme "Awareness raising among Family Welfare Program and Youth Organization group members of the importance of Family Nutrition Literacy and of nutrition education and mastication improvement through provision of removable dentures" in Ketapang sub-district, Kademangan district, Probolinggo. **Aim**: This community-based service was intended to inform the public of the importance of nutritional consumption to ensure a well-nourished family and enhanced mastication resulting from the use of removable dentures. This event was held in the middle of the COVID-19 pandemic. **Methods**: Two teams managing innovative and promotion were created. The role of the former was to conceptualize activities, while that of the latter was to directly inform the target community using a combination of printed and electronic media. These teams consisted of lecturers and 2nd year residents of the Department of Prosthodontics, Faculty of Dentistry, Universitas Airlangga. **Results**: The event involved the use of video conferencing through which residents delivered online counselling session to Family Welfare Program, Youth Organization group, and health cadre members who had already gathered at Ketapang Health Center, while maintaining physical distancing. Several residents worked on site alongside health cadres from the Ketapang Health Center. Given the ongoing pandemic, the teams decided to donate certain props: four full dentures, four removable partial dentures and four fixed partial dentures. **Conclusion**: Online counseling of the Ketapang Health Center cadres was expected to increase their awareness and comprehension of nutrition education and improvement in the mastication function of dentures through the use of teaching aids.
Keywords: nutrition education, making denture, improvement of mastication function

INTRODUCTION

Indonesia is one country that still experiences nutritional problems. Malnutrition in Indonesia currently affects 40.41% of the population. Of the total number of cases, approximately 6% involve of children aged less than 5 years suffering from severe malnutrition, 7.3% of children aged more than 5 years old with malnutrition, and 14% of children aged less than 5 years old who are overweight.[1]

In order to overcome nutrition-related problems in Indonesia, Presidential Decree No.8 of 1999 initiated a nationwide campaign to address food and nutrition problems with the intention of empowering families and communities, while simultaneously strengthening cross-sector cooperation. In line with this Presidential Decree,[2] the Ministry of Health of the Republic of Indonesia established the main strategy of acceleration a reduction in the incidence of malnutrition in children under the age of five years old by implementing the Family Nutrition Literacy program (Keluarga Sadar Gizi/Kadarzi). Kadarzi represents a family demonstrating a balanced nutritional attitude which facilitates the recognizing, preventing and overcoming of nutritional problems in each of its members. Families are said to demonstrate positive Kadarzi behavior if they have consistently applied its five indicators, namely; monitoring body weight on a regular basis, making exclusive use of breastfeeding, following a varied diet, and consuming iodized salt and nutritional supplement.[2]

The results of the 2010 survey highlighted two indicators that resulted in poor Kadarzi performance; not exclusively breastfeeding infants and following a less varied diet.[3] In general, the objective of Kadarzi is to achieve optimal nutritional conditions for all family members by expanding their knowledge, thereby enabling them to address nutritional problems, increasing community awareness in overcoming family nutrition problems, and enhancing the ability and skills of health officers to empower the community or family to prevent and solve nutritional problems. The target population of the Kadarzi program is all family members because decision-making regarding the fields of food, nutrition and health is an activity conducted at the family level. Resources owned and expended in meeting daily needs and addressing nutritional problems are closely related to family behavior, not solely due to poverty and food insecurity.[3]

Oral hygiene is an integral and inseparable aspect of overall physical health. Teeth play nume-

rous roles in well-being. However, as an individual age, the greater his or her susceptibility to tooth loss results in anatomical, physiological and functional changes, and, occasionally, even psychological trauma for the person concerned. This situation underpins the increasing need for dentures.[4] Dentures can be broadly divided into two types; fixed and removable. Removable dentures (which the patient him/herself can detach from the gum) are divided into two varieties, complete and partial.[5] They are intended to restore the functions of mastication, aesthetics, and speech, while helping to retain the remaining teeth, improve occlusion, and maintain the remaining soft tissue of the mouth in a healthy condition. The community service provided will include counseling on family nutrition literacy and improved chewing function among community members through the production of removable dentures in the Ketapang sub-district, Probolinggo, East Java.

METHODS

The technical implementation of this community service involved several stages. First stage: Survey and field coordination, a field survey team consisting of innovative team members and the residents conducted a field survey. The survey team met with the Head of the Ketapang Health Center as well as representatives of the cadre members of the Family Welfare Program (*Pembinaan Kesejahteraan Keluarga*/PKK) and the Youth Organization (Karang Taruna) in Ketapang District, Probolinggo to discuss a series of community service activities. This meeting also discussed the criteria to be applied to individuals suitable for being fitted with removable partial dentures.

Second stage: Data collection and examination. During this visit, patient administration data was collected at the reception desk. Patients who had been registered were subjected to dental examination, diagnosis, recording of preliminary treatment requirements, and the taking of dental impressions in order to produce a study model for the purposes of denture manufacture. In this stage, the dental impression process was conducted by the residents and Indonesian Prosthodontic Society (IPROSI) Surabaya branch members accompanied by a dentist from Ketapang Health Center. The preliminary treatment was undertaken by the Ketapang Health Center dentists. Acrylic-based removable dentures with wrought-wire clasps were produced by the residents at the Faculty of Dental Medicine, Universitas Airlangga, Surabaya.

Third stage: Counselling and insertion of dentures. During this stage, PKK and Karang Taruna gathered at the Ketapang Health Center to receive counseling, while patients who had previously been examined were ready for the fitting of removable partial dentures. Fourth stage: Control. This stage was completed one day after fitting of the dentures by the Ketapang Health Center dentist.

RESULTS

Implementation of dental health education

This social service was intended to raise awareness of nutrition education and the importance of adults replacing lost teeth with dentures in order to improve their quality of life. As many as 40 participants were following health guidelines delivered in two sessions, each attended by 20 individuals. Each cadre was provided with basic requirements: rice (3 kg), sugar (1 kg), one toothpaste, one toothbrush, a dental health pocket book, and IDR50,000 as transport allowance. This package was provided to enable them to increase nutrition awareness and pass on dental health information to their families and neighbours.

Two residents served as counseling session leaders for each session; session 1 and session 2. In each session two topics were presented, namely "Dental Health to Improve Nutrition", and "The Importance of Replacing Missing Teeth in Adults in order to Improve their Quality of Life through Denture-based Treatments". Each session was followed by a question and answer section, with issues being raised by participants and responded to by the residents who provided counseling.

Social aid provided the Prosthodontics Specialist Study Program, Faculty of Dental Medicine, Universitas Airlangga to the Ketapang Health Center

Donations were given to the Ketapang Health Center and participants after the closing session. Those intended for the center comprised three pieces of level 3 personal protective equipment, one pack of KN 95 masks, 3 packs of surgical masks, souvenir bags, 3 pairs of goggles, and 20 dental health pocket books. Donations for counselling session participants consisted of rice (3 kg), sugar (1 kg), one toothpaste, one tooth-brush, one dental health pocket book, and a transport allowance of IDR50,000.

The following is a description of the counselling, which covers two topics: dental health education intended to improve oral health and the importance of replacing lost teeth with dentures in adults in order to improve their quality of life.

Figure 1 The virtual dental health education. The participants divided into 2 sessions (**A** and **B**); each consist of 20 people, **C** the counseling session was performed virtual using ZOOM platform, **D** the donation for Ketapang Health Center and participants were given.

The COVID-19 pandemic remains ongoing. This prevents the manufacture of dentures at the Ketapang Public Health Center. Therefore, denture manufacture was replaced by the charitable activity of providing denture props for the dentists and cadres of the center to enable them to provide continuous dental health education. The denture props in question consisted of three sets of complete acrylic dentures of both upper and lower jaw, four sets of removable acrylic partial dentures of both upper and lower jaw, three sets of porcelain anterior and posterior fixed partial dentures, 100 pocketbooks for the cadres, and 100 pocketbooks containing information about denturesin addition to the 60 pocketbooks that had already been distributed on the day of the counselling.

DISCUSSION

The COVID-19 pandemic

The pandemic that struck the world in December 2019 originated in Wuhan, China. The outbreak in Indonesia began three months later and affected almost the entire archipelago, from Sabang in the west to Merauke in the east. At the time of writing, the pandemic continues to infect individuals across the whole country, with the province of East Java constituting the second red zone after Jakarta, the capital, where the death rate and active cases are persistently high. All social activities have been curtailed due to the pandemic, including social service activity described here. Community service represents one of the three Ministry of Higher Education missions in Indonesia consisting of education, research and community service. The Prosthodontics Specialist Study Program falls under the management of the Prosthodontics Department which is dedicated to undertaking community service in deprived areas. The program also provided residents with essential practice in applying their theoretical knowledge for the benefit of the community. Such community service is invariably performed annually and involves different places. The lecturers and residents provided counseling on nutrition awareness and the need for replacement teeth, as well as performing examinations, dental impression and insertion of dentures as part of this community service activity. The problems encountered and the solutions offered are as follows.

The problem identified in the surrounded area of the Ketapang Public Health Center, Probolinggo was that numerous families do not understand the importance of meeting nutritional requirements in the development of children and adults. This community service activity sought to provide counseling as a means of improving public awareness that the fulfilling of nutritional needs is essential to physical growth and development can be achieved for both children and adults. For adults, tooth replacement treatment was provided so that fulfillment of needs can be achieved as a result. The basic contribution to the target audience was an increase in awareness of the importance of fulfilling nutritional requirements in child development

and of replacing missing teeth in adults in order to improve the quality of life through the provision of removable partial dentures.

Constraints on the provision of community service at the Ketapang Health Center, Kademangan sub-district, Probolinggo.

The authors had already drafted a proposal for the implementation of community service at the beginning of 2020, but the COVID-19 pandemic is devastating the world, including Indonesia. Numerous obstacles to implement the tripartite mission of the Ministry of Higher Education during the pandemic exist. East Java has been includeed as a red zone since the high level of virus transmission, which caused significant suffering on the part of the population, inducing the local government to introduce Large-Scale Social Restrictions. Several hospital-based Dentistry and Health Centers were forced to lock down due to the virus infecting health workers. Ketapang Health Center was also experiencing PSBB which culminated in dental practice being unable to comply with health protocols. Therefore, the implementation of this community service at the Ketapang Health Center was only possible by means of video conferencing. The residents were based at home, providing online counselling using Zoom application to Karang Taruna and PKK health cadres. The participants that had arrived at Ketapang Health Center were following health protocols including: physical distancing (1-2 meters), limiting each session to a maximum of 20 participants, washing of hands before entering meeting rooms, and the wearing of face masks. The event was conducted through two sessions with a total of 40 participants. A representative of the residents was one of them, whose parents-in-law live in Probolinggo, while counselling programs were all managed by Universitas Airlangga Surabaya. Producing dentures for members of society who need them most urgently cannot be undertaken in the near future because of the COVID-19 pandemic. The resumption of full dentistry services at the Ketapang Health Center and an end to the COVID-19 pandemic remain the collective hope of all sections of society.

The article can be summarized briefly and concisely that implementation of community services at the Ketapang Health Center, Kademangan sub-district, Probolinggo, experienced certain obstacles that can only be surmounted by resorting to online forms of delivery. The event consisted of two sessions, each consisting of 20 participants, giving a total of 40 participants. Donations of teaching aids were made to the Ketapang Health Center in the form of four complete dentures, four removable partial dentures and four bridge or fixed dentures, in addition to 100 pocketbooks containing information and advice about the importance of dentures in maintaining oral health.

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