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- Antitumor activity of antisense oligonucleotide p45^{Skp2} in soft palate carcinoma cell squamous in vitro
- Evaluation of local muscle soreness treatment with anterior bite splint made of soft putty impression material
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Case Report

Evaluation of local muscle soreness treatment with anterior bite splint made of soft putty impression material

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ABSTRACT

Background: Local muscle soreness is the most common temporomandibular disorders complaint of patients seeking treatment in the dental clinics. The emergency treatment that can be done in the clinics to manage this disorder is by making anterior bite splint. Anterior bite splint is usually made of acrylic, but currently there is a soft putty impression material that can also be used for making anterior bite splint. The effectiveness of soft putty anterior bite splint in local muscle soreness treatment still has not clear. **Purpose:** To determine the effectiveness of the soft putty impression material as a material used for making anterior bite splint in the treatment of local muscle soreness. **Case:** Six patients was reported five female patients aged 20-40 years old and one male patient aged 37 years old with local muscle soreness. Four female patients with a “click” sound on TMJ. **Case management:** Make differential diagnosis with screening history (anamnesis), clinical examination consists of extra oral examination such as muscle and temporomandibular joint palpation, measure the mandibular movement, end-feel, load test, intra oral examination and radiographic evaluation. Record the results and make the diagnosis. Make a soft putty anterior bite splint, adjusted and inserted in the maxillary anterior teeth. Record the results based on signs and symptoms. **Conclusion:** It can be concluded that anterior bite splint made of soft putty impression material is effective for treatment the local muscle soreness.

Key words: Soft putty, anterior bite splint, local muscle soreness

ABSTRAK

Latar belakang: Salah satu tipe temporomandibular disorders yang paling sering dijumpai di klinik dokter gigi adalah local muscle soreness. Perawatan yang dapat dengan segera dilakukan di klinik untuk mengelola gangguan tersebut adalah dengan pembuatan anterior bite splint. Biasanya anterior bite splint terbuat dari akrilik, namun saat ini telah ada bahan cetak soft putty yang memungkinkan untuk dipakai sebagai bahan pembuatan anterior bite splint. Efektivitas pemakaian anterior bite splint dari bahan putty untuk perawatan local muscle soreness sampai saat ini masih belum jelas. **Tujuan:** Mengetahui efektivitas pemakaian bahan cetak soft putty sebagai bahan anterior bite splint pada perawatan local muscle soreness. **Kasus:** Dilaporkan enam pasien terdiri dari lima pasien wanita usia 24-40 tahun dan satu pasien laki-laki usia 37 tahun dengan diagnosis local muscle soreness. Empat pasien wanita disertai suara “klik” pada sendi. **Tatalaksana kasus:** membuat diagnosis banding dengan anamnesis, pemeriksaan klinis terdiri dari pemeriksaan di luar rongga mulut yang meliputi palpasi otot pengunyahan dan sendi temporomandibular, mengukur pergerakan rahang bawah, end-feel, uji beban, pemeriksaan di dalam rongga mulut dan radiologis. Mencatat hasil pemeriksaannya dan membuat diagnosis. Setelah itu membuat soft putty anterior bite splint dan melakukan penyesuaian dan pemasangan. Mencatat hasilnya berdasarkan keluhan-keluhan dan tanda-tanda. **Kesimpulan:** Anterior bite splint yang terbuat dari bahan cetak soft putty efektif untuk perawatan local muscle soreness.

Kata kunci: Soft putty material, anterior bite splint, local muscle soreness

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INTRODUCTION

Temporomandibular disorders (TMDs) includes a variety of clinical problems, such as pain in facial area, limited mouth opening, joint sounds, and others involving temporomandibular joint (TMJ) as well as its supporting structure and/ or masticatory muscles.¹⁻³ It is extremely important that they be differentiated because their treatments are quite different.^{2,4,5}

Epidemiological studies have proven that TMDs is more commonly found in the population between the ages of 20-40 years old.^{1,2,6} In general, TMDs is more commonly in women than in men.^{1,7} In a study conducted through interviews on Asian and Caucasian populations, the prevalence shows 6%-30% of joint sounds, 5%-33% of joint pain, and 4%-16% of any abnormality or limitation in mouth opening. Another studies shows that 2,2 out of every 100 suffer with TMDs, especially on women.⁸ In general, the prevalence is 4%-6%.¹

Local muscle soreness (LMS) is the most common TMDs complaint of patients seeking treatment in the dental clinics.^{2,9} LMS is a non inflammatory, myogenous pain disorder, and usually occurs after a few hours or one day after an event with the clinical signs, such as pain to palpation, and pain will increase as the jaws function.²

The main goal of LMS treatment is to eliminate pain and improve the function of masticatory muscles.² Nowadays, many international studies have shown the success of TMDs treatment with various types of splint.^{1,2} One of the splint types that can be used is anterior bite splint (ABS).^{1,2,10,11}

Anterior bite splint is a partial coverage splint worn over 2-4 maxillary anterior teeth, and few anterior symmetrical contact with opposing mandibular anterior teeth.^{2,7} This splint used as a tool for emergencies treatment that is immediately fabricated by dentist without the help of an articulator and can easily be adjusted in dental office.¹¹ However, studies about the effectiveness of ABS in decreasing pain are still limited either in their reports or in the number of patients involved.⁷ Treatment using ABS can provide the same results with that using stabilization splint.¹⁰ Nevertheless, some studies do not recommend it since it is still considered to be less effective, increasing of pressure on the TMJ, excessive eruption on the back teeth, as well as being easily swallowed.^{1-3,7,12,13} Some studies even stated that the use of ABS can only be used for the treatment of acute muscle pain in short period of time, about no more than 2 weeks.^{1-3, 11}

The use of hard splint is more effective to reduce hyperactivity of masticatory muscle than the use of soft splint.¹⁴ Meanwhile, the use of soft splint is more effective in protecting the antagonist teeth from pressure than the use of hard splint, as well as better patient compliance, and fewer side effect.¹⁵ The use of soft splint is more cost-effective than pharmacotherapy in long period of time.¹⁶ However, the deficiencies of wearing the soft splint

are always be very limited in time,¹⁷ and need for close monitoring in their use.¹⁸

Nowadays, there was a soft putty material as an addition (vinyl) silicone impression materials.¹⁹ These materials may be use as an ABS because of the intermediate hardness. Nevertheless, the effectiveness of the use of ABS made of soft putty materials for LMS treatment is still not clear. The aim of this case report is to determine the effectiveness of the use of soft putty ABS in LMS treatment.

CASE

In this case report, data sources were obtained from the Universitas Airlangga Dental Hospital. The number of cases used was 6 cases, in which there were 5 female patients aged 20-40 years old and 1 male patient aged 37 years old with LMS diagnosis as well as 4 female patients with a "click" sound on TMJ. Those diagnosis were made based on the classification system of American Academy of Orofacial Pain (AAOP).²

CASE MANAGEMENT

In this case report, the standard measurement of LMS diagnosis was made by using anamnesis (comprehensive history), clinical examination, muscle and TMJ palpation, and millimeter ruler to measure the movement of the lower jaw when the mouth opens, moves to the right and the left, and protrudes.² Anamnesis was conducted with the operator sits on the right beside the patient who sits in upright position.⁶ The initial evaluation involves interviewing and recording about his or her symptoms consists of several question about duration of pain, pain character, activities of lower jaw which can cause the increasing and decreasing of the pain, and the effects of pain on jaw activities like chewing food, talking, and swallowing.^{2,20} Afterwards, type of treatment that will be conducted as well as possible treatment outcomes was clearly explained to the patient prior to the treatment. After anamnesis was completely, followed by recording the extra and intra oral examination.

In extra oral examination, range of motion (ROM) examination measured prior to palpating the masticatory muscles. ROM examination consist of interincisal maximum distance measurements (Figure 1), left and right lateral movement, and protrusion.^{1,2,20,21} Palpation examination was done by manual palpation in the temporalis and masseter muscles, and TMJ by using bilateral techniques with the middle finger and the index finger.²⁰ The examination was done by pressing slowly, but strong enough with rotating movement for 1-2 seconds, and each pain emerged in each muscle was recorded on examination form with four categories, which are "A0" if

the patient does not feel pain during muscle palpation, “A1” if the patient feels uncomfortable (tenderness or soreness), “A2” if the patient feels pain, “A3” if the patient feels hard pain signed with closing his or her eyes or moving the body.^{2,22} Afterwards, end-feel or passive stretch of the mandible evaluation was done by placing the thumb finger on maxillary incisive incisors and the index finger on mandibular incisive incisors, and then slowly press down for 10-15 seconds. If the lower jaw slightly pushed down, it will be called “soft end feel”, while if the lower jaw can not be pushed down, it will be called “hard end feel”.^{2,8,20}

In intra oral examination, the lateral pterygoid muscle evaluate by pressing the vestibule area of the maxillary alveolar ridge as the most posterior by using the index finger (Figure 2), and the medial pterygoid muscle by pressing the inferior alveolar injection area by using the index finger,^{1,2,20} teeth and surrounding tissue examinations and the occlusion. These evaluation followed by radiological evaluation, then cotton-roll clench test by asking the patient to bite the cotton roll placed on the area of the canines and premolars on the right side, and then moved to the left side (Figure 3). If the pain occurred on the ipsilateral, the disorder could be considered as muscle disorders, whereas if the pain occurred on the contralateral, the disorder could be considered as TMJ disorders.^{4,5}

After all of the examinations were completely, a diagnosis was then made based on the classification system of AAOP. Patients were indicated with LMS if the history reported by the patient reveals that the pain complaint began several hours or one day following an event. The clinical characteristics were structural dysfunction, minimum pain at rest, increased pain to function, actual muscle weakness, and increased tenderness and pain to palpation on local muscle.^{2,7}

After a diagnosis is achieved by careful evaluation of information derived through the history and examination procedures, the treatment was immediately done by making soft putty ABS. The process was done by mixing base

and catalyst soft putty, and then it was placed on a stock tray for partial edentulous, followed with impression the maxillary incisors regions (Figure. 4), and after the soft putty hardened, the stock tray removed. Afterwards, the ABS was trimmed with a scalpel, and smoothed by using a frazer. The next step is to adjust the ABS occlusion with the help of articulating paper and frazer (Figure 5) in order to make a symmetrical contact only with opposing 2 anterior mandibular teeth (Figure 6), and disocclusion on posterior teeth with interocclusal distance of 2 mm (Figure 7 and 8). On lateral movement, ABS must be made no contact with the mandibular canines.

Once completed, the ABS inserted in anterior maxillary teeth, and the patient was instructed to wear it all day long, except when eating and sleeping, to eat soft foods, not to open the mouth too wide, to put a cold compress on the sore area, and to have exercise therapies, such as assisted muscular stretching and stretching against resistance. Evaluation process was conducted after 1, 3, 7, and 14 days of the use of ABS.⁴ In evaluation process, the same examination process was done as the initial examination step, and the results of the examination were then recorded and graphed to evaluate pain caused by the treatment.

RESULTS

The results of LMS treatment with soft putty ABS showed the reducing of pain. T1 showed that the pain was reduced from A3 to A2 (day 1), A1 (day 14), and A0 (day 24); T2 showed that the pain was reduced from A3 to A1 (day1), and A0 (day 7); T3 showed that the pain was reduced from A3 to A2 (day 1), A1 (day 3), and A0 (day 7); T4 showed that the pain A2 is still on day 1 and was reduced to A1 (day 7), and A0 (day 14); T5 showed that the pain A3 is still on day 1 and was reduced to A2 (day 3), and A0 (day 7); T6 showed that the pain was reduced from A2 to A1 (day 1), and A0 (day 14) (Figure 9).

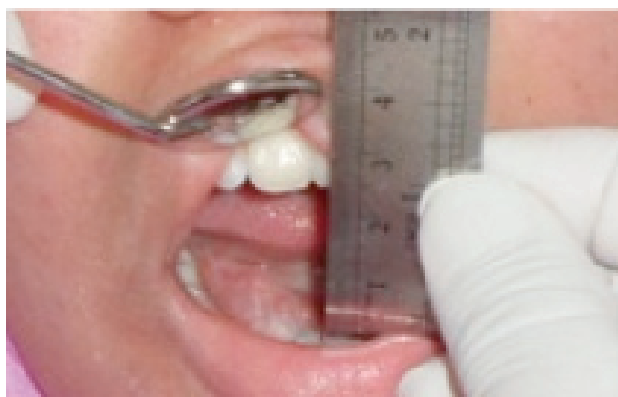


Figure 1. Interincisal maximum distance.

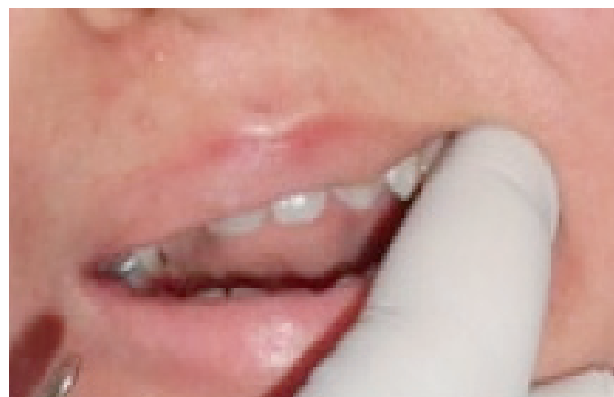


Figure 2. The palpation of lateral pterygoid muscle.



Figure 3. Cotton roll clench test.



Figure 6. Symmetrical contact with opposing teeth.



Figure 4. Impression the maxillary incisors.



Figure 7. Disocclusion of left posterior teeth.



Figure 5. Adjusting with articulating paper.



Figure 8. Disocclusion of right posterior teeth.

DISCUSSION

The evaluation of the effectiveness of the use of ABS made of soft putty in LMS treatment as a conservative treatment has been conducted. Treatment with soft putty ABS was selected for the treatment because of its simple construction technique, and also because it can easily be repaired, non-invasive, and relatively cheaper than other treatments. This appliance serves as a stop for the incisal mandibular teeth and the surface must be flat and parallel

to the long axis of the mandibular anterior teeth in order to make the position of the lower jaw does not deflect when there is a pressure on maximal intercuspation position (MI). This situation leads to two condyles sitting musculoskeletally stable position (MS) by elevator muscles.²

LMS is a condition characterized by local changes of muscle tissue. These changes are characterized by the release of certain algogenic substances, such as bradykinin, substance prostaglandins, and histamine that produce pain. The changes were caused by ischemia occurred in LMS.⁹

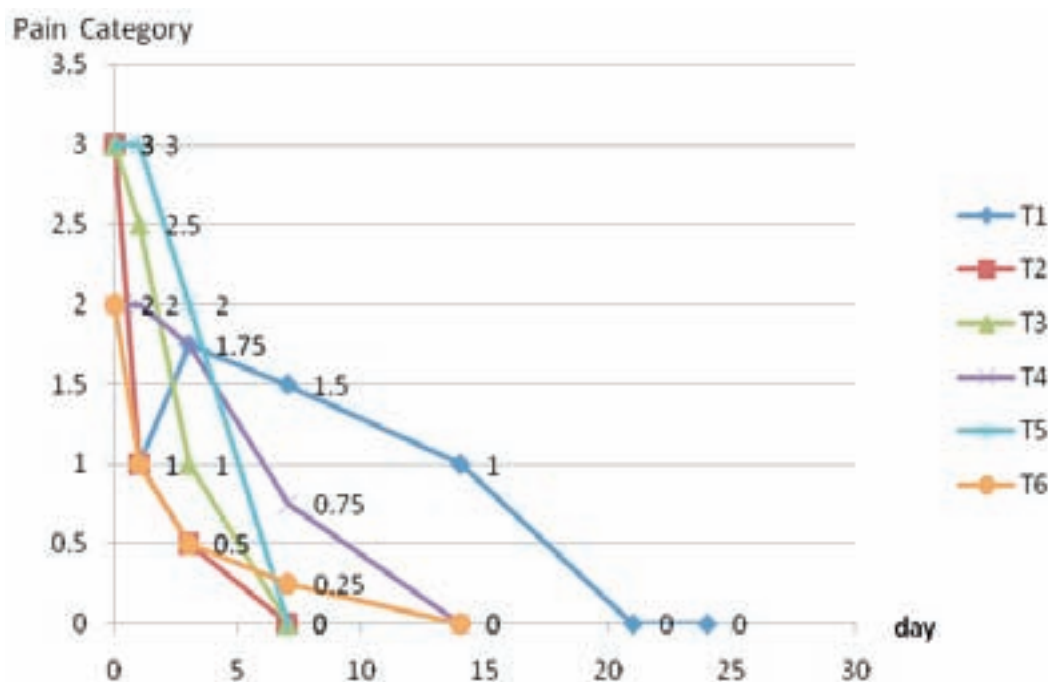


Figure 9. The result of pain evaluation after using soft putty ABS in 6 patients with LMS.

Note: T1 is the result of pain evaluation for patient 1; T2 for patient 2; T3 for patient 3; T4 for patient 4; T5 for patient 5; and T6 for patient 6. A0: 0–1 cm; A1: 1–2 cm; A2: 2–3 cm; A3: 3–3.5 cm.

According to Manfredini¹, pain in LMS is caused by *ischemia* along with muscle contraction. The mechanism involves the activation of acid-sensing ion channel (ASIC) and transient receptor potential vanilloid 1 receptor (TRPV1) that play a role in physiological pain that releases ions H^+ , from low pH due to ischemia. LMS presents clinically with muscles that are tender to palpation and reveal increased pain with function. Structural dysfunction is common, and when the elevator muscles are involved, limited mouth opening and weak muscle results.^{2,9}

In this case report, magnetic resonance imaging (MRI) was not conducted because the use of manual measurement standards for TMDs diagnosis with anamnesis, clinical examination, manual palpation of the muscles and TMJ, millimeter ruler to measure mandibular movement are still credible (reliable, valid, sensitive, and specific), relatively inexpensive.²² In addition, muscle palpation is still considered as a diagnostic gold standard which is very useful to diagnose the masticatory muscle disorders. This is because the main complaint of musculoskeletal disorders is pain.^{1,2,4,13,23}

Although until now how occlusal splints reduce pain still does not clear, there are some concepts that still can be used to explain several things, such as the concept of distribution of forces, relaxing the muscles, allowing condyles to seat in the centric relation (CR), normalizing periodontal ligament proprioception, cognitive awareness theory, placebo effects, and increase in the vertical

dimension of occlusion (VDO). However, all of these concepts are overlapping.²⁴ The concept of relaxing the muscles is often used to explain how occlusal splint reduce pain. This concept explained about the occlusal disorders during centric relation will cause hyperactivity of lateral pterygoid muscle, and in which posterior teeth disruption during the lower jaw movement will cause hyperactivity of mouth muscles when the mouth closes; thus, muscle fatigue can then cause hyperactivity later causing pain complaints. As a result, when hyperactive muscles are terminated, the pain will be eliminated.^{1,2,4,20,24}

Treatment of pain caused by masticatory muscle disorders with ABS has still been debated recently. Some studies even do not recommend its use because of many deficiencies^{1-3,15,16} and was not as effective as a stabilization splint (SS).^{7,25} Another risk of ABS is its small dimensions, which can lead to swallowing or aspiration. Medical emergency due to swallowed ABS has been reported in Norway.²⁶ ABS has the same effectiveness with SS for reducing muscle pain.²⁷ In addition, another research showed the use of ABS does not lead to the changes of condyles position with maximum bite force.²⁸ Some of literatures and researches also still recommend the use of ABS, but not more than 2 weeks with closely monitored.^{4,11,24,29}

For occlusal bite registration, this case report used MI position, because patients have complete teeth and stable occlusion. Position of MI can be used as a guide for making

occlusal splints in patients with stable occlusion without large differences between CR and MI.³⁰ This technique is relatively simple and inexpensive.

In intra-oral examination, showed that pain occurred during the palpation of the lateral pterygoid muscle so that they were able to close their mouth in MI position. Based on some previous studies, it can be caused by muscle fatigue or inability to stretch as the normal one during resting position. In patients 1, 2, 4, and 6, the pain was also accompanied with “click” sound on TMJ. It could be caused by both lateral pterygoid muscles that hold the discs and condyles impaired so that the disk position would be pushed over to the anterior, especially when the condyles sliding. This condition known as anterior disc displacement with reduction.^{2,20}

In patient 4 and 5, showed that one day after the used of the anterior bite splint the pain was still not decreased and they also still felt less comfortable. It may be due to the increasing of the masticatory muscle activities as stated in a research with EMG showing that masseter muscle activities were immediately increased after the used of a soft splint for maximum clenching.³¹ The result of study showed that in 5 of 6 patients (T2-T6), the pain was eliminated (from A3 to A0) from 1-3 weeks after the used of ABS. This finding is in accordance with Okeson² that LMS treatment can be recovered in 1-3 weeks. However, it is also showed that in patient 1, the pain just could disappear in 24 days. This is because once the pain was reduced and she was able to open his mouth on day 18, the patient has odontectomy of her left third maxillary molar. Thus, the pain in the area of the extraction possibly was spread to his face, especially in front of his ear, and then perceived by the patient as TMDs pain symptom.

In the evaluation phase, it is showed that the decreasing of pain could significantly improve the ability to chew, maximum mouth opening and optimally after 1-3 weeks after the used of soft putty ABS as well as to reduce click sounds on TMJ. It is seems that the condition of the masticatory muscles was back to normal again after the used of the ABS. In terms of the eliminating of masticatory muscle pain and ability to chew, the result in according with previous studies. They stated that pain in the masticatory muscles play an important role in the decreasing of the bite force so that patients are difficult to chew food, the decreasing of the pain will directly improve the patient's ability to chew³²⁻³⁴ due to the recovery of the muscle strength, and the pain can reduce the bite force, approximately about 35% to 50%.⁹

Based on the evaluation report, it can be concluded that soft putty impression material can be used as ABS material. However, to determine whether soft putty ABS is effective for treating LMS still requires more samples. Nevertheless, based on this case report, soft putty ABS can be used to reduce pain in emergency cases caused by LMS. If the pain does not reduce within 2 weeks, it is advisable to make a new diagnosis or replace the ABS with SS appliances.

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