

The difference of matrix metalloproteinase-9 level in saliva between myofascial pain and disc displacement of temporomandibular joint disorders

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ABSTRACT

Introduction: Saliva is the type of liquid which contains enzyme, hormone, antibody, constituent microbe, and cytokines. Matrix metalloproteinase-9 (MMP-9) is one kind of proteolysis cellular enzyme in saliva that has a role in inflammation. Saliva is very easy to take and noninvasive treatment, proved efficient for early diagnosis. The purpose of this research was to study the difference MMP-9 level in saliva patient with temporomandibular joint disorders between myofascial pain and disc displacement. **Methods:** Cross sectional comparative study. The research was carried out at the Prosthodontics Clinic of Arifin Achmad Pekanbaru Hospital and at Biomedical Laboratory of Faculty of Medicine, Universitas Andalas Padang, Indonesia. The saliva samples were taken from 37 myofascial pain patients and 37 disc displacement patients. MMP-9 levels were examined by the Elisa and the data result was analyzed using the t-test. **Result:** The average value of MMP-9 level of disc displacement was 650.98 ± 384.94 pg/mL and myofascial pain was 168.70 ± 41.24 pg/mL. There was a significant difference on MMP-9 level in saliva between myofascial pain and disc displacement ($p < 0.05$). **Conclusion:** The MMP-9 level in saliva of patients with disc displacement of temporomandibular joint disorders was higher than patients with myofascial pain.

Keywords: Matrix metalloproteinase-9, saliva, myofascial pain, disc displacement, temporomandibular joint disorders

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INTRODUCTION

Temporomandibular joint disorders (TMD) is a disorder of the stomatognath system in the

form of a functional clinical dysfunction of the craniomandibular involving the chewing muscles, temporomandibular joints, and other functional structures. TMD have multifactorial etiologies

with many symptoms.¹ This TMD involves many very complex and difficult factors to understand, including: trauma, physical stress, clenching, bad habits, such as chewing hard foods, loss of missing posterior tooth, poor posture, including forward head posture, chin rest, and incorrect sleep method.²

Temporomandibular joint complaints are primarily painful, due to the rise and fall of muscular tension of mastication and the psychic aspect. This stage pain is usually diagnosed as myofascial pain. In the advanced stages, heavy loads of mastication can cause the discs becoming abnormal (such as disc position changes, bone changes, and damage to cartilage), and then resulting in synovitis. In the end, synovitis can cause clicking in the opening of the mouth with or without a reduction (locking jaw) accompanied with pain and inflammation and diagnosed as disc displacement.¹⁻³

Disc displacement of temporomandibular joint may occur due to continuous friction affecting the joint articular surface that causes erosion and fibrillation of articular cartilage and subchondral bone degeneration.² The mechanism of degenerative diseases of the temporomandibular joint due to the emergence of changes in extracellular matrix caused directly by genetic disorders or indirectly by hormonal factors.³

Matrix metalloproteinases (MMPs) play a major role in physiological resorption of collagen and other macromolecules during post-natal development and tissue remodeling and resorption pathologic associated with malignant tumors, periodontal disease, and joint damage on rheumatoid arthritis. Matrix metalloproteinase-9 (MMP-9) is a cellular proteolytic enzymes present in saliva that play a role in inflammation.⁴

MMP-9 levels can be determined using saliva. In patients with TMD, currently examination using saliva is a diagnostic fluid competent, easily retrieved, diagnosed, and non invasive as well.^{5,6} It is suggested that disc displacement condition more severe than myofascial pain, so MMP-9 level maybe will be higher in disc displacement. Based on the problems which has been mentioned, this research studied the differences of MMP-9 levels in saliva of patient with myofascial pain and disc displacement through Elisa technique.

METHODS

This study was conducted with a cross-sectional comparative design that is dependent and independent variables checked in the same time. The study population is all patients of temporomandibular joint disorder (myofascial pain and disc displacement) came to Prosthodontics Clinic Arifin Achmad Hospital Pekanbaru in January 2013 to May 2015. The saliva examination was conducted at Biomedical Laboratory of Faculty of Medicine Universitas Andalas Padang. The saliva sampling was done with consecutive method.

All the research subjects were giving explanations before approval and followed by the signing of informed consent. Sample criteria are: men and women between the ages of 17-50 years; having a temporomandibular joint disorder complaint based on Research Diagnostic criteria of temporomandibular joint disorder/RDC-TMD Revision 2010 Axis 1, with diagnosis myofascial pain or disc displacement; healthy oral mucosa; willing to sign informed consent; no history of diabetes, hepatitis, kidney disease, heart disease, fungus in the oral cavity, joint disorders (arthritis) and respiratory infections; no hospitalization history within the last 6 months; and do not in orthodontic treatment and history of infertility or pregnancy.

The saliva collection: before collecting saliva subject had to fasting 2 hours before, and prohibited to eat or drink with sugar, acid, alcohol, and caffeine levels 12 hours before, except drink water, in order to avoid of decreasing salivary pH and increasing bacteria growth; prohibited to brush teeth too strong no later than 2 hours before. Saliva samples were collected at 09:00 to 11:00 am, the patient sat in the dental unit with an ergonomic position then performed status record and examination of TMD. Each research subject was asked to rinse with distilled water to remove food scraps and then spit into a universal sterile plastic container (rinse mouth). Five minutes later, subjects were asked to spit out the entire saliva naturally into collection tubes in one to ten minutes and then collected in 10 ml sterile glass. After that, the 5 ml of collected saliva were transferred to a plastic container and placed in the refrigerator before being analyzed at the laboratory. Saliva samples will be tested by Elisa

Table 1. Characteristics of sample

Characteristics	Group		P
	Disc displacement Mean ±SD	Myofascial pain Mean ±SD	
1. Gender			
- Male	8±9.32	7± 9.32	0.772
- Female	29±10.32	30±10.81	
2. Age	27.00±9.32	30.32±10.81	000

Table 2. Differences in MMP-9 levels in disc displacement and myofascial pain

Group	Mean±SD	P
Disc displacement	650.98±38.94	0.01
Myofascial pain	168.70±41.24	

within 90 minutes at room temperature or sample can be stored at -20°C not more than 6 months. MMP-9 samples were examined using Elisa human kit MMP-9 (Human MMP-9 Quanticine Elisa Kit-R & D System).

RESULT

The Kolmogorov Smirnof test showed that all of the data were normal distributed for both groups, in disc displacement and myofascial pain, between both male and female and also age (p value>0.05, Table 1). In Table 2 revealed that there was a significant difference on the level of MMP-9 on disc displacement and myofascial pain group (p value<0.05).

DISCUSSION

Based on the result in Table 1, it is seen that from all samples of temporomandibular joint disorders most of them are women (n=59). This study is similar with previous studies which reveals that the incidence of temporomandibular joint disorders is more prevalent in women than men. Sex characteristics of patients with temporomandibular joint disorders were more in women than men.⁷ The Nilsson *et al.*⁸ study found that the temporomandibular joint disorder was more at risk for women than men. According to Sener and Akgunlu⁹, the ratio of temporomandibular joint patients between women and men was 1: 2.

Temporomandibular joint disorders are found in young adult ages (27-42 years), this may be associated with high masseter muscle activity in young adulthood. According to Mazzetto¹⁰ no correlation between the age and severity of temporomandibular joint disorders but there was a greater tendency of severity in young adults (25-50 years). The relationship between sex with CMI (craniomandibular index) in women is more likely to be associated with greater EMG (electromyography) activity of the anterior temporalis muscle in relation to the masseter muscle. The electromyographic activity of the anterior temporal and right masseter muscles correlates positively with temporomandibular joint disorders.¹⁰

There was a difference in severity of temporomandibular joint disorders between women and men. Women have higher values than men, this difference may be due to behavioral, hormonal, anatomical, and psychological factors.^{8,11,12} Significant differences in age do not occur in cases of myofascial pain and disc displacement, average age of the sufferer was 27 years² and lubrication and nutrition due to biomechanical disorders.¹³

In this study, there were significant differences in MMP-9 levels between disc displacement and myofascial pain patients. MMP-9 in disc displacement were higher than myofascial pain patient. MMP-9 has an important role in temporomandibular joint disorders. The presence of correlation of MMP-9 levels in the synovial fluid will increase if the severity of the temporomandibular joint disorder increases as well, as seen in the disc displacement levels of MMP-9 higher than myofascial pain.¹² MMP-9 plays an important role in inflammation through the cleavage of the extracellular matrix protein of cytokines and chemokines. MMP-9 was also involved early in neutrophil recruitment and inhibited the production of TNF-α. Then those marker implicate in inflammation of the temporomandibular joints.¹³

CONCLUSION

There was difference of MMP-9 level in saliva between myofascial pain and disc displacement of TMD. It can be concluded that the level of matrix

metalloproteinase-9 (MMP-9) in patients saliva with disc displacement is higher than myofascial pain patients.

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