

## Analisis Ekspresi Gen TIMP-1 pada Pengguna Alat Ortodontik Cekat = Analysis of TIMP-1 Gene Expression in Fixed Orthodontic Appliance Patients

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### Abstrak

Latar Belakang: Tingkat keberhasilan dan stabilitas jangka panjang dari perawatan menggunakan alat ortodontik cekat dapat dipengaruhi oleh beberapa faktor, seperti mekanisme biomekanik dan biologis yang mendasari pergerakan gigi ortodontik. Penelitian terdahulu menunjukkan adanya keterkaitan antara faktor keberhasilan perawatan ortodontik dan ekspresi gen, seperti gen TIMP-1 yang berperan dalam pergerakan gigi ortodontik. Tissue inhibitor of metalloproteinase (TIMP) merupakan kelas penghambat MMP (TIMP-1, -2, -3, dan -4) yang dapat menghambat hampir setiap MMP secara nonspesifik. MMP dan TIMP terlibat dalam pergantian fisiologis jaringan periodontal dan dianggap memainkan peran penting dalam pergerakan gigi ortodontik. Penelitian ini dilakukan untuk memvalidasi perbedaan ekspresi gen pada pengguna alat ortodontik cekat dibandingkan dengan kontrol. Tujuan: Menganalisis ekspresi gen pada pengguna alat ortodontik cekat dibandingkan dengan individu sehat yang tidak menggunakan alat ortodontik cekat. Metode: Sampel penelitian ini menggunakan sampel buccal swab pada pengguna alat ortodontik cekat, masing-masing 61 sampel untuk sampel buccal swab dari tiap pengguna alat ortodontik cekat serta 30 sampel kontrol dari individu sehat. Kemudian dilakukan ekstraksi RNA dan sintesis cDNA pada masing-masing sampel. Setelah itu, ekspresi gen TIMP-1 dan gen referensi GAPDH diuji menggunakan quantitative reverse-transcription PCR (RT-qPCR), Hasil: Tidak ada perbedaan ekspresi relatif gen TIMP-1 antara pengguna alat ortodontik cekat dan kontrol yang bermakna secara statistik ( $p < 0,05$ ). Kesimpulan: Tidak terdapat perbedaan ekspresi gen TIMP-1 yang signifikan pada pengguna alat ortodontik cekat dibandingkan dengan individu sehat.

.....Background: The success rate and long-term stability of treatment using fixed orthodontic appliances can be influenced by several factors, such as the biomechanical and biological mechanisms that underlie orthodontic tooth movement. Previous studies have shown that there is a link between success factors for orthodontic treatment and gene expression, such as the TIMP-1 gene, which plays a role in orthodontic tooth movement. Tissue inhibitors of metalloproteinase (TIMP) are a class of MMP inhibitors that can inhibit almost every MMP nonspecifically. MMP and TIMP are involved in the physiological turnover of the periodontal tissues and are considered to play an important role in orthodontic tooth movement. This study was conducted to validate differences in gene expression in fixed orthodontic appliance patients compared to controls. Objective: To analyze gene expression in fixed orthodontic appliance patients compared to healthy individuals who do not use fixed orthodontic appliance. Methods: The sample of this study used buccal swab samples in patients who used certain materials for treatment in dentistry, namely fixed orthodontic appliances, 61 samples for each patient's buccal swab samples and 30 control samples from healthy individuals. Then, RNA extraction and cDNA synthesis is performed in each sample. Furthermore, the expression of the TIMP-1 gene and the GAPDH reference gene were tested using quantitative reverse-transcription PCR (RT-qPCR). Results: There was no statistically significant difference in the relative expression of the TIMP-1 gene between fixed orthodontic appliance patients and healthy patients ( $p < 0.05$ ).

Conclusion: There was no significant difference in TIMP-1 gene expression in patients with fixed orthodontic appliances compared to healthy patients.