

# Analisis ekspresi tumor necrosis factor- $\alpha$ pada pasien ortodontik yang menggunakan sistem self-ligating dan preadjusted edgewise appliance pada tahap awal perawatan = Tumor necrosis factor expression analysis in orthodontic patients with passive self ligating and conventional preadjusted brackets in initial stage of orthodontic treatment

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## Abstrak

Fase awal pergerakan gigi ortodontik diawali dengan respon inflamasi akut. Proses ini menimbulkan respon dari sel paradental dan sel pertahanan tubuh dengan mensintesis dan melepaskan berbagai biomolekul seperti sitokin. Tumor necrosis factor- $\alpha$  TNF- $\alpha$  merupakan sitokin pro-inflamasi penting yang meregulasi respon awal inflamasi pada pergerakan gigi ortodontik. Tujuan dari penelitian ini adalah untuk menganalisis ekspresi TNF- $\alpha$  dengan membandingkan konsentrasinya pada gingival crevicular fluid GCF antara sistem self-ligating SL dan preadjusted edgewise appliance PEA pada tahap awal perawatan.

Metode: Delapan belas pasien usia 15-35 tahun yang berpartisipasi dalam penelitian ini dibagi menjadi dua kelompok eksperimental PEA dan SL dan satu kelompok kontrol tanpa perawatan ortodontik. Pasien dipilih berdasarkan kriteria inklusi: indeks iregularitas Little sebesar 4-9 mm pada anterior maksila dengan indikasi perawatan non-ekstraksi serta tanpa karies aktif, penyakit periodontal, dan penyakit sistemik terkait kerusakan tulang. Cairan krevikular gingiva subjek diambil pada lima titik di anterior maksila sebelum perawatan dan pada: 1, 24, dan 168 jam setelah aplikasi gaya ortodontik. Konsentrasi TNF- $\alpha$  pada sampel GCF diperiksa menggunakan metode enzyme-linked immunoabsorbent assay ELISA.

Hasil: Konsentrasi TNF- $\alpha$  meningkat pada 1 jam dan 24 jam setelah aplikasi gaya ortodontik pada kedua sistem baik pada kelompok SL dan PEA. Konsentrasi TNF- $\alpha$  menurun signifikan pada 168 jam setelah aplikasi gaya ortodontik pada kelompok PEA. Sementara itu, pada kelompok SL konsentrasi TNF- $\alpha$  pada 168 jam tetap meningkat walaupun secara statistik tidak signifikan.

Kesimpulan: Konsentrasi TNF- $\alpha$  meningkat pada 1 jam dan 24 jam setelah aplikasi gaya ortodontik pada kelompok PEA dan SL. Pada kelompok PEA, konsentrasi TNF- $\alpha$  menurun signifikan pada 168 jam, sedangkan pada kelompok SL konsentrasi TNF- $\alpha$  tetap meningkat. Perbedaan konsentrasi TNF- $\alpha$  antara kelompok PEA dan SL mungkin disebabkan oleh perbedaan braket, kawat, dan sistem ligasi yang digunakan antara kedua sistem tersebut.

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The early phase of orthodontic tooth movement begins with acute inflammation response. This processes engender a response on the part of paradental cells and migrating inflammatory cells from periodontal ligament capillaries via the synthesis and release of various biomolecules such as cytokines. Tumor necrosis factor  $\alpha$  TNF is an important pro inflammatory cytokine that regulates the early phase of inflammation reaction during orthodontic tooth movement. The aim of the present study was to analyze TNF expression by comparing its concentrations in the gingival crevicular fluid GCF between self ligating SL and preadjusted edgewise appliance PEA systems during the early levelling stage of orthodontic treatment.

Methods: Eighteen patients aged 15 35 years who participated in this study were divided into two experimental groups PEA and SL and control group without orthodontic treatment. Patients were selected

according to the inclusion criteria Little irregularity index on maxillary anterior teeth ranging from 4-9 mm non-extraction orthodontic treatment for the experimental group no active dental caries, periodontitis, and medical history of bone disorder. The GCF was taken at five sites in the maxilla anterior teeth from each subject just before bracket bonding and at 1, 24, and 168 hours after orthodontic force application. TNF levels in GCF were determined by enzyme-linked immunosorbent assay (ELISA).

**Results:** The concentration of TNF was significantly higher in the experimental groups than in the control group at 24 hours after force application. TNF levels were significantly decreased at 168 hours after force application in the PEA group. Meanwhile, in the SL group, the level of TNF at 168 hours was still increased, although there was no statistically significant difference.

**Conclusion:** TNF concentration was increased at 1 hour and 24 hours after orthodontic force application in both the PEA and SL groups. In the PEA group, TNF concentration was significantly decreased at 168 hours, meanwhile in the SL group, this value remained increased at this time point. The differences in TNF concentration between the PEA and SL groups may be caused by their different types of brackets, wires, and ligation methods.