INTISARI

Relaps merupakan masalah yang sering terjadi setelah perawatan ortodonti. Osteoklastogenesis meningkat saat relaps dan dapat diseimbangkan dengan osteoblastogenesis sehingga tercipta kestabilan jaringan periodontal pada saat fase retensi. Ekspresi *transforming growth factor-beta 1* (TGF-β1) dan *bone morphogenic protein*-2 (BMP-2) mampu meregulasi fungsi Runx-2 untuk menginduksi diferensiasi sel punca mesenkimal. *Carbonate-apatite* (CHA) merupakan kandidat ideal biomaterial yang dapat menginduksi remodeling tulang, sedangkan *advanced-platelet-rich fibrin* (a-PRF) merupakan konsentrat *growth factor* yang berperan dalam penyembuhan tulang. Penelitian ini bertujuan untuk menganalisis pengaruh injeksi hidrogel CHA-aPRF terhadap ekspresi TGF-β1 dan BMP-2 saat relaps.

Empat puluh lima kelinci dibagi menjadi 3 kelompok (n=15): kontrol, CHA, dan CHA-aPRF. *Open-coil spring* dipasang diantara braket untuk menggerakan insisivus ke distal dengan gaya sebesar 50 cN selama 1 minggu. Kedua insisivus dipertahankan posisinya selama 2 minggu dan hidrogel CHA dan CHA-aPRF diinjeksikan ke sulkus gingiva 7 hari sekali. Peranti ortodonti kemudian dilepas dan gigi insisivus mulai relaps. Ekspresi TGF-β1 dan BMP-2 kemudian diamati pada hari ke- 0, 3, 7, 14 dan 21 paska *debonding* menggunakan pengecatan IHC. Data yang diperoleh dianalisis menggunakan ANAVA dua jalur dilanjutkan *Tukey's post-hoc test* ($P < .05$).

Hasil penelitian menunjukkan jumlah sel osteoblast yang positif mengekspresikan TGF-β1 pada kelompok CHA-aPRF lebih tinggi secara signifikan dibandingkan kelompok lain pada hari ke- 0, 3, dan 7 paska *debonding* ($P < .05$). Ekspresi BMP-2 pada kelompok CHA-aPRF lebih tinggi secara signifikan dibandingkan kelompok lain pada hari ke- 3, 14, dan 21 paska *debonding* ($P < .05$). Hasil penelitian menyimpulkan hidrogel CHA-aPRF dapat meningkatkan ekspresi TGF-β1 dan BMP-2 selama relaps ortodonti.

Kata kunci: relaps, *carbonate-apatite*, *advanced-platelet-rich fibrin*, *transforming growth factor-beta 1*, *bone morphogenic protein*-2

ABSTRACT

Relapse is considered a significant failure after orthodontic treatment. In response to relapse, osteoclastogenesis induced. Osteoblastogenesis is expected to counteract the osteoclastogenesis. Transforming growth factor-beta 1 (TGF-β1) and bone morphogenic protein-2 (BMP-2) expressions has fundamental roles in osteoblastogenesis by positively regulates Runx-2 function to promote mesenchymal stem cells differentiation. Carbonate-apatite (CHA) is thought to be one of an ideal candidate for enhancing bone remodeling, while advanced-platelet-rich fibrin (a-PRF) is a high levels concentrate growth factors that play a central role in bone healing process. This study was intended to investigate the hydrogel CHA-aPRF effect on TGF-β1 and BMP-2 expressions during relapse.

Forty-five rabbits were divided into three groups (n=15): a control, CHA, and CHA-aPRF group. An open-coil spring was compressed between brackets, to move the lower incisors distally. The force (50 cN) was exerted for one week. Both incisors were then retained in the new position for 2 weeks and CHA-aPRF hydrogel was gently injected every 7 days. Next, the appliances were debonded to allow relapse. At 5 subsequent time points (0, 3, 7, 14, 21 days after debonding), TGF-β1 and BMP-2 expression were examined using immunohistochemistry staining. Data gathered were analyzed through two-way ANOVA followed by Tukey's post-hoc test ($P < .05$).

Results revealed that the number of TGF-β1 positive cells in CHA-aPRF group was significantly higher than the other groups on day 0, 3, and 7 after debonding ($P < .05$). Statistical analysis presented BMP-2 expression in CHA-aPRF group was significantly higher than other groups on day 3, 14, and 21 after debonding ($P < .05$). Therefore, it can be concluded that Hydogel-CHA-aPRF can up-regulating TGF-β1 and BMP-2 expressions during orthodontic relapse.

Keyword: orthodontic relapse, carbonate-apatite, advanced-platelet-rich fibrin, transforming growth factor-beta 1, bone morphogenic protein-2