

Effect of low level laser therapy on orthodontic miniscrew displacement (A randomized controlled clinical trial)

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INTRODUCTION

The first design of the miniscrew was created by Creekmore and Eklund, they used it as a skeletal anchorage device. (1) Miniscrew has a beneficial use in correcting several orthodontic problems such as crossbite, open and deepbite, class II and class III. (2) The challenge was preventing its drawbacks as loss of stability, peri-implantitis and displacement. Low level laser therapy stimulates wound healing, bone and nerve regeneration, acceleration of tooth movement, reduction of the pain, improves stability and has anti-inflammatory effect. (1,3) So the aim was to evaluate the effect of LLLT on miniscrews displacement under orthodontic load and gingival inflammation around it.

METHODOLOGY

The study was a randomized controlled trial with a split mouth design, the left and right sides were randomly located to control side and experimental side. The study sample was 12 adult healthy patients. Their inclusion criteria was patients aged 18 to 22 years old, permanent dentition, class I bimaxillary protrusion and class II division 1 patients, their treatment need upper first premolars extraction and canine retraction and good oral hygiene. After a complete diagnostic set we started to insert the miniscrew in the buccal side between 1st molar and 2nd premolar 8 mm away from alveolar crest, a CBCT imaged was taken for the maxilla immediately after insertion. The experimental side received one laser application every 72 hrs with a total of four laser applications (figure 1). The control side received no laser. Two weeks after miniscrews insertion, canine retraction was carried out with 150 mg force. After 6 months of canine retraction another CBCT was taken for the maxilla. The difference between 1st and 2nd reading was recorded as displacement.



Figure (1): Laser application on the experimental side

RESULTS AND DISCUSSION

Displacement was measured from anterior nasal spin to head and tail of the miniscrew (figure 2) and gingival inflammation was recorded using gingival index.

There was a displacement of the head of the miniscrew in both groups and the displacement was in the direction of force application, the control side showed more displacement than the experimental one. Unfortunately the results were not statistically significant. About the tail displacement it either displaced in the direction of the force or in the opposite direction. The experimental side showed less displacement than the control side, but the results was not statistically significant. The experimental side showed no sign of inflammation through the study period, while the control side in 8 patients showed inflammation around the miniscrew in different period of the study, one of them was

developed to loss of the miniscrew. Unfortunately there is no statistically significant difference. Table (1)

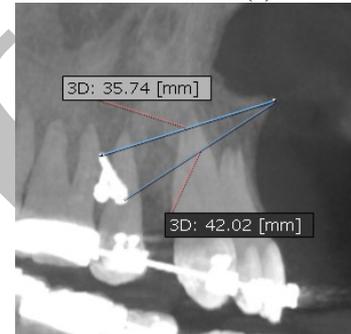


Figure (2): measurement of the head and tail of the miniscrew to anterior nasal spin

That result may explain as LLLT biostimulates cells that initiate osteoblasts proliferation and then bone formation as MG63 and MC3T3 also biostimulates osteoblastic proteins as bone morphogenetic protein 2 and bone sialoprotein expression so the experimental side showed less displacement than the control side. (4) LLLT decreases interleukin 1- β which triggered the peri implantitis and increases interleukin-6 which absorbs the traumatized bone area so help in bone metabolism. Also it decreases tumor necrosis factor alpha which is another inflammatory mediator (5). So that clarifies the anti-inflammatory effect of LLLT.

Table (1): Comparison between the two studied groups according to head and tail displacement

| | control | experimental | Test of sig. | P |
|----------------------|---------------------|---------------------|--------------|-------|
| Head Displacement | | | U=51.0 | 0.562 |
| Mean \pm SD. | 0.74 \pm 1.18 | 0.49 \pm 1.06 | | |
| Median (Min. – Max.) | 0.66 (-0.86 – 3.24) | 0.27 (-1.0 – 2.73) | | |
| Tail Displacement | | | U=57.0 | 0.847 |
| Mean \pm SD. | 0.30 \pm 1.14 | 0.13 \pm 1.18 | | |
| Median (Min. – Max.) | 0.85 (-1.77 – 1.64) | 0.32 (-2.90 – 1.42) | | |

CONCLUSION

- Miniscrews showed displacement under orthodontic loads. LLLT did not show significant reduction of this displacement.
- LLLT is effective in reducing the gingival inflammation at the miniscrews sites.

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