Biostimulation using an 810nm Diode Laser - A Case Series

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Abstract:
A decrease in orthodontic treatment time is not only a demand by the esthetically concerned patient but is also the duty of every orthodontist. With the advent of 810 nm diode laser it could be made possible. This article presents a case series wherein use of 810 nm has been used to biostimulate the tissues and thereby resulting in increased rate of tooth movement appreciated by amount of clinically detected space closure.

Introduction
A decrease in orthodontic treatment time is not only a demand by the esthetically concerned patient but is also the duty of every orthodontist.¹ Therapeutic laser treatment offers numerous benefits.

During the past thirty years, lasers have been used as an alternative to conventional surgical techniques as it promotes tissue healing and reduces edema, inflammation, and pain.² Laser light irradiation has been applied in the medical field and possesses biostimulatory effects on wound healing, collagen synthesis and fibroblast proliferation.³ The physiological effects of low level lasers occur at the cellular level and can stimulate or inhibit biochemical and physiological proliferation activities by altering intercellular communication.⁴

For more than ten years, laser has been an interesting but not well-defined field among the orthodontic profession. Kawasaki and Shimizu¹ investigated the effects of low-power laser irradiation on bone remodeling during experimental tooth movement in rats and observed that the amount of bone formation and cell proliferation rate in the tension side as well as the number of osteoclasts in the pressure side were all significantly increased in the irradiated group when compared with the nonirradiated group. Cruz et al⁵ demonstrated clinically that low level laser therapy (LLLT) accelerates the orthodontic movement in humans. These findings suggest that LLLT can accelerate tooth movement accompanied by alveolar bone remodeling and thus reduce orthodontic treatment duration.

The present case report shows the clinically visible difference in space closure between the two sides in maxillary arch in three patients after biostimulating with 810 nm diode laser.

Case 1
A 20 year old female reported with a chief complaint of forwardly placed upper front teeth. She had skeletal Class I bimaxillary jaw relation on account of forwardly placed maxilla and forwardly placed and large mandible and an average growth pattern tending towards vertical, dentoalveolar Angle's Class I malocclusion, crowding with respect to mandibular anteriors along with rotations (34 & 43) and protrusive upper and lower lips. (Fig.1) The treatment plan selected was all four 1st premolar extractions. The space closure was carried out on 0.019x0.025" SS wire under direct anchorage with TAD (8mm length, 1.5 mm diameter (BMK, Korea) and NiTi closed coil springs as force delivery system (Fig. 2). The biostimulation was carried on the right side. All irradiations were done by the same operator using 810nm gallium-aluminum-arsenide (Ga-Al-As) diode laser (Creation, Italy). The laser irradiation was delivered with a power output of 2Watts in a continuous non contact wave mode. The laser beam was delivered using a round 0.8 cm diameter metal conductor held perpendicular to the mucosa. Experimental doses were delivered on the buccal, and palatal surfaces over an area of 2 cm² (Fig. 3). The active treatment duration was 23 months. This was followed by a permanent retention using fixed lingual bonded retainers in both arches.

Case 2
An 18 year old male reported with a chief complaint of forwardly placed upper front teeth. He had skeletal Class III jaw relation on account of normally placed maxilla and forwardly placed and large sized mandible and horizontal growth pattern, dentoalveolar Angle's Class III malocclusion, KATZ (-2:-4.5), with cross bite, spacing w.r.t maxillary anteriors and competent lips and rotations (Fig.4-6).
Conclusion:
The results of this case series suggests that laser biostimulation with the use of 810nm diode laser might actually be able to accelerate the rate of tooth movement. It would be better to conduct a more detailed study designed to standardize protocols on a larger sample size to be able to conclude empirically the effect of laser biostimulation on the rate of tooth movement.

References:

Case 3
An 18 year old male reported with a chief complaint of forwardly placed upper front teeth. He had skeletal Class I jaw relation with normally placed maxilla and normally and large sized mandible and a horizontal growth pattern, dentoalveolar Angle's Class I malocclusion, with simple tongue thrusting habit, with Class I canine, spacing with respect to maxillary anteriors, with upper dental midline shifted towards left side by 0.5 mm & rotated 16 and 26 and normal upper and protrusive lower lip (Fig. 7-9).


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