ISSN 1855-9913

Journal of the Laser and Health Academy
Vol. 2014, No.1; www.laserandhealth.com

CASE REPORT: Clinical Crown Lengthening: Laser-Assisted Versus Conventional surgical therapy

S Milavec[1] and B Gaspirc[2]
[1]Zdravstveni dom Sežana, Partizanska 24, Sežana
[2]Department of Oral Medicine and Periodontology, Faculty of Medicine, University of Ljubljana

ABSTRACT

Clinical crown lengthening is a periodontal resective procedure aimed at partial removal of supporting periodontal tissues to increase exposure of coronal tooth structure. Crown-lengthening involves various techniques, including gingivectomy or gingivoplasty, apically positioned flap procedure, which may include osseous resection and forced tooth eruption with or without fiberotomy. Soft-tissue crown lengthening is best accomplished with an external or internal bevel gingivectomy. Laser-tissue ablation results in adequate exposure of tooth structure with minimal or no bleeding, allowing the clinician to place a restoration immediately. The Er:YAG laser is very safe and useful for esthetic periodontal soft-tissue management because this laser is capable of precisely ablating soft tissues using various tips, and the wound healing is fast and favorable, owing to the minimal thermal alteration of the treated surface.

Key words: crown lengthening, aesthetics, erbium laser

Article: J. LA&HA, Vol. 2014, No.1; pp.42-44.
Received: April 14, 2014; Accepted: May 22, 2014

I. INTRODUCTION

Clinical crown lengthening is a periodontal resective procedure aimed at partial removal of supporting periodontal tissues to increase exposure of coronal tooth structure. It is a valuable adjunctive procedure in restorative dentistry that may be indicated for a number of reasons. Crown-lengthening surgery has been categorized as aesthetic or functional. It is undertaken to enhance maxillary anterior aesthetics or to provide an adequate amount of tooth structure for proper restorative therapy. Crown-lengthening involves various techniques, including gingivectomy or gingivoplasty, apically positioned flap procedure, which may include osseous resection and forced tooth eruption with or without fiberotomy.

II. INDICATIONS

Periodontal crown lengthening can be used for aesthetic enhancement in the presence of excessive gingival display, often referred to as the "gummy smile" (Lang, 1995; Lanning, Waldrop, Gunsolley, & Maynard, 2003). Gummy smile may be the result of several factors, such as gingival enlargement, altered or delayed passive eruption, insufficient clinical crown length, vertical maxillary excess and a short upper lip [5,7].

Moreover, crown lengthening can be used for teeth with an inadequate amount of tooth structure for proper restorative therapy, for teeth with subgingival caries and subgingival fracture lines. This treatment can establish a biological width and a ferrule length facilitating prosthetic management [4].

Short clinical crowns can be due to excessive coverage of the coronal portion of the tooth by the soft tissues or may be associated with posterior bite collapse or excessive parafunctional patterns (bruxism, etc.) that have resulted in a reduced tooth height [3].

III. CONTRAINDICATIONS

Osseous resection may pose a contraindication to crown-lengthening therapy when the periodontal stability of the treated dentition may be affected. Generally, dentists should avoid excessive osseous removal if it will compromise the crown-to-root ratio [2]. The dentist also should avoid removing bone in the furcation area. In anterior areas where aesthetic considerations are highly significant, surgical crown lengthening alone may have an unacceptable result. If the gingival margin of the tooth to be restored is in harmony with adjacent teeth and at an acceptable level with regard to aesthetics, then crown lengthening would need to be performed on all of the adjacent anterior teeth, and this could adversely affect aesthetics. In cases of incisal attrition where the teeth do not continue to erupt, there is a loss of vertical dimension and the gingival margin is stable and in proper relation with the upper lip. This situation is an indication for restorative treatment to lengthen the

teeth and restore the vertical dimension, and it is a contraindication for esthetic crown lengthening [8].

IV. SOFT-TISSUE CROWN LENGTHENING

To plan a crown-lengthening procedure one should be concerned about the quantity and quality of residual gingival tissues left behind after the resected tissue has healed completely. The first concern in flap design or excision is the height of gingiva present on the facial and lingual aspects of the involved tooth or teeth. The dentist can accomplish a tissue excision via a gingivectomy by means of a scalpel, an electrosurge, a radiosurge or a laser.

Maynard and Wilson [6] recommended a minimum of 3 mm of attached gingiva in the presence of subgingival restorative therapy. A gingivectomy tool could result in complete removal of the attached gingival tissue. If soft-tissue excision via a gingivectomy would result in a postoperative gingival width of less than 3 mm, one should consider the apically positioned flap as an alternative to a simple gingivectomy. Another parameter to consider is the need to visualize the bone. If the underlying bone crest is less than 3 mm from the level of gingival resection, then the dentist should consider using an elevated flap procedure for access. Access to the bone yields the opportunity to perform additional resection of bone if the dentist also intends to expose a ferrule [4].

Soft-tissue crown lengthening is best accomplished with an external gingivectomy. If a gingivectomy procedure is used to remove "excess" gingiva, but the new gingival margin position is too close to the underlying bone, the biologic width will be violated and the gingival margin will usually rebound toward its original position. If the new gingival margin position is close to the underlying bone, a flap should be reflected and an adequate amount of osteoplasty and ostectomy should be performed to reestablish an adequate biologic width.

V. LASER-ASSISTED CROWN LENGTHENING

Lasers have made their way into conventional dental therapy for use in performing gingivectomy or gingivoplasty. Laser-tissue ablation can result in adequate exposure of tooth structure with minimal or no bleeding. This type of tissue removal can result in a dry field, thus allowing the clinician to place a restoration immediately [4].

Lasers can be classified into two types according to the penetration depth: types where the laser light penetrates the tissue more deeply (such as Nd:YAG and diode lasers), and types where the laser light is absorbed in the superficial layers (such as Er:YAG laser) [1]. The Er:YAG laser is effective for soft-tissue surgery. As this laser is the most highly absorbed in water among dental lasers, the width of the thermally affected layer after Er:YAG laser irradiation is minimal [10]. Therefore, the hemostatic effect is weaker than for other lasers, but the healing of the laser wound is relatively fast and comparable to that of a scalpel wound. When Er:YAG (AT Fidelis, Fotona, Slovenia) is used at the parameters 110 mJ, 30 Hz, LP, spray 2/2, with Varian fiber tip of 500 μm in diameter, almost no anesthesia is needed as it does not cause thermal damage to the tissue (Fig 1).

Fig. 1: a) Short clinical crown on teeth 23 and 24 before prosthetic restoration.
b) Er:YAG laser assisted soft tissue crown lengthening.
c) Healed completely at 1 week.

Compared with the use of a conventional scalpel, lasers can cut, ablate and reshape the oral soft tissue more easily, with minimal bleeding and no need for suturing. Less wound contraction and minimal scarring are other advantages of laser surgery that are not observed in scalpel surgery. Thus, lasers are

generally used for gingivectomy and gingivoplasty with some benefits when compared with the use of a scalpel or electrosurgery.

VI. CONCLUSIONS

Lasers can be applied in esthetic procedures, such as the recontouring or reshaping of gingiva and in crown lengthening. Using lasers, the depth and amount of soft-tissue ablation is more precisely controlled than with mechanical instruments. In particular, the Er:YAG laser is very safe and useful for esthetic periodontal soft-tissue management due to its clear-cut ablation of soft tissues as well as fast and favorable wound healing.

REFERENCES

1. Aoki, A., Sasaki, K. M., Watanabe, H., & Ishikawa, I. (2004). Lasers in nonsurgical periodontal therapy. *Periodontol 2000, 36*, 59-97. doi: 10.1111/j.1600-0757.2004.03679.x.
2. Dibart, S., Capri, D., Kachouh, I., Van Dyke, T., & Nunn, M. E. (2003). Crown lengthening in mandibular molars: a 5-year retrospective radiographic analysis. *J Periodontol, 74*(6), 815-821. doi: 10.1902/jop.2003.74.6.815.
3. Goldberg, P. V., Higginbottom, F. L., & Wilson, T. G. (2001). Periodontal considerations in restorative and implant therapy. *Periodontol 2000, 25*, 100-109.
4. Hempton, T. J., & Dominici, J. T. (2010). Contemporary crown-lengthening therapy: a review. *J Am Dent Assoc, 141*(6), 647-655.
5. Lang, N. P. (1995). Periodontal considerations in prosthetic dentistry. *Periodontol 2000, 9*, 118-131.
6. Lanning, S. K., Waldrop, T. C., Gunsolley, J. C., & Maynard, J. G. (2003). Surgical crown lengthening: evaluation of the biological width. *J Periodontol, 74*(4), 468-474. doi: 10.1902/jop.2003.74.4.468.
7. Levine, R. A., & McGuire, M. (1997). The diagnosis and treatment of the gummy smile. *Compend Contin Educ Dent, 18*(8), 757-762, 764; quiz 766.
8. Ochsenbein, C. (1986). A primer for osseous surgery. *Int J Periodontics Restorative Dent, 6*(1), 8-47.
9. Pourzarandian, A., Watanabe, H., Aoki, A., Ichinose, S., Sasaki, K. M., Nitta, H., & Ishikawa, I. (2004). Histological and TEM examination of early stages of bone healing after Er:YAG laser irradiation. *Photomed Laser Surg, 22*(4), 342-350. doi: 10.1089/1549541041797913.
10. Walsh, J. T., Jr., Flotte, T. J., & Deutsch, T. F. (1989). Er:YAG laser ablation of tissue: effect of pulse duration and tissue type on thermal damage. *Lasers Surg Med, 9*(4), 314-326.