Laser Treatment in Oral and Maxillofacial Hemangioma and Vascular Malformations

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INTRODUCTION

Vascular tumors in the facial and oral region are more frequently encountered in youngest and oldest ages. These vascular lesions localized especially on exposed sites affect the physiognomic aspect and may cause significant psychological distress.¹

The exact diagnosis and extent of the tumor must be determined before any treatment, because the visible portion may represent only a part of the lesion. For this purpose some authors used color-Doppler imaging, magnetic resonance imaging (MRI) or color-coded duplex ultrasonography to detect the depth of the lesions.²,⁴

Injection of sclerosing agents and embolization with solid materials followed by surgical excision are usually used for the treatment of hemangioma and vascular malformations.⁵,⁸ Cryotherapy was
also used in the treatment of these vascular tumors with good results.9,10 Different kinds of lasers have been introduced for use in management of vascular lesions (hemangioma and vascular malformations) since the late 1980’s, in the attempt to avoid the risk of hemorrhage related to conventional surgery of these lesions.11,12 The application of laser techniques was studied and reports have encouraged the use of laser light energy in various modalities – contact, non-contact and interstitial.11,13

The aim of this study was to evaluate the efficacy of the diode laser and the Er:YAG laser photocoagulation in the treatment of vascular lesions which are located on the oral and maxillofacial areas, using pre- and postoperative color Doppler ultrasonography for evaluation of the results.

**MATERIAL AND METHODS**

A prospective, controlled, clinical study was conducted on a group of 70 patients (26 males and 44 females, with ages varying between 6 months and 77 years) with hemangioma and low-flow vascular malformations of oral and maxillofacial regions was selected for laser treatment. All patients signed an informed consent before participation in this study and were treated in our department in the period between 2005 and 2009. Inclusion criteria for patients into the study were: age between 0 and 80 years, presence of different forms of hemangioma and vascular malformation in oral and maxillofacial regions, no other treatment for same disease before. Exclusion criteria were: chronic diseases, diabetes, other benign or malign tumors in the same area, increased severe allergies or hypersensitivity, participation in another clinical trial. The high-flow and high impedance vascular malformation were not included in this laser treated group. All lesions were located in regions of high functional or aesthetic significance. Color Doppler ultrasonography was used for an accurate diagnosis, in order to acquire additional information about the vascularization and flow type, location and type of vascular pedicles, as well as the lesion volume. Photographic documentation was undertaken for each case, serving for comparative long-term evaluation.

A 980 nm (Ga-Al-As) diode laser type Ceralas D15 (manufactured by Biolitec, Germany), was used in continuous mode (cw) for the treatment, with power ranging between 9 – 11 W, delivering an energy of 1000 J/cm³. Under local or general anesthesia a flexible laser fiber with diameter of 200 μm was introduced into the lesion via a 22-gauge needle, and the laser fiber was advanced in radial direction as photocoagulation proceeded within the tissue (Fig. 1). The interstitial technique was performed in multiple stages, each one delayed by six weeks interval. With the same device, laser photocoagulation was performed through a glass plate using a fiber diameter of 320 μm in case of superficial localization of hemangioma or vascular malformation (Fig. 2). Ice cooling was used pre-, intra- and postoperatively.

A 2940 nm Er:YAG laser type Fidelis (manufactured by Fotona, Slovenia), was used with a RO5 handpiece, energy 350 mJ, VLP mode, frequency 12 Hz and spot diameter 5 mm, for ablation and vaporization of hemangioma or vascular malformations (Fig. 3).

The decrease in size of the vascular lesion, amount of energy applied to achieve reduction in size and the modifications of the vascularization were evaluated by clinical examination, color-doppler ultrasonography, photographic measurements in all stages of treatment. The patient’s comfort with the procedure was also documented at all stages.

**Figure. 1.** Interstitial laser treatment on hemangioma of the lower lip

**Figure. 2.** Laser treatment through a glass plate on hemangioma of the upper lip

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RESULTS

Based on objective criteria and patients’ evaluation, the results of this study could be assessed as favorable. After laser therapy we obtained a reduction of treated vascular lesions in all 70 patients with good cosmetic results (Fig. 4, Fig. 5). The volume regression of the lesions and the reduction of vascular signal as measured ultrasonographically varied between 45% and 95% (Fig. 6, Fig. 7).

The healing process after each stage of laser treatment evolved without any scars or other complications. The patients had no complaint about pain or functional discomfort in the treated areas during and after laser treatment. No reperfusion...
was noted after a mean follow-up of 6 to 12 months (Fig. 8, Fig. 9).

Laser photocoagulation was well tolerated by all the patients with no intraoperative or postoperative adverse effects. All patients healed post-surgically with no loss of function in the treated area.

Figure 8. Vascular malformation of the tongue

Figure 9. Clinical aspect of vascular malformation of the tongue after three stages of laser therapy

DISCUSSION

This study reflects a five years clinical experience with the application of 980 nm (Ga-Al-As) diode laser and Er:YAG laser in the treatment of hemangioma and vascular malformations in the oral and maxillofacial regions.

The 980 nm wavelength produced by the (Ga-Al-As) diode laser has similar effects in tissue coagulation with the Nd:YAG laser, confirmed by other authors as well. By using this type of laser, reduction of vascular lesions could be obtained with an interstitial or contact laser procedure.

The results of this study with the interstitial or contact 980 nm (Ga-Al-As) diode laser therapy and Er:YAG laser of vascular tumors demonstrate a high effectiveness of this novel therapy.

The interstitial laser photocoagulation technique is similar to other interstitial techniques used in different parts of the body for the treatment of hemangioma or other vascular malformations. Our results show that application of the diode laser or Er:YAG laser photocoagulation produces regression in hemangioma and vascular malformations, similar with the results of other studies using interstitial Nd:YAG laser treatment. We obtained a healing process with no scars and no reperfusion of the hemangioma, as reported by other studies using the diode laser (980 nm) or Er:YAG laser (2940 nm). Another study has shown that intralesional photocoagulation treatment with a KTP laser is effective and safe for treatment of a vascular lesion in the oral cavity.

Overall, the literature reflects that laser treatment is safe and effective therapy for port wine stains, however, laser treatment of hemangiomas remains controversial. In our study we obtained good results even in laser therapy of childhood hemangiomas.

The color-Doppler ultrasonography represents an important instrument for diagnosis and postoperative evaluation of the results. This imaging technique should be recommended for routine preoperative and postoperative monitoring in hemangioma.

As a difference, we used a specific wavelength (980nm, 2940 nm), a different type of laser (diode laser, Er:YAG laser), energy density, power and a different procedure of photocoagulation. In our study we also treated patients of various age groups.

CONCLUSION

Laser assisted surgery has established itself as a reliable method to increase the surgical and patient’s comfort during and after laser procedures in the oral and maxillofacial regions owing to its advantages consisting in reduced surgery and healing duration. With these methods we can considerably reduce the risks during and after the surgical intervention because of the minimal bleeding during the surgery and also because of the rapid healing without any complications. Photocoagulation through laser therapy represents a new kind of treatment for hemangioma and vascular malformations. In some cases it represents the only treatment alternative.

Ethical approval

Ethical approval for this study was given by Ethical Commission from University of Medicine and Pharmacy “Iuliu Hatieganu” Cluj-Napoca, by document number 15 of April 24, 2005.
REFERENCES