

# Treatment of Vascular Lesion in Oral Region with Diode Laser 980 nm, 3 Years of Follow- Up

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**Abstract:** *Introduction:* Accurate terminology leads to precise identification of the vascular entity in most of the cases an accurate history and physical examination to establish the diagnosis. They can be situated in different area of oral-maxillofacial region; tongue, lip, palate, buccal-mucosa, gingiva. Management of these lesions with laser is an option. The choice of treatment depends on the type of lesion (vascular content), location, depth and characteristics of flow of the lesion. *Aim:* We chose the application of 980 nm diode laser for the management of vascular lesion of lip, due to the fact that the wave length of 980 nm was good absorbed in hemoglobin and make possible to achieve very good coagulation and hemostasis. *Material and methods:* This study comprised 60 patients aged 10 to 80 years, treated for vascular lesions of the oral region. The research protocol was performed in two groups. In the first group 30 patients were treated with 980 nm diode laser and the second group, the control group 30 patients treated with cold scalpel. Treatment was conducted from May 2007 to May 2010 at the Department of Oral Surgery, Dental Clinic of the University of Tirana, Albania. The follow-up period was one month, six months, one year and three years for the evaluation of the characteristics of wound healing as early and long term results. All stages of treatment and follow-up were photographically documented serving for comparative long-term evaluation. *Results:* The patients of laser group were treated in one session. Time of surgery for laser group was very short that make possible a surgical comfort of the patient and no sutures were required and the wound was healed in two or three weeks depending of the size of the lesion. None of the patients reported complications during wound healing here included compromised patients. *Conclusion:* Laser treatment versus scalpel surgery is minimal invasive and minimal aesthetic results. Postoperative period is comfortable for the patients treated with 980 nm diode laser regarding to the post-operative pain and swelling compared with the patients treated by conventional method. This treatment provided satisfactory results and also well-accepted by all age groups.

**Keywords:** Diode Laser, Wound Healing, Recurrence, Functional Disturbance

## 1. Introduction

Mulliken and Glowacki introduced a simple classification in 1982 that was based on the clinical, histochemical and cellular criteria to distinguish between the various vascular anomalies [12]. They described two distinct entities—hemangiomas and vascular malformations. Acquired lesions may be traumatic or idiopathic in origin. Hemangiomas present with variable morphology. Some are small and hardly noticeable, whereas others are large and disfiguring. Hemangiomas that are flat and appear reddish are considered superficial and those that are deep beneath the skin and appear bluish are called deep hemangiomas [30]. When hemangioma is superficial and deep is called compound hemangioma. The correct diagnosis is critical for proper treatment. Vascular malformations are always present at birth though some may not be apparent until a later stage and they never proliferate or involute. Instead they expand slowly and relentlessly throughout life, in pace with the growth of the patient. Trauma, puberty and pregnancy can cause accelerated growth. These lesions are sub classified according to the predominant type of vessel and characteristic of flow like capillary malformation, venous malformation and arterial-venous malformation. They present initially as flat pink macules. They are usually soft, compressible and enlarge in size when venous pressure is increased. Some lesions such as venous lakes and

varicosities are part of the normal aging process. The congenital anomalies may be further subdivided according to vessel type. Capillary, venous and lymphomatous malformations are low-flow lesions, whereas arterial-venous lesions are high flow [12,13,34,37]. Malformations may be seen in a number of different syndromes involving the oral cavity as well as the head and neck like: Rendu-Osler-Weber syndrome, Sturge-Weber syndrome, Maffucci syndrome [34]. Accurate terminology leads to precise identification of the vascular entity in most cases an accurate history and physical examination will help establish the diagnosis [1,4,5,37]. They can be situated in different area of oral-maxillofacial region; tongue, lip, palate, buccal-mucosa, gingiva [34]. Numerous methods of treatment have been used such as cryotherapy, embolization, sclerotisation, cold scalpel and combination of these. They are variable in their success and all can be complicated by scarring. The choice of treatment depends on the type of lesion (vascular content), location, depth and characteristics of flow of the lesion [4,6,12]. Management of these lesions with laser is an option. Because of the esthetic importance of the lip, the discrete anatomic borders such as the vermilion border and their functional importance the use of lasers for treatment in this region has some important benefits [34]. Several laser systems have been developed using principles of selective photothermolysis [6]. The target chromophore vascular lesion is oxyhemoglobin present in the red blood corpuscles which

circulates in blood vessels. Laser therapy is a good method to treat vascular lesion.

## 2. Aim

Among different laser systems, we chose the application of 980 nm diode laser for the management of vascular lesion of lip, due to the fact that the wave length of 980 nm was good absorbed in hemoglobin and this characteristic made possible to achieve very good coagulation and hemostasis very important for vascular lesion.

## 3. Patients and Methods

### Patients

This study comprised 60 patients (32 males and 28 females) aged 10 to 80 years treated for vascular lesions of the oral region. The research protocol was performed in two groups. In the first group 30 patients were treated with 980 nm diode laser and the second group, the control group 30 patients treated with cold scalpel. Treatment was conducted from May 2007 to May 2010 at the Department of Oral Surgery, Dental Clinic of the University of Tirana, Albania. All patients were provided with clinical file from the laser group, 20 patients were medically free and 10 others compromised (diabetic 3, cardiopathy 3 and under anticoagulant therapy 4). From the control group 18 patients were medically free and 12 others compromised (diabetic 4, cardiopathy 4, under coagulant therapy 4). For all patients the lesions were considered to be vascular lesion based on their medical history, age, thorough extra and intra oral examination and findings of ultrasonography. All patients were given a written and verbal information on the nature of laser treatment and signed informed consent forms were obtained prior to treatment. The follow-up period was one month, six months, one year and three years for the evaluation of the characteristics of wound healing as early and long term results. All stages of treatment and follow-up were photographically documented serving for comparative long-term evaluation.

### Methodology

Treatment was performed on an outpatient basis under local anesthesia. For the laser group a 980 nm diode laser was used. Laser energy was delivered through a fiber optic with gauge 300 micrometer and average power 3 W in a continuous mode from 10 to 60 seconds according to the size of the lesion in contact and non-contact. The laser tip was placed non-contact mode 2 mm away from the area. It started by working around the border of each lesion circling around it several time all in one direction, changes of colour, visible shrinkage were used as signal for the end point of treatment, until blanching of the treated area and photocoagulation was completed. In contact mode, the fiber was in contact with mucosal surface of the lesion using gentle pressure, it was advanced into the substance of vascular lesion to the periphery four such passes are required. The treated surgical area was bloodless and intralesional photocoagulation was completed. The treated areas were iced for 3 to 5 minutes. After the treatment analgesic medication was prescribed to be used if necessary but no antibiotics were prescribed. Instructions for post-

surgical behavior treatment consisting in ice compress for 2 hours, abstention of warm food and drinks intake, to place vitamin E ointment on the lased area and to avoid sun exposure for one month. The patients of control group were treated with conventional removal techniques by means of blade. Excision as surgical technique was performed to fully enucleate the lesion and the wounds were sutured. Antibiotics were prescribed for all patients and for the patients under anticoagulant therapy had interrupted it prior the surgery. The follow-up visits for the protocol research for laser group and control group were scheduled 10 days, one month, six months, one year and three years. Pain, bleeding, swelling, scar formation, functional disturbance, aesthetic result, recurrence as well as wound healing characteristics were evaluated.

## 4. Results

In this study according the protocol research the results from two groups of populations were compared. The first was a group of 30 patients treated with 980 nm diode laser (Sirona-laser) with different vascular lesion of the oral cavity. A second group considered as the control group was treated by conventional surgical blade manner. The results were evaluated as early and long-term results. The patients of laser group were treated in one session. In this study is included a case of vascular of entire lower lip which was treated in five sessions, in different sections. Another case to be considered from laser group is a patient with vascular lesion in lower and upper lip which was treated in different session in distance of 2-3 weeks from each other. Time of surgery for laser group was very short that make possible a surgical comfort of the patient and no sutures were required and the wound was healed in two or three weeks depending of the size of the lesion. None of the patients reported complications during wound healing included compromised patients. On the basis of the data reported from the patients of control group 3 to 30 patients showed delays time due to local problems favored from compromised patients. The parameters evaluated are the following:

### Bleeding

The bleeding during the surgical removal of vascular lesions can be considered a typical feature of such treatments. During the treatment with laser no bleeding in all patients was observed (Fig.1.b, 2.b). After the excision with scalpel from the control needed prolonged packing and sutures were used to close surgical wound.

### Pain

The second parameter evaluated was post-surgery pain. Only one patient out of 30 treated with laser reported pain when the effect of local anesthesia stopped. The other patients had an optimal post-surgical comfort and they didn't refer pain. Among the patients treated with conventional blade surgery 22 out of 30 (70 % of the patients) referred pain solved by analgesic drugs for some days.

### Swelling

Another parameter evaluated in the control visits during follow-up during first week after treatment was swelling. None of the patients treated with laser reported swelling. On

the other hand 20 patients out of 30 (66% of the patients) from the control group referred swelling the first week after the surgical excision.

### Scarring

A common problem related to the lesions of the lip was scar formation. Scar formation was evaluated at the control visit one month after the treatment. In all patients treated with 980 nm diode laser scar formation was not observed (Fig. 1c, 2.c). On the other hand in all patients treated with conventional blade surgery scar formation were observed in the site of the performed excision.

### Functional disturbance

The parameter functional disturbance was evaluated six months after the treatment. No functional disturbance was recorded and the lip looked normal in colour and consistence from the laser group. From the control group 6 cases out of 30 (20% of the patients) reported functional disturbance

### Recurrence

Recurrence was evaluated as a long-term result at the follow-up of one year, two years and three years after the treatment. According the clinical data reported by patients treated with laser no recurrences were observed. Only one case from the control group was reported recurrence of the lesion during the first year after the excision.



Figure 1 (a): Vascular lesion of lip



Figure 1 (b): Immediately after the treatment

Photocoagulation was completed. Surgical field was bloodless



Figure 1 (c): 4 weeks after the treatment with 980 nm diode laser.

Wound was completely healed without scarring.



Figure 2 (a): Vascular lesion



Figure 2 (b): Immediately after the treatment



Figure 2 (c): 4 weeks after the treatment

### Statistical Analysis

All statistical test and graphics were created using SPSS for Medical Calculation MedCalc. Data were expressed as mean  $\pm$  standard deviation and 95% confidence interval and the statistical significance was estimated by Student's *t*-test and *p* values  $<0.05$  were considered significant. From May 2007 to May 2010 we treated 60 patients: 32 males and 28 females mean age  $45 \pm 2$  years. In this investigation it is used the Cochran's Q Test, which is a non parametric statistical test to verify if scalpel and laser treatments have identical effects or not This analysis is a two-way randomized block designs where the response variable is coded as two possible outcomes; coded as 0 and 1. (Woldrige, 2003). Moreover, this test relies on the null hypothesis where states that both treatment have identical effect and from the other hand the alternative one states that there is a difference on the effectiveness among treatments.

These tests were performed for every variable we selected such as: pain, bleeding, edema swelling, functional disturbance, scar formation and aesthetic result. Accordingly, the null hypothesis for the Cochran's Q test is that there are no differences between the variables; the equivalence of the groups under control. If the calculated probability is lower than 0.05 (in this case 0.001) the null-hypothesis is rejected and variables are significantly different from each other.

This suggests that there is statistically a difference between the groups which were applied the laser and the control group; the scalpel method.

### 5. Discussion

Many vascular lesions involve the lip. Different methods can be used to manage these lesions with beneficial effect. It is important to well determine the advantages and disadvantages of each modality of treatment and the surgeon may choose any method of management. The surgical excision is a treatment option. The goal of each surgical procedure is to remove a pathological lesion avoiding tissue damages and allowing the healing without complications in short or long time<sup>[19]</sup>. Total resection of these lesions has the risk of hemorrhage. Operative bleeding was evident in the clinical cases included in this study treated with scalpel. To prevent this complication preoperative embolization or sclerotherapy can be performed<sup>[26]</sup>. As it is reported in literature sclerotherapy is a modality of treatment<sup>[23,25]</sup>, but it is a good choice if it is associated with surgery<sup>[19,20,21,23,25,26]</sup>. Another point to be considered regarding surgical resection is the aesthetic result. My results and the reports of authors<sup>[19,20,21]</sup> had proved that surgical excision produce scarring and for aesthetic reasons another plastic surgical intervention is needed. Aesthetic result is the disadvantages of this method of treatment<sup>[28]</sup>. In the mouth mainly on the lip there is an aesthetic challenge when surgery or sclerosing agent are used particularly in large lesions and in hemangiomas<sup>[48]</sup>. Electrocautery which also acts by means of coagulation may causes scarring particularly on the lip border<sup>[48]</sup>. The use of cryosurgery may result in aesthetic scarring mainly in the lesion located on the vermilion border of the lip<sup>[48]</sup>. Different laser systems are used for the treatment of these lesions according

to the publications<sup>[24,29,30,31,32,38]</sup>. Diode laser photocoagulation technique was effective in the treatment of vascular lesion required only one irradiation<sup>[48]</sup>. Azevedo L and al 2009<sup>[48]</sup> reported that 810 nm diode laser was successfully used for the management of vascular lesion with good postoperative results<sup>[48]</sup>. Genovese and al 2010<sup>[13]</sup> reported that the use of the use of 980 nm diode laser in the treatment of vascular lesion reduces bleeding during surgery with a consequent reduction in operating time and provides hemostasis. Romanos and Nentwing 1999 confirmed that with 980 nm diode laser the coagulation of the tissue was excellent. Laser procedure is well accepted by all patients included in this study as it is showed in different publications<sup>[2,3,24,25,29,30,31,32,34,37,39,45,46,47,48]</sup>. In this study different age groups were treated from 10 to 80 years old. Short time of laser surgery is a huge advantage for pediatric and geriatric patients who tolerate with difficulty the surgical intervention. Children are afraid and anxious from the dental chair<sup>[3]</sup> and the generation of old people are health compromised and can not tolerate long surgical procedure. Some of the patients from laser group were under anticoagulant therapy and it was not necessary to interrupt it before the treatment (INR $>1,7$ ) versus the patients of control group it was mandatory to interrupt the administration of anticoagulant drugs before intervention according the treatments' protocol.

No complications were observed during the wound healing time, here included the compromised patients. These are the same results comparing to the report of authors from literature<sup>[2,12,35,37]</sup>. Bogdan V and al 2010, Desiate A and al 2009, Romanos G and Nentwig G 1999 reported in the publications good results after the treatment of vascular lesions with 980 nm diode laser. At the 4-weeks follow-up they referred that all vascular lesions had healed without leaving any macroscopically visible scars. Results of this study in comparison with the results of referred authors showed that 980 nm diode laser allows treatment of vascular lesion of lip in a simple, fast and safe manner with minimizing the danger of massive hemorrhage and huge lip structure loss. The approach is simple with satisfactory results.

### 6. Conclusion

Clinical applications of 980 nm diode laser for the management of vascular lesion of lip have beneficial effects due to the good absorption in hemoglobin. Laser treatment versus scalpel surgery is minimal invasive and minimal aesthetic results. Postoperative period is comfortable for the patients treated with 980 nm diode laser regarding to the post-operative pain and swelling compared with the patients treated by conventional method. The patients under anticoagulant therapy were treated without substitution prior to laser surgery and there was not bleeding during the treatment. Laser treatment is short in time and well-accepted by all age group. Surgical lased wounds were healed in time, without scar formation and functional disturbance.

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