TREATMENT OF VASCULAR LESION OF LIP WITH 980NM DIODE LASER COMPARED WITH CONVENTIONAL METHOD

Merita Bardhoshi, DDS, MD, Msc
Medicine University Department of Oral Surgery, Tirana, Albania
Prof. Dr. Med Norbert Gutknecht, DDS, PhD
RWTH, Aachen University, Department of Restorative Dentistry, Aachen
Dr. Edit Xhajanka, DDS, MD
Medicine University, Prosthetic Department, Tirana, Albania
Dr. Esat Bardhoshi
Medicine University, Oro-Maxillofacial Departement, Tirana, Albania
Dr Neada Hysenaj
University Dental Clinic, Tirana, Albania, Prosthodontics Department

Abstract

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. They described two distinct entities which are haemangiomas and vascular malformations. Hence, they can be situated at different area of the oromaxillofacial region: tongue, lip, palate, buccal mucosa, and gingiva. Numerous method of treatment has been used such as cryotherapy, embolization, sclerotisation, cold scalpel and combination of these. Management of these lesions with laser is an option, and several laser systems have been developed using principles of selective photothermolysis. Thus, the clinical cases presented in this study are treated with 980 nm diode laser.

Material and methods: In this study, we reported 60 cases with vascular lesions of lip treated in the Dental Clinic of the University of Tirana from May 2007 to May 2012. 30 cases were treated with 980 nm diode laser and 30 cases with scalpel. Thus, the operative treatment and post-operative follow-up for the evaluation of early and long term results was documented. All statistical test and graphics were created using SPSS for Medical Calculation (MedCalc). Data were expressed as mean –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.

Results: According the protocol research, the results of the two groups of population were compared as laser group and the control group. Diode laser surgery was rapid and bloodless. The wounds were healed without complications in two to three weeks depending on the size of the lesions. The parameters evaluated are: bleeding, pain, swelling, scar formation, functional disturbance, and recurrence. On the basis of the data collected from the laser group, no pain, or swelling were reported during the first week after intervention and from the control group, 22 of the patients reported pain and 20 referred swelling after the surgical excision. After one month of the treatment, no scar formation was reported from laser group and in the patients of control group, scarring was observed in the site of the performed excision. After 3 years of follow-up, no recurrence was recorded after laser surgery versus one case was treated with scalpel during the first year. No functional disturbance was recorded from the laser group versus 6 cases reported from the control group.

Conclusion: 980 nm is a good modality for the treatment of vascular lesion of lip. This treatment provides satisfactory results, and is well accepted by all patients without compromising their health and functionality.

Keywords: 980 nm diode laser, wound healing, functional disturbance, recurrence

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 (Genovese, 2010) .They described two distinct entities– haemangiomas and vascular malformations. Though, acquired lesions may be traumatic or idiopathic in origin, hence haemangiomas is present with variable morphology. Some are small and hardly noticeable, whereas others are large and disfiguring. Haemangiomas that are flat and appear reddish are considered superficial and those that are deep beneath the skin and appear bluish are called deep haemangiomas (Thurnherr, 2010) .When a haemangioma is superficial and deep, it is known as 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. Thus, these lesions are sub-classified according to the predominant type of vessel and characteristic of flow like capillary malformation, venous malformation and arteriovenous malformation. They present initially as flat pink macules; and 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 maybe further subdivided according to vessel type. Capillary, venous and lymphomatous malformations are low-flow lesions, whereas arterial or arteriovenous lesions are high flow (Genovese, 2010). 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, and Maffucci´syndrome (Salins ,2005). Furthermore, accurate terminology leads to precise identification of the vascular entity. In most cases, an accurate history and physical examination will help establish the diagnosis(Van Doorne ,2002,Lapidoth, 2005,Ternowity ,2000,Alling, 1999).They can be situated in different area of oro maxillofacial region; tongue, lip, palate, buccalmucosa, and gingival (Romanos ,2012). Numerous methods of treatment such as cryotherapy, embolization, sclerotisation, coldscalpel and combination of these have been used. 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 (Lapidoth ,2005, De Biase ,2006, Genovese, 2010). Also, the 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 of the use of lasers for treatment in this region has some important benefits (Romanos, 2012). Several laser systems have been developed using principles of selective photothermolysis (De Biase ,2006). The target chromophor in vascular lesions is oxyhemoglobin present in the blood corpuscles which circulates in blood vessels. Laser therapy is a good method to treat vascular lesion. Therefore, among different laser systems, we choose the application of 980 nm diode laser for the management of vascular lesion of lip due to the fact that the wavelength of 980 nm is good to be absorbed in haemoglobin and this characteristic makes it possible to achieve very good coagulation and haemostasis that is very important for vascular lesion .

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 lip. 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 which is the control group, 30 patients was treated with cold scalpel. Treatments were conducted from May 2007 to May at the Department of Oral Surgery, Dental Clinic of the University of Tirana, Albania and all the patients were provided with clinical file. From the laser group, 20 patients were medically free and 10 others

compromised (diabetic3, 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). Thus, 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 written and verbal information on the nature of laser treatment and signed informed consent forms were obtained prior to treatment. The follow-up period were one month, six months, one year and three years for the evaluation of the characteristics of wound healing as early and long term results. Furthermore, all the stages of the treatment and follow–up were photographically documented serving for comparative long-term evaluation.

Method

Treatments were performed on an outpatient basis under local anesthesia. For the laser group, a 980 nm Diode laser (Sirona Dental Company-Germany) 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 in a 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, and changes of colour; thus, 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 treatment, analgesic medication was prescribed to be used if necessary but no antibiotics were prescribed. Instructions for post-surgical behavior treatment consisting of ice compressed for 2 hours, abstention from warm food and drinks intake, to place vit 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 a surgical technique was performed to fully enucleate the lesion and the wounds were sutured. Antibiotics were prescribed for all patients, thus 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.

Results

In this study, according the protocol research, the results from two groups of populations were compared. The first is a group of 30 patients treated with 980 nm diode laser (Sironalaser) with different vascular lesion of the lip. A second group considered as the control group 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, a case of vascular of entire lower lip which was treated in five sessions, in different section was included. Another case to be considered from laser group is a patient with vascular lesion in the lower and upper lip which was treated at different session in distance of 2-3 weeks from each other. Time of surgery for laser group was very short, hence this makes it is possible for a surgical comfort of the patient and ensures that no sutures were required and the wound was healed within two to three weeks depending on the size of the lesion. None of the patients reported complications during wound healing due to compromise. 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 (Table 1). Therefore, the parameter evaluated includes the following:

a. Amount of Bleeding during surgical treatment
b. Post-surgery pain symptomatology
c. Swelling
d. Functional disturbance
e. Scarring
f. Recurrence

Table.1 Early and long-term results of laser group and control group

Parameter	Op-bleeding	Pain	Edema	Scarring	Functional disturbance
Laser group	**0**	**1**	**0**	**0**	**0**
Control group	**30**	**22**	**20**	**30**	**6**

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 was treated with laser reported pain when the effect of local anesthesia stopped. The other patients had an optimal post–surgical comfort

and they did not mention 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 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.

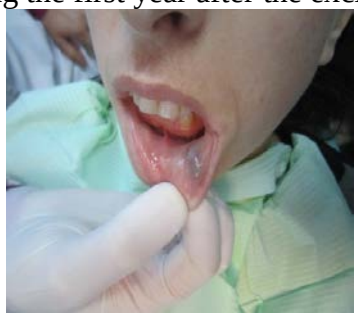
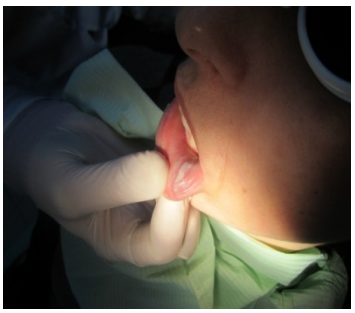


Fig.1.a Vascular lesion of lip Photocoagulation was completed.



b. Immediately after the treatment Surgical field was bloodless

c. 4 weeks after the treatment with 980 diode laser..Wound was completely healed without scarring

Fig.2 Vascular lesion

b. Immediately after the treatment **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 ± 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 2012, we treated 60 patients: 32 males and 28 females mean age 45±2 years.

In this investigation, it uses 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 which states that both treatments have identical effect and from the other hand, the alternative one states that there is a difference on the effectiveness among treatments.

$$T = k\,(k-1)\,\frac{\sum_{j=1}^{k}\left(X_{\bullet j}-\frac{N}{k}\right)^2}{\sum_{i=1}^{b}X_{i\bullet}\,(k-X_{i\bullet})}$$

Where, k is the number of treatments (in this case k=2)

$X_{\bullet j}$ is the column total for the j^{th} treatment

b is the number of blocks (in this case b=6)

$X_{i\bullet}$ is the row total for the i^{th} block

N is the grand total

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 and 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.

Discussion

Many vascular lesions involve the lip. In this study, we present the clinical findings of vascular lesions including haemangiomas and vascular malformations. Vascular lesions can been classified based on anatomical, structural features and biological behavior (Van Doorne ,2002). The head and neck region is more commonly affected especially the face, oral mucosa, lip, tongue (Jeddy ,2012). Hence, the size can vary from few millimeters to several centimeters. Lip as an anatomical structure has some special characteristics regarding function and aesthetic (Caprioglio ,2011). Different methods can be used to manage these lesions with beneficial effect.

Thus, it is important to well determine the advantages and disadvantages of each modalities 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 (Erika, 2010). 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 (Levy ,2004). As it is reported in the literature, sclerotherapy is a modality of treatment (Yang ,2009, Mariano ,2011), but it is a good choice if it is associated with surgery(Erika, 2010, Turabian, 2007,Jeddy, 2012, Kono, 2006, Yang, 2009, Mariano, 2011, Levy, 2004) .Another point to be considered regarding surgical resection is the aesthetic result. My results and the reports of authors (Erika ,2010,Yang, 2007, Kono ,2006) had proven 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 (Zhou, 2005). In the mouth, mainly on the lip, there is an aesthetic challenge when surgery or sclerosing agents are used particularly in large lesions and in hemangiomas (Luciane, 2010). Electrocautery which also acts by means of coagulation may cause scarring particularly on the lip border (Luciane, 2010). The use of cryosurgery may result in aesthetic scarring mainly in the lesion located on the vermillion border of the lip (Luciane, 2010). Yang 2009 reported that the management of 121 vascular lesions with long-pulse Nd:YAG laser in the mean follow-up period of 13 months showed neither functional nor cosmetic shortcomings. Diode laser photocoagulation technique was effective in the treatment of vascular lesion which requires only one irradiation. Azevedo 2009 reported that 810 nm diode laser was successfully used for the management of vascular lesion with good postoperative results. Genovese 2010 reported that 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 Nentwing1999 confirmed that with 980 nm diode laser, the coagulation of the tissue was excellent. In this study, different age groups were treated from 10 to 80 years old. Short time of laser surgery is a huge advantage for paediatric and geriartric patients who tolerate with difficulty the surgical intervention. Children are afraid and anxious from the dental chair (Lawrence, 2009) and the generation of old people are health compromised and cannot 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. Therefore, it was mandatory to interrupt the administration of

anticoagulant drugs before intervention according to the treatments´ protocol. No complications were observed during the wound healing time, but here was included the compromised patients. Bogdan 2010, Desiate 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 were healed without leaving any macroscopically visible scars. Similar clinical results in the use of 980 nm diode laser in this study were obtained compared with authors(Bogdan,2010, Genovese ,2010 , Moghtader 2012) regarding pain, bleeding, swelling, functional disturbance and wound healing. 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 by minimizing the danger of massive haemorrhage and huge lip structure loss. Thus, the approach is simple and has satisfactory results.

Conclusion

Clinical applications of 980 nm diode laser for the management of vascular lesion of lip is of beneficial effects due to the good absorption in hemoglobin. Laser treatment versus scalpel surgery is minimal invasive and minimal aesthetic results. Postoperative period is confortable 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 no 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 (no retraction and no anatomic alterations)

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