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Management of Vascular Malformations in the Oral Cavity: Case Report

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Abstract **Case Report**

Vascular anomalies are diverse, and several classifications are available for these anomalies, the most recent and accepted classification is that of the "International Society for the Study of Vascular Anomalies (ISSVA) that was made in 2014 and revised in 2018. It divides vascular anomalies into vascular tumors (including hemangiomas) and vascular malformations. Various treatment modalities are available, including laser therapy, steroid therapy, embolization, blocking therapy, sclerosing therapy, surgery or cryosurgery. This article presents the usefulness of CO2 laser and diode laser for the treatment of vascular anomalies of the oral cavity, while presenting an unusual combination, for the treatment of an oral hemangioma associated with an angiomatous epulis, between sclerotherapy and diode laser. This study not only confirmed the treatment's effectiveness in reducing lesion size and minimizing intraoperative bleeding from the epulis but also highlighted its ability to enhance aesthetic outcomes, patient comfort, and overall satisfaction.

Keywords: Hemangioma; Gingival Diseases; Lasers; Sclerotherapy.

INTRODUCTION

In the literature, many classifications have been found to describe vascular lesions; one of the most accepted classifications is that of the International Society for the Study of Vascular Anomalies (ISSVA) updated in 2018 [1], which separates vascular anomalies into two principal groups, vascular tumors (VT) and vascular malformations (VM), taking into account different clinico-histological features. Vascular tumors, characterized by a proliferation of blood vessels, originate from neoplastic endothelial cells that appear in childhood, with proliferative changes, followed by a process of involution of unknown etiology. Whereas vascular malformations, characterized by vessels of abnormal structure, result from local dysregulation of embryogenesis and angiogenesis pathways, these malformations are present at birth, with normal endothelial mitotic activity, which grows throughout life without the presence of an involution process. The ISSVA classification also distinguishes between high-flow and slow-flow MV based on flow intensity, and recognizes venous, lymphatic, capillary, arteriovenous and combined malformations by studying the vessel types in the lesions. Interdisciplinary diagnosis and treatment are of real importance in these cases. These vascular lesions can sometimes be subjected to a tendency of spontaneous regression. However, several treatments have been used in the management of these lesions, such as, laser therapy, steroid therapy, embolization, -blockers therapy, sclerosant therapy, surgery or cryosurgery, depends largely on several factors that characterize each case. The choice of treatment depends on multitude factors, such as size, location, and behavior of the lesion, as well as age and systematic condition of the patient. Laser therapy is a mainstay of management of mucosal and skin vascular malformations nowadays with different wavelengths, different irradiation parameters and application procedures. However, it should be noted, that the most commonly used method in all previous studies has been a combination of surgery and sclerotherapy. But surgical treatment is controversial, because of the high risk of bleeding and scar formation. On the other hand, laser treatment can be used as a complement to sclerotherapy, to avoid the disadvantages and risks associated with conventional surgery. The aim of this work is to present a case of an angiomatous epulis in a patient with a congenital hemangioma of the face, treated with sclerotherapy and diode laser, while discussing the different types of lasers and their indications [2-6].

CASE REPORT

A 27-year-old female patient without medical or surgical history, consulted the oral medicine and surgery department of the Monastir dental clinic, for a

bleeding gingival swelling in the anterior maxilla, that has been evolving for 6 months.

The questionnaire showed the absence of tobacco, alcohol or medication consumption, as well as the absence of any notion of pain. Exobuccal examination revealed bluish-red patches on the upper right hemi-lobe, on the right wing of the nose, and on the external angle of the right eye, extending to the temporal region "Figure 1".

Figure 1: Exobuccal photo showing pigmented patches of facial hemangioma

Endobuccal examination showed an erythematous plaque, bluish in some areas, 3 cm long, extending from the mesial face of 12 to the mesial face of 14, covered by an inflammatory mucosa, bleeding on the least contact, distally limited by a nodule, sessile, 1 cm long, of soft consistency, covered by bluish erythematous mucosa, which occupies the papilla between 13 and 14 and extends palatally to occupy the papilla on this side. Dental examination showed no tooth mobility "Figure2a, b".

Figure 2: (a) Endobuccal examination showed an erythematous plaque, bluish in some areas distally limited by an angiomatous epulis (b): Endobuccal examination showed the angiomatous epulis extends palatally

The radiological examination, the panoramic X-ray, showed no abnormal findings. A complete blood count (CBC) and hemostasis test were ordered, and no special changes were reported. Treatment consisted of intra-lesional injection of a sclerosing drug for local injection, which showed a marked improvement in the inflammatory appearance of the lesion "Figure 3a, b", was used to reduce the bleeding before surgical excision of the inflammatory epulis extending between 13 and 14, which was performed using the 980 nm diode laser "Figure 4a, b".

Figure 3: (a) Control after two weeks of the first injection of the sclerotic agent. (b): Control after one month of the first injection of the sclerotic agent

Figure 4: (a) Lesion excision using laser diode. (b): Endobuccal examination after lesion excision

Favorable healing was observed after 8 months and 2 years of recovery "Figure 5a, b".

Figure 5: (a) Lesion control after 8 months. (b): Control of lesion after 2 years with no sign of recurrence

The patient was consulted 2 years later, with a bleeding swelling on the palate. Endobuccal examination revealed a 3 cm long pedicled nodule in the maxillary retro incisor region, 2 months history, soft consistency, covered by an inflammatory mucosa "Figure 6".

Figure 6: Endobuccal examination revealed a pedicled nodule in the maxillary retro incisor region

The treatment was based on intra-lesional injections of a sclerosing drug, with two sessions spaced 15 days. The result was spectacular, with total disappearance of the lesion without the need for surgery or laser ablation “Figure 7”.

Figure 7: Control after two weeks of intralesional injections of the sclerosing agent, with total elimination of the lesion

DISCUSSION

Laser technology is developing rapidly. It is an instrument that enables maximum oral health to be achieved in a minimally invasive way. New lasers with a diverse range of characteristics are available today and are being used in various domains of medicine and dentistry. The search for new equipment and technologies for dental procedures has always been a challenge, especially for the past two decades.

According to several authors, the use of lasers to treat various lesions in the oral cavity is considered one of the greatest technological advances in dentistry. Their absorption, scattering and transmission properties, as well as their ability to vaporize, coagulate and cut tissue, have made lasers useful in the surgical treatment of vascular lesions, particularly of the oral mucosa. While reducing the risk of bleeding, they improve healing and post-operative aesthetics [3, 7].

The diode laser (810-980 nm) is currently the most widely used for surgical excision of proliferating benign and malignant lesions in the oral cavity. This laser is poorly absorbed in water and selectively absorbed by hemoglobin and melanin. As result this laser penetrates deeply in the tissue (4–5 nm) and his light turns into heat when absorbed by hemoglobin, resulting in coagulation deeper than 7–10 nm, in a process designated by "photocoagulation". Diode laser induces photocoagulation of the lesions and consequent healing without adverse events such as intraoperative and postoperative bleeding, recurrences, and scars, which are the main risks associated with the treatment of those malformations, with less operating time, even though it might require more than one session for bigger and deeper vascular lesions. And complete cicatrisation was observed in approximately 2–3 weeks. without forgetting the lower cost, the small size and the ease of use od this laser compared with others. These characteristics make this laser ideal as a non-invasive procedure, and limited the use of general anesthesia and preserve the compliance of pediatric patients. compared with other types of lasers, such as the CO2, A study conducted in 2013, demonstrated that high-intensity diode laser can prevent tissue changes or discoloration, which is usually caused by CO2 lasers. The disadvantage of this technique is the lack of specimen for histopathological report. and it is indicated for small and low-flow venous anomalies and the supericial and interstitial lesions [4, 6, 8].

Regarding the CO2 laser, which can be recommended for vascular lesions, emits energy with a 10.6m wavelength in the infrared zone that is absorbed by the high water content of the oral soft tissues makes this laser one of the most used in oral soft tissue surgery with high precision cut. Concerning photo-vaporization using the CO2 laser, the absorption of photons by the water content of the tumor provokes a sudden local increase in temperature due to Intern. At the end of the surgery, the mucosal layer covering the blood cittern is

totally vaporized, exposing the bottom of the tumor cavity. In a study the aesthetic outcome values obtained with the Er,Cr:YSSG (incision) and CO2 (total photo-vaporization of lesions) lasers were significantly better than those obtained with the diode and the Nd:YAG lasers (transmucosal photo-thermo-coagulation), but that's only for the short term; on the long term, aesthetic results are similar for all types of lasers However, the CO2 laser, coagulates only vessels smaller than 0.5mm diameters. In another study they observed that the CO2 laser was more effective at cutting than coagulation, and because the straight-line open-tube delivery of the CO2 laser beam may not permit good visualization of the lesion, vascular bleeding may be difficult to control. From which this laser takes its indication in the treatment of well-circumscribed and small low-flow vascular malformation [3, 4, 9].

Other types of lasers can be used, such as the Nd:YAG laser (transmucosal photo-thermo-coagulation) consists of targeting the chromophores inside the vascular lesions, essentially hemoglobin. These chromophores absorb the laser's energy and convert it into heat, which is transferred to the vessel wall, causing coagulation and vessel closure and, finally, thrombosis of the blood vessels [9].

Or argon laser, at a wavelength of 514.5 nm, which is well absorbed by the pigmented tissues rich in hemoglobin and melanin absorbed and that it was the most suitable choice of apparatus for the removal of vascular lesions, but because it is not absorbed by water, the presence of saliva complicates its use in the buccal mucous membrane. Another factor against the use of the argon laser in dentistry is its high cost [3].

Laser- based treatments have multiple benefits: on the one hand, it is conservative, without significant hemorrhage, and a reduced necessity of anesthesia, faster healing, disinfection of the surgical wound, more precise cutting, and less postoperative discomfort due to the bio stimulative effect. On the other hand, the procedure has no need for sutures, with a bloodless operative field and a relative facility and speed of execution [4, 5]. Vascular anomaly therapies continue to pose a challenge to oral surgeons. For an effective treatment, the laser must penetrate deep into the target vessel. In addition, the exposure must be long enough to induce sufficient coagulation of these vessels. To correctly treat a lesion with a high blood content, it is necessary to choose a laser emitting at a wavelength that is well absorbed by hemoglobin. In addition, many other parameters, such as pulse duration, spot size and energy density, need to be assessed to ensure correct laser treatment [5]. In agreement with the existing literature, there was a low incidence of post-operative complications of the use of lasers such as edema, bleeding, pain, scarring, and/or infection. Nor were any major complications encountered [10].

Other than laser, various techniques have been used in the treatment of vascular lesions such as intralesional sclerotherapy, consisting of the injection of sclerosing agents (polidocanol, 3% sodium tetradecyl sulfate) to induce inflammation and thrombosis within the malformation and many sclerosing agents have been proposed, each with specific characteristics, indications, and risks. The use of the sclerosis inducing agents at the level of vascular lesions in the oral and maxillofacial field has led to obtaining of some favorable results regarding the reduction in size of these lesions and of the risk of a local relapse. Other authors support sclerotherapy as the gold-standard treatment for VMs because such a technique is minimally invasive and carries a low risk of intraoperative and postoperative bleeding and scarring formation. These results depend however very much on the sclerosis inducing agent used, the duration and mode of administration, and the association with other therapies. Concerning the aesthetic aspect, the latter was assessed by patients as being far better when the laser was used, as opposed to sclerotherapy. some patients who have received sclerotherapy as a treatment suffer from pain, edema, irritation, itching and wound infection, develop necrosis and ulceration of the skin and soft tissues, and some of them experience severe side effects such as anaphylaxis, pulmonary embolism, and cardiovascular collapse. For small lesions, sclerotherapy may be sufficient by intralesional injection of sclerosing agents, such as 95% ethanol, which stimulates fibrosis. In larger lesions, after sclerotherapy, excision surgery is performed, but it is not pleasant to patients because of pain, swelling, and anesthetic injection, that's why we used the laser to remove the lesion in our clinical situation, to avoid the negative effects of surgery [5, 7, 10, 11].

Embolization has also been used to treat vascular lesions. It was useful for occluding the vessels of arteriovenous malformations localized in the maxillofacial region and uses permanent or temporary embolizing agents; embolization is an aid in the management of vascular malformations, particularly those with high flow rates ; however, embolization requires angiography to perform the procedure safely, and adverse effects such as pain, edema, skin and mucous membrane ulceration, neurological damage, anaphylaxis and cardiovascular collapse are common [5, 8, 10].

The decision for invasive treatment (surgery) should be made by an interdisciplinary team and is based on individual symptoms and possible complications of the natural course of the disease. The risks of the invasive procedure have to be weighed against the potential benefits [5].

Other methods are available but are poorly documented and present several drawbacks in the treatment of vascular lesions, for example, corticosteroids have several systemic side effects;

therefore, they should only be exploited in particular cases. Although radiotherapy can ablate the lesion, it causes tissue atrophy, particularly on the skin, and the use of immunosuppressors [5, 11].

In the underlying table, you will find a comparison of the different types of treatment available for hemangiomas “Table 1”.

Table 1: Advantages and inconveniences of hemangioma treatment options

	Advantages	**Inconveniences**
KTP laser		-Lack of comfort during the 24 h after the procedure [2] -Danger of transmural injury if the duration of the laser application is excessive [3] -Bulky and difficult to transport and may have a warm-up period of several minutes and require water cooling and regular maintenance [2]
Sclerotherapy	-Favorable results regarding the reduction in size of lesions and of the risk of a local relapse [11]	-Results depend on the sclerosis inducing agent used, the duration and mode of administration, and the association with other therapies [10] -Aesthetic results are better with laser than with sclerotherapy [10]
Diode laser (Photo thermo coagulation)	-Ability to cut while also performing coagulation and hemostasis and a higher tissue ablation capacity than the KTP laser, with bleeding hemostatic properties equivalent to the KTP laser [2]. -Regression of the hemangioma and vascular malformations in a way similar to the use of Nd:YAG laser [10]. -Small, compact, portable, and relatively quiet [2] - procedure without pain, scarring, hemorrhage and edema [3] -Complete cicatrisation was observed in approximately 2–3 weeks [9]. - Effectiveness and minimal invasiveness of this kind of treatment, which is useful to preserve the compliance of pediatric patients [7].	-Not all of the VMs studied were completely removed after a single procedure [4] -The lack of specimen for histopathological report [3]
Carbon dioxide laser (CO2)	- The quality of the scar after 4 weeks was higher with CO2 lasers [3]. -High precision cut and excellent haemostasis [3].	-Appears to carry a serious risk of injury to deep structures [2]. -More effective at cutting than coagulation. [2] -May not permit good visualization of the lesion, and vascular bleeding may be difficult to control [2].
Nodymium-doped yttrium aluminum garnet (Nd:YAG)	-Provides a bloodless field and complet healing without stenosis or scar formation [2] -Ability to cut while also performing coagulation and hemostasis and a higher tissue ablation capacity than the KTP laser, with bleeding hemostatic properties equivalent to the KTP laser [2]	-Bulky and difficult to transport and may have a warm-up period of several minutes and require water cooling and regular maintenance [2]
Argon laser		-Not absorbed by water, the presence of saliva complicates its use in the buccal mucous membrane [2]. -high cost [2]. -Bulky and difficult to transport and may have a warm-up period of several minutes and require water cooling and regular maintenance [2].
Embolization	-Embolization is an aid in the management of vascular malformations, especially those with high flow [8].	-Embolization requires angiography to perform the procedure safely [7]. -Adverse effects such as pain, edema, skin and mucous ulcerations, neurological damage, anaphylaxis, and cardiovascular collapse are frequent [7].

CONCLUSION

In conclusion, small, low-flow vascular anomalies can easily be treated by CO2 laser excision or diode laser photocoagulation. The laser delivers very efficient results, while guaranteeing patients satisfaction, especially without pain, and postoperative complications such as hemorrhage, infection and extensive scarring.

Informed Consent: Written informed consent was obtained from patient.

Conflict of Interest: The authors declare no conflict of interest

Authors' Contributions:
Abir Charfeddine: Wrote the article.
Afef Slim: Involved in the writing and editing of the article.
Chaima Khalifa, Maroua Garma: Followed up the patient and involved in the writing of the article.
Jamil Selmi: Reviewed the article for important intellectual content.

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