Minimal Invasive Approach for Lips Venous Lake Treatment by 980 nm Diode Laser with Emphasis on the Aesthetic Results. A Clinical Series

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Introduction: A venous lake (VL) is a vascular lesion with common occurrence in many patients, manifested as a dark blue-to-violet compressible papule, caused by dilation of venules. The main reasons for the treatment of VL are aesthetic. The haemorrhaging episodes or impairment of oral normal functions are also under considerations. Treatment of lip VL includes surgical excision, selective photocoagulation, cryotherapy, sclerotherapy and electrodessication. The high-intensity diode laser is an option. The 980 nm diode laser is selectively absorbed by haemoglobin and selectively destroys blood vessels, minimising injury to the surrounding healthy skin.

Aim: The purpose of this study was to evaluate the effectiveness of diode laser in the treatment of VL lesions with the accent on the postoperative defects and aesthetic results.

Methods: 35 patients aged 37 to 71 were included in this study. A 980 nm diode laser was used in noncontact mode, under local anaesthesia in continuous wave (2-3W, for 20-60s). All patients received only one procedure.

Results: Healing process was completed within 2 to 4 weeks after treatment with no scarring. None of the typical adverse effects were observed in the process of healing.

Conclusions: Selective photoagulation is an effective method for treatment of VL. Lower morbidity, minimal patient discomfort and satisfactory functional and aesthetic results are favourable for patients. To optimise the results and to reduce the adverse effects, basic knowledge on lasers and laser-tissue interactions is requisite.
VL is unknown. Bean and Walsh reported that 95% of VL were observed in males at the mean age of 65 years. They suggest that the disproportionately large distribution in males may be related to occupational exposure to the harmful environmental factors. In other two moderate-size studies women comprised the majority of treated patients. This may be related to increased concern among women regarding the cosmetic appearance of VL rather than with true incidence.

Physical examination usually reveals a soft, compressible, purple coloured lesion (slightly elevated), approximately 10 mm in diameter or greater. The lesions usually are well demarcated with a smooth surface, and the compression often causes an emptying of the blood content. Lesions typically are distributed on the sun-exposed surfaces of the face, neck and the ear. Vermillion border of the lower lip is also commonly affected. Sometimes, several lesions are found on the same person, and the surrounding skin reveals actinic damage.

The main reasons for the treatment of VL are aesthetic because they are acquired defects commonly affecting the facial appearance. The haemorrhaging episodes or impairment of oral normal functions are also under considerations. Treatment modalities of lip VL include surgical excision, selective photothermolysis, cryotherapy, sclerotherapy, and electrodessication. Although all of these approaches are economical, multiple treatments may be necessary. Treatment of VL may be complicated by prolonged bleeding, swelling, pain, textural changes in treated areas, and scarring.

Treatment with high-energy lasers is an option. When the proper wavelength is carefully chosen the selective laser photothermolysis can be used. The 810 to 980 nm diode laser beam is selectively absorbed by haemoglobin (the penetration depth vary from 4 to 5 mm) and selectively destroys vascular components (photocoagulation), minimising injury to the surrounding healthy tissue.

High-intensity diode lasers have been increasingly used over the past decades in the treatment of vascular lesions. Accordingly, the purpose of this study was to evaluate the effectiveness of diode laser in the treatment of VL lesions putting the emphasis on the postoperative defects and aesthetic results.

PATIENTS AND METHODS
In this clinical series, a total of 35 patients with VL were managed. Informed consent was obtained before treatment. A 980-nm diode laser (LiteMedics®, Italy) was used in a non-contact mode, under topical or local infiltrative anaesthesia. Irradiation was delivered using a flexible non-activated fiber 300 µm in diameter. The laser tip was held 2 to 3 mm away from the target area, circling around the lesion several times in continuous wave mode (2-3W, for an average irradiation time of 20-60 s deepening on the lesion size). The energy density was 224J/cm² (for 2W and 20 s irradiation time) and 344J/cm² (for 3W and 60 s irradiation time). The endpoint of treatment was blanching and visible shrinkage of the lesion. The patients were instructed to raise a hand if they feel any discomfort during the procedure. All patients reported that they were comfortable during the procedure (Figs 1, 2).

Statistical analysis was performed using SPSS v. 17.0. Descriptive statistics, analyses of proportions, Spearman’s rho correlation coefficient and one-way ANOVA were applied. As a level of significance P<0.05 was accepted. All P-values were two-tailed.

RESULTS
In this study, 28 men and 7 women aged 37 to 71 years were included (mean ± SD 56 ± 9.09) (Fig. 3).

All VL lesions were located on the lips (3 on the upper lip, 26 on the lower lip and 6 on oral commissures) (Table 1). The diagnosis was made on a clinical basis and the vitropression technique. The lesions were from 5 to 15 mm in diameter.

The present study confirmed that the frequency of VL in males is greater than that in women (80% men and 20% women).

All patients received only one procedure. Postoperative pain was minimal in most patients. Only one patient reported scanty bleeding after the secondary trauma of the wound (Table 2).

The healing process was completed within 2 to 4 weeks after treatment with no scarring. In most of the patients (65.6%) this period was 2 weeks. Statistical significance was found using correlation analysis between lesions’ diameter and its postoperative healing period (r = 0.617, P<0.0001) (Table 3). None of the typical adverse effects (significant scars, hyper- or hypopigmentation, atrophy, or wrinkled texture) were observed after complete healing (Figs 3, 4 and 5).
Figure 1. 65-year-old male presented with a lesion, approximately 10 mm in diameter, on the left side of his lower lip (vermillion – mucosa border). The lesion appeared blue in colour and was pronouncedly raised.

Figure 2. The laser tip was held in noncontact mode, circling constantly around the lesion (3W, continuous wave for 20s).

Table 1. Characteristics of VL lesions

| Characteristics                                      | N  | %   |
|------------------------------------------------------|----|-----|
| Possible causes based on medical history             |    |     |
| Post-traumatic                                       | 19 | 54.3|
| Senile                                               | 16 | 45.7|
| Localization on the lips (vermillion and vermillion - mucosa border) |    |     |
| upper lip                                            | 3  | 8.6 |
| lower lip                                            | 26 | 74.3|
| left angle                                           | 2  | 5.7 |
| right angle                                          | 4  | 11.4|
| Lesion type                                           |    |     |
| elevated                                             | 20 | 57.1|
| flat                                                 | 15 | 42.9|
| Persisting period (presence of the lesion)           |    |     |
| 1 year                                               | 8  | 22.9|
| more than 1 year                                     | 27 | 77.1|
| VL size (mm)                                         |    |     |
| Range                                                | 5-15|     |
| Mean ± SD                                            | 7.14 ± 2.54 |     |
Figure 3. Patients’ distribution in age groups.

Table 2. Early results after VL laser photothermolysis

| Characteristics                  | N   | %  |
|----------------------------------|-----|----|
| Complications                    |     |    |
| None                             | 32  | 54.3|
| Ulceration                       | 1   | 45.7|
| Healing period                   |     |    |
| 14 days                          | 21  | 65.6|
| 21 days                          | 9   | 28.1|
| 28 days                          | 2   | 6.3 |
| Postoperative results assessed by the patients | | |
| Good                             | 3   | 9.4 |
| Very good                        | 29  | 90.6|
| Subjective patients’ evaluation of the procedure | | |
| Acceptable                       | 13  | 37.1|
| Felt Nothing                     | 22  | 62.9|

*There are missing values because of patients lost to follow-up.

Table 3. Mean VL diameter according to the duration of the postoperative healing period

| Healing period | N  | VL diameter (mm) mean ± SD | F   | P       |
|----------------|----|----------------------------|-----|---------|
| 14 days        | 21 | 6.00 ± 1.18                |     |         |
| 21 days        | 9  | 8.78 ± 2.48                | 23.316 | < 0.0001 |
| 28 days        | 2  | 13.50 ± 2.12               |     |         |

DISCUSSION

Vascular lesion treatment, especially on the face, is based on two major rules: radical elimination and obtaining good functional and aesthetic postoperative results. The main reasons for the treatment of VL are aesthetic considerations or haemorrhaging episodes. It was mentioned that nowadays various therapeutic modalities are available for VL treatment. Laser treatment such as Nd:YAG laser, CO₂ laser, and diode lasers have been found to be safe and effective.

The high-intensity diode laser is preferable for VL treatment because of its deeper penetration compared to the other lasers, and selective absorption
that minimises injury to the surrounding healthy tissue. In addition, the high-intensity diode laser does not generate textural or pigmentary changes, which are commonly seen when using CO₂ lasers.

The cryosurgery, as an alternative treatment for VL, may result in aesthetic scarring or pyogenic granuloma as a complication, mainly in lesions located on the vermilion border of the lips. Electrocautery could also be used (acting by means of coagulation); it may cause severe scarring due to its non-selective interactions with the tissue.

In this clinical series, the diode laser photocoagulation technique was effective in the treatment of VL, requiring only one session. The postoperative problems resulting from this minimally invasive and bloodless technique were limited to minimal discomfort. This therapeutic approach is also practical because the diode lasers are portable and have a significantly lower cost than other high-power lasers.

CONCLUSION

Selective photocoagulation via diode laser is an effective method for treatment of VL. Inpatient care is not required for venous lakes, which are superficial vascular anomalies. Lower morbidity, minimal patient discomfort and satisfactory functional and aesthetic results are favourable for patients. However, clinicians should be careful when using high-intensity diode lasers because they can generate excessive tissue coagulation, leading to severe thermal injury of the surround healthy tissues. Therefore, to optimise the results and to reduce the risks and the adverse effects, basic knowledge of lasers and laser-tissue interactions is requisite.

With continuing advances in the laser technol-
logy and intense pulsed light sources, the clinicians can rely on predictable results with minimal pain, minimal postoperative care, reduced scarring and reduced costs to increase patient satisfaction.

REFERENCES
1. Bean WB, Walsh JR. Venous lakes. AMA Arch Derm 1956;74(5):459-63.
2. Alcalay J, Sandbank M. The ultrastructure of cutaneous venous lakes. Int J Dermatol 1987;26:645-6.
3. Suhonen R, Kuflik EG. Venous lakes treated by liquid nitrogen cryosurgery. Br J Dermatol 1997;137:1018-9.
4. Bu JK, Shi HY, Hu M, Liu HC. Oral venous lakes: a clinicopathologic analysis of 20 cases. Zhonghua Kou Qiang Yi Xue Za Zhi (Ch. J. Dermatol.) 2002;37:33-5.
5. Burt D. Noncontact venous lake treatment using a 980 nm diode laser. J Laser Dent 2008;16(3):126-129.
6. Bekhor PS. Long-pulsed Nd:YAG laser treatment of venous lakes: report of a series of 34 cases. Dermatol Surg 2006;32:1151-4.
7. del Pozo J, Peña C, Garcia Silva J, Goday JJ. Fonseca E. Venous lakes: a report of 32 cases treated by carbon dioxide laser vaporisation. Dermatol Surg 2003;29:308-10.
8. Colver GB. The infrared coagulator in dermatology. Dermatol Clin 1989;7:155-67.
9. Ah-Weng A, Natarajan S, Velangi S, Langtry JA. Venous lakes of the vermilion lip treated by infrared coagulation. Br J Oral Maxillofac Surg 2004;4:251-3.
10. Kuo HW, Yang CH. Venous lake of the lip treated with a sclerosing agent: report of two cases. Dermatol Surg 2003;29:425-8.
11. Niccoli-Filho W, Americo MG, Guimarães-Filho R, Rodrigues NAS. Lip hemangioma removed with CO₂ laser: a case report. Braz J Oral Sci 2002;1:89-91.
12. Azevedo LH, Galletta VC, Eduardo Cde P, Migliari DA. Venous lake of the lips treated using photocoagulation with high-intensity diode laser. Photomed Laser Surg 2010;28(2):263-5.
13. Angiero F, Benedicenti S, Romanos GE, Crippa R. Treatment of hemangioma of the head and neck with diode laser and forced dehydration with induced photocoagulation. Photomed Laser Surg 2008;26:113-8.
14. Mott A. Using an 810-nm diode laser to remove a venous lake. J Laser Dent 2010;18(1):17-8.
15. Ccchi R, Giomi A. Pyogenic granuloma as a complication of cryosurgery for venous lake. Br J Dermatol 1999;140(2):373-4.
Цель: Целью настоящего исследования является оценка эффективности лазерного диода при лечении VL повреждений с обращением внимания на послеоперационные дефекты и эстетические результаты.

Методы: В данном исследовании приняли участие 35 пациентов в возрасте от 37 лет до 71 года. В неконтактном режиме был использован 980 нм лазерный диод, под местным наркозом, с непрерывной волной (2-3W, в течение 10 с). Со всеми пациентами была проведена одна процедура.

Результаты: Процесс восстановления был завершен в течение 2 до 4 недель после лечения, без рубцов. В рамках процесса восстановления не наблюдалось характерные неблагоприятные эффекты.

Заключение: Селективная фотокоагуляция представляет собой эффективный метод лечения VL. Благоприятное воздействие на пациентов оказывается низкая степень болезненности, минимальный дискомфорт и удовлетворяющие функциональные и эстетические результаты. В целях оптимизации результатов и сокращения неблагоприятных последствий обязательным условием являются базовые знания в области лазерной техники и взаимодействия лазера с тканями.