

8. Torrelo A, Baselga E, Nagore E, Zambrano A, Happle R. Delineation of the various shapes and patterns of nevi. *Eur J Dermatol.* 2005;15:439-50.
9. Park YM, Kang H, Cho BK. Plaque-type blue nevus combined with nevus spilus and smooth muscle hyperplasia. *Int J Dermatol.* 1999;38:775-7.
10. Cabanillas González M, Monteagudo B, de las Heras C, Cacharrón JM. Unilateral agminated melanocytic nevi. *Dermatology.* 2009;218:387-8.
11. Monteagudo B, Cabanillas M, Suárez-Amor O, Pérez-Valcárcel J, de la Cruz-Mera A. Lentiginosis unilateral parcial siguiendo las líneas de Blaschko. *Piel.* 2009;24:459-60.

B. Monteagudo,<sup>a,\*</sup> A. Ramírez-Santos,<sup>a</sup> M. Cabanillas,<sup>a</sup> O. Suárez-Amor,<sup>a</sup> and J. Pérez-Valcárcel<sup>b</sup>

<sup>a</sup>*Servicio de Dermatología, Complejo Hospitalario Arquitecto Marcide-Novoa Santos, Ferrol, A Coruña, Spain*

<sup>b</sup>*Servicio de Anatomía Patológica, Complejo Hospitalario Arquitecto Marcide-Novoa Santos, Ferrol, A Coruña, Spain*

\*Corresponding author.

*E-mail address:* benims@hotmail.com (B. Monteagudo).

## Oral Venous Malformation Treated with Pulsed-Dye and Neodymium:Yttrium-Aluminum-Garnet Sequential Laser

### Malformación venosa oral tratada con aplicación secuencial de láser de colorante pulsado y Nd:YAG

*To the Editor:*

Venous malformations are slow-flow vascular malformations present at birth, although they occasionally do not become clinically evident until several years later. They manifest clinically as soft, nonpulsatile masses of blue or violaceous color that compress easily on palpation. Their presence within the mouth is not uncommon and can be associated with bleeding, ulceration, pain, difficulty swallowing, airway obstruction, and facial deformity.<sup>1,2</sup>

The classic approaches to these lesions include sclerotherapy and surgery although this can occasionally result in significant deformity, prolonged pain, skin necrosis, nerve damage, or systemic toxicity. This has led to the use of various lasers—carbon dioxide, argon or diode—sometimes in combination with radiofrequency current<sup>3</sup> and, more recently, alexandrite<sup>2</sup> or long-pulsed Neodymium:Yttrium-Aluminum-Garnet (Nd:YAG) lasers.<sup>4,5</sup> The Nd:YAG laser is considered the treatment of choice for this condition.

We present the case of a 16-year-old man with a soft, compressible bluish tumor on the mucosa of the cheek, lower lip, and half of the tongue on the right side (Figure 1). The patient reported the lesion had been present since birth and had increased progressively in size over the years. Doppler ultrasound confirmed the tumor to be a slow-flow vascular malformation. Sequential treatment with pulsed dye laser (PDL) and Nd:YAG laser (Cynergy with Multiplex<sup>®</sup>, Cynosure, Westford, MA, USA) was recommended in view of the diagnosis of venous malformation, the patient's difficulty swallowing, and the marked deformity.

The patient received 7 sessions of treatment over a 10-month period, using PDL (595 nm wavelength) followed

by Nd:YAG (1064 nm wavelength) with a 1-second delay. The following parameters were employed: 7 mm spot size; 10 ms pulses with a fluence of 10 J/cm<sup>2</sup> with PDL, and 15 ms pulses with a fluence of 70 J/cm<sup>2</sup> with the Nd:YAG laser. Throughout the treatment a pre-cooled airflow skin cooling system (Cryo5<sup>®</sup>, Zimmer Medizinsysteme GmbH, Neu-Ulm, Germany) was used at its highest setting.

Treatment was applied in a slow and progressive manner in order to avoid causing lingual edema that could compromise the airway, and 20 mg to 40 mg of intramuscular methylprednisolone was administered in the initial sessions. Anesthetic infiltration of the lesion with mepivacaine 2% was required prior to laser treatment but in the 2 last sessions no anesthesia was needed. Moderate edema was observed in the treated areas but there was no respiratory compromise and no other significant adverse reactions were seen. Follow-up 8 months after treatment showed a marked reduction in the size of the venous malformation, with complete resolution in some areas (Figures 2 and 3).



**Figure 1** Soft bluish tumor on the mucosa of the right cheek and tongue.



**Figure 2** Marked reduction following laser treatment with resolution of lesion on the mucosa of the cheek.

The sequential application of 595-nm PDL followed by 1064-nm Nd:YAG laser is known to be effective in the treatment of some capillary malformations resistant to conventional treatment with PDL.<sup>6,7</sup> Similarly good outcomes have been reported in the treatment of venous malformations of the thorax, neck, or eyelids.<sup>8,9</sup> The response develops because the sequential application of the 2 lasers reaches structures at different levels of the dermis: PDL penetrates to approximately 1 mm while Nd:YAG laser generally penetrates to a depth of 5 mm or 6 mm. Initial use of PDL reduces the oxyhemoglobin within the red blood cells to methemoglobin, leading to a 3-to-5 fold increase in the level of Nd:YAG absorption. Nd:YAG fluence can thus be reduced, decreasing the associated pain and edema.<sup>8-10</sup> In this way, we are able to reduce considerably the adverse effects associated with the isolated use of the Nd:YAG laser, where the use of higher fluences increases the risk of atrophy or disfigurement from scarring.

Yang et al<sup>5</sup> reported that long-pulse Nd:YAG laser is extremely effective in the treatment of oral venous malformations, with resolution after 1 to 3 sessions. However, this is a more painful procedure and anesthesia was necessary in all cases, with general anesthesia for children. In addition, they reported cases of necrosis, ulceration and atrophy secondary to treatment.



**Figure 3** Marked reduction following laser treatment with almost complete resolution in lingual area.

We consider that sequential use of PDL and Nd:YAG laser is a good alternative treatment for venous malformations due to the good response obtained, the better safety profile, and fewer adverse effects when compared to other lasers. However, further studies are needed in the adjustment of parameters in order to fully optimize effectiveness.

## References

1. Garzón MC, Huang JT, Enjolras O, Frieden IJ. Vascular malformations part I. *J Am Acad Dermatol.* 2007;56:353-70.
2. McGill DJ, Mackay IR. Alexandrite laser treatment in intraoral venous vascular malformations. *Plast Reconstr Surg.* 2007; 119(6):1962-4.
3. Lapidot M, Yaniv E, Ben Amitai D, Raveh E, Kalish E, Waner M, et al. Treatment of facial venous malformations with combined radiofrequency current and 900nm diode laser. *Dermatol Surg.* 2005;3:1308-12.
4. Scherer K, Waner M. Nd:YAG lasers (1064nm) in the treatment of venous malformations of the face and neck: challenges and benefits. *Lasers Med Sci.* 2007;22:119-26.
5. Yang HY, Zheng LW, Yang HJ, Luo J, Li SC, Zwahlen RA. Long-pulsed Nd:YAG laser treatment in vascular lesions of the oral cavity. *J Craniofac Surg.* 2009;20:1214-7.
6. Boixeda P, Calvo M, Bagazgoitia L. Recientes avances en láseres y otras tecnologías. *Actas Dermosifiliogr.* 2008;99:262-8.
7. Boixeda P, Carmona LP, Vano-Galva S, Jaén P, Lanigan SW. Advances in treatment of cutaneous and subcutaneous vascular anomalies by pulsed dual wavelength 595- and 1064-nm application. *Med Laser Appl.* 2008;23:121-6.
8. Pereyra-Rodríguez JJ, Boixeda P, Pérez-Carmona L, Vaño-Galván S. Successful treatment of large venous malformation with dual wavelength 595 and 1064 nm system. *Photodermatol Photoimmunol Photomed.* 2009;25:283-4.
9. Bagazgoitia L, Boixeda P, López-Caballero C, Beà S, Santiago JL, Jaén P. Venous malformation of the eyelid treated with pulsed-dye-1064-nm neodymium yttrium aluminum garnet sequential laser: an effective and safe treatment. *Ophthal Plast Reconstr Surg.* 2008;24:488-90.

10. Randeberg LL, Bonesronning JH, Dalaker M, Nelson JS, Svaasand LO. Methemoglobin formation during laser induced photothermolysis of vascular skin lesions. *Lasers Surg Med.* 2004;34:414-9.

J. Alcántara-González,<sup>a,\*</sup> P. Boixeda,<sup>a</sup>  
V. Fuentelsaz-del Barrio,<sup>b</sup> and R. Jiménez-Bellinca<sup>c</sup>

<sup>a</sup>*Servicio de Dermatología, Hospital Universitario Ramón y Cajal, Madrid, Spain*

<sup>b</sup>*Servicio de Dermatología, Hospital Clínico Lozano Blesa, Zaragoza, Spain*

<sup>c</sup>*Servicio de Cirugía Maxilofacial, Hospital Universitario Ramón y Cajal, Madrid, Spain*

\*Corresponding author.

*E-mail address:* raistlin\_majere\_19@hotmail.com  
(J. Alcántara-González).