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Case Report

HIGH-POWER DIODE LASER IN THE SURGICAL MANAGEMENT OF ORAL LYMPHANGIOMA: A CASE REPORT AND LITERATURE REVIEW

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Purpose: Lymphangiomas are rare benign lymphatic malformations that most commonly affect the head and neck region. Their vascular nature may complicate surgical management because of the risks of bleeding, functional impairment, aesthetic deformity, and recurrence.

Methods: This case report describes the surgical excision of a lingual lymphangioma in a 15-year-old male using a high-power diode laser under local anaesthesia. A brief review of the literature on oral lymphangiomas treated with laser devices is also presented.

Results: Surgical excision was successfully performed under local anaesthesia using a high-power AlGaAs diode laser . At the 18-month follow-up, complete healing was observed, with no evidence of recurrence.

Conclusion: High-power diode laser-assisted surgery proved to be a safe and effective treatment for oral lymphangioma, representing a valuable alternative for lesions located in anatomically sensitive sites such as the tongue.

Keywords: Lymphangioma. Diode laser. High power laser. Oral Pathology. Oral Surgery.

Statement of Clinical Significance:

High-power diode laser excision of oral lymphangioma offers a safe, effective, and minimally invasive alternative to conventional surgery, ensuring complete removal with reduced bleeding, faster healing, and improved patient comfort, particularly valuable in anatomically sensitive sites like the tongue.

Introduction

The majority of vascular anomalies occur in the craniofacial region, where they may present with a wide range of clinical signs and symptoms, including pain, trauma, haemorrhage, rapid growth, disfigurement, functional impairment, and severe respiratory, swallowing, and speech difficulties.[1–3] Lymphangiomas are rare, benign, low-flow lymphatic malformations that may be classified as capillary (simplex), cavernous (macrocystic), or cystic hygromas.[4,5], [6]

Oral lymphangiomas may occur at various intraoral sites but are most frequently found on the anterior two-thirds of the tongue, where they may cause macroglossia. Clinically, the surface typically has a pebbly appearance due to the presence of translucent vesicles resembling either “frog eggs” or “tapioca pudding”. Secondary haemorrhage within the lymphatic spaces may impart a purplish discolouration to the lesion.[7] The diagnosis is generally established through the correlation of the patient's clinical history with physical examination findings.

Although lymphatic malformations are benign, spontaneous regression is uncommon.[2] The management of head and neck lymphangiomas depends on the size, location, and subtype of the lesion. Despite the availability of several therapeutic approaches, recurrence remains a significant challenge, particularly following incomplete treatment.[3] Although cryotherapy[8] and sclerotherapy have been proposed as less invasive alternatives to reduce surgical morbidity, complete surgical excision remains the treatment of choice whenever feasible. However, total resection is often limited by lesion size, infiltration of adjacent vital structures, and the associated risks of infection, bleeding, functional impairment, and postoperative morbidity.[9–11] Furthermore, the infiltrative growth pattern of these lesions and the difficulty in distinguishing abnormal lymphatic tissue from surrounding healthy structures in the head and neck region make complete excision particularly challenging.[2]

Given the technical complexity of surgical treatment, the risk of recurrence following conventional surgery, and the variable outcomes reported with alternative therapies such as cryotherapy and percutaneous sclerotherapy, laser-assisted surgery has emerged as a promising treatment option. Carbon dioxide (CO_2),[10,12–15] neodymium-doped yttrium aluminium garnet (Nd:YAG),[16,17] and diode lasers have all been described for the management of oral vascular lesions. However, evidence regarding the use of high-power diode lasers for the treatment of oral lymphangiomas remains limited to isolated case reports, with no consensus regarding the optimal laser settings, treatment protocols, or long-term outcomes. Therefore, this report describes the successful management of a lingual lymphangioma using a high-power diode laser and includes a review of the literature, highlighting its potential as a safe and effective treatment option for lesions located in anatomically sensitive sites.

Case Report

A 15-year-old male with no relevant medical history presented with unilateral macroglossia caused by a painless swelling on the left dorsum of the tongue, which had been progressively increased in size over an estimated period of 5 years. The patient's chief complaint was both aesthetic and functional, reporting persistent discomfort, but no difficulty with phonation. Intraoral examination revealed a soft, nodular lesion measuring approximately 4 cm in diameter, characterised by numerous compressible translucent vesicles, giving the lesion the classic appearance of "frog eggs" (Figure 1).

Figure 1. Swelling involving the left dorsum of the tongue, exhibiting a characteristic pebbly surface due to multiple translucent vesicles, giving the lesion a typical "frog-egg" appearance, clinically consistent with lymphangioma.

Based on the clinical presentation, the main differential diagnoses were lymphangioma and haemangioma. However, the characteristic clinical features strongly suggested a provisional diagnosis of lymphangioma. For this reason, additional imaging examinations were not considered necessary.

The diagnosis was established following correlation of the clinical history and physical examination findings. Surgical excision was performed under local anaesthesia using an infiltrative technique with 2% mepivacaine containing 1:100,000 epinephrine (1.8 mL). The lesion was excised using a high-power aluminium gallium arsenide (AlGaAs) diode laser (TW Surgical Laser, MMOptics, São Carlos, SP, Brazil) operating at 5,000 mW, with an 808-nm wavelength, delivered through a 400-µm optical fibre in continuous-wave, contact mode. During the procedure, the output power could be adjusted by ±1,000 mW to optimize either tissue vaporisation or haemostasis, according to the surgical requirements (Table 1).

Table 1. Laser parameters.

Type of laser	AlGaAs diode laser
Wavelength	808 nm
Power	5,000 mW ±1,000 mW
Power density (irradiance)	500W/cm^2
Mode	Continuous output power
Optical fiber	400 µm
Area	0.001 cm^2
Number of sessions	one

Surgical margins were defined to ensure complete removal of all clinically visible tissue in both surface extension and depth. The entire procedure was completed in approximately 15 minutes. The excised specimen was submitted for histopathological examination (Figure 2),

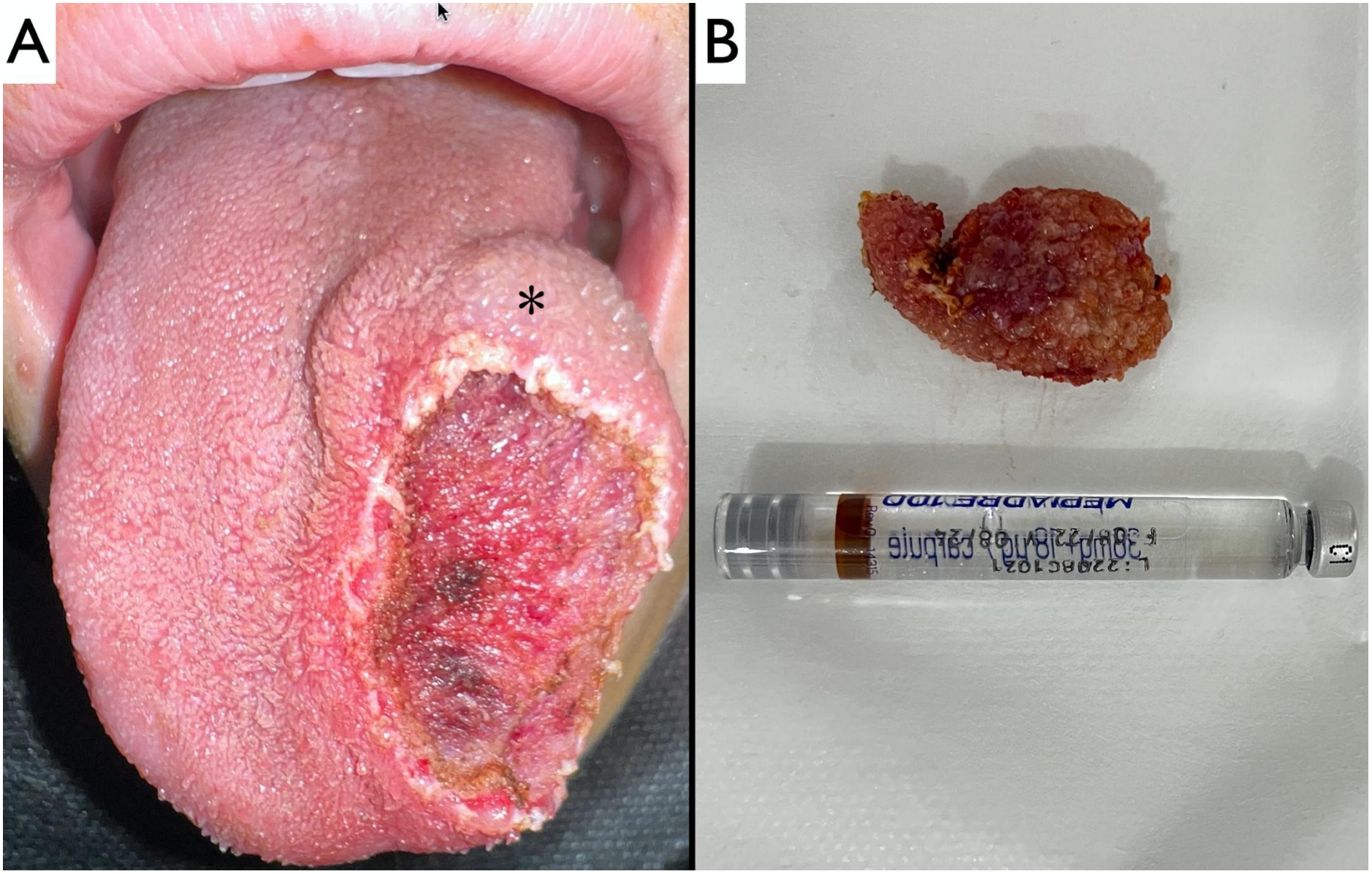
A
B
*

Figure 2. (A) Immediate postoperative appearance following excision with a high-power diode laser. Excellent haemostasis is evident immediately after the procedure. The more posterior swelling (*) corresponds to local anaesthetic infiltration. (B) Macroscopic appearance of the surgical specimen submitted for histopathological examination.

which confirmed the diagnosis of cavernous lymphangioma (Figure 3).

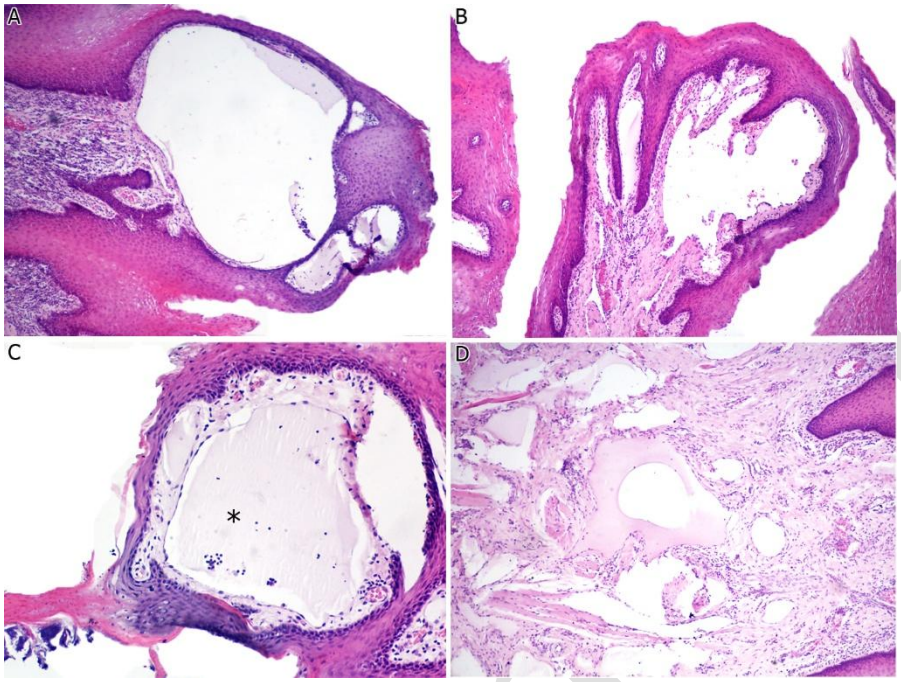

Figure 3. Histopathological findings (haematoxylin and eosin staining). Dilated lymphatic vessels lined by endothelial cells immediately beneath the surface epithelium (A–C), predominantly containing lymph (*, C). Numerous lymphatic vessels extend from the subepithelial region into the deeper connective tissue (D), confirming the diagnosis of cavernous lymphangioma.

Postoperatively, metamizole sodium 500 mg was prescribed every six hours as required for pain control, together with 0.12% chlorhexidine gluconate mouthwash three times daily for 14 days. The patient was also instructed to maintain meticulous tongue hygiene and to gently clean the surgical site using gauze soaked in the same

chlorhexidine solution. A cold liquid or soft diet was recommended for the first three to five postoperative days. At the 7-day follow-up, the surgical site exhibited normal healing, characterised by the presence of a fibrinous membrane, and the patient reported only mild discomfort (Figure 4A).

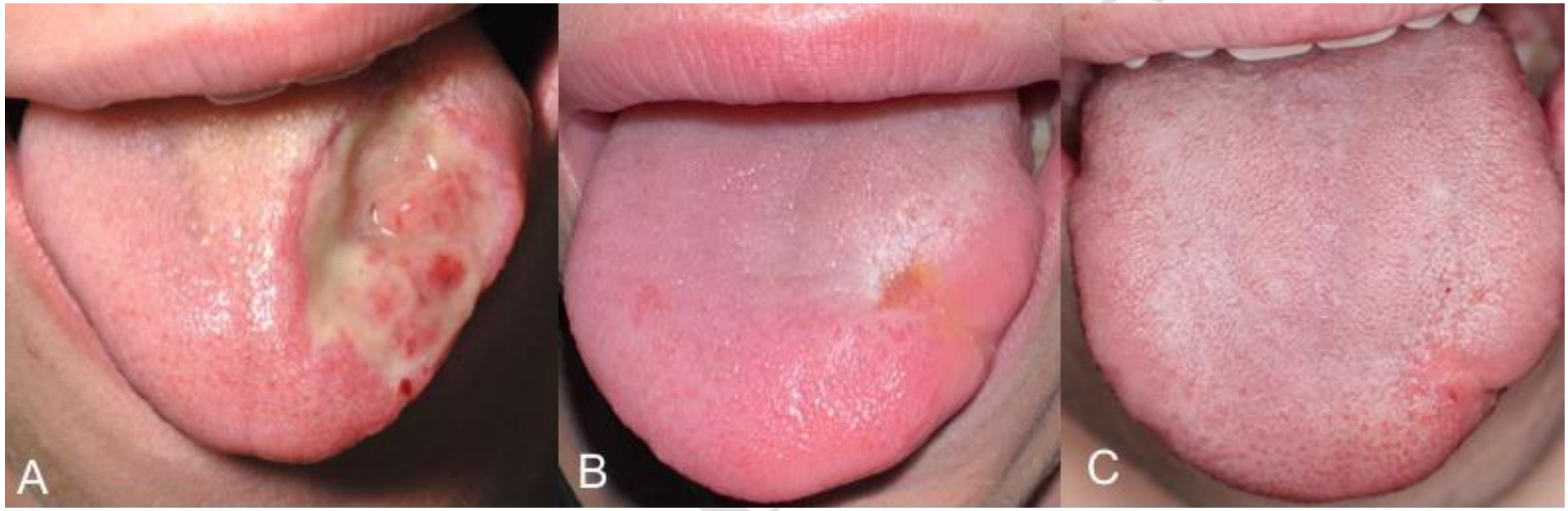

Figure 4. Postoperative follow-up. Clinical appearance of the surgical site at 7 days (A), 30 days (B), and 18 months (C) after surgery, demonstrating progressive healing and the absence of recurrence.

Clinical follow-up at 30 days and 18 months demonstrated complete healing with no evidence of recurrence (Figure 4B and C). Furthermore, the patient reported no alterations in taste, tongue mobility, speech, or other functional impairment.

Clinical Reports of Oral Lymphangiomas Treated with High-Power Lasers

A narrative literature review was conducted to identify published reports of oral lymphangiomas treated with high-power lasers. The search was performed in the PubMed database and complemented by searches in Google Scholar and manual screening of the reference lists of the retrieved articles. Studies published between January 2001 and March 2026 were considered. The search strategy included combinations of the keywords "oral lymphangioma", "lymphatic malformation", "diode laser", "CO_2 laser",

"Nd:YAG laser", and "oral cavity", combined using the Boolean operators AND and OR. Only case reports and case series describing the use of high-power laser devices for the surgical management of oral lymphangiomas were included. Review articles, conference abstracts, letters to the editor, studies involving extraoral lymphangiomas, and reports using non-surgical laser applications were excluded. Data extracted from the eligible studies included patient demographics, lesion location, histological subtype, laser type and parameters, number of treatment sessions, follow-up period, recurrence, and clinical outcomes. A total of eight studies, comprising 25 cases, met the inclusion criteria (Table 2).

Table 2. Cases of oral lymphangiomas treated with high-power lasers.

Authors (year)	n	Gender, age	Location	Microscopic type	Laser	Parameters	Sessions (n)	Follow-up time (months)	Recurrence
Harashima et al., 2001	1	Woman, 9y	Buccal mucosa	Not reported	Nd:YAG	Exposure of 10 min at an interval of 10 days, 1 W, 10 Hz	5	12	No
Aciole et al., 2010	2	Man, 10y Man, 37y	Upper lip Hard palate	Not reported	CO_2	10,600 nm, 8W/10W, focused mode to excise the lesion and defocused mode to promote better hemostasis	1	12-18	No
Arslan et al., 2011	1	Woman, 63y	Gingiva	Cavernous lymphangioma	CO_2	10,600 nm, 3W, focused mode, continuous wave	1	24	No
Torezan et al., 2013	1	Woman, 18y	Ventral surface of the tongue	Microcystic lymphangioma	CO_2	Fracional, 225mJ, 25W	7 monthly sessions	12	No
Singh et al., 2016	1	Man, 45y	Alveolar ridge	Cavernous lymphangioma	CO_2	10,600 nm, 4W, defocused mode, continuous wave	1	3	No
Nammour et al., 2016	17	9-38 years (±23 years)	Invasive and extensive oral lymphangiomas (location not specified)	Not reported	CO_2	2W, noncontact and defocus mode, power density 0.63 W/cm^2 for irradiation time in the range of 3-5 min, energy density 114.65–191.02 J/cm^2	Several sessions (treated area was 3x3 cm or 4x4 cm per session)	12 months - 20 years	Localized recurrence in three cases

Aires et al., 2020	1	Man, 9y	Dorsum of the tongue	Microcystic lymphangioma	Diode	808 nm, 2-2.5W, continuous output power, 400 µm optical fiber, area of 0.001 cm^2.	2 sessions with interval of 3 months	12	No
Mozafarpoor et al., 2021	1	Woman, 18y	Dorsum of the tongue	Microscopic examination not performed	Nd:YAG	long-pulsed, 5 mm handpiece, 11 J/cm^2 fluency, 30 ms pulse	3 (thirty-day intervals)	12	No
Present case	1	Man, 15y	Dorsum of the tongue	Cavernous lymphangioma	Diode	AlGaAs diode laser, continuous output power, 5W, 400 µm optical fiber, 808 nm, area of 0.001 cm^2.	1	3	No

Discussion

There is currently no universally accepted treatment protocol for oral lymphangiomas.[11] As spontaneous regression is uncommon,[2] management should be tailored according to the lesion's size, location, extent, and associated functional or aesthetic impairment. Small, asymptomatic lesions that do not compromise function or appearance may be managed conservatively through clinical observation.[10,11]

Alternative treatment modalities, including cryotherapy[8] and sclerotherapy with agents such as bleomycin and OK-432, have been described, particularly for macrocystic lymphangiomas.[11] Nevertheless, surgical excision remains the treatment of choice whenever complete removal is feasible. Although effective, conventional surgery carries a risk of recurrence and postoperative complications, including bleeding, infection, tissue defects, and functional impairment.[2,10,11] Reported complication rates following complete excision include tissue defects (3.1%), haemorrhage (1.6%), and infection (2.5%).[2] Furthermore, the poorly defined margins of these lesions and the fragile walls of the lymphatic vessels often make complete excision technically challenging.[2]

The present literature review identified 25 patients reported between 2001 and 2025. Successful treatment of oral lymphangiomas has been described using carbon dioxide (CO_2),[10,12–15] neodymium-doped yttrium aluminium garnet (Nd:YAG),[16,17] and diode lasers.[9] Most lesions were located on the dorsum of the tongue[9,17] or the buccal mucosa,[16] followed by the upper lip and hard palate,[11] the ventral tongue,[14] and the alveolar ridge.[15] In the series reported by Nammour et al.,[10] comprising 17 cases, the anatomical locations were not specified. Surgical treatment was performed under local anaesthesia in all studies except that of Harashima et al.,[16] in which no anaesthesia was administered.

Most reports did not specify the histological subtype of lymphangioma. Among the published cases, two lesions were classified as microcystic and two as cavernous, the latter corresponding to the present case. Although cystic hygromas account for approximately 90% of lymphangiomas occurring in the head and neck region, lesions confined to dense tissues such as the tongue more commonly present as cavernous lymphangiomas.[4] To the best of our knowledge, this is the first reported case describing the surgical excision of an oral cavernous lymphangioma using a high-power diode laser. Across the published reports, the number of treatment sessions ranged from one to seven, with follow-up periods varying from three months to 20 years. Localised recurrence was reported in only three cases.[10]

High-power lasers produce tissue ablation primarily through photothermal interactions, resulting in tissue vaporisation, coagulation, and, when excessive energy is applied, carbonisation. Owing to their high affinity for chromophores such as haemoglobin and melanin, diode lasers provide excellent haemostasis while simultaneously reducing the microbial load within the surgical field, thereby facilitating intraoperative decontamination and promoting favourable wound healing. Furthermore, compared with other surgical laser systems, diode lasers are more compact, cost-effective, and easier to operate, making them an attractive option for soft-tissue surgery.[9, 21]

The active medium of diode lasers consists of a solid-state semiconductor composed of aluminium, gallium, arsenide and, in some devices, indium, producing wavelengths between 810 and 980 nm with high absorption by haemoglobin.[9] Consequently, diode lasers are particularly suitable for soft-tissue surgery, allowing simultaneous excision and coagulation of abnormal blood and lymphatic vessels.[18] Haemostasis is achieved through coagulation of small blood and lymphatic vessels, reducing intraoperative bleeding and frequently eliminating the need for sutures.[9,18] In addition, the thermal effect contributes to microbial reduction within the surgical field, while postoperative discomfort and oedema are often reduced, partly because of the photobiomodulatory effects observed in the surrounding tissues.[18]

Despite these advantages, excessive thermal energy may cause collateral tissue damage and potentially delay wound healing. However, experimental studies comparing laser surgery with electrosurgery have demonstrated superior tissue repair following laser use, while electrosurgical devices may produce thermal injury extending three to five times deeper than that observed with conventional surgical techniques.[19, 20]

To minimize thermal injury, continuous movement of the optical fiber throughout the procedure is essential, avoiding prolonged contact with any single point of the tissue.[9] Furthermore, appropriate adjustment of the laser output according to the surgical objective is critical for balancing cutting efficiency and thermal control. In the present case, no thermal artefacts interfered with the histopathological examination, demonstrating that the selected laser parameters allowed complete excision while preserving tissue architecture for microscopic diagnosis.

In the present case, the indication for surgical treatment was based on persistent local trauma together with the patient's functional and aesthetic concerns. Following the clinical diagnosis, complete excision was achieved in a single surgical session using a high-power diode laser. Histopathological examination confirmed the diagnosis of

cavernous lymphangioma. According to Zhou et al.,[2] the diagnosis of lymphangioma can often be established based on the clinical history and characteristic clinical presentation, as observed in this patient.

Complete removal of all clinically visible tissue was achieved by defining surgical margins according to both the surface extension and depth of the lesion. Zhou et al.[2] recommend extending the treatment margin approximately 2 mm beyond the clinically apparent lesion to minimize the risk of recurrence, with the depth determined by the vertical extent of the malformation. During the 18-month follow-up period, no evidence of recurrence was observed. The patient also reported no alterations in taste, tongue mobility, or speech, and demonstrated excellent adherence to the postoperative care instructions, contributing to an uncomplicated healing process.

Although diode lasers require specialised training and represent a greater initial financial investment than conventional surgical instruments, they offer important clinical advantages, including excellent haemostasis, a clear surgical field, reduced postoperative morbidity, and favourable functional outcomes. Nevertheless, clinicians should be aware of the possibility of postoperative fibrosis and discuss the potential aesthetic consequences with patients before treatment.[10] In the present case, the patient reported complete satisfaction with both the functional and aesthetic outcomes, with preservation of all tongue functions throughout follow-up.

The main clinical message of this report is that high-power diode laser-assisted surgery represents a feasible and minimally invasive alternative for the management of oral lymphangiomas, particularly in anatomically sensitive sites such as the tongue. In addition to providing excellent haemostasis and favourable postoperative recovery, the technique preserves tissue architecture for histopathological diagnosis. Although further studies are required to establish standardised treatment protocols, this case supports the inclusion of high-power diode lasers among the therapeutic options for oral lymphangiomas.

Conclusion

In the present case, the use of a high-power diode laser enabled complete surgical excision of an oral lymphangioma with a short operative time, minimal intraoperative bleeding, no requirement for suturing, and reduced postoperative medication. Healing was uneventful, with minimal postoperative pain and oedema, and no evidence of recurrence during the follow-up period. Histopathological evaluation was not compromised by the laser procedure, confirming its suitability for diagnostic purposes. Although further studies with larger patient cohorts are required, high-power diode laser-assisted surgery appears to be a safe and effective treatment option for oral lymphangiomas, particularly in anatomically sensitive sites, offering favourable surgical, functional, and postoperative outcomes.

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AUTHORS' CONTRIBUTIONS

E.S.T: Conceptualization; investigation; writing original draft; writing review and editing; visualization; validation; methodology; software; formal analysis; project administration; resources; supervision; data curation. A.R.C.M: Conceptualization; investigation; writing original draft; writing review and editing; visualization; validation; methodology; software; formal analysis; project administration; resources; supervision; data curation. F.V.M: Conceptualization; investigation; writing original draft; writing review and editing; visualization; validation; methodology; software; formal analysis; project administration; resources; supervision; data curation. T.C.S: Conceptualization; investigation; writing original draft; writing review and editing; visualization; validation; methodology; software; formal analysis; project administration; resources; supervision; data curation. H.A.S: Conceptualization; investigation; writing original draft; writing review and editing; visualization; validation; methodology; software; formal analysis; project administration; resources; supervision; data curation. C.L.C: Conceptualization; investigation; writing original draft; writing review and editing; visualization; validation; methodology; software; formal analysis; project administration; resources; supervision; data curation

CONFLICT OF INTEREST STATEMENT

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Competing interests: The authors declare that they have no conflict of interest.

Ethics approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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