

IMPACTED INFERIOR WISDOM TEETH EXTRACTION: HISTOMORPHOLOGICAL DIFFERENCES BETWEEN OSTEOTOMY PERFORMED WITH SURGICAL BUR AND ER:YAG LASER

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Aim: compare the histomorphological characteristics of osteotomy performed using a surgical bur and Er:YAG laser in QSP mode on an animal model (*ex vivo*).

Methods: six bone tissue samples (2 x 2 mm) were analyzed using 3D microscopy, a profilometer, histology and an infrared thermometer. The samples were taken from the posterior vestibular side of a pig mandible – three obtained using a Lindemann surgical bur at 40,000 rpm and three using an Er:YAG laser in QSP mode (energy: 330 mJ, frequency: 15 Hz, power: 4.95 W).

Results: the 3D microscopy image of the cut surface revealed that the profile peaks on the bone surface cut with the surgical bur were higher than those obtained with the Er:YAG laser

(49.76 μm vs 33.03 μm , respectively). Profilometer analysis showed that the differences (Δ) between the maximum and minimum peaks along the X and Y axes of the bone surface were greater for the surgical bur ($\Delta\text{Zx bur} = -660 \mu\text{m}$, $\Delta\text{Zy bur} = -290 \mu\text{m}$) compared to the Er:YAG laser ($\Delta\text{Zx Er:YAG laser} = -92 \mu\text{m}$, $\Delta\text{Zy Er:YAG laser} = -49 \mu\text{m}$).

Conclusions: the results suggest that the Er:YAG laser is less traumatic than the surgical bur. It is expected that the osteotomy performed with the Er:YAG laser will have a better post-operative course as the absence of debris on the bone surface results in increased inflammatory cells, revascularization, and proliferation of fibroblasts and osteoblasts during the healing phase, all of which lead to the formation of osteoid tissue.

USE OF DYE LASER IN THE MANAGEMENT OF TONGUE ARTERIOVENOUS MALFORMATION: A 40-MONTH FOLLOW-UP CASE REPORT

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Aim: to evaluate the effectiveness of dye laser therapy as a minimally invasive alternative to surgical excision in the treatment of arteriovenous malformations (AVMs) of the tongue.

Methods: a 53-year-old healthy male presented with a large bluish-red nodular lesion on the left lateral border of the tongue, covered by intact mucosa. The lesion exhibited firm-elastic consistency and was asymptomatic on palpation. Imaging investigations revealed a well-defined capsulated lesion consistent with AVM. The patient underwent two sessions of rhodamine dye laser treatment with the following parameters: fluence of 12 J/cm², 6 mm

spot size, single pulse emission with repetition up to 1.0 Hz, and a pulse duration of 3.0 ms. Follow-up evaluations were performed at 12, 24, 36, and 40 months.

Results: at the 40-month follow-up, a significant reduction in lesion size was observed, along with improved vascular organization. The lesion was no longer clinically detectable.

Conclusions: although limited by the nature of a single case report, dye laser therapy appears to be a promising, less invasive treatment option for AVMs, offering favorable long-term outcomes.

PHOTOBIOMODULATION THERAPY IN THE MANAGEMENT OF HZV-RELATED ORAL LESIONS IN RAMSAY HUNT SYNDROME: A CASE REPORT

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Aim: this report describes a case of Ramsay Hunt Syndrome with oral involvement, highlighting the adjunctive role of photobiomodulation (PBM).

Methods: a 46-year-old male, heavy smoker, on atorvastatin and paroxetine, presented with left-sided facial nerve palsy (House-Brackmann grade IV), ipsilateral hypoacusis, and herpetiform vesicles on the left hemipalate not crossing the midline. Panoramic radiography was performed to exclude other local pathologies. Blood tests and serology supported Varicella-Zoster Virus (VZV) reactivation, with elevated anti-VZV IgG titers. The patient received Valaciclovir 1 g 3 times daily, systemic corticosteroids, and topical oral treatment with a hyaluronic acid-based gel. PBM was performed using a 635 nm diode laser, 100 mW, CW (100% duty cycle), 4 J/cm², 20 s per point (8 mm applicator). The treat-

ment was applied in 4 sessions over 2 weeks.

Results: after 10 days, facial nerve function progressively improved to House-Brackmann grade II, with complete recovery after physiotherapy. In contrast, the palatal lesion showed slower resolution. After PBM, lesion regression and symptom improvement were observed at 2-month follow-up.

Conclusions: antiviral and corticosteroid therapy were effective in facial nerve recovery, whereas the persistence of the oral lesion likely reflects residual damage and neurogenic inflammation rather than ongoing viral replication. In this context, PBM may have promoted healing by modulating inflammation, reducing pain, and enhancing epithelial repair, supporting its use as an adjunctive treatment in delayed mucosal recovery.

CROSS LINKED HYALURONIC ACID, PORCINE PERICARDIUM MEMBRANE AND ND:YAG LASER SURGERY IN MANAGEMENT OF EARLY CANCER OF THE TONGUE. A CASE SERIES

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Introduction: oral cancer is the sixth most common cancer worldwide, with about 389,846 new cases annually and a mortality rate of about 1.9%. Oral squamous cell carcinoma (OSCC) represents 90% of oral malignancies, with the tongue being the most affected site. Treatment depends on tumor stage, but surgical excision with free margins remains the mainstay of therapy. The extent of glossectomy was first standardized by Ansarin *et al.* in 2019, defining 5 types of resections, from superficial mucosal excision to total removal of the mobile tongue.

Methods: the case series includes 5 patients with early-stage tongue OSCC. Biopsy confirmed in situ or microinvasive cancer without nodal or distant metastases. All patients underwent surgery in an outpatient setting and under local anesthesia: lesions were excised using an Nd:YAG laser, with 1 cm free

margins. A cross-linked hyaluronic acid gel was then applied to the surgical wound bed and covered with a resorbable membrane. No adjuvant therapy was required.

Results: outcomes were assessed at 7 days, 3 weeks, and 2 months post-surgery. At 1 week, all surgical wounds were covered by fibrin, without signs of inflammation. At 3 weeks, almost complete re-epithelialization was observed. Complete healing was achieved on average after 2 months, with preserved function and no late complications.

Conclusions: the proposed reconstructive technique represents a minimally invasive approach for tongue defects following early-stage OSCC excision, avoiding donor-site morbidity and allowing outpatient management. Preliminary observations suggest that it promotes rapid healing with favorable functional outcomes.

FIBROBLAST PROLIFERATION INDUCED BY NANOPULSED ND:YAG LASER: AN *IN VITRO* STUDY

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Aim: the nanopulsed Nd:YAG laser (nano-YAG, 1064 nm) is characterized by pulses lasting 4 μ s, achieving very high-power levels. This allows the thermal effect to be contained, reducing energy loss and maximizing clinical efficacy. These features are combined with the intrinsic ability of the Nd:YAG laser to penetrate deep into tissues, extending up to 10 mm from the application point. This study presents preliminary results on the effects of this laser on the viability and migration of human gingival fibroblasts (HGFs).

Methods: laser output was preliminarily measured using a power meter, showing an average loss of 14.7%, which was considered for all settings. The subsequent experiments involved the photobiomodulation of HGF cells cultured in low-glucose DMEM supplemented with 10% FBS, using a 0.8

cm diameter handpiece, with different combinations of power and irradiation time tested. Cell viability and migration were assessed using the MTT and wound healing assays.

Results: at 48h, the MTT assay showed increased cell viability in laser-treated HGFs compared to controls, particularly at 0.3 W for 180 s (62% vs 57%). Consistently, wound healing assay demonstrated a significantly faster gap closure at 48 h in irradiated cells compared to controls (81.84% vs 86.46%).

Conclusions: photobiomodulation using a nano-YAG enhances HGF viability and migration *in vitro* settings, suggesting a potential role in promoting soft tissue healing. Despite the positive results reported, further studies are needed to validate these findings.

LASER ACUPUNCTURE AS A THERAPEUTIC APPROACH FOR MYOFASCIAL PAIN IN TEMPOROMANDIBULAR DISORDERS

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Aim: this systematic review and meta-analysis evaluated the efficacy of conventional acupuncture and laser acupuncture in reducing pain related to temporomandibular disorders (TMD).

Methods: a systematic search was performed to identify randomized controlled trials comparing conventional acupuncture or laser acupuncture with other therapeutic approaches for TMD management. PubMed, EMBASE, and Scopus were searched up to July 2023. Methodological quality was assessed using the Cochrane Risk of Bias 2 (RoB 2) tool. A meta-analysis was then conducted to quantitatively synthesize the evidence.

Results: eleven studies met the inclusion criteria. Overall,

acupuncture was effective in providing short-term pain relief in patients with TMD-related muscle pain. Meta-analysis showed that both conventional and laser acupuncture were significantly more effective than placebo. Laser acupuncture appeared to provide more consistent symptom improvement across studies.

Conclusions: acupuncture may be a useful option for reducing pain in patients with TMD, although the overall strength of evidence remains limited. Among the evaluated approaches, laser acupuncture showed more favorable and consistent outcomes, suggesting that it may be a promising non-invasive treatment.

HISTOLOGICAL CHARACTERIZATION AND QUANTIFICATION OF THE MICROCIRCULATION IN LASER-ASSISTED BIOPSIES

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Aim: laser biopsies are a minimally invasive procedure, but the potential for thermal damage raises concerns about the quality of histological assessment of microcirculation. This study assesses these effects in a standardized manner.

Methods: thirty formalin-fixed, paraffin-embedded biopsies were analyzed. The microcirculation was studied with immunohistochemistry (CD31, MCT1, ephrinB2, α -SMA, NG2). Microvascular density was assessed using the Chalkley method on hot spots, excluding areas with thermal artifacts (>0.5 mm from the margins). 3D architecture was reconstructed from serial CD31+ sections, using automated analysis (AngioTool).

Results: the analysis showed MVD of 118 ± 26 vessels/mm²,

Chalkley count of 6.1 ± 1.2 , with 2.9 ± 0.7 hot spots/sample. The CD31+ vascular area was $3.8 \pm 1.3\%$. The phenotypic distribution showed arterioles (EphrinB2+) $42 \pm 8\%$ and venules (MCT1+) $48 \pm 9\%$. The vessels were mature, with pericyte coverage (NG2+) $68 \pm 11\%$ and α -SMA+ $55 \pm 10\%$.

Conclusions: the multiparametric approach allows for reliable assessment of the microcirculation in laser biopsies. Thermal damage, although present, is limited and does not significantly compromise the analysis if marginal areas are excluded. Overall, the laser proves to be a usable and safe instrument, capable of providing adequate samples for both diagnostics and research, especially when combined with standardized protocols.

PHOTOBIOMODULATION IN HYPOSALIVATION MANAGEMENT: A PRELIMINARY RANDOMIZED CONTROLLED CLINICAL TRIAL

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Aim: hyposalivation is an objective reduction of salivary flow, commonly caused by medications, head and neck radiotherapy and Sjögren's syndrome. Basal flow falls below 0.1 ml/min and stimulated flow is below 0.5 ml/min. It may cause taste loss, pain, burning sensations, dysphagia and dysphonia. Photobiomodulation therapy (PBMT) promotes tissue repair, reduces inflammation and relieves pain. This study aims to evaluate PBMT efficacy in stimulating salivary flow in patients with real hyposalivation.

Methods: 22 patients with real hyposalivation were enrolled using sialometry and the Real Hyposalivation Survey. Sample size was set at 40 patients. Patients were divided into two groups and received 4 lasers applications once a week. The trial group was treated with a 980nm diode laser for 3 minutes per spot across 10 spots, while controls received placebo.

Pain and discomfort were assessed at each session using VAS and NRS scales. Basal and stimulated salivary flow were measured by spitting method. Capillaroscopy was performed before and after the sessions. AngioTool was used to assess angiogenesis through vessel length, density, branching index and lacunarity.

Results: a positive trend in increased salivary flow and reduced discomfort was observed, although no statistically significant differences between groups emerged. AngioTool analysis showed increased capillary branching and diameter, suggesting neoangiogenesis. PBMT effects were maintained at 1-year follow-up.

Conclusions: PBMT shows potential benefits in managing hyposalivation. Further studies are needed to standardize laser parameters and confirm these results.

LASER-ASSISTED BIOPSIES AND HISTOPATHOLOGY

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Aim: evaluate the efficacy and safety of combining 645 nm photobiomodulation with a 980 nm diode laser in oral excisional biopsies, with particular focus on early clinical outcomes and histopathological sample quality.

Methods: twenty-four patients were randomized into two groups: combined laser (980 + 645 nm) and control (980 nm). Evaluations were performed at baseline (T-1), immediately post-surgery (T0), and at 1 (T1), 2 (T2), and 4 weeks (T3). Clinical endpoints included postoperative pain (VAS, VRS, SF-MPQ), intraoperative bleeding (VIBe), tissue healing (EHS, PHI), and patient satisfaction. Excised samples underwent standardized histopathological analysis of surgical margins. Statistical analysis was conducted using non-parametric tests (Kolmogorov-Smirnov, Mann-Whitney, Friedman with Dunn's post-hoc), with significance set at $p < 0.05$.

Results: the combined laser group showed a statistically sig-

nificant improvement in early healing (EHS, PHI) at T1 compared to controls ($p < 0.05$), suggesting a synergistic photobiomodulation effect. Postoperative pain was also significantly reduced in the early phase, with no differences at later follow-ups. Histopathological analysis revealed no differences between groups in thermal damage, carbonization, necrosis, epithelial alterations, or cellular parameters such as intraepithelial adhesion loss, nuclear pyknosis, and hyperchromatism. The extent of peri-incisional damage was comparable.

Conclusions: the addition of 645 nm photobiomodulation to a 980 nm diode laser significantly improves early healing and pain control without compromising histopathological quality. This approach appears safe and effective in laser-assisted oral surgery. Further multicenter studies with larger samples are needed to confirm these findings and support their inclusion in clinical guidelines.

EFFECT OF PHOTOBIO-MODULATION ON POST-SURGICAL PAIN FOLLOWING EXPOSURE OF IMPACTED MAXILLARY CANINES: A CLINICAL STUDY

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Aim: this clinical study aims to evaluate the effect of photobiomodulation (PBM) on postoperative pain after surgical exposure of palatally impacted canines.

Methods: 25 patients (17 females, 8 males) were assigned to 4 groups based on surgical technique and PBM: diode laser only (A), scalpel only (B), diode laser + PBM (C), and scalpel + PBM (D). Only patients requiring surgical exposure without systemic conditions were included. PBM was administered as a single 15-minute session using a diode laser (910 nm wavelength, 30 Hz), delivering a total energy of 180 J distributed across both canines immediately after surgery. Pain was recorded daily for 7 days using a Visual Analogue Scale (VAS) diary, including analgesic intake. Mean VAS over 7 days was compared among groups using the Kruskal-Wallis test ($p < 0.05$).

Results: PBM-treated patients (groups C and D) showed a more regular and consistent reduction in pain, while greater variability was observed in the scalpel-only group. Analgesic use was descriptively lower in PBM groups, particularly in the early postoperative phase. No statistically significant differences were found ($p = 0.115$), although a trend toward lower pain levels was observed in PBM-treated patients.

Conclusions: PBM appears to improve the consistency of postoperative pain control and was associated with a more stable course and reduced early analgesic intake. Although no statistically significant differences were detected, the observed trends suggest a potential clinically relevant effect that warrants further investigation in larger, adequately powered studies.

ER:YAG LASER IN QSP MODALITY *VERSUS* TRADITIONAL SANDBLASTING IN ADHESIVE CEMENTATION: A RETROSPECTIVE STUDY OF 187 POSTERIOR INDIRECT RESTORATIONS

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Aim: adhesive indirect restorations are increasingly common in clinical practice. Effective surface cleaning and microporosity enhancement prior to etching is critical. The aim of this study was a retrospective analysis of indirect adhesive restorations in which the build-up was prepared using either a conventional sandblaster with aluminium oxide powder or an Er:YAG laser in QSP mode.

Methods: a total of 187 indirect posterior adhesive restorations were cemented using two different conditioning techniques: in 96 cases (51.34%) conditioning was performed using an intraoral sandblaster with aluminium oxide (Microetcher CD, Kavo, Biberach, Germany); in 91 cases (48.66%) conditioning was achieved using Er:YAG laser (Fotona LighWalker®, Ljubljana, Slovenia) in QSP mode (1 W, 10 Hz, 100 mJ). The

clinical efficacy of the two techniques was evaluated and compared, assessing the occurrence of complications such as debonding, fracture, secondary leakage, and hypersensitivity over time. The mean follow-up was 30 months.

Results: among the two techniques compared, postoperative hypersensitivity was the only complication that reached statistical significance: 6% in the sandblasting group and 1% in the laser group ($p = 0.064$). The Kaplan-Meier curves of the two conditioning techniques showed comparable survival over time (Log-rank test $\chi^2 = 2.4864/p = 0.1148$).

Conclusions: Er:YAG laser conditioning of build-up provides excellent outcomes, minimal complications, and lower post-cementation hypersensitivity. This data require confirmation through prospective clinical trials.

LOW-ENERGY ND:YAG LASER PHOTOCOAGULATION FOR THE AESTHETIC MANAGEMENT OF LABIAL VENOUS LAKES: A CLINICAL EVALUATION OF EFFICACY AND PATIENT COMFORT

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Aim: to evaluate the clinical efficacy and patient tolerability of a specific Neodymium-doped Yttrium Aluminum Garnet (Nd:YAG) laser protocol, utilizing a low absolute energy level (4.9 J), for the aesthetic treatment of labial venous lakes (VLs).

Methods: a cohort of 47 patients with 50 labial VLs was treated in a single laser session without local anesthesia. Clinical outcomes were assessed using the Vlachakis criteria for area reduction at 7 and 30 days post-intervention. Patient discomfort was quantified during the procedure and at 24 hours post-treatment using the Numeric Rating Scale (NRS). Long-term stability was monitored over a 2-year follow-up period.

Results: all patients achieved complete clinical resolution within 30 days. Specifically, lesions with a diameter ≤ 6 mm (62.1% of cases) reached total clearance within 7 days ($p < 0.001$). Intraoperative discomfort was minimal (NRS 0–3), with a total absence of pain reported 24 hours after the procedure ($p < 0.001$). No major complications or recurrences were observed during the 2-year follow-up.

Conclusions: the application of a low-energy Nd:YAG laser represents an effective, safe, and minimally invasive modality for the management of labial phlebectasias. This approach ensures rapid healing and high patient compliance, making it an optimal choice for aesthetic vascular correction.

LASER VAPORIZATION OF ORAL LEUKOPLAKIA: A RETROSPECTIVE STUDY OF 60 PATIENTS

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Aim: to evaluate the efficacy of laser vaporization in the management of oral leukoplakia (OL) and proliferative verrucous leukoplakia (PVL) at 3- and 6-month follow-up, and to identify clinical and histological factors associated with therapeutic success.

Methods: a retrospective study was conducted on 60 patients with mean age of 63.98 years (32 females and 28 males), including 32 cases of OL and 28 of PVL. Clinical outcomes were assessed at 3 and 6 months and categorized as complete healing, partial recurrence or complete recurrence. Collected data included patient characteristics such as general anamnestic information, comorbidities, smoking and alcohol consumption habits, clinical features and the presence or absence of dysplasia. All variables were recorded in an Excel sheet and subsequently analyzed.

Results: at 3 months, 58.3% of patients achieved complete healing, rising to 65% at 6 months. Demographic/clinical variables and dysplasia did not significantly influence recurrence ($p > 0.05$). Notably, the absence of dysplasia was more frequent in OL (75%) than in PVL (39.29%; $p = 0.0055$), highlighting the aggressive nature of PVL. A critical correlation was found: healing at 3-months was highly predictive of stability at 6 months ($p = 0.0001$), while early recurrence indicated a negative prognosis ($p = 0.0002$).

Conclusions: laser vaporization was effective, but recurrences were frequent and independent of baseline variables. The 3-month follow-up was the key diagnostic window for defining prognosis. Due to higher dysplasia rates, PVL requires more stringent follow-up protocols.

HISTOPATHOLOGICAL DIAGNOSIS OF ORAL LICHEN PLANUS: CONVENTIONAL VS LASER-ASSISTED BIOPSY TECHNIQUES

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Aims: laser-assisted biopsy has become increasingly adopted in incisional biopsy. This study aimed to compare conventional scalpel and laser-assisted biopsy techniques in the diagnosis of Oral Lichen Planus (OLP).

Methods: all patients presenting with clinically suspected OLP underwent incisional biopsy under local anaesthesia. Biopsies were performed using two different approaches: conventional scalpel technique or Diode laser-assisted excision (c.w., 2-4 W). Microscopic assessment focused on epithelial integrity, preservation of the keratin layer, degeneration of the basal cell layer and maintenance of the epithelial-connective tissue interface. Stromal analysis included evaluation of the readability of the juxta epithelial band-like lymphocytic infiltrate and carbonization artifacts. All patients were enrolled in a clinical follow-up.

Results: 25 patients underwent incisional biopsy. Scalpel specimens (15) showed excellent preservation of tissue architecture, allowing clear diagnosis of OLP. In the laser group (10), diagnosis was feasible in most cases, although thermal microscopic alterations were more frequent. Smaller samples (<3 mm) exhibited margin artifacts, occasionally reducing interpretation of key diagnostic criteria.

Conclusions: although scalpel biopsy should still be considered the gold standard, laser-assisted biopsy represents a feasible alternative to conventional biopsy for selected OLP cases, offering clinical advantages in bleeding control and patient comfort. Nevertheless, thermal artifacts remain a relevant limitation, especially with diode devices and under-sized specimens.