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Research Article

Dual Case Report: Laser-Assisted Management of Delayed Complications Following Non-Biodegradable Fillers Using Nd:YAG 1440 nm and Diode 1470 nm Technologies

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Abstract

Introduction: Complications arising from the use of non-biodegradable substances in aesthetic procedures represent an increasing challenge in clinical practice. This paper describes two clinical cases of late-onset inflammatory reactions associated with the injection of permanent substances into the face.

Methods: Patients were treated with optical fiber endolaser using two distinct laser systems: the Nd:YAG 1440 nm (LipoAI DEKA) and the SmartFiber LMG diode laser (1470 nm, 400-micronfiber). Both cases were monitored through clinical photography and ultrasound imaging (pre-, intra-, and post-treatment).

Results: Imaging exams demonstrated significant improvement in tissue architecture, with reduction of encapsulated hyperechoic areas, partial reabsorption of materials, and absence of inflammatory signs. Clinically, edema, asymmetry, and palpebral retraction improved, with satisfactory aesthetic outcomes.

Conclusion: Endolaser with optical fiber proved to be a safe, effective, and minimally invasive therapeutic strategy for managing late complications due to permanent fillers. Combined use of high-resolution imaging and standardized photo documentation reinforces the clinical validity of this technique.

Keywords: Endolaser; Nd:YAG 1440 nm; Diode 1470 nm; SmartFiber LMG; Aesthetic Complications; Permanent Fillers; Granuloma; Facial Ultrasound

Introduction

The use of dermal fillers has grown exponentially in recent years. While hyaluronic acid remains the most common and reversible option, permanent substances such as polymethylmethacrylate (PMMA), silicone oil, and unregulated fat grafts are still used— particularly by non-medical professionals. These non-biodegradable materials exhibit high tissue persistence and are often associated with late complications including fibrosis, granulomas, nodules, and infections.

It is estimated that up to 60% of late-onset aesthetic complications stem from permanent fillers, despite representing less than 10% of injected materials. Managing these complications is complex, traditionally involving surgery, infiltrations, or partial dissolution attempts. In this context, Nd:YAG 1440 nm laser

emerges as a novel technology with high lipid affinity and selective liquefaction of infiltrated material.

Another emerging modality is the diode laser (1470 nm), which also employs optical fiber to deliver precise thermal energy. Both systems rely on selective photothermolysis with high lipid affinity, but the diode laser has a higher water absorption coefficient than Nd:YAG, influencing thermal profile and penetration depth. In some clinical scenarios—such as previous surgical history or coexisting biomaterials—the choice of wavelength may be individualized.

Minimally invasive energy-based interventions, particularly laser-assisted modalities, have shown promise for managing such complications. This dual-case report aims to compare two distinct laser platforms—Nd:YAG 1440 nm and Diode 1470 nm—in the management of chronic filler-related nodules and fibrosis. The hypothesis is that tailored laser wavelength selection and fiber characteristics influence clinical outcomes in treating non-biodegradable filler complications, particularly in fibrotic periorbital regions.

Case Report 1

A 59-year-old female patient presented in April 2024 with persistent induration, erythema, and edema in the periorbital region. She had undergone filler injections performed by a dental surgeon using 'Chantelle' and 'Skin booster Intense Optimus Pharma' in December 2023, seeking to reduce dark circles. Prior therapeutic attempts with hyaluronidase, red laser, and ozone therapy were unsuccessful. An endolaser procedure using a Nd:YAG 1440 nm device (LipoAI DEKA) was indicated.

Pre-treatment ultrasound revealed multiple bilateral hypoechoic areas with encapsulated oily material, compatible with silicone oil, located in the subcutaneous tissue. The treatment involved the use of a Nd:YAG 1440 nm SmartLipo laser (Deka®) with a 600-micron fiber. A tumescent anesthetic technique was applied, followed by subdermal and periorbital treatment using a total of 300 J in the right eye and 390 J in the left. No aspiration was performed. Manual drainage was used post-laser. Taping was applied for 3 days. After 45 days, follow-up ultrasound showed significant reduction of hypoechoic areas, improved tissue echogenicity, and absence of active inflammation. The patient demonstrated functional and aesthetic improvement, confirmed by standardized clinical photography.

Case Report 2

A 51-year-old female patient with a history of multiple facial interventions—including blepharoplasty, fat grafting, and PMMA injections—presented with chronic edema, persistent discharge, and infrapalpebral scar retraction. MRI revealed inflammatory changes and residual filler in the infraorbital region. Ultrasound with Doppler confirmed active inflammation and partial encapsulation of the material.

Following failure of drainage, antibiotics, and conventional surgery, the patient underwent treatment utilizing a Diode 1470 nm laser (Smartfiber LMG) with a 400-micron fiber.

Energy was delivered in continuous mode at 2.5W, with 75 J applied to the subcutaneous plane and 75 J to the dermis. No aspiration or additional medications were used.

Clinical photographs showed progressive improvement at 45 days post-procedure, with partial resorption of inflammatory content, reduction in fibrosis, and normalization of eyelid contour. Post-treatment ultrasound revealed reduced thickness of deep planes, improved echogenicity, and absence of inflammation. MRI imaging showed heterogeneous residual material with perilesional fibrosis.

Comparative analysis of laser systems

Parameter	Nd:YAG 1440 nm (Case 1)	Diode 1470 nm (Case 2)	Clinical Implication
Wavelength	1440 nm	1470 nm	Tissue-specific absorption profile
Fiber Size	600 microns	400 microns	Precision of tissue ablation
Absorption Peak	High in fat	High in water and fat	Selective depth targeting
Mode	Pulsed	Continuous	Thermal spread and coagulation
Energy Used	300-390 J	150 J total	Tailored dosing by case severity
Target Plane	Subcutaneous/periorbital	Dermis + SC	Depth-specific application

Table

Clinical outcomes and retrospective GAIS assessment

Both patients experienced a marked improvement in tissue irregularity, fibrosis, and visible nodule formation post-procedure. At three-month follow-up, results were stable with no recurrence or adverse events. The Global Aesthetic Improvement Scale (GAIS) was retrospectively applied based on photographic documentation and physician assessment:

- Case 1 (Nd:YAG 1440 nm): GAIS Score = +2 (Much Improved)
- Case 2 (Diode 1470 nm): GAIS Score = +2 (Much Improved)

Both treatments resulted in clinically significant improvements in surface texture and volume normalization.

Discussion

Managing complications arising from non-biodegradable fillers remains one of the greatest challenges in aesthetic medicine. Substances such as PMMA, silicone oil, and unregulated fat grafts have unpredictable behavior, with a high tendency for migration, encapsulation, and chronic inflammatory responses.

Traditional management options—ranging from corticosteroids to surgical excision—often fail to provide satisfactory outcomes or carry high risk of morbidity. Laser-assisted techniques provide a minimally invasive alternative with tissue-selective photothermolysis and minimal downtime. In this context, optical fiber endolaser technology presents itself as a promising alternative. Both the Nd:YAG 1440 nm and the diode 1470 nm lasers have high lipid absorption coefficients, enabling selective photothermolysis and controlled liquefaction of infiltrated tissues. However, there are important distinctions between the two wavelengths. The Nd:YAG 1440 nm has greater tissue penetration and lower water absorption, making it more effective for deeper or denser infiltrates. The 1470 nm diode laser, on the other hand, demonstrates higher water absorption, making it ideal for fibrotic areas and edema, with a safer thermal profile for delicate regions.

Literature supports the efficacy of both systems in dermatologic and reconstructive surgery. Recent publications (post-2020) highlight their role in managing delayed-onset filler complications, particularly in the periorbital and mid-face regions. Subpalpebral applications, while off-label, can be performed safely with ultrasound guidance and strict power controls.

The satisfactory clinical responses observed in both cases reinforce that technology selection should be based not only on the material involved, but also on tissue depth, local vascularity, and prior interventions. Pre-, intra-, and post-treatment ultrasound imaging played a critical role in guiding diagnosis, monitoring therapeutic progress, and assessing safety. Literature supports the efficacy of both technologies, with potential advantages of diode lasers in complex clinical profiles.

This report includes only two clinical cases, which limits the generalizability of findings. No histologic confirmation was obtained. Future studies should include prospective designs, and long-term outcomes beyond three months [1-11].

Figure 1: Frontal view before and after treatment – Case 1.

Figure 2: Frontal upward gaze before and after treatment – Case 1.

Figure 3: Left oblique view before and after treatment – Case 1.

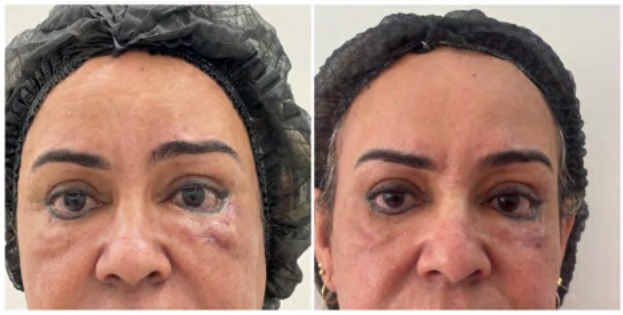

Figure 4: Frontal view before and after treatment – Case 2.

Figure 5: Left oblique view before and after treatment – Case 2.

Figure 6: Right oblique view before and after treatment – Case

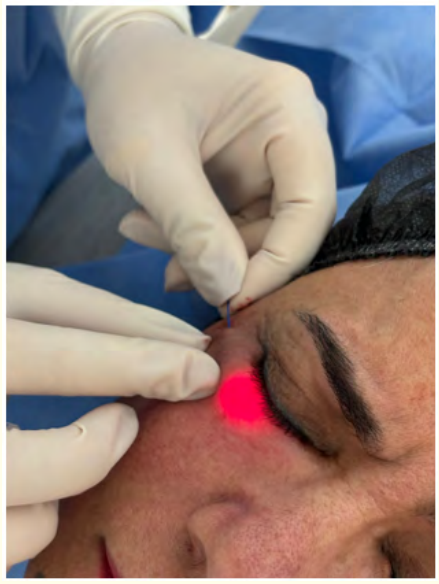

Figure 7: Intraoperative endolaser procedure – Case 2.

Conclusion

Laser-assisted treatment of delayed non-biodegradable filler complications can be optimized through strategic selection of wavelength, delivery mode, and fiber type. Whether via Nd:YAG 1440 nm or diode 1470 nm—the treatment proved to be a safe, effective, and a minimally invasive solution for the treatment of late-onset complications caused by non- biodegradable fillers. Both cases showed sustained clinical improvement, supported by high-resolution imaging and standardized photographic documentation.

The choice between laser platforms should consider the characteristics of the treated tissue: Nd:YAG 1440 nm may be preferable for dense or deep materials, while the diode 1470 nm is particularly useful in superficial fibrosis or previously treated areas. This dual-case comparison illustrates the tailored use of Nd:YAG and Diode technologies based on granulomatous versus fibrotic pathology. Both cases resulted in substantial clinical improvement with no adverse effects. Controlled clinical trials are warranted to validate these findings.

This report was conducted in accordance with the principles of the Declaration of Helsinki. Due to the retrospective and anonymized nature of the cases, IRB approval was not required. Written informed consent was obtained from both patients for the procedure and the publication of images and outcomes.

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