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CASE REPORTS

LASER-ASSISTED SURGERY IN THE TREATMENT OF CHRONIC PERIODONTITIS

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Abstract. Background: *Laser-assisted treatment of pathological processes in the hard and soft periodontal tissues is an innovative approach that offers several advantages compared to traditional methods. Root resorption is a pathological process, in which the degradation of the dental structure is observed, often as a result of trauma, infection, or orthodontic treatment. Our aim is to present a case of total periodontitis, with indications for extraction of the causative tooth, treated with a combined endodontic approach and laser-assisted periapical surgery.* ***Case presentation:*** *A 60-year-old female patient, with total periodontitis of tooth 11, sought help for esthetic correction 5 years ago. During the examination, the following were found: discolored upper right central incisor with a fistula, extensive carious defect involving the cervical tissues, marginal recession, root perforation, and a periapical lesion.* ***Conclusion:*** *Laser-assisted surgery, in combination with precisely executed endodontic treatment, increases the success rate in similar clinical cases and can be considered an appropriate treatment option for clinicians.*

Key words: *periodontitis, laser, endodontic treatment*

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INTRODUCTION

The treatment of diseases affecting the dental pulp and periapical tissues is a fundamental aspect of clinical dental practice [1]. Recent advancements in endodontics have significantly improved the success rates of conservative approaches for managing various types of periodontitis [2, 3, 4]. However, in many cases, surgical interventions remain necessary to ensure effective treatment outcomes [5].

The Er:YAG laser represents a state-of-the-art technology that has found widespread application in modern dentistry, particularly in the management of periodontitis [6, 7, 8]. With a wavelength of 2940 nm, the Er:YAG laser is efficiently absorbed by water and hydroxyapatite, allowing for precise ablation of both hard and soft tissues while minimizing thermal damage to the surrounding structures [9-12].

One of the key advantages of the Er:YAG laser is its ability to effectively eliminate granulation tissue in

periodontal therapy, making it particularly beneficial in the treatment of periapical lesions. Additionally, the laser exhibits bactericidal properties, aiding in the eradication of pathogenic microorganisms within the infected area [13-16].

The primary benefits of the Er:YAG laser include:

- Selective tissue removal: It enables the precise removal of infected tissues while preserving healthy structures, thereby enhancing treatment precision and safety [11, 17, 18].
- Reduced mechanical instrumentation: By minimizing the need for traditional mechanical instruments, laser-assisted therapy reduces procedural trauma and enhances patient comfort [16].
- Improved patient experience: Studies have reported decreased postoperative discomfort and accelerated healing following laser-assisted procedures [4, 19, 20].

Research indicates that the application of the Er:YAG laser in periodontal therapy leads to significant clinical improvement, including reductions in periodontal pocket depth and enhanced epithelial attachment levels [21, 22, 23]. These findings underscore the potential of laser technology as an effective adjunct in the comprehensive management of periodontitis (Table 1).

Table 1. Comparison of Laser-Assisted Surgery with Traditional Periodontal Surgery

Feature	Laser-Assisted Surgery	Traditional Surgery
Invasiveness	Minimally invasive	More invasive
Pain & Discomfort	Reduced	Higher
Hemorrhage	Minimal	More significant
Healing Time	Faster	Longer
Bacterial Reduction	High	Moderate
Need for Sutures	Rarely required	Often required

The aim of this study is to present a clinical case of total periodontitis, initially indicated for tooth extraction, which was managed through a combination of endodontic treatment and laser-assisted periapical surgery.

CASE PRESENTATION

A 60-year-old female patient with total periodontitis affecting tooth 11 sought dental care for an esthetic correction five years prior. Upon clinical examination, the upper right central incisor was found to be discolored and presented with a fistula. The tooth exhibited an extensive cervical carious lesion involving the surrounding tissues, marginal recession, root perforation, and a periapical lesion (Fig. 1). Cone-beam computed tomography (CBCT) revealed a mid-root perforation, further complicating the prognosis and limiting treatment options for tooth preservation (Fig. 2).

Various treatment options were considered, including extraction followed by prosthetic rehabilitation with either a dental implant or a fixed bridge. However, an alternative approach combining endodontic retreatment with laser-assisted periodontal surgery was proposed. The patient expressed a strong preference for preserving the tooth.

Endodontic retreatment was initiated by gaining access to the root canal system, removing the old restorations, and thoroughly cleaning the carious lesion. The endodontic space was then obturated, followed by irrigation with sodium hypochlorite. Subsequently, surgical intervention was performed. A mucoperiosteal flap was elevated without vertical incisions (envelope flap technique). The root perforation was sealed using a biocompatible conventional glass-ionomer cement (Ketac Molar) (Fig. 3).

The periapical and marginal lesions were visualized and debridement was performed, followed by careful curettage and laser ablation with an Er-YAG laser (Fig. 4).

A B

Fig. 1. Total periodontitis of tooth 11

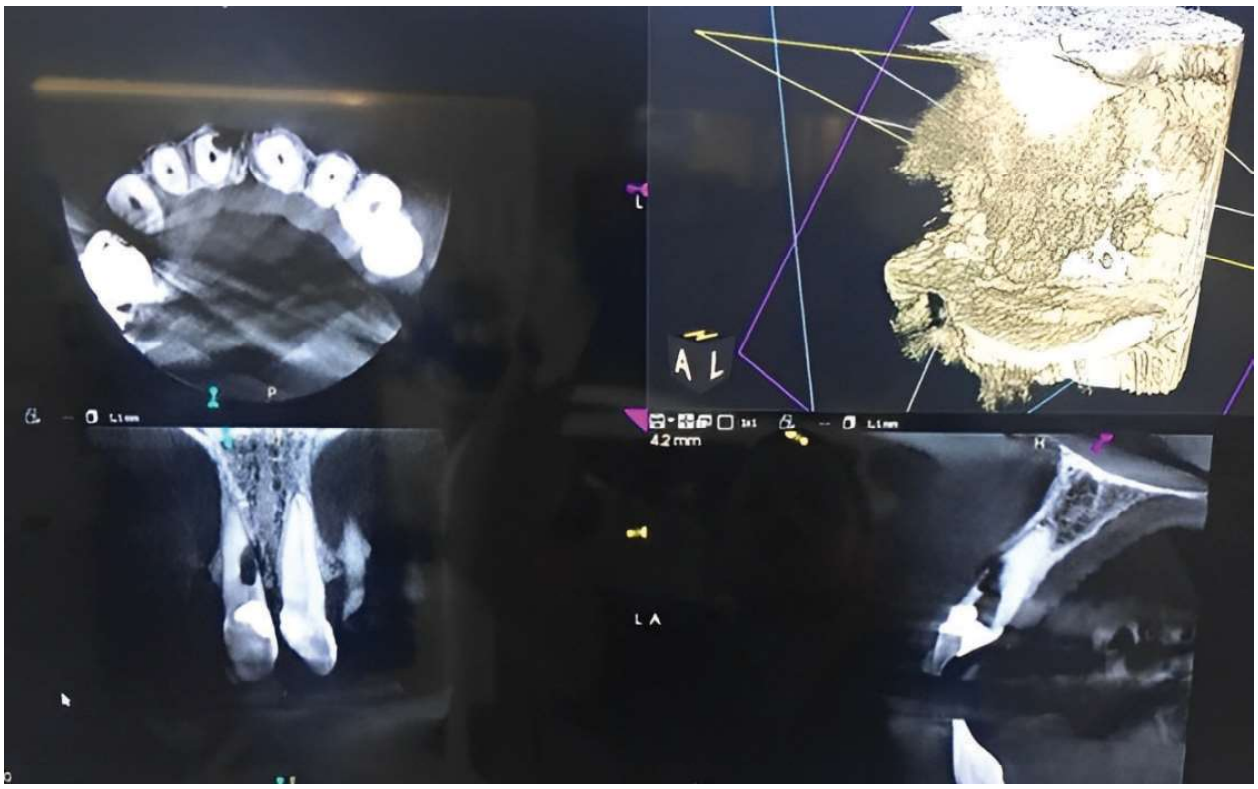

Fig. 2. Perforation in the middle part of the root of tooth 11

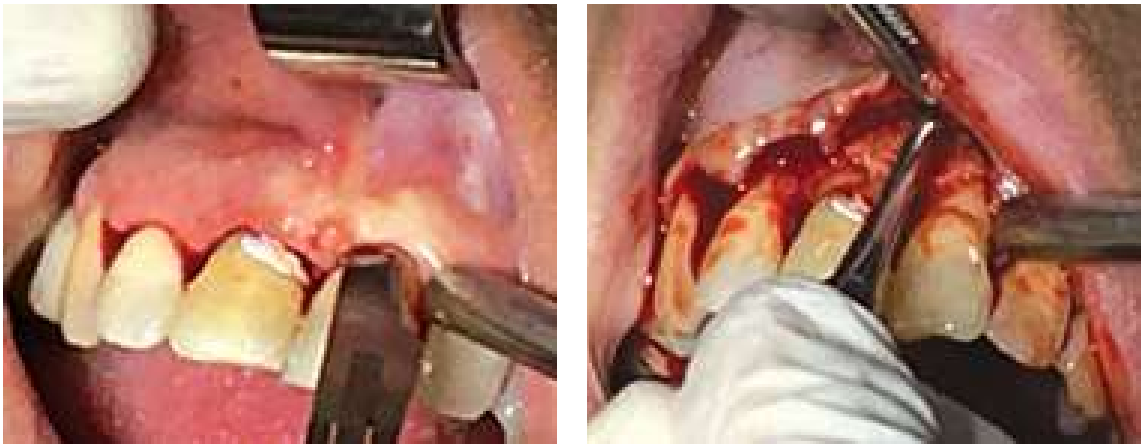

Fig. 3. Mucoperiosteal flap formation

Fig. 4. Laser ablation

Endodontic treatment followed and obturation of the root canal with bioceramic sealer, gutta-percha and MTA in the area of perforation was completed (Fig. 5).

The bone defect was filled with platelet-rich plasma with xenograft (sticky bone). A collagen membrane and PRF membrane were placed under the flap. Upper lip frenulum plastic surgery was performed combined with a coronally moved flap to close the recession.

One month postoperatively, the wound was calm, with no signs of inflammation or dehiscence. At the scheduled follow-up examinations in the second postoperative month, calm periodontal tissues were visualized, with a normal color and without signs of inflammation.

The crown part was restored using a composite restoration. A rubber dam was used to isolate the field (Fig. 6).

After the examination in the second postoperative month, the patient had to travel abroad, which is why follow-up was not carried out regularly. The same patient appeared after five years, on another occasion. The dentition and periodontal tissues were completely preserved, and for the past five years she has not observed any signs of inflammation around the treated tooth (Fig. 7).

DISCUSSION

Laser-assisted surgery in the treatment of chronic periodontitis represents a modern and minimally in-

Fig. 5. Closure of the perforation with MTA

Fig. 6. Restoration of the coronal part

Fig. 7. Follow-up examination after five years

vasive approach that enhances the effectiveness of traditional methods. The application of laser energy allows for more precise removal of infected tissues, disinfection of root canals, and stimulation of regeneration within periodontal structures [2, 10].

Lasers exhibit numerous beneficial tissue interactions, including ablation or vaporization, hemostasis, bactericidal properties, and a range of biological effects within tissues [24]. These characteristics make lasers particularly effective in treating various inflammatory diseases of the periodontium. The Er:YAG laser, in particular, can be utilized for surgical procedures in both soft and hard tissues with minimal thermal side effects. Furthermore, the Er:YAG laser does not elevate the temperature within the pulp chamber, which is critical for preserving pulp vitality [25].

These properties render the Er:YAG laser a conservative method for treating periapical periodontitis. Its advantages, such as precise ablation and antibacterial effects, make it a valuable tool in contemporary dental practice. However, the success of treatment is dependent on individual case factors and the clinician's expertise [5, 9, 20, 26, 27].

CONCLUSION

It is challenging to determine which treatment option is superior for total periodontitis cases. The application of a conservative approach involving the preservation of the affected tooth or opting for extraction followed by subsequent prosthetic rehabilitation is frequently debated. Often, efforts to preserve the tooth prove to be unjustified, ultimately leading to extraction. These pessimistic outcomes discourage attempting treatment in similar cases. However, laser-assisted surgery, when combined with properly executed endodontic therapy, enhances the success rate in such clinical scenarios. As a result, it may be considered a favorable treatment modality by clinicians, offering a viable alternative for managing complex periodontal conditions.

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Ethical statement: *This study has been performed in accordance with the ethical standards as laid down in the Declaration of Helsinki.*

Informed Consent for a Clinical Case: *Written informed consent was obtained from the patient for the publication of this case report, including any accompanying images.*

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