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Title:

**LiteTouch Er:YAG laser Preparation of Class VI
Restorations Lower Incisors**

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Academy of Laser Dentistry

Advanced Proficiency Clinical Case Studies

A. Outline of case

1. Full clinical description

61-year-old male patient. The patient was concerned with the overall appearance of his discolored incisal edges, and the rough sensation to his tongue (Figure 1) .



Figure 1: Preoperative view

Medical history: No medical abnormalities or concerns.

Dental history: Missing teeth #6. Upper arch restored with crowns on teeth #3, #5, #7~12.

Remaining teeth showed no evidence of periodontal disease. Low incidence of caries, and good oral hygiene.

Pre-treatment perio charting

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Upper Facial		424	423	X	321	212	212	211	211	212	211	113	213	314		
Upper Lingual		423	423	X	322	211	212	212	212	212	112	212	223	224		
Lower Lingual		323			312	212	212	212	212	213	212	223	223	322	323	
Lower Facial		323			312	212	212	212	212	221	221	223	223	322	222	
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Figure 2 : Preoperative periodontal chart

Occlusion: This patient was class III of the Angle classification.

TMJ: TMJ examination by palpation and radiographic evaluation revealed no abnormalities. The

patient had 10mm lateral excursions and a 35mm maximum opening, both normal. He did not deviate on opening and reported no difficulties or sounds on opening or in lateral excursions.

2. Radiographic exam

Periapical radiographs showed no signs of bony lesions. Bone density was within normal limits and moderate attrition was visible radiographically.

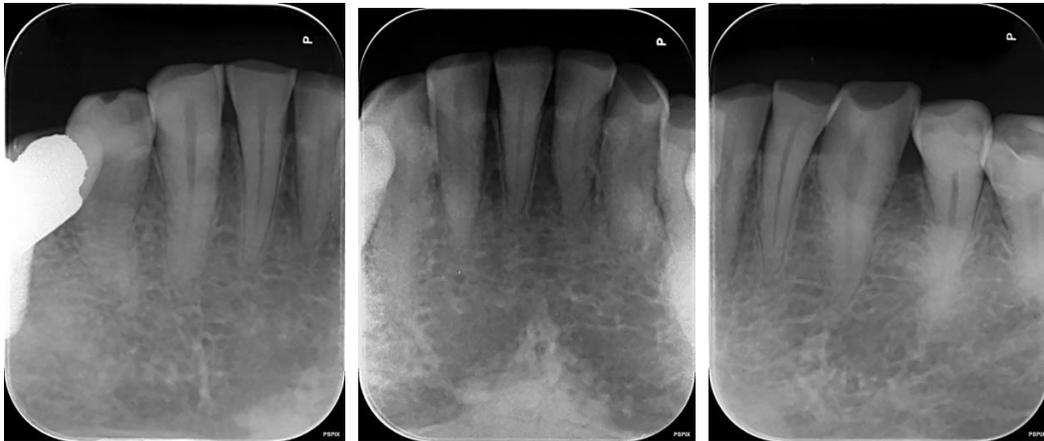


Figure 3: Preoperative radiographs

3. Soft tissue status

Soft tissue evaluation was within normal limits with all remaining pockets within 2-3 mm on periodontal probing. Adequate attached tissue existed on remaining lower dentition

4. Hard tissue status, tooth vitality

Remaining lower dentition was intact with no signs of mobility or decay. Lower dentition from Premolar to Premolar (#21 through #28) showed signs of moderate attrition with incisal wear exposing dentin and felt rough to the patient's tongue. These rough incisal edges were stained (dentin). All teeth present in lower arch were vital relative to thermal assessment, percussion, and healthy apices on periapical films.

5. Other tests

There were no mobility recorded at any natural tooth, percussion testing for all teeth showed no hyperaesthesia.

Impressions for study models were made.

B. Diagnosis

1. Provisional diagnosis

Incisal caries, abrasion, and erosion on teeth #21~#28.

2. Final diagnosis

Moderate lower incisor attrition was noted by the patient due to dentin discoloration (brown stains) and roughness to his tongue upon touching. Incisal fracture was noted on teeth, and slight incisal decay was noted on teeth.

Class IV caries, abrasion, and erosion on teeth #21~#28.

3. Treatment plan outline

Conservative use of the Er:YAG laser to treat these moderately deep Class VI lesions by preparing the incisal edges for composite resin restorations by removing the stain, decay and fractures and restoring with a flowable composite. All preparations and the concomitant restorations were to be placed without anesthetic.

Er:YAG laser was planned to remove the carious lesions and etch the teeth, followed by the standard bonding protocol procedures.

4. Indications and contraindications

a. Indications

Class VI lesions are ideally suited for treatment with the Er:YAG laser in that the lack of enamel in these areas allows for lower energy settings to be used efficiently and without discomfort to prepare the teeth. Multiple teeth in multiple sextants can be quickly and painlessly treated without anesthetic. The immediate and rapid improvement both visually and to the patient's sense of touch with the tongue is dramatic, while minimal preparations are needed to retain the restorations. In addition, the laser is able to provide a 30% increase in bonding strength when combined with phosphoric acid etching than can be obtained by etching alone.

Er:YAG laser will remove the carious lesion without excessive heat.

b. Contraindications

Contraindications to the use of the Er:YAG laser in this case were not observed, but would include any previous complications from erbium laser usage.

There were no contraindications for the planned treatment or the use of the lasers.

5. Precautions

When using an Er:YAG laser for cavity preparation in close proximity to healthy tooth and soft tissue structures, the laser tip should be angled and the energy must be aimed away from those healthy surfaces to avoid collateral damage. Hard tissue ablation with laser should proceed with care, the laser tip should be as close as 1-2mm to the target tissue to optimize the efficiency.

Nonetheless, the use of minimum power parameters, frequency and adequate air and water spray to allow thermal relaxation and avoid carbonization, would all reduce the risk of primary and secondary

collateral damage.

6. Treatment alternatives

Standard high-speed and low-speed hand- piece preparations with anesthetic would be the alternative conservative treatment. Additionally, full coverage restorations or porcelain laminate veneers could be considered as an alternative.

Use of traditional conventional instruments, bur and high- speed rotary instruments to caries removal, would result in more traumatic postoperative results.

7. Informed consent

Verbal and written consent was obtained from the patient prior to beginning the procedure.

Alternative treatments risks and benefits involved were explained to the patient. Informed consent for treatment was obtained from the patient and signed in the chart.

Treatment

A. Treatment objectives strategy

Remove incisal caries, stain and fractures and restore the incisal edge with composite resins to improve visual appeal and tactile feel of lower incisal edges, without the usage of anesthetic.

The Er:YAG laser would then be used to remove the caries and etch the tooth, followed by the standard protocol for bonding composite restoration.

B. Laser operating parameters

An Er:YAG laser (Lite Touch, Light Instruments LTD, Israel) 2940 nm, 800 micron sapphire tip in non-contact mode with water, and with control panel settings of 200 mJ and 30 Hz for 10 minutes in total to remove the stain, decay and smear layer on the dentin while etching the enamel surfaces for improved retention.

1. Wavelength: 2,940nm
2. Delivery system: Direct Drive Delivery System
3. Beam diameter: 800- micron sapphire tip in non-contact mode
4. Power: 6 Watts
5. Pulse Rate: 30 Hz
6. Energy Level: 200 mJ
7. Total time taken: 10 minutes

C. Treatment delivery sequence

- The teeth were isolated with cotton rolls as it was felt that adequate isolation was possible without rubber dam placement.

- The Er:YAG laser was used with water to prepare the teeth, with special attention paid to avoiding higher energy settings which would risk the involvement of pulpal exposure or sensitivity.
- A slight “paint brushing” motion was used as the preparations proceeded without discomfort from right (tooth #28) to left (tooth #21). The removal of stain, decay and fractures was rapid and the final result was obtained very quickly.
- 37% phosphoric acid was used for 30 seconds in a total etch manner to etch the enamel and dentin surfaces and a bonding agent (Scotchbond Universal 3M ESPE) was brushed onto the prepared surfaces. LED Ultracapacitor Curing Light system (Demi Ultra , Kerr) was used to cure the bond in 5-second increments per tooth.
- Flowable composite resin (MI LOW Flow A3, GC) was placed into the incisal edges and again cured for 5 seconds with Curing Light system.

Shaping and polishing was accomplished with diamonds and 12- and 30- bladed composite resin burs, and the interproximal areas were cleaned with Brassler diamond strips. Enhance polishing cups with PrismaGloss polishing paste were used to complete the restorative phase.

The Er:YAG laser used to remove the caries and etch the tooth, followed by the standard protocol for bonding composite resins.



Figure 4: Preoperative view



Figure 5: Er:YAG laser procedure underway



Figure 6: Immediate postoperative view of Er:YAG cavity preparation





Figure 7: View just prior to bonding



Figure 8: Cavity isolation



Figure 9: Composite filling



Figure 10: Restorations in place



Figure 11: Immediate postoperative view

D. Post-operative instructions

Verbal instructions were given to the patient on proper protocol for post-treatment complications such as sensitivity to cold, chewing, or loss of the restorations due to bruxism.

E. Complications

There were no unusual complications. The patient reported no discomfort during the procedure.

F. Prognosis

The surgical prognosis is good. Given the patient's age and the ease with which the procedure was completed, repair or replacement of the resins with the Er:YAG laser is a simple and cost-effective measure for treating the teeth.

G. Treatment records

Treatment records were completed in the patient’s file and operating parameters of the laser were noted.

The treatment record included written documentation and digital photographs obtained through a digital camera (EOS kiss x7i, Canon) attached to the surgical operating microscope used to enhance the magnification and illumination during the procedure.

Follow up

A. Assessment of treatment outcome

1. Post-treatment perio charting

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Upper Facial	323	323	X	221	112	211	111	111	212	111	112	212	313			
Upper Lingual	323	323	X	222	211	211	212	212	212	112	212	222	223			
Lower Lingual	322			212	212	112	211	212	211	212	222	222	222	223		
Lower Facial	322			212	212	212	212	221	211	212	222	222	322	222		
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Figure 12 : Periodontal charting at three months

2. Specify treatment assessment intervals

The patient returned for a 1-week postoperative evaluation and the restorations looked fine. He mentioned that it did take him a little longer to get used to the new feel of the incisal edges of the restorations but that in the last couple of days he was not noticing them anymore. The patient returned for a 1-month post- operative evaluation. All teeth maintained their vitality and are extremely comfortable to function as of the 1-month healing time.

B. Complications

The procedure was quick and painless for him and he appreciated the improvement in tooth color and reduced roughness to his tongue.

The patient reported no unusual side effects or complications.

C. Long term results

As of nearly 3 months postoperatively, the restorations are intact and appear to be lasting well. The long-term photographs taken 6 months postoperatively show excellent, stable results with no further attrition or loss of the restorations

D. Long term prognosis

This case demonstrated an approach to conservative restoration of the incisal edges in a geriatric adult patient who felt that the edges of his lower dentition were unsightly and sharp to his tongue. Anesthetic and preparation with a bur might have been quite dis-comforting for this gentleman and instead the Er:YAG laser was used successfully and in an efficient manner to prepare the eight lower anterior teeth, and remove stain and rough incisal edges. The process was performed quickly and without anesthetic, and yielded an esthetic, functional, and inexpensive solution to his dental needs.

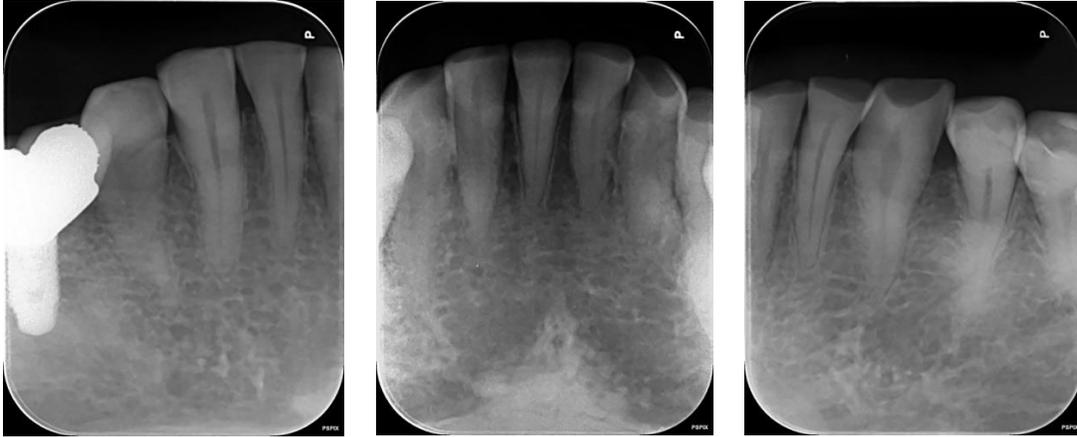


Figure 13: three-month postoperative radiographs



Figure 14: One-month postoperative view



Figure 15: One-month postoperative view



Figure 16: Three-month postoperative view



Figure 17 Three-month postoperative view



Figure18: Six-month postoperative view



Figure19: Six-month postoperative view