

Name: Tsuneo Kawai D.D.S

Address: 4F-6-6-19, Chuo-ku, Ginza, Tokyo, JAPAN

Phone: 81-3-3573-9330

Fax: 81-3-3573-9330

E-mail: kawai@maronie-dental.com

Title:

Apicoectomy and Cavity Preparation with LiteTouch Er:YAG Laser

April 3, 2019

Academy of Laser Dentistry

Advanced Proficiency Clinical Case Studies

Pre- treatment

A. Outline of case

1. Full clinical description

A 38-year-old Japanese female patient came in complaining of gingival swelling (Figure 1 and 2) as a new patient. Because her own dentist only looks on, and it was said that we do not have to worry. But these Crown(PFM) are the third, it becomes uneasy. And these Crown want to take nothing off if it is possible.

Clinical examination revealed extensive caries on the mesial and distal aspects of tooth #11.

Medical history:

The patient was in excellent health. She had no known allergies to any medications and was not taking any medication at the time.

Dental history:

Patient had several inter-proximal fillings. Teeth #13 and 15 were fixed bridge, these teeth had undergone root canal treatment at 10 years ago.



Figure 1: Preoperative full anterior view



Figure 2: Preoperative

Pre-treatment perio charting

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Upper Facial		323	X	323	334	443	X	X	444	433	322	222	323	X	333	
Upper Lingual		222	X	323	322	333	X	X	334	323	222	222	333	X	233	
Lower Lingual		X	X	322	223	222	222	222	222	222	222	232	232	X	333	
Lower Facial		X		322	222	222	222	222	222	222	222	222	223	X	334	
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Figure 3: Preoperative periodontal chart

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

TMJ: TMJ examination revealed no abnormality.

2. Radiographic exam

The anterior portion is shown in Figure 4.

Dental X-ray was taken on upper left teeth.

#11 had a recurrent decay under old resin restoration.

The teeth #12,#13 had apical lesion.

Review of cone beam computed tomography(CBCT) Figure 5 ,6, 7, and Figure 8.



Figure 4: Preoperative periapical radiographs

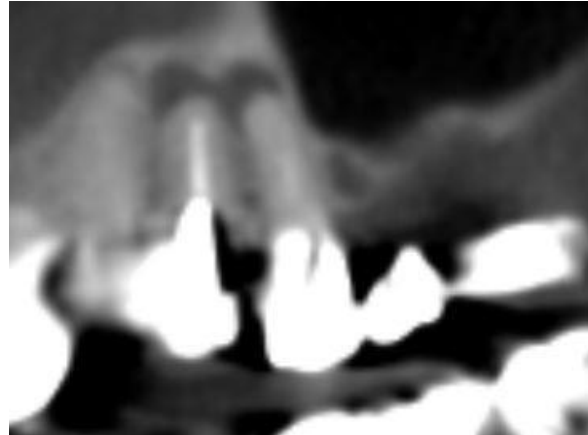


Figure 5: Lateral view of initial CBCT,

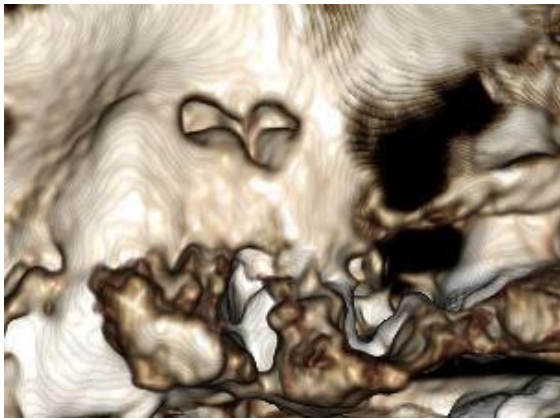


Figure 6: Facial view of CBCT, preoperative CBCT #13



Figure 7: Later view of CBCT #12 Figure 8: Later view of CBCT #13

3. Soft tissue status

No bleeding was observed upon probing. The depth of pocket measured by probing was within normal limits.

There was not a fistel on teeth #12,#13.The gum at root apex of teeth #12,#13 had a pressure pain, and could feel the root apex.

4. Hard tissue status, tooth vitality

Tooth(#11) vitality tests within normal limits. Hard tissue examination revealed good bone support around tooth#11.

Teeth #12, 13, were non-vital and done root canal treatment. There were percussion pain on teeth #12,13.

5. Other tests

The lip line was medium to high.

B.Diagnosis

1. Provisional diagnosis

Class II caries lesion on #11.

Root apex exposure from the maxillary alveolar bone caused by labial bone loss of root apex.

2. Final diagnosis

Recurrent decay under composite resin filling on tooth #11.

Final diagnosis has Chronic apical periodontitis with bone loss on Facial tooth #12 and #13

3. Treatment plan outline

Removal of old restoration tooth #11. Cavity preparation with Er:YAG laser.

Treatment plan was removal of exposed root apex and placed the root within a normal depth of the maxillary alveolar bone using Er:YAG laser.

4. Indications and contraindications

a. Indications

Er:YAG laser's indications are ablation, vaporization of soft tissue and hard tissue.

Er:YAG laser can cut root tip and can abrade the bone structure without heating damage.

Decontaminated treatment area can be expected by using laser.

b. Contraindications

Er:YAG can damage healthy teeth structure. Hemostasis is difficult.

High power setting and laser beam can damage adjacent tissue which is unexpected for absorption.

5. Precautions

The Er:YAG laser wavelength easily interacts with both hard and soft tissue, so care must be taken to avoid interaction with any associated healthy tissue, especially hard dental tissue. It is important that adequate water spray be used during soft tissue ablation to avoid thermal damage through charring.

6. Treatment alternatives

Conventional dental treatment using hand instruments, drills and injections.

Conventional apicoectomy with round drills. G.B.R. on exposed root apex.

7. Informed consent

The dentist and patient discussed advantages and disadvantages of laser treatment as well as alternative treatment prior to the treatment. The patient signed the consent form that discussed complications and proper care.

Treatment

A. Treatment objectives strategy

Removal of exposed root tip decontaminate the surgical area and getting fresh surface of the surrounding bone.

B. Laser operating parameters

Removal of composite resin #11

600 micron sapphire tip with water

200 mj, 20 Hz for 2 minutes

Cavity preparation #11

600 micron sapphire tip with water

Initial setting 300mj, 30 Hz for 1 minutes

Then 100 mj 30 Hz for 3 minutes

Er:YAG laser 2940nm, 600 micron sapphire tip was used with water for the treatment of the caries. Initial setting for caries removal were 300 mj and 30 Hz for 1 minutes. Afterwards, a lower setting for deep caries removal was used; 100 mj and 30 Hz for another 3 minutes.

An Er:YAG laser (Lite Touch, Light INSTRUMENTS LTD, Israel) was used for the soft and hard tissue surgery. The operating features are as follows:

1. Wavelength: 2,940 nm
2. Delivery system: Direct Drive Delivery System
3. Beam diameter: 800 micron sapphire tip
4. Power: From 4.0 to 9.0 Watts
5. Energy Level: 200 to 300 mJ

6. Pulse Rate: 20 to 30 Hz
7. Total time taken: 7 minutes

600 micron sapphire tip was used to enlarge bone window which was absorbed by the previous apical lesion, 200 mj, 20Hz, with water, 3 minutes for cutting and removal of root tip, 300 mj, 30Hz, with water, 2 minutes, for dressing the root end surface, 200 mj, 30Hz, with water 1 minutes, for decontamination of the surgical area, 200mj, 20Hz, with water, 1 minutes.

C. Treatment delivery sequence

After cleaning of the preparation site and disinfection with acrinol. This treatment was provided under surface anesthesia. (20% ethyl aminobenzoic acid) It was placed from tooth areas #11 to #14, followed by local anesthesia (2% Lidocaine with 1/100,000 epinephrine, 1.8ml). The laser warning sign was posted before the operation.

All people present in the operating room wore protection goggles to protect their eyes. A test fire of the laser was performed to establish correct working and patency of light delivery. A safety area check (only required personnel present, safety warning signs posted, reflective surfaces minimized) was carried out. The patient and all personnel within the above-mentioned safety area were issued protective glasses. High-volume evacuation was used for tissue cooling and suction of removed tissue.

The patient was given local anesthesia with 2 % lidocaine (1/100,000 epinephrine) 3ml. The safety requirements for laser applications were monitored. Caries lesion and old resin filling were removed on tooth #11 with Er:YAG laser.



Figure11: Cavity removal by Er:YAG laser



Figure12: Finishing preparation



Figure13: Post operative view



Figure14: Finishing filling

A periosteal elevator was used to separate the tissues. After the flap was lifted the granulated tissue was removed and evaluation of the amount of root structure to removed by ablation and vaporization using a 800-micron tip, near-contact mode, at a distance of 1-1.5 mm from the target tissue (Figure 19). The energy used for this procedure was 300mJ/30Hz(=9W). The Er:YAG laser was used to incise through freely movable mucosa below mucogingival junction, noting apical resorption. And complete curettage of periapical pathology.

After the laser was used to decontaminate the root end surface and intraosseous cavity. Amputation of exposed root tip with retrofilling completed (MTA cementation). The power set is 200mJ/20Hz(=4W). The

tip of choice is a 800-micron sapphire tip applied in near-contact mode. The flap was sutured.



Figure 15: Preoperative view



Figure 16: Fistula below sulcus of tooth



Figure 17: Laser removal of granulation tissue

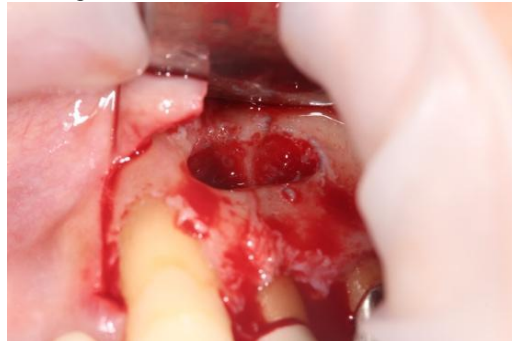


Figure 18: Laser cut of the root apex



Figure 19: ultrasonic



Figure 20: Amputation of exposed root tip



Figure 21: evaluation of the amount of root structure to remove

D. Post-operative instructions

The patient was instructed that some pain might be felt upon the anesthesia wearing off.^[17] The patient

did not report pain or discomfort, and most of the gingivae which were treated improved within a few days.

E. Complications

Complications following soft tissue laser surgery can include pain, swelling, deformation, bleeding and infection. In this case, however, no such complications were encountered.

F. Prognosis

No significant complications arose from the procedures. The surgical prognosis was good.

G. Treatment records

The kind of the laser and the wavelength, the parameter and the intraoral photograph and the X-ray.

Follow up

A. Assessment of treatment outcome

The patient was asked to return at one-week, and at one-month and three-month intervals. She reported no discomfort and was not taking any analgesics. At the one-week follow-up, the sutures were removed, the tissue looked pink, the incisions were healing satisfactorily, and the patient had no complaints.

At the one-month follow-up, the tissue continued to heal satisfactorily with no evidence of swelling or inflammation. At the three-month follow-up, the healing was progressing very fine.

1. Post-treatment perio charting

The periodontal pocket did not have the problem as figure 22 showed it. The influence with the laser was not seen in the periodontal pocket.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Upper Facial		223	X	333	333	323	X	X	223	222	223	323	333	X	333	
Upper Lingual		222	X	323	322	222	X	X	223	222	223	323	322	X	333	
Lower Facial		X	X	322	222	222	222	222	222	222	222	222	222	X	233	
Lower Lingual		X	X	322	222	222	222	222	222	222	222	222	222	X	223	
	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

Figure 22: Periodontal charting at three-months

2. Specify treatment assessment intervals

The patient was asked to return at one-week, one-month and three month intervals



Figure 23: one-month postoperative view



Figure 24: one-month postoperative radiographs



Figure25: one-month postoperative view

B. Complications

There were no side effects or complications.

C. Long term results

Long-term results are expected to be good.

D. Long term prognosis

The measures using the Er:YAG laser went very well. After three months, recession didn't exist. When this patient laughs, Gingiva is exposed. Because gingiva swelling has been reduced, the patient is very pleased with the results of the procedure.



Figure 26: Three-month postoperative view



Figure 27: Three-month radiographs



Figure:28 Three-month



Figure:29 Six-month postoperative view



Figure30: Six-month radiographs



Figure31: Six-month