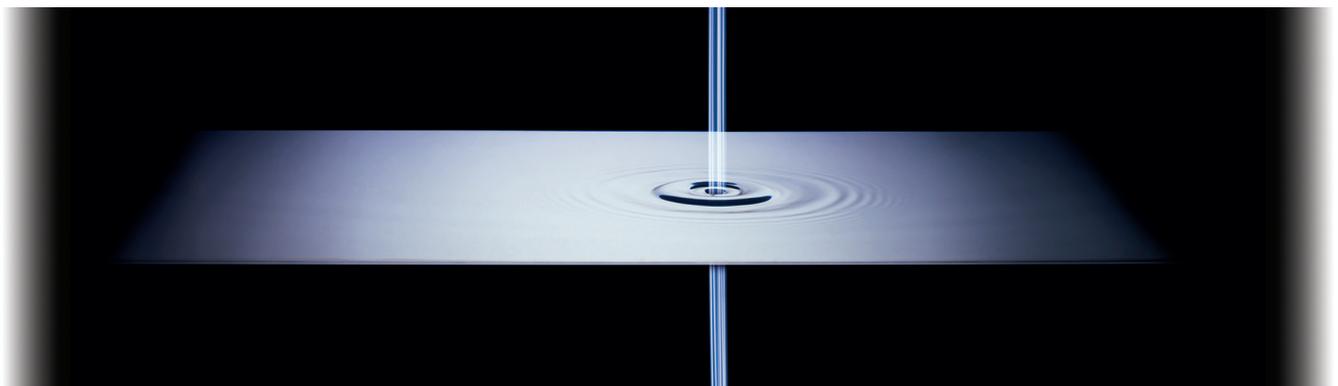


PELT™

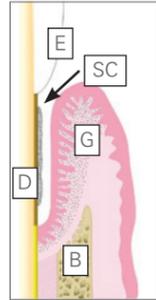
Protocols for Er:YAG Laser Treatment



Er-LCPT

(Akira Aoki, DDS, PhD)

Diseased Periodontal Pocket

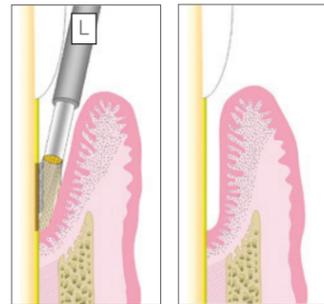


Advanced periodontal pocket showing subgingival calculus deposition and contamination of the root surface, epithelial down growth and lining of the inner surface of diseased gingival connective tissue with inflammation in the vertical bone defect.

- | | |
|--------------------------------|------------------------|
| E enamel | D dentin |
| SC subgingival calculus | B alveolar bone |
| G gingival tissue | |



Root Debridement / Decontamination / Detoxification



Laser-assisted debridement (or debridement by laser alone) following mechanical instrumentation (curettes and ultrasonic scalers) of the diseased root surface for removal of the subgingival calculus, decontamination and detoxification of the root surface.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 50-70mJ
(Start with the lowest power setting)
Water: 7 / Air: 10
Type of Tips: C400F/PS600T
Contact (sweeping motion)

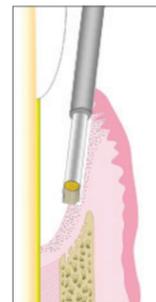
Set all values on the laser control panel.



L laser tip

WARNING! Cooling air from the contact tip can cause subcutaneous emphysema or air embolism. It is advised to turn OFF the cooling air if the pocket is too deep.

Removal of Epithelial Lining and Diseased Connective Tissue

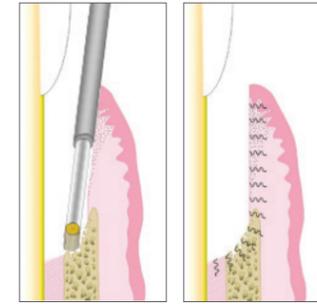


Ablate lining epithelium and diseased connective tissue on the inner surface of the gingival tissue. In order to thoroughly decontaminate the whole pocket and to increase bleeding in the bone defect (which would be advantageous for tissue regeneration) it is recommended to remove all diseased connective tissue in the vertical bone defect. Adjunctive use of mini-curette and/or mini bone curette is helpful for narrow defect.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 50-70mJ
(Start with the lowest power setting)
Water: 7 / Air: 10
Type of Tips: C400F/PS600T
Contact (sweeping motion)

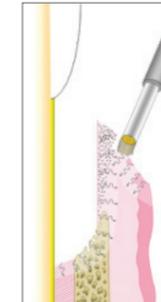
Bone Defect Debridement



Low level laser penetration during pocket irradiation leads to simultaneous photobiomodulation effects activating the surrounding gingival and bone tissues.

WARNING! Cooling air from the contact tip can cause subcutaneous emphysema or air embolism. It is advised to turn OFF the cooling air if the pocket is too deep.

Removal of External Epithelium

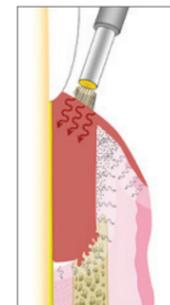


Laser ablation of the epithelial tissue from the external gingival surface. Depending on the cases, the underlying connective tissue is also ablated to some extent helping in pocket depth reduction. Removal of epithelial tissue is intended to prevent the down-growth of the epithelial tissue in the pocket. Removal of the inflamed epithelial and connective tissues on the external surface may result in rapid reduction of the gingival inflammation. Exposure of connective tissue may delay epithelial tissue migration from the external surface into the pocket, and production of the ablated rough surface enhances retention of blood clot at the pocket entrance, thereby assuring sealing of the pocket entrance. Removal can be done either before or after debriding the pocket.

Laser Irradiation Conditions

PPS: 20 pps / Energy 50-70mJ
(Start with the lowest power setting)
Water: 7 / Air: 10
Type of Tips: C800F
Contact

Blood Coagulation



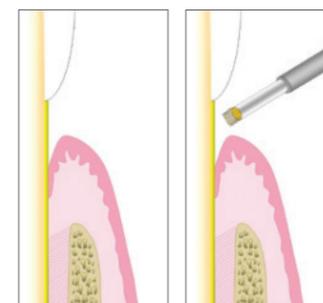
Blood coagulation (BC) at the pocket entrance is achieved by defocused irradiation without water spray. This may stabilize blood clot formation and its seal the pocket entrance. **Do not brush the treated area for a week to maintain the coagulation layer. Rinsing with chlorohexidine rinse is recommended.**

Laser Irradiation Conditions

PPS: 10 pps / Energy: 30mJ
Water: OFF / Air: OFF
Type of Tips: C800F
Defocus irradiation
Keep moving the tip. (Approx. 30 seconds)



Improved Wound Healing



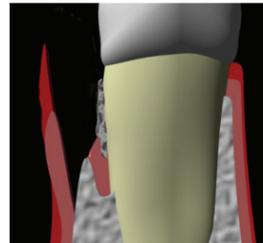
Oral hygiene instructions and post operative care consistent with regenerative surgery should be given to patient.

No probing for 3 - 6 months.
Patient may experience post operative hyper sensitivity.



Laser Assisted Flap Approach

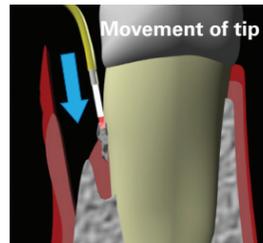
Raise the Flap



Intrasulcular incision and flap elevation.



Root Debridement / Decontamination / Detoxification



Laser vaporization of subgingival calculus from the root surface.

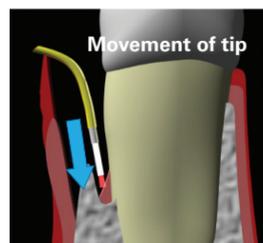
- Hold tip parallel to the root surface and extend apically to the bottom of the defect avoiding perpendicular irradiation of the root surface (This will preserve the integrity of the tip).

Laser Irradiation Conditions

PPS: 20 pps / Energy: 50-70mJ
(Start with the lowest power setting)
Water: 7 / Air: 10
Type of Tips: PS600T or C600F or CS600F
Contact (sweeping motion)



Removal of Granulation Tissue / Bone Defect Debridement



Laser removal of granulation tissue by irradiating along the junction between the bone and the tissue and remove the tissue in one piece.

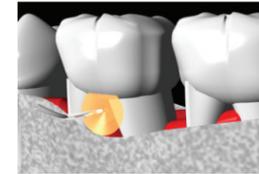
- Hold tip along the bone and to the base of the defect.

WARNING! Cooling air from the contact tip can cause subcutaneous emphysema or air embolism. It is advised to turn OFF the cooling air if the pocket is too deep.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 50-70mJ
(Start with the lowest power setting)
Water: 7 / Air: 10
Type of Tips: PS600T or C600F or CS600F
Contact (sweeping motion)

Furcation Involvement

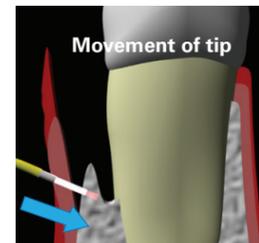


If the furcation is involved, the R-tip may be used to debride the furcation effectively.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 50mJ
Water: 7 / Air: 10
Type of Tips: PS600T or R600T
Contact

Additional Option



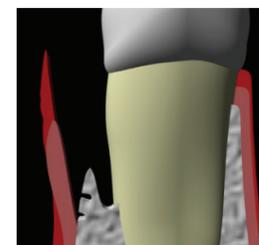
If decortication of the bone surface is desired, hold the tip perpendicular to the bone surface and use contact irradiation.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 100mJ
Water: 7 / Air: 10
Type of Tips: C400F
Contact (pumping motion)



After Laser Irradiation

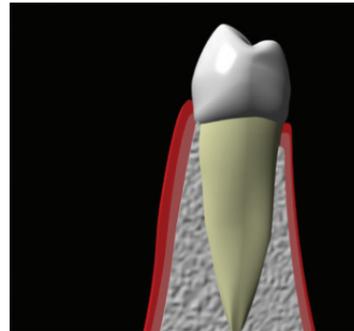


Suture the treated area.



Crown Lengthening

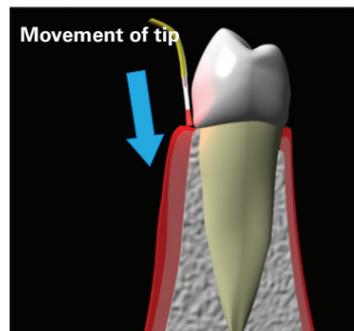
Bone Sounding



Measure the distance from the gingival margin to the crest of the bone.



Ablate Gingiva



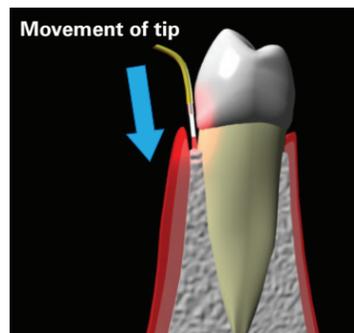
Laser assisted gingivectomy to shape gingival margin.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 60mJ
Water: 7 / Air: 10
Type of Tips: C400F/CS600F
Contact



Ablate the Alveolar Bone



Vaporize the alveolar bone without flap elevation through sulcus. Shape the bone to match the gingival tissue. Vaporizing bone tissue should be done carefully and slowly.

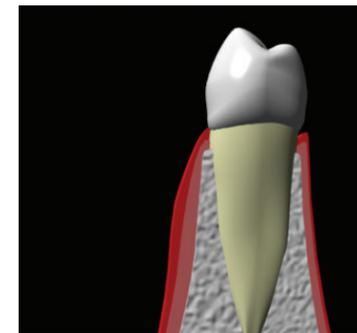
- Calculate desired bone removal carefully.
- Irradiate perpendicular to the crestal alveolar bone.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 60-70mJ
(Start with the lowest power setting)
Water: 7 / Air: 10
Type of Tips: C400F/CS600F
Contact



After



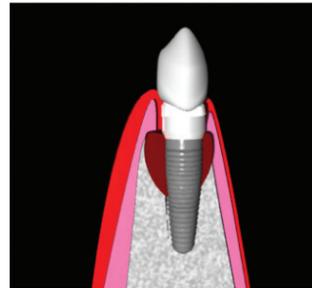
No suturing is required. Crown extension using the Er:YAG laser does not reduce the thickness of the alveolar bone.

- Follow conventional post operative instructions



Peri-implantitis

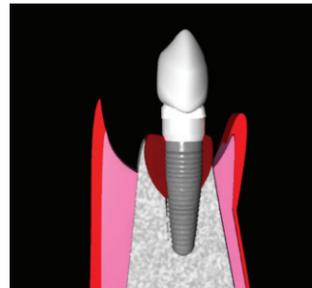
Diagnosis / Remove Prosthetic Crown



Remove the prosthetic crown or bridge if possible.

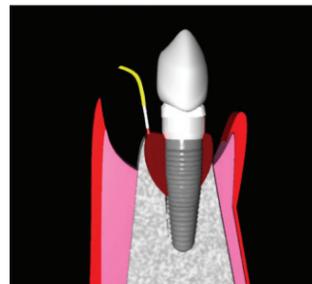


Incision



Conventional sulcular incision and flap elevation.

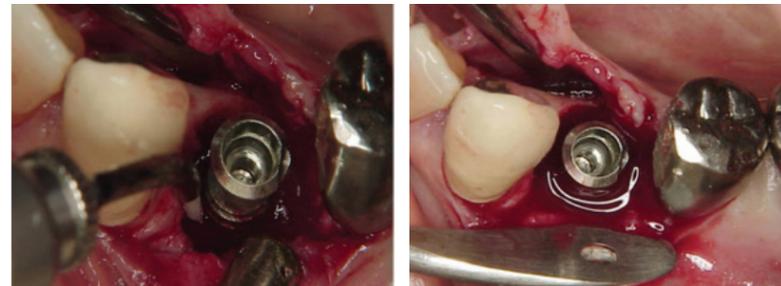
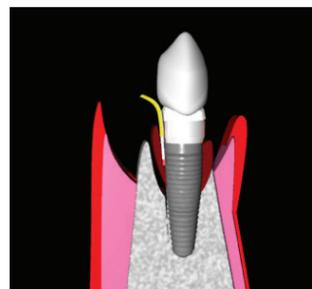
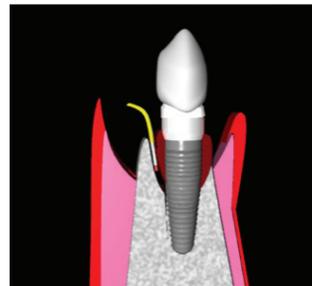
Remove Granulation Tissue



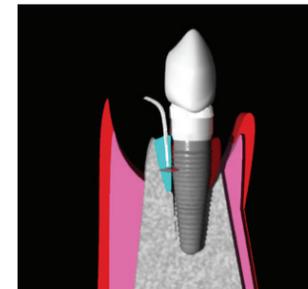
Remove the granulation tissue. Place the tip at the junction of the inflamed tissue and the bone and between the tissue and the implant surface to remove it easily.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 40-50mJ
(Start with the lowest power setting)
Water: 7 / Air: 10
Type of Tips: PS600T
Contact (sweeping motion)



Debride and Decontaminate the Implant Surface



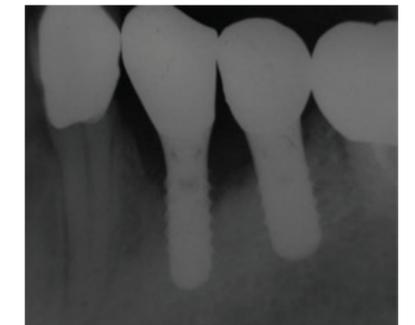
Debride the implant surface utilizing a sweeping motion between threads using the R600T tip.

Note: Irrigation with water is essential. Supplemental implant surface debridement with ultrasonics, titanium brushes or curettes is recommended. Final detoxification of the surface is accomplished with a last laser pass with the R600T tip.

Depending on the defect shape, a clinical decision can be made to use additional regenerative or resective approaches.

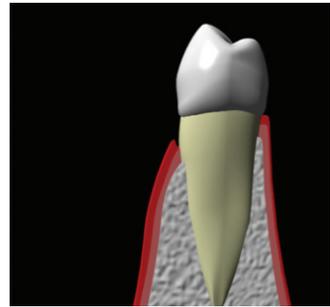
Laser Irradiation Conditions

PPS: 20 pps / Energy: 40-50mJ
(Start with the lowest power setting)
Water: 7 / Air: 10 or
Water: OFF / Air: OFF (if water is overflowing the pocket)
Type of Tips: R600T
Contact (vertical motion)

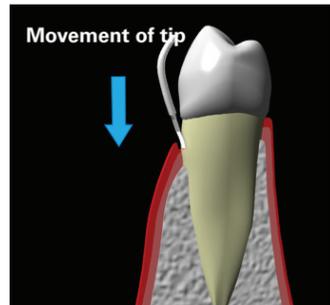


Semilunar Incision For Coronally Repositioned Flap

Measure the Gingival Recession



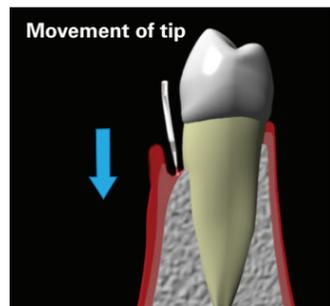
Root Decontamination



Condition the root surface to be covered with the brush tip using a brushing and circular motion. There is no need for chemical root conditioning.

Laser Irradiation Conditions
 PPS: 10 pps / Energy: 30mJ
 Water: 7 / Air: 10
 Type of Tips: Brush
 Contact (brushing motion)

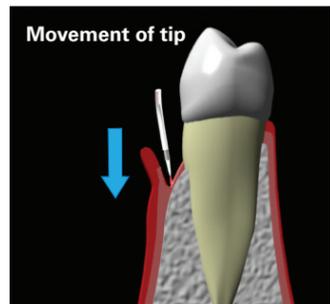
Sulcus Incision



Create an envelope flap by using the S600T tip parallel to the root surface.

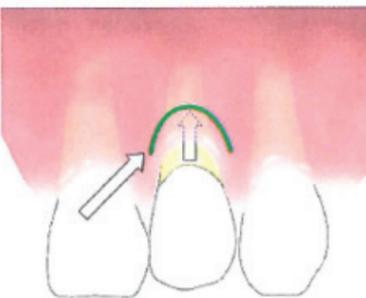
Laser Irradiation Conditions
 PPS: 20 pps / Energy: 40-60mJ
 (Start with the lowest power setting)
 Water: 7 / Air: 10
 Type of Tips: S600T
 Contact

Partial Thickness Flap

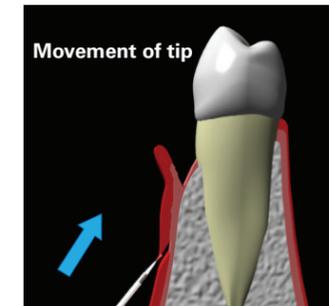


Gradually deepen the laser incision and make a partial thickness flap.

Laser Irradiation Conditions
 PPS: 20 pps / Energy: 40-60mJ
 (Start with the lowest power setting)
 Water: 7 / Air: 10
 Type of Tips: S600T
 Contact



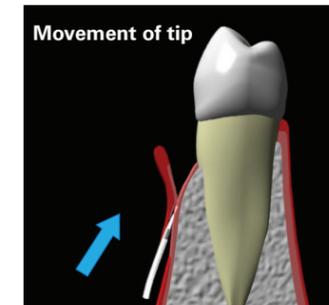
Semilunar Incision



With the laser tip, make a semi lunar partial thickness incision through the alveolar mucosa.

Laser Irradiation Conditions
 PPS: 20 pps / Energy: 40-60mJ
 (Start with the lowest power setting)
 Water: 7 / Air: 10
 Type of Tips: S600T
 Contact

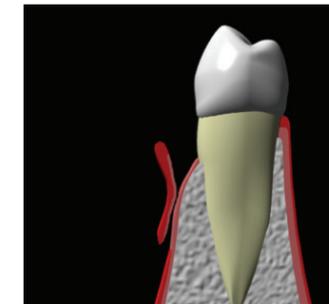
Semilunar Flap



Tunnel from the semilunar incision to the sulcular incision.

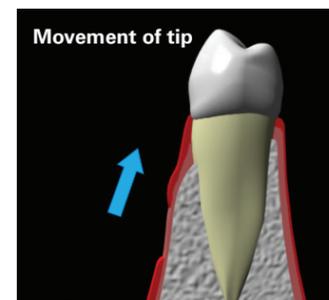
Laser Irradiation Conditions
 PPS: 20 pps / Energy: 40-60mJ
 (Start with the lowest power setting)
 Water: 7 / Air: 10
 Type of Tips: S600T
 Contact

Semilunar Flap



The flap is completed when it is passively mobile.

Flap is Moved to Crown

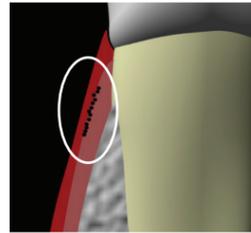


Coronally advance the semilunar flap towards the crown to cover the tooth surface. Apply pressure to the flap to stop bleeding and stabilize it. If necessary, apply a suspension suture.



Removal of Pigmentation

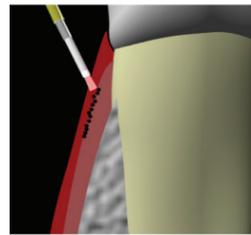
Measure the Width of the Free Gingival Margin



This area should not be lasered to avoid perforation and recession.



Ablate Epithelium

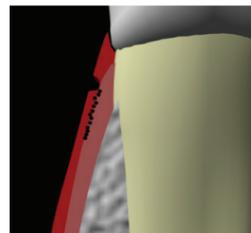


Vaporize the surface epithelium up to the connective tissue at a 45 degree angle. This may done with or without anesthesia, depending on the patient.

Laser Irradiation Conditions

PPS: 10 pps / Energy: 30-50mJ
 (Start with the lowest power setting)
 Water: 7 / Air: 10
 Type of Tips: C600F
 Contact

Vaporize Only the Surface Layer



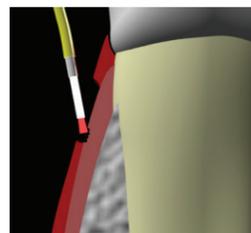
Excessive vaporization could cause pain and bleeding later.

Laser Irradiation Conditions

PPS: 10 pps / Energy: 30-50mJ
 (Start with the lowest power setting)
 Water: 7 / Air: 10
 Type of Tips: C600F
 Contact



Vaporize the Pigmentation Layer



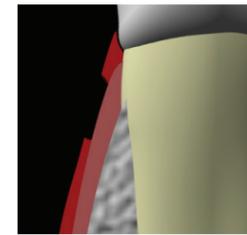
Extend the ablated area by vaporizing the pigmentation layer up to the outer layer of the connective tissue. If the ablation is too deep and excessive bleeding occurs, change the angulation of the tip.

Laser Irradiation Conditions

PPS: 10 pps / Energy: 30-50mJ
 Water: 7 / Air: 10
 Type of Tips: C600F
 Contact



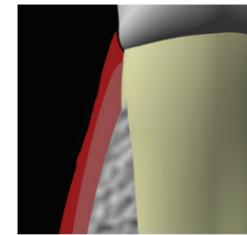
Check That the Pigmentation is Completely Gone



Check that the pigmentation is completely gone.



If the Pigmentation Goes Deep, Perform the Operation Several Times

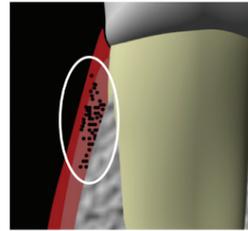


After about 1 week, the treated area will be covered with epithelium.



Removal of Metal Tattoo

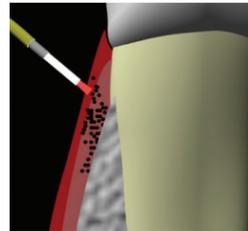
Metal Tattoo



Ensure that the staining is due to metal tattooing and not to any other pathology.



Metal Tattoo Removal



Put the tip in the darkest area.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 60mJ

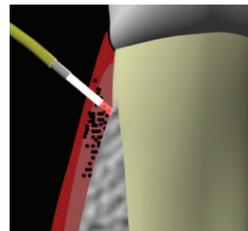
Water: 7 / Air: 10

Type of Tips: C600F

Contact



Remove Metal Tattoo



Vaporize the tissue until the tip reaches the bone surface. Thoroughly irrigate the area.

Laser Irradiation Conditions

PPS: 20 pps / Energy: 60mJ

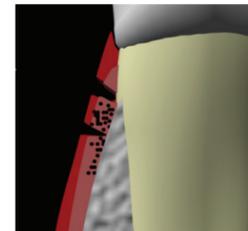
Water: 7 / Air: 10

Type of Tips: C600F

Contact



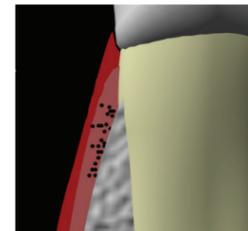
Vaporize the Pigmented Area



Make several perforations 1 or 2 mm away from each other to remove the pigmentation.



Observation of Healing Process



Repeat the process a few sessions every 4 weeks until the tattoo is completely removed.

- Vaporizing an area too much can cause unwanted gingival recession.



Stomatitis

Stomatitis



NOTE: Any tissue growth (i.e., cysts, neoplasm or other lesions) must be biopsied and submitted to a qualified laboratory for histopathological evaluation.

Irradiate With a Circular Motion From Far Away to Closer



Irradiate the lesion with the laser tip in a defocused circular motion starting approximately 10 mm away from the lesion surface and then moving in closer up to 3 mm away.

Laser Irradiation Conditions

PPS: 10 pps / Energy: 30mJ

Water: OFF / Air: OFF

Type of Tips: C800F

Defocus irradiation

Gradually Get Closer



The tip should be brought up to approximately 3 mm from the lesion.

Laser Irradiation Conditions

PPS: 10 pps / Energy: 30mJ

Water: OFF / Air: OFF

Type of Tips: C800F

Defocus Irradiation

Irradiate Until the Surface is a Little White



Irradiate until the surface is slightly white. Excessive irradiation will result in post-operative pain. The lesion should heal within 3-5 days.

Observation of Healing Process



Before and after photos
Left: Before irradiation
Right: 7 days after irradiation

About the Authors

Clinical images and content provided by:



Dr. Akira Tsukui

ICOI Fellow, CAMLOG Biotechnologies Official Adviser,
Director and specialist for Japanese Society for Laser Dentistry,
Steering Committee Member of CSEr,
J. Morita Corporation Laser Instructor



Dr. Akira Aoki

Junior Associate Professor, Department of Periodontology,
Graduate School of Medical and Dental Sciences, Tokyo
Medical and Dental University (TMDU), Tokyo, Japan



Dr. Koji Mizutani

Assistant Professor, Department of Periodontology,
Graduate School of Medical and Dental Sciences,
Tokyo Medical and Dental University



Dr. Veronique Benhamou

Associate Professor and Recent Former Director of
Periodontology at McGill University,
Consultant for J. Morita USA, Inc.



Dr. Hector L. Sarmiento

University of Pennsylvania, School of Dental Medicine,
Associate Clinical Professor, Division of Periodontics and
Implant Surgery, Private Practice - Manhattan, New York

- All intellectual property rights for these protocols belong to the authors.
- Copying part or all of these protocols without permission is prohibited.
- The authors will not be responsible for any damage, lost profits, or demands by third parties due to the use of these protocols.

For more information, please contact Yuzo Hirukawa at +81-75-605-2300.