

*Dr. Fornaini is an eminent researcher and lecturer in the field of lasers in oral applications and dentistry. He currently holds a research position at the University of Nice Sophie Antipolis where he also coordinates the EMDOLA, European Master degree in Oral Laser Applications program. He practices laser dentistry in his own private practice in Fiorenzuola d'Arda (Italy) with a particular focus on pediatric dentistry.*



## TouchWhite Er:YAG Tooth Whitening

Carlo Fornaini

Many dental patients are not satisfied with the color of their natural teeth, and dental lasers are now routinely used for aesthetic tooth whitening treatments. Both Nd:YAG and diode lasers are frequently used for tooth whitening, but there is growing concern about the risk of thermal damage to the tooth pulp.

This case presents the results obtained by using a newer and safer form of laser-assisted tooth-whitening, known as TouchWhite™, which is based on the Er:YAG wavelength. Since the Er:YAG laser beam is fully absorbed by the aqueous bleaching gel, it does not directly heat the patient's hard tissue or pulp and therefore poses no safety risk. The procedure is also exceptionally fast.

The patient is a 43 year-old female who came to our office seeking whiter teeth. We recommended the TouchWhite treatment and educated the patient regarding the expected improvement. The following laser parameters were used during the treatment:

### Parameters:

|                 |                  |
|-----------------|------------------|
| Laser source:   | Er:YAG (2940 nm) |
| Spotsize:       | 7 mm             |
| Pulse duration: | VLP              |
| Energy:         | 80 mJ            |
| Frequency:      | 10 Hz            |

Fotona Tooth Whitening gel (35% hydrogen peroxide) was applied according to the procedure described in the LightWalker laser's application notes and gel instructions. The laser presets were adjusted to R16 (7mm spot size), VLP, 80mJ (increased from 40mJ, because of spot size), 10Hz.

The treatment was performed in line with instructions from the manufacturer, in which all steps are important: from taking before-and-after photos, polishing, protecting the gums, carefully applying the gel coating, using the preset laser parameters, and the use of an after-bleaching care gel. The total length of time for the procedure was 30 minutes for 20 teeth (total laser irradiation time: 10 min) and the patient was happy to leave our office in half the time she had planned.

The result was an immediate improvement from C2 to A1. Both dentist and patient were highly satisfied with the results and the very short procedure time.



Before TouchWhite Treatment



Application of the Er:YAG laser



Immediately after TouchWhite  
Courtesy of Dr. Carlo Fornaini

*Dr. Anil Türem Dinç graduated from Hacettepe University School of Dentistry in 2001. After graduation she worked for 3 years at a private dental clinic in Kartal and now works at MedicaDent dental clinic in Istanbul, Turkey.*



*Dr. Özge Erbil Maden graduated from Istanbul University School of Dentistry in 2005. Since then she has been working at MedicaDent dental clinic in Istanbul, Turkey.*



## Laser Tooth Whitening: Diode vs. TouchWhite Er:YAG Tx

**Anil Türem Dinç and Özge Erbil Maden**

Two patients came to our office to receive tooth whitening treatment. We decided to use different laser wavelengths, a diode 810 nm and a Er:YAG 2940 nm, for each patient in order to compare the efficiency of each treatment method. In both procedures the same bleaching gel - a 38% H<sub>2</sub>O<sub>2</sub> bleaching gel - was used.

Dr. Anil Türem Dinç treated the first patient, a female in her early twenties, using a standard 2 W 810 nm diode laser. Although diode lasers are widely used in tooth whitening treatments, the result was not as effective as we had hoped (see Figures 1 and 2 below). While a satisfactory whitening efficacy was achieved, there were miniature opaque white areas on the hard tissue surface, giving the teeth an artificial-looking uneven matt appearance.

In the second case Dr. Özge Erbil Maden used a Fotona Er:YAG laser to treat a male patient in his twenties. In the so-called TouchWhite™ technique, the Er:YAG laser light is fully absorbed in the bleaching gel, resulting in faster and less invasive treatment. That is why the Er:YAG laser power in the TouchWhite technique can be utilized more effectively, and Dr. Maden was able to heat the gel to higher temperatures, without compromising the safety of the tooth or pulp. The end result was effective whitening and an even, transparent natural shine on the tooth surface (see Figures 3 and 4 below). Additionally, the patient treated with the Er:YAG laser felt significantly less discomfort during the procedure.

### Parameters:

| Laser source:   | Diode (810 nm) | Er:YAG (2940 nm) |
|-----------------|----------------|------------------|
| Spotsize:       | N/A            | 7 mm             |
| Pulse duration: | CW             | VLP              |
| Energy:         | N/A            | 120 mJ           |
| Power:          | 2 W            | N/A              |
| Frequency:      | N/A            | 10 Hz            |

These two cases demonstrate that in comparison with diode bleaching, the TouchWhite Er:YAG whitening method has proven to be faster, gentler and more effective in achieving natural whitening results and shine.



Fig 1: Diode Tooth Whitening Before



Fig 2: Diode Tooth Whitening After



Fig 3: Er:YAG TouchWhite Tx Before



Fig 4: Er:YAG TouchWhite Tx After

Courtesy of Dr. Anil Türem Dinç and Dr. Özge Erbil Maden

*Dr. Mironov Evgeniy is a dental surgeon with a degree from the Sofia Medical university in Bulgaria. He practices laser dentistry in his own private practice, Dental studio Mironovi in Sofia, with a particular focus on oral implantology and aesthetic dentistry. He is also currently attending the M.Sc. laser dentistry program at RWTH Aachen University.*



## QSP Preparation for Veneer Bonding

### Evgeniy Mironov

A patient came to our office to improve the aesthetics of her smile. After the initial check-up and discussion of options, the patient decided to replace her 2-year old direct-made composite veneers with new ones. We made the decision to keep the enamel untouched and to work in the previous composite only.

Using our Fotona LightWalker AT, we started ablation with QSP mode, 150mJ, 12 Hz – higher settings than for surface modification in enamel/dentine, because in this case we needed to remove more volume than in a laser surface modification procedure only. After we saw the material's response, we raised the energy to 180 mJ, while in areas with a thicker layer of the existing composite we switched over to 15 Hz. In QSP mode the effect of changing the energy or repetition rate is more notable than in MSP preparation modes – this helps us to work more quickly with the same level of precision. We went 0.3 mm into the old composite, but still had not reached the enamel. The preparation was very clean and a hi-adhesive surface for adding new material was achieved. The preparation took 1.5 – 2 minutes for each of the central incisors and one minute each for the laterals.

After placing the rubber dam, direct adhesive restorations were made with a layer of Grandioso Heavy flow (Voco) placed first to establish a strong and uniform connection between the two types of composites. A brush was used to homogenize the material. After curing the flow material, the final shaping was done with Grandioso B1. Finishing and polishing was performed with the Dimanto (Voco) polisher set. After a total time of an hour and a half, the patient was satisfied with her new look and felt very relaxed after the painless procedure.

#### Parameters:

|                 |                  |
|-----------------|------------------|
| Laser source:   | Er:YAG (2940 nm) |
| Pulse duration: | QSP              |
| Energy:         | 150 – 180 mJ     |
| Frequency:      | 12 - 15 Hz       |
| Handpiece:      | H02-C            |



Beginning of treatment



After surface preparation



Immediately after treatment

*Courtesy of Dr. Evgeniy Mironov*

*Dr. Fornaini is an eminent researcher and lecturer in the field of lasers in oral applications and dentistry. He currently holds a research position at the University of Nice Sophie Antipolis where he also coordinates the EMDOLA, European Master degree in Oral Laser Applications program. He practices laser dentistry in his own private practice in Fiorenzuola d'Arda (Italy) with a particular focus on pediatric dentistry.*



## Treating Amelogenesis Imperfecta with the Er:YAG Laser

**Carlo Fornaini**

One of the greatest advantages in using the Er:YAG laser in dentistry is that it allows the dentist to perform minimally-invasive dental procedures. This is important for every treatment, but it becomes particularly interesting in the treatment of enamel lesions which are not related to decay, but that originate due to a defect in the formation of teeth also known as amelogenesis imperfecta.

This case study describes the treatment of a fifteen year-old female patient with amelogenesis imperfecta of the upper central incisors. For this case there was no alternative treatment possibility, such as creating a rubber dam, because the patient had a splint as a result of previous orthodontic treatment (Fig. 2).

When treating these type of lesions, it is important that we ablate the minimum volume of enamel and, at the same time, give the maximum result possible in terms of aesthetic appearance. We decided to use the Fotona Er:YAG laser, which can produce precise and minimally-invasive ablation. When removing the discolored enamel, the laser – set at SSP pulse mode – had a shallow, peeling-like effect. It was extremely easy to control the area of ablation and, in this way, ablate only the discolored enamel. No anesthesia was necessary and the patient felt no pain.

### Parameters:

|               |                                   |
|---------------|-----------------------------------|
| Laser source: | Er:YAG (2940 nm)                  |
| VSP Mode:     | SSP (50 µsec)                     |
| Pulse energy: | 150 mJ                            |
| Frequency:    | 10 Hz                             |
| Handpiece:    | R02-C – Non Contact mode (0.8 mm) |

No acid etching was needed prior to adhesion because the laser produces the ideal surface for adding composite resin. Also, any type of composite can be used. The patient was very satisfied with the result.



Fig. 1: White lesions on upper central incisors



Fig. 2: Palatal splinting on upper front teeth



Fig. 3: Er:YAG treatment



Fig. 4: The ablated enamel after laser Tx



Fig 5: End result

*Courtesy of Dr. Carlo Fornaini*



*Dr. Vesnaver is a specialist in maxillofacial surgery. He currently practices at the Department of Maxillofacial & Oral Surgery of the University Medical Center Ljubljana, where he is also an assistant professor. He has been involved in the research and development of several oral laser surgical procedures including laser photo-coagulation of intra- and extra-oral vascular lesions and laser ablation of intra-oral leukoplakia.*



## Intralesional Ultrasound-Guided Photocoagulation Using the Nd:YAG Laser

Aleš Vesnaver, Alenka Višnar – Perovič and Bojana Černelč

A 61-year old male patient was referred to our department with a sensitive elastic tumor in the left masseter muscle, which caused functional and aesthetic complaints. Doppler ultrasound (US) revealed a low-flow intramuscular haemangioma.

The decision was made to treat the haemangioma intralesionally with the Fotona Nd:YAG laser. As blind intralesional photocoagulation (PhC) could endanger branches of the overlying facial nerve, US guidance was used, quite similar to US-guided needle aspiration biopsies. In this way, the position of the fiber-optic cable tip can be controlled throughout the procedure. Additionally, the extent of PhC can be controlled in vivo, as the density and thus echoing properties of vascular tissues change instantaneously upon coagulation.

The complete treatment of the lesion required one Nd:YAG laser PhC session. The procedure was conducted under local anesthesia with Ultracain and sedation with Dormicum. The fiber-optic cable was inserted into the lesion via a long wide bore needle using the same US probe as used for US-guided needle aspiration biopsies. As the US properties of the vascular lesion change instantaneously upon coagulation, in-vivo control of the extent of treatment was possible. The US probe was moved to different positions and the needle with the fiber-optic cable inserted to various depths, until complete coagulation of the whole lesion was visible on the US monitor.

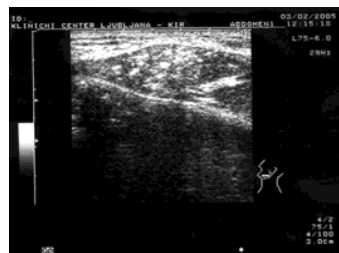
### Parameters:

|                          |  |
|--------------------------|--|
| Laser source:            | Nd:YAG (1064 nm)                                     |
| VSP Mode:                | SP   |
| Power:                   | 12 W   |
| Frequency:               | 50 Hz  |
| Handpiece:               | Ultrasound probe used for needle aspiration biopsies |
| Water/Air Spray Setting: | None   |

In the first week after treatment, the treated area was oedematous and painful, and pain was controlled with non-steroidal analgetics. Later, the oedema subsided, and gradual shrinkage took place due to interstitial scarring. In the following months, the scar softened to a certain degree. There was no tissue sloughing, as the surface epithelium remained undisturbed and no damage to the facial nerve branches occurred. The patient was very satisfied with the result.



Haemangioma before PhC:  
fiber-optic tip visible (arrow)



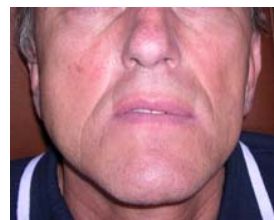
Haemangioma after PhC



US probe with fiber-optic cable  
inserted into needle



Pre-op



3 months post-op

Courtesy of Dr. Aleš Vesnaver

Dr. Seto obtained his Bachelor of Dental Surgery degree in 1992 from the University of Hong Kong and his Diploma of General Dental Practice from the Royal College of Surgeons of England in 1996. He also received a Post-Graduate Diploma in Dental Surgery (HK) in 1999 and an MSc (London) in 2001. Dr Seto then switched to the cutting edge of technology, where he obtained his MSc (Lasers In Dentistry) with distinction from the RWTH Aachen University, Germany, in 2007.



## Gingival Depigmentation with Er:YAG or Nd:YAG Lasers

Seto Siu Keung

Gingival hyperpigmentation may appear unaesthetic to patients with a high lip-line or gummy smile. The traditional means of treating such conditions involves the use of rotary instruments. However, with the use of lasers, pigmented tissue can be ablated more precisely, layer by layer, without bleeding.

Both Er:YAG and Nd:YAG lasers can perform this type of procedure since both wavelengths can ablate gingival tissue efficiently at low power settings that avoid damage to underlying tissues such as the periosteum, bone, root and pulp. This case presents the results obtained with implementing gingival depigmentation treatment procedures using the following laser parameters:

### Parameters:

| Laser source:   | Er:YAG (2940 nm)   | Nd:YAG (1064 nm)  |
|-----------------|--------------------|-------------------|
| Pulse duration: | 1000 $\mu$ s (VLP) | 100 $\mu$ s (MLP) |
| Pulse energy:   | 80 – 100 mJ        | N/A               |
| Frequency:      | 10 - 15 Hz         | 25 Hz             |
| Power:          | 0.8 – 1.5 W        | 2.5 W             |
| Water / Air:    | Water + air        | N/A               |

The diameter of the sapphire tip for the Er:YAG handpieces used was 1-1.2mm. A smaller diameter tip end will increase the energy density, which may endanger underlying tissues. For the Nd:YAG laser, a 320 $\mu$ m fiber was used for the procedure. The fiber should not be pointed perpendicularly over the pigmented area, as the laser can easily penetrate and damage the underlying tissue. A more horizontal angulation, e.g., about 30 degree, will be safer to the bone and pulp.

The handpiece or fiber tip should be kept in motion. The gingival margin or papilla area should be handled very carefully to avoid causing gingival recession. For most patients, topical or even local anesthesia will be indicated, and there will be no bleeding or pain post-operatively. Patients can brush and eat as usual and the wound will typically heal in 7-10 days.

### Er:YAG case:



Pre-op



Immediate post-op



10 days post-treatment

### Nd:YAG case:



Pre-op



Immediate post-op



10 days post-treatment  
(only upper treated)

Courtesy of Dr. Seto Siu Keung

*Dr. Litvak received his dental degree from the Hadassah Dental School in Israel, where he practices general dentistry using laser since 2000. He completed his Advanced Proficiency in Er:YAG lasers and is founder and co-owner of BED Laser Technologies an R&D company that develops patented Er:YAG laser technology. Dr. Litvak is also founder of the Academy of Laser Dentistry's Israeli chapter.*



## Er:YAG Laser Apicoectomy

**Emil Litvak**

In this clinical case a 48-year-old female visited our office due to swelling of the top right part of the face as a result of acute dentoalveolar abscess on tooth #13. The patient had a six-year old bridge between tooth #13 and tooth #16. Teeth #14 and #15 were missing. Examining the gums we found that the color and structure of the gums were healthy, but general recession was present in all 4 quadrants. Periodontal pockets were up to 3 mm deep. The soft tissue around the problematic tooth #13 showed signs of gingival recession and there was dentin wear on the buccal side of the tooth. A radiograph examination revealed a radiolucent area around the apex of tooth #13. On the X-ray images root canal fillings looked healthy.

We decided to selectively cut and remove granulation tissue around the apex of tooth #13 and disinfect the exposed part of the infected root by means of a free running ER:YAG dental laser system.

Local anesthetic was infiltrated on the buccal and palatal side of the tooth. A semilunar incision was performed at the apex area on the free gingiva above the tooth. A spot size of 400 micron and a R02 sapphire window handpiece were used without water or air spray. After opening the surgical site we switched to a R14 handpiece and the water was turned on, but without air. That handpiece was used to remove the granulation tissue, disinfect the bone surrounding the apex and, after changing parameters, cut the apex. We removed the apex and sutured the flap. The patient was instructed to take painkillers if needed to ease discomfort and to start rinsing with chlorhexidine after 24 hours.

### Parameters:

|                   | Soft tissue      | Hard tissue      |
|-------------------|------------------|------------------|
| Laser source:     | Er:YAG (2940 nm) | Er:YAG (2940 nm) |
| Handpiece:        | R02              | R14              |
| Spot size:        | 400 micron       | 940 micron       |
| Mode:             | VLP              | SP               |
| Frequency:        | 15 Hz            | 20 Hz            |
| Energy per pulse: | 180 mJ           | 250 mJ           |

The patient returned for check-ups after one week, one month and three months. After one week we removed the sutures. A mild swelling was still present, which is normal, apart from that, there were no post-operative complications. At the one month check-up no swelling or other symptoms were present. The soft tissue was healing nicely. Both the soft tissue and hard tissue appeared healthy at the 1 and 3 month check-ups, proving that Er:YAG laser technology can be utilized for dental soft, hard and alveolar tissue surgery with excellent results and low risk of complications.



Before



Soft tissue cutting



Apex removal



1 month post-op

*Courtesy of Dr. Emil Litvak*

*Dr. Litvak received his dental degree from the Hadassah Dental School in Israel, where he practices general dentistry using laser since 2000. He completed his Advanced Proficiency in Er:YAG lasers and is founder and co-owner of BED Laser Technologies an R&D company that develops patented Er:YAG laser technology. Dr. Litvak is also founder of the Academy of Laser Dentistry's Israeli chapter.*



## Er:YAG Laser-Assisted Gingivectomy After Orthodontic Treatment

**Emil Litvak**

A 14-year-old male in the final stages of orthodontic treatment presented with soft tissue proliferation due to orthodontic treatment and poor oral hygiene. The maxillary gingival buccal upper area was proliferated and covered about half of the surface of teeth #6-11. There was no sign of acute inflammation. The excessive tissue should be removed to improve the periodontium. The redundant tissue also adds to plaque retention and further inflammation.

Laser surgery was chosen because of its inherent minimal bleeding, reduced need for anesthesia and excellent healing. The Er:YAG laser wavelength is well suited for soft tissue surgery in situations where bleeding is not a major concern. The tip should be directed parallel to the tooth's long axis to avoid contact with the enamel. Accidental touching of the tooth surface usually results in a small surface interaction, which can be polished. During removal of gingival tissue, proper contour must be restored to avoid rebound growth. Hemostasis is usually adequate with the Er:YAG laser; however, if the tissue is highly inflamed, bleeding may be expected.

### Parameters:

|                          |                 |
|--------------------------|-----------------|
| Laser source:            | Er:YAG, 2940 nm |
| Mode:                    | VLP             |
| Energy:                  | 120 mJ          |
| Frequency:               | 10 Hz           |
| Handpiece:               | R02, tipless    |
| Water/Air Spray Setting: | none            |

Because of the conservative nature of this procedure, it was agreed that no anesthetic agent would be used. The laser pilot beam was aimed to a point 2 mm higher than the gingival edge on tooth #6. The procedure continued by slowly moving the handpiece on the same level for other teeth to be treated (#7, 8, 9, 10 and 11). Minimal bleeding was observed and no hemostatic procedure was needed.

The patient was released from the office 20 minutes after the procedure was completed. No signs of bleeding or charring existed. He was instructed to avoid any hard or hot food and drinks for the remainder of the day and not to brush for 24 hours. After 24 hours, he was told to brush very gently with a soft toothbrush softened even more by hot water. The patient was instructed to start use of chlorhexidine immediately after brushing, 3 times per day for 5 days, for infection control.

The patient returned after 48 hours, 5 days and 18 months for follow-up. The tissue healing progress was excellent and no sign of any complication related to the procedure was found. At 18 months, the soft tissue at the surgical site appeared healthy with no sign of swelling or proliferation.



Before



After

*Courtesy of Dr. Emil Litvak*



*Dr. Jovanovic is a researcher and lecturer in the field of lasers in oral applications and dentistry. He is a member of several international laser dentistry organizations and has lectured and published numerous articles on laser dentistry. He practices laser dentistry on a daily basis in his private practice in Kozarac – Prijedor, BiH in aesthetic dentistry, endodontics, periodontics and oral surgery. He is currently involved in several clinical research projects to serve these interest areas.*



## Pulsed Nd:YAG Laser Treatment of the Root Canal

### Jugoslav Jovanovic

This clinical case presents the possibilities of using Nd:YAG lasers (1064 nm wavelength) to correct endodontic failure.

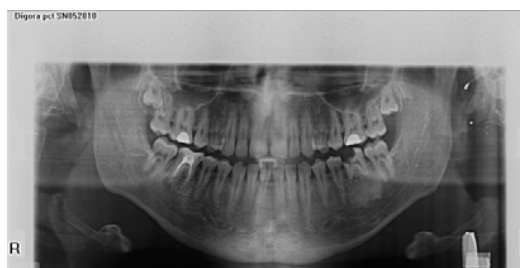
A 22-year old patient came to our office with endodontic failure of the tooth 46. The patient complained of having a sharp pain in the problematic tooth. After radiography, periodontal progression could clearly be observed at the apex of the distal root apex (see Picture 1). The tooth was opened and we started to clean out the filling material from the two root canals that had prior been treated by another dentist. In doing so, we discovered two more root canals which had not been treated. After mechanical preparation and chemical cleansing, rinsing and drying of all four root canals, we introduced Fotona's Nd:YAG fiber (200 µm) and irradiated the four canals five times for five seconds in the apical-coronal direction. After irradiation the root canals were filled with Apex cal and closed for 3 days. We performed 3 therapy sessions every 3 days and finally filled the canals with a root canal sealer paste and gutta-percha points.

#### Parameters:

|               |                         |
|---------------|-------------------------|
| Laser source: | Pulsed Nd:YAG (1064 nm) |
| Mode:         | VSP                     |
| Frequency:    | 15 Hz                   |
| Power:        | 1.5 W                   |

On the control radiography following the therapy we could observe the four canals successfully filled up to the apex (see Picture 2).

This clinical case supports research conducted by Dr. Norbert Gutknecht – the first to demonstrate therapeutical success in treating endodontic failure with the Nd:YAG laser - that Fotona's pulsed Nd:YAG laser is the laser source of choice for endodontic treatment because of its deep penetration depth (more than 1000µm) into the lateral dental tubulus and extreme efficiency on germ eradication.



Picture 1: Periodontal progression on tooth 46



Picture 2: The four canals filled up to the apex post-treatment

*Courtesy of Dr. Jugoslav Jovanovic*

*Dr. Dimitris Strakas has been actively involved in the development and practice of laser dentistry since 2002. He is currently serving as the president of the Greek Society for Laser Dentistry (GSLD) and a member of the World Federation for Laser Dentistry (WFLD). Dr. Strakas works with a Fidelis Plus, all-tissue Fotona laser system.*



## Aphthae Removal

**Dimitris Strakas**

### Parameters:

|                          |                              |
|--------------------------|------------------------------|
| Laser source:            | Nd:YAG (1064 nm)             |
| VSP Mode:                | MSP                          |
| Power:                   | 2 W                          |
| Frequency:               | 20 Hz                        |
| Handpiece:               | 300 µm fiber (R21 handpiece) |
| Water/Air Spray Setting: | None                         |
| Anesthesia:              | None needed                  |

### Treatment Procedure:

The 300 µm fiber-optic beam delivery tip was held perpendicular to the aphthous lesion. Using small circular movements and without making contact with the target tissue the target surface was disinfected using the parameters listed above. The treatment is completed when the entire surface of the aphthous lesion is coagulated and crusty, and has a whitish appearance (See Figure 1B). The patient felt immediate pain relief. This procedure did not require any anesthesia, there was no bleeding and the patient reported minimal discomfort.

### Discussion:

Excellent results were achieved. No follow up treatment was necessary. In two days healing was nearly complete, at four days most visible signs of surgery were gone. The patient's pain was relieved.

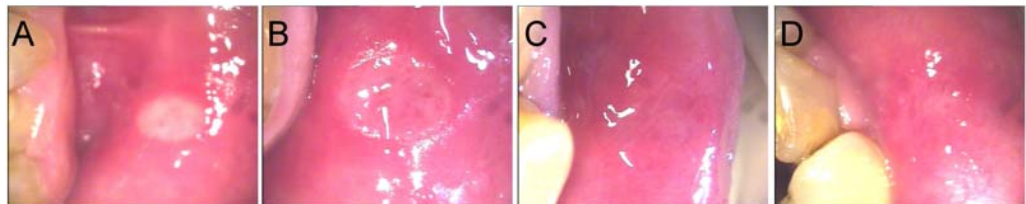


Figure 1. A) before treatment, B) immediately after treatment, C) 2 days after, D) 4 days after treatment

*Courtesy of Dr. Dimitris Strakas*

*Dr. Kazak graduated from the Faculty of Dentistry at the Istanbul University in 1987. The following year he co-founded Medicadent, dental health poli-clinic, where he works as administrator and clinical director, as well as practices in specialized fields of dentistry. In 2007 he completed the RWTH Aachen University Masters program in »Lasers in Dentistry«. He is actively involved in pioneering laser dentistry in Turkey.*



## Treatment of a Hemangioma on the Lower Lip

**Zafer Kazak**

The patient was referred to us by their GP to treat a hemangioma on the lip due to the patient's aesthetic concerns. It was the first time the patient underwent any kind of laser treatment.

The treatment of a hemangioma on the lower lip is usually more of an aesthetic treatment, although there is always a risk of excessive bleeding should the lesion be accidentally bitten. We opt to use Nd:YAG laser in our practice to treat these type of lesions, because of the laser's wavelength's ideal absorption characteristics. Nd:YAG targets hemoglobin while leaving the surrounding tissue unscathed, which is particularly important when working on the lips. We find that this in combination with the speed and ease of the treatment give the Nd:YAG laser treatment significant advantages over more conventional treatment methods such as sclerotherapy, excision, cauterization and cryotherapy. We do not use anesthesia, although to limit any excessive thermal effects we do shoot the laser through an ice cube.

Using the parameters below, we applied the Nd:YAG laser three times for a one-minute period and with 1-minute intervals. During the treatment the lesion can be clearly seen shrinking and disappearing. Anesthesia was not required during any of the procedures. Three weeks after the Nd:YAG procedure we used the Er:YAG laser in our AT Fidelis system to remove the coagulated tissue and obtain a better post-op aesthetic effect. No specific post-treatment care was required.

### Parameters:

|                 |                  |                  |
|-----------------|------------------|------------------|
| Laser source:   | Nd:YAG (1064 nm) | Er:YAG (2940 nm) |
| VSP Mode:       | MSP              | VLP              |
| Power / Energy: | 5 W              | 140 mJ           |
| Frequency:      | 100 Hz           | 10 Hz            |
| Handpiece:      | R21              | Titanium R02     |



Before



During



Immediately after



Complete recovery

*Courtesy of Dr. Zafer Kazak*

*Dr. Fornaini is an eminent researcher and lecturer in the field of lasers in oral applications and dentistry. He currently holds a research position at the University of Nice Sophie Antipolis where he also coordinates the EMDOLA, European Master degree in Oral Laser Applications program. He practices laser dentistry in his own private practice in Fiorenzuola d'Arda (Italy) with a particular focus on pediatric dentistry.*



## Unerupted Tooth Exposure Using Two Complementary Wavelengths

Carlo Fornaini

The surgical exposure of retained teeth is the most important step of orthodontic procedures. It is paramount to the strong adhesion of the bracket to the enamel that the procedure is as minimally invasive as possible and bleeding must be avoided. Nd:YAG laser is an excellent choice of treatment modality as bleeding can be avoided altogether and pain easily controlled both intra- and post-operatively. The Er:YAG laser is for us the modality of choice to expose bone-retained teeth. Due to its highest affinity for water and hydroxyapatite of all hard dental tissue lasers it is capable of ablating bone with less intense laser treatment settings than any other source. The combination of both lasers in orthodontic therapy provides an extremely wide assortment of treatment options and benefits for both the patient and practitioner.

This case study describes the treatment of a sixteen-year old that presented at our office seeking treatment for a malocclusion with agenesis of the upper permanent lateral incisors and inclusion of the upper left canine. After having fitted a fixed apparatus to open space for the lateral incisors, we were able to proceed with a surgical intervention to expose the unerupted canine.

The Nd:YAG laser was used to incise the soft tissue until the bone was reached. We then switched to the Er:YAG laser on the same Fidelis laser system, to further ablate the bone to create a window which would allow us to bond the bracket. The Nd:YAG laser was then once more used to achieve complete coagulation. At this point we were able to apply the brackets to the canine tooth and commence with traction.

Six months after the procedure the tooth reached into the arch and at nine months we were able to remove the apparatus and place temporary prosthetics with lateral incisors. Soft tissues and periodontal structures were found to be in good clinical condition. We used only a topic anaesthetic (EMLA, Astratech) and the control of pain and discomfort was good during the intervention and in the period after. It was not necessary to prescribe any kind of drug (antibiotics, NSAIDS) therapy, except for mouthwashes with clorexidine.

### Parameters:

|               | Soft tissue incision | Bone resection         |
|---------------|----------------------|------------------------|
| Laser source: | Nd:YAG (1064 nm)     | Er:YAG (2940 nm)       |
| VSP Mode:     | SP                   | MSP                    |
| Power/Energy: | 4 W                  | 300 mJ                 |
| Frequency:    | 40 Hz                | 10 Hz                  |
| Handpiece:    | R21, 300 µm fiber    | R02, tipless handpiece |



Before



Nd:YAG soft tissue incision



Er:YAG bone resection



Nine months after



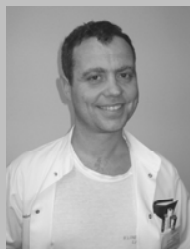
Access to tooth complete



Bracket fixed  
Courtesy of Dr. Carlo Fornaini



*Dr. Vesnaver is a specialist in maxillofacial surgery. He currently practices at the Department of Maxillofacial & Oral Surgery of the University Medical Center Ljubljana, where he is also an assistant professor. He has been involved in the research and development of several oral laser surgical procedures including laser photo-coagulation of intra- and extra-oral vascular lesions and laser ablation of intra-oral leukoplakia.*



## Large Venous Malformation Treatment Using Nd:YAG – A Case Study

**Aleš Vesnaver**

A 42-year old male was referred to our department with a large venous malformation located on the right side of the lower lip and the oral vestibule. The patient's concerns were mainly aesthetic. From a medical viewpoint, the lesions could be accidentally bitten, initiating excessive bleeding.

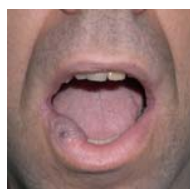
We decided to treat the lesion with a Fotona Nd:YAG laser because the procedure is fast and minimally invasive with good long-term results. The Nd:YAG laser procedure puts the least amount of strain on the resources available to our busy surgical department. Furthermore, the laser's wavelength allows it to penetrate deep into the tissue and the lesion, where its energy is absorbed by hemoglobin. Alternative therapies include chemical sclerotherapy which requires radiological control, excision which is time-consuming, cryotherapy which is hard to control and electro-cauterization, which poses a significant risk of excessive bleeding and procedural complications if the lesion is penetrated into.

The procedure was completed under local anesthesia; bilateral mental nerve block with Ultracain. With the fiber tip in near contact with the tissue surface the lesion's borders were first outlined with the laser. The lesion was then systematically covered with consecutive passes across the entire lesion's surface. Immediate shrinking and blanching of the mucosa was observed. Varying the distance between the fiber tip and the mucosa can to a certain degree alter and control the shrinking and blanching effect. When initiating the treatment the fiber tip is held slightly further from the target, once the clinical effects of the parameter settings have been confirmed visually, the target is closed in on with the fiber. This procedure was completed, without any complications, within 10 minutes.

### Parameters:

|                          |                       |
|--------------------------|-----------------------|
| Laser source:            | Nd:YAG (1064 nm)      |
| VSP Mode:                | SP                    |
| Power:                   | 12 W                  |
| Frequency:               | 50 Hz                 |
| Handpiece:               | R21 with 300 µm fiber |
| Water/Air Spray Setting: | None                  |

The patient was placed on a soft diet and oral non-steroidal analgesics for 7 days after the procedure. The patient spent two days in hospital care. Healing proceeded normally with re-epithelization starting from the wound margins. Complete wound healing and return to normal function was achieved within 5 weeks after the procedure.



Before



Before



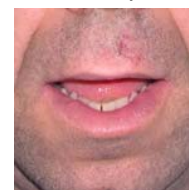
Immediately after



4 weeks after



7 weeks after



Complete recovery

*Courtesy of Dr. Aleš Vesnaver*

*Dr. Dovšak is a specialist surgeon in maxillofacial surgery. He is the founder of the AMOK surgery and dentistry clinic, and an Expert Clinical Lecturer for the Laser and Health Academy.*

*Dr. Dovšak has been using a variety of Fotona dental laser systems in his practice for over a decade.*



## Xanthelasma Treatment Using Er:YAG – A Case Study

**David Dovšak**

The patient had been referred to our maxillofacial surgery for an apiectomy procedure, which we successfully completed. The patient expressed some aesthetic concerns about the xanthelasmata. Her GP had provided blepharoplasty as the only treatment option. Given the invasiveness, down-time and expense of the procedure the patient had not considered aesthetic treatment any further. Having explained that no cutting and suturing is involved in the laser treatment the patient elected to have the xanthelasmata removed from both eyelids.

The procedure was conducted under local anesthesia without additional cooling during the treatment. Xanthelasmata are cholesterol deposits underneath the skin. SP mode, Er:YAG pulses were used to plane down the lesions until the deposits were completely removed. Longer pulsewidth, LP mode pulses were then used to continue ablation. The longer pulses of LP mode introduce a thermal element to the otherwise cold ablation, providing coagulation. The entire procedure was performed in approximately 10 minutes.

### Parameters:

|                          |                       |
|--------------------------|-----------------------|
| Laser source:            | Er:YAG (2460 nm)      |
| VSP Mode:                | SP and LP             |
| Fluence:                 | 7.5 J/cm <sup>2</sup> |
| Frequency:               | 5 Hz                  |
| Handpiece:               | R11                   |
| Spotsize:                | 4 mm                  |
| Water/Air Spray Setting: | None                  |

No further post-operative care was required. The patient was released immediately after the procedure and instructed to apply a hydrating cream over the scab until it releases. The main advantage for the patient was the significantly lower invasiveness compared to the provided alternative therapy. The elimination of cutting from the treatment and subsequent suturing improve post-operative comfort for the patient. Recovery after the removal of xanthelasmata using Er:YAG laser is generally faster than with conventional methods.



Before



1 week after



6 months after

*Courtesy of Dr. David Dovšak*

*Dr. Dovšak is a specialist surgeon in maxillofacial surgery. He is the founder of the AMOK surgery and dentistry clinic, and an Expert Clinical Lecturer for the Laser and Health Academy.*

*Dr. Dovšak has been using a variety of Fotona dental laser systems in his practice for over a decade.*



## Er:YAG Lingual Fibroma Removal – A Case Study

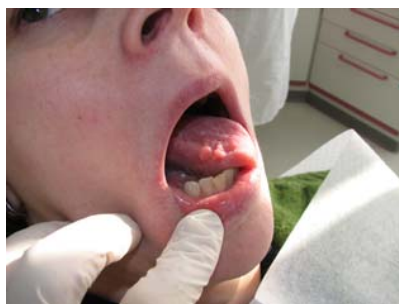
David Dovšak

In this case a patient presenting with several, localized lingual fibromae, was referred by the patient's dentist. The patient reported aesthetic concerns and general annoyance with repeatedly biting the lesion, causing discomfort. After confirming the lesion was benign, the decision was made to remove the lesion using Er:YAG laser. If there is any doubt that the lesion may not be benign it is paramount to have a biopsy checked out by a qualified laboratory. Conventional techniques would include the use of a scalpel or a radio-frequency device, which would have required stitching in this case. This would have lead to some degree of post-operative discomfort as well as the need for a return visit to remove the stitches. The procedure was performed under local anesthesia. Using the treatment parameters described below no bleeding occurred during the procedure. SP mode was used to ablate the fibroma to just above the adjacent tissue. Longer, LP mode pulses were used to continue ablation down to the level of the adjacent tissue. The thermal effect of the longer, LP mode pulses coagulate the smaller blood vessels in the surrounding area, eliminating bleeding. The ablative action of the Er:YAG laser, which removes tissue in micron-thin layers, contributes to higher levels of accuracy in planning the lesion. These levels of accuracy would be hard to achieve with more conventional in the 1-minut treatment time it took with the Er:YAG laser. In addition, the hemostasis provided by the laser reduces hematoma formation, thereby contributing to a more comfortable recovery. In that respect the use of the ER:YAG laser to remove lingual fibromae provides unique benefits and can be considered irreplaceable for such treatments in oral surgery.

### Parameters:

|                          |                         |
|--------------------------|-------------------------|
| Laser source:            | Er:YAG (2940 nm)        |
| VSP Mode:                | SP and LP               |
| Fluence:                 | 5 – 9 J/cm <sup>2</sup> |
| Frequency:               | 7 Hz                    |
| Handpiece:               | R11                     |
| Spotsize:                | 4 mm                    |
| Water/Air Spray Setting: | None                    |

No further post-operative care was required. The wound should heal without problems through the formation of new fibrin. The patient was released immediately after the procedure with instructions to use the tongue normally; moving the tongue avoids scar formation. The main benefit of the ER:YAG lingual fibroma removal procedure for the patient is its simplicity, speed and minimal discomfort both during and post-operatively. It is an ideal solution for young patients.



Before



Immediately after

*Courtesy of Dr. David Dovšak*

*Dr. Dovšak is a specialist surgeon in maxillofacial surgery. He is the founder of the AMOK surgery and dentistry clinic, and an Expert Clinical Lecturer for the Laser and Health Academy.*

*Dr. Dovšak has been using a variety of Fotona dental laser systems in his practice for over a decade.*



## Lingual Frenectomy Using Er:YAG – A Case Study

David Dovšak

Ankyloglossia is a congenital anomaly that limits the mobility of the tip of the tongue. In cases where feeding, speech and oral hygiene are affected a frenectomy may be considered, especially when the development of an open bite deformity and mandibular prognathism are likely. Conventional frenectomy techniques would include the use of a scalpel, radio-frequency device or scissors, which often requires at least one stitch and leads to some degree of post-operative discomfort as well as the need for a return visit to remove the stitch(es). The main advantages of using the Er:YAG laser with the below recommended settings are that there is no bleeding and stitching is not required, minimizing post-operative discomfort for the patient, and reducing procedure time for the practitioner.

In this case the patient was referred by the pediatrician and presented with speech problems. We placed cotton pads under the patient's tongue for approximately 30 seconds before administering normal local anesthesia. Securely holding the superior part of the frenulum with forceps, the Er:YAG laser treatment was administered from the superior part of the frenulum downwards, using the settings provided in the table below. The procedure was concluded in a matter of seconds; the first number of laser shots was administered approximately in the same location to initiate the separation of the frenulum from the tongue. The following sequence of laser shots in quick succession along the frenulum to provide a clean incision.

### Parameters:

|                          |                  |
|--------------------------|------------------|
| Laser source:            | Er:YAG (2940 nm) |
| VSP Mode:                | LP               |
| Pulse energy:            | 550 mJ           |
| Frequency:               | 6 – 10 Hz        |
| Handpiece:               | R14              |
| Water/Air Spray Setting: | None             |

No further post-operative care was required. The patient was released immediately with instructions to eat ice-creams. Licking ice cream provides discomfort relief and moving the tongue avoids scar formation. The main benefit of the Er:YAG lingual frenectomy for the patient is its simplicity, speed and minimal discomfort both during and post-operatively. It is an ideal treatment solution for young patients.



Before



Immediately after

*Courtesy of Dr. David Dovšak*



Dr. Dovšak is a specialist surgeon in maxillofacial surgery. He is the founder of the AMOK surgery and dentistry clinic, and an Expert Clinical Lecturer for the Laser and Health Academy. Dr. Dovšak has been using a variety of Fotona dental laser systems in his practice for over a decade.



## Fibroma Removal on the Nasal Labia Using Er:YAG – A Case Study

David Dovšak

The patient in this case presented directly at our surgery with a benign fibroma on the right nasal labia, which caused aesthetic concerns. The patient also expressed aesthetic concerns. Prior to having the luxury of an Er:YAG laser at hand, we would have removed the fibroma using the Limberg flap technique. This is a considerably time consuming procedure, requiring a follow up visit and the results of the procedure are not as predictable as the removal of the fibroma with the Er:YAG laser.

The procedure was conducted under local anesthesia without additional cooling during the treatment. SP mode, Er:YAG pulses were used to plane down the lesion to just above the level of the adjacent tissue. Longer pulsewidth, LP mode pulses were then used to continue ablation to the level of the adjacent tissue. The longer pulses of LP mode introduce a thermal element to the otherwise cold ablation, providing coagulation of the vessels in the center of the fibroma. The coagulation of the blood vessels will be seen as a small dark spot appears in the center of the planed-down lesion. The entire procedure was performed in approximately one minute.

### Parameters:

|                          |                          |
|--------------------------|--------------------------|
| Laser source:            | Er:YAG (2460 nm)         |
| VSP Mode:                | SP and LP                |
| Fluence:                 | 8 J/cm <sup>2</sup>      |
| Frequency:               | 10 Hz (SP) and 5 Hz (LP) |
| Handpiece:               | R11                      |
| Water/Air Spray Setting: | None                     |

No further post-operative care was required. The patient was released immediately after the procedure and instructed to apply a hydrating cream over the scab until it releases.



Before

Immediately after

3 weeks after

Courtesy of Dr. David Dovšak

*Dr. Julio Lomelli is President of the Venezuelan Academy of Laser Dentistry. He has performed over 25.000 laser treatments since he pioneered in 1997 with a Fotona laser, being the first Venezuelan laser dentist in his country. Dr. Lomelli currently owns two Er:YAG and one Nd:YAG Fotona laser systems.*



## Tooth Hypersensitivity Treatment

Julio Lomelli

### Parameters:

|                          |                  |
|--------------------------|------------------|
| Laser source:            | Er:YAG (2940 nm) |
| VSP Mode:                | SP               |
| Pulse energy:            | 80 - 90 mJ       |
| Frequency:               | 2 Hz             |
| Handpiece:               | R02              |
| Water/Air Spray Setting: | None             |

### Treatment procedure:

- Remove plaque on the affected tooth by gently rubbing the area with wet gauze or a prophylaxis brush.
- To establish a reference sensitivity measure and set a treatment goal, spray air on the affected area (the patient will react) and request that the patient quantifies the pain on a scale from 0 to 10.
- After explaining the procedure to the patient, establish a working distance for the treatment. Hold the handpiece approx. 6 cm from the affected tooth and while emitting the laser move the handpiece slowly from left to right while gradually closing in on the tooth. When the patient starts feeling sensitivity, immediately stop the advance towards the tooth. Move the handpiece slightly away from the tooth (0,5 to 1 cm) so that the patient does not feel overpowering hypersensitivity anymore.
- At the working distance, move the handpiece three times slowly from mesial to distal ends covering the neck area of the tooth and following the contour of the gum. Allow a slight overlap of each shot. Aim the laser beam as closely as possible to the gum border. If gum tissue is touched, it will harm at this low power setting.
- Stop the laser emission and with the patient's mouth closed rub the treated area in order to wet the zone with the patient's own saliva.
- Repeat the previous two steps twice more.
- Have the patient rinse gently with water at body temperature and test with the air spray to determine any decrease in sensitivity. Do not use the air spray at full strength. The process can be repeated 2 more times (3 passes each), after swishing, repeat the air test until no sensitivity is felt.
- If sensitivity remains, the procedure may be repeated after 48 hours in order completely eradicate sensitivity. In some cases the patient may declare to feel no sensitivity because of the dramatic decrease in sensitivity. But one day later the patient may realize that some sensitivity has returned and returns for a final touch-up. The procedure has been 100% effective and lasting on all types of patients with the exception in cases of Taurodontism due to the peculiar anatomy of the teeth.
- Patients must be instructed not to brush for one day, then brush for three days without toothpaste, so the calcium in the saliva will work on the affected area. After the fourth day we can polish using resin polishers in order to eliminate any roughness that may have remained, which can lead to increased adhesion of bacterial plaque.

This laser technique is shown to be extremely effective in treating hypersensitivity, although the etiology (brushing technique or other) must be addressed for a long-lasting result.

*Dr. Thomas A. Sult co-runs a private practice in Minnesota where he provides a wide variety of surgical and laser-based procedures and is actively involved in laser clinical research and protocol development. Dr. Sult is a faculty member of the Institute for Functional Medicine and Aesthetic Lasers Inc., an expert clinical lecturer for the Laser and Health Academy and a member of the American Society for Lasers Medicine and Surgery.*



*Robin Sult co-runs Aesthetics Inc., an aesthetic laser practice, as Director of Laser Services. She is actively involved with clinical research and protocol development in laser aesthetics and a frequent presenter in both domestic and international laser conferences. She is also an expert clinical lecturer for the Laser and Health Academy.*



## Onychomycosis Treatment with Nd:YAG Laser

Thomas A. Sult and Robin Sult

A 72 year old male patient came to our office with a fungus infection of the toes (Fig. 1). After securing the diagnosis of onychomycosis with a positive culture (*Trichophyton Rubrum*), we decided to use a 1064 nm wavelength Fotona Nd:YAG laser to perform the ClearSteps treatment.

First the infected nails were filed down in order to allow for full penetration of the laser light into the nails. A Fotona S11 scanner with a 6 mm spotsize was used to treat the nails. The treatment only takes about 10 minutes. We performed 4 treatments in a period of two weeks (2 treatments per week). No topical anti-fungal creams were necessary.

### Parameters:

|                   |                      |
|-------------------|----------------------|
| Laser source:     | Nd:YAG (1064 nm)     |
| Fluence:          | 45 J/cm <sup>2</sup> |
| Scanner spotsize: | 6 mm                 |
| Pulse duration:   | 35 ms                |
| Frequency:        | 1 Hz                 |

After 4 treatments a culture-proven clearance of the nails was achieved, meaning that the fungus was successfully eradicated. After a period of 4 months the growth of clear nails was observed (Fig. 2). The patient returned for a check-up visit after 27 months. The nails were still clear and there was no sign of reoccurrence of onychomycosis (Fig. 3). The patient was highly satisfied with the results.



Fig. 1: Before



Fig. 2: After 4 months



Fig. 3: After 27 months

Courtesy of Dr. Thomas A. Sult and Robin Sult

Dr. Claudia Pidal has been working with Fotona lasers for over a decade. As laser surgeon consultant she has authored numerous guides on laser surgery techniques for a variety of laser sources, as well as several papers on laser treatments in the lower genital tract. She has also been closely involved in the development of novel and innovative aesthetic laser techniques. Dr. Pidal runs her own Universo Laser clinic in Buenos Aires.



## Intra and Extraoral Treatment for Rejuvenation of the Nasolabial Fold and Perioral Wrinkles

Claudia M. Pidal

Over time the depth and length of the nasolabial folds and the proliferation of rhytides in the lower third of the face create the most obvious signs of aging in the face. The technique presented in this case aims to maximize the tissue tightening effect by using a combined Er:YAG modality approach in both intra- and extraoral lip and perioral regions.

Histological and anatomical features unique to the intraoral mucosa allow us to produce retraction of both the skin and the aponeurosis of perioral muscles. This results in elevation of the labial commissure and flattening of rhytides and nasolabial folds.

This case presents the results obtained with a technique implementing Er:YAG laser in non-ablative SMOOTH mode in which trains of pulses at high repetition generate controlled, deep thermal effects.

The treatment does not require any special patient preparations and only requires topical anesthesia in the extraoral region. The intraoral mucosa does not require any anesthesia. Recovery can be expected to be immediate. Post-operative hydration of the skin in the treated region is recommended. The treatment has no adverse effects or contraindications, except for those normally associated with Er:YAG skin treatments (e.g. undergoing phototherapy treatments such as PUBA-UV, collagen disorders, active herpes).

### Parameters:

|                        |   |  |
|------------------------|---|--|
| Laser source:          | Er:YAG, 2940 nm   |  |
| Handpiece / Spot size: | extra-oral; PS01 @ 10 mm, pixel level 1<br>intra-oral; PS03 @ 7 mm                          |  |
| VSP Mode:              | SMOOTH  |  |
| Fluence                | <i>Dualis line*</i><br>extraoral; 3,0 J/cm <sup>2</sup><br>intraoral; 3,2 J/cm <sup>2</sup> | <i>Dynamis and Spectro lines</i><br>extraoral; 4,5 J/cm <sup>2</sup><br>intraoral; 9,5 J/cm <sup>2</sup> |
| Frequency:             | 1,5 Hz  |  |
| # Passes:              | 3   |  |
| # Sessions:            | 3 – 5 (according to age; older more sessions) at 15-day intervals                           |  |

\* When using PS Technology handpieces in combination with Dualis laser system, R04 and spot size 12 mm must be selected on the system's display before setting the fluence as given in the table above.



Before



After

Courtesy of Dr. Claudia M. Pidal



Dr. Kozarev has over fifteen years of experience in dermatology and skin disease treatment. She has performed over 2500 skin laser surgeries. Throughout her career Dr. Kozarev has gained a tremendous amount of experience using lasers on a daily basis. Throughout her long-standing cooperation with Fotona she has worked with virtually all of Fotona's laser systems in the aesthetic and surgery range and currently owns the DualisSP.



## Tattoo Removal with Q-switched 1064 nm Nd:YAG and 532 nm KTP Laser Sources

Jasmina Kozarev

A patient with a Fitzpatrick Skin Type 2 presented with a ladybug tattoo of Kirby-Desai Rank 8. We needed to remove both darker tattoo colors (black, grey), which commonly respond more intensely to laser treatments, and the lighter color (red) which is more complex to remove.

With a Q-switched laser, the optimal laser source for tattoo removal because of its nanosecond pulses with very high peak powers, we performed a test area. After a few days we evaluated the test spots in order to make sure that there were no adverse effects like scarring or blistering, in which case we would have to assess other treatment options. In this clinical case the test lesion cleared well and we were able to proceed with treating the rest of the tattooed area.

We moved the laser beam across the tattoo, using the wavelengths specified in the Table below for each individual color. The treated area develops raised white spots and the patient experiences a mild stinging sensation across the treated area. The area then takes between 7 and 10 days to heal. After the area had completely healed we allowed the body's natural clearance methods to remove the broken up tattoo ink and waited approximately 6 more weeks before the next treatment. This same general procedure was followed during all subsequent treatments. Two different wavelengths had to be used for successful removal of this tattoo. The density of the concentration of pigment determines the number of treatments needed. In our case, the tattoo was treated over a series of 4 sessions using the Q-switched Nd:YAG laser at 1064 nm wavelength and a Q-switched KTP laser at 532 nm wavelength. By the fourth session the tattoo had faded significantly.

### Parameters:

|               | Black and grey color        | Red color                 |
|---------------|-----------------------------|---------------------------|
| Laser source: | QS Nd:YAG (1064 nm)         | QS KTP (532 nm)           |
| Spotsize:     | 4 mm                        | 3 mm                      |
| Frequency:    | 6 - 8 Hz                    | 4 – 5 Hz                  |
| Fluence:      | 3.5 – 4.8 J/cm <sup>2</sup> | 2 – 2.6 J/cm <sup>2</sup> |

### Post treatment instructions

After treatment we lubricated the area with vaseline ointment and covered it with a band-aid until the irritated skin soothed, usually in 2-4 days. It is important that the area is kept moist to avoid formation of scabs and scars. We advised the patient use an occlusive cream, which at the same time promotes healing and soothes the skin. Additionally, after treatment the patient can cool the area with cold compressions but not directly on the skin.

We advised the patient avoid the sun until the area heals completely, because exposure to the sun may lead to hyperpigmentation. The skin healed in approximately two weeks, while fading of the tattoo usually lasts up to eight weeks and reduces approximately 20% less with each treatment.

Q-switched Nd:YAG and KTP lasers are successful in removing the tattoo without scarring, hypo or hyperpigmentation. The final result showed an almost complete clearance of the Tattoo.



Before



After 2 treatments



After 4 treatments



After 8 months  
Courtesy of Dr. Jasmina Kozarev

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## Treatment of Post-Filler Granuloma Formation

Jasmina Kozarev

In a prospective study we tested if Fotona's QX MAX Q-switched Nd:YAG laser could be used to successfully treat post-filler granuloma formation.

A 48-year-old female patient developed a granuloma formation 8 months after the first Hyaluronic Acid (HA) injection. The patient underwent clinical management, biochemical blood tests, hormonal analysis, immunology tests, biopsy and follow-up. Laboratory abnormalities revealed that the patient has a history of EEM (Erythema Exsudativum Multiforme) and developed contact dermatitis to nickel sulfate and latex. A cutaneous examination revealed very light erythematous and several hyperpigmented nodular lesions in a linear pattern which measured 0.5 to 3 cm in diameter. The patient had abnormal collagen and elastic fibers and necrotic dermal content in the upper dermis showing transepidermal elimination.

### Procedure:

- Anesthesia was achieved with phonophoretic application of lidocaine for 10 minutes prior to each of the three treatments. During the procedure cold air cooling was additionally used.
- In the three treatment sessions we first used a Q-switched Nd:YAG laser (QX MAX).
- Immediately after the Q-switched laser, we applied a fractional Er:YAG laser (SP Dualis) session
- After the fractional Er:YAG procedure we introduced 40 mg/ml of Triamcinolone Acetonide evenly across the treated skin tissue.
- Follow-up time was 10 months.

### Parameters:

|                        | 1 <sup>st</sup> Pass        | 2 <sup>nd</sup> Pass          |
|------------------------|-----------------------------|-------------------------------|
| Laser source:          | QS Nd:YAG (1064 nm)         | Fractional Er:YAG (2940 nm)   |
| Spotsize:              | 4 mm                        | 10 mm                         |
| Fluence:               | 4.5 – 5.6 J/cm <sup>2</sup> | 5 J/cm <sup>2</sup> (Turbo 4) |
| Frequency:             | 10 Hz                       | N/A                           |
| Handpiece:             | N/A                         | PS01                          |
| Pixel number and size: | N/A                         | 75 / 500 µm                   |

Results revealed laser treatment with a Q-switched Nd:YAG laser is an effective noninvasive treatment modality for the reduction of hyperpigmentation, pigmented infiltration and reduction of biofilm in granulomatous reactions to HA gel injections. By using laser energy that penetrates deep without injuring the top layer of the skin, the deep dermis is stimulated to produce natural collagen and other vital proteins that make up healthy skin.

Only lasers with pulses in the nanosecond region (5-20 ns), like the Q-switched Nd:YAG laser in the QX MAX, are able to successfully remove pigmented inflammatory infiltration and biofilm without significant skin destruction. Skin textural changes generally resolve within 4-6 weeks, suggesting an optimal treatment interval. The fractional Er:YAG laser treatment additionally removes inflammatory and pigmented cells, and induces regeneration in the epidermal and dermal compartment. The small areas of untreated skin around the regularly spaced micro-holes speed up re-epithelialisation, recovery and healing, with a minimal risk of complications.



Before



After

Courtesy of Dr. Jasmina Kozarev