Investing in a soft tissue laser

Investing in a laser

Which one is the best fit for your particular type of practice

What do you want to do with your laser hard and soft tissue or just soft tissue surgery?

We are changing dentistry, not just investing in a laser

If you really want to do something, you’ll find a way. If you don’t, you’ll find an excuse.

Missed opportunities & lost income

Some practitioners fail to recognize and treat abnormal oral conditions.

Some practitioners choose to ignore abnormal oral soft & hard tissue problems.

Some practitioners refer all soft tissue abnormalities and pathology out.

Laser Dentistry

The use of lasers for treatment of both hard and soft tissues in dentistry is the present state of the art of dentistry and is the new standard of care.

“Laser” - an acronym...

Light

Amplification by the

*Stimulated

Emission of

Radiation

Are lasers safe for children?

The American Academy of Pediatric Dentistry recognizes the judicious use of lasers as a beneficial instrument in providing dental restorative and soft tissue procedures for infants, children, and adolescents, including those with special health care needs.
You do not just buy a laser and start treating infants

2013 Academy of Pediatric Dentistry's Oral Health Policies

This is a document which establishes Standards of Care which are intended to be applied rigidly, versus Guidelines which are recommendations.

Policy the use of lasers in the pediatric patient

1. Recommends that dentists receive additional didactic and educational training before using lasers on their patients.
2. Use protective eyewear specific for laser wavelengths during treatment for the DENTAL TEAM, PATIENT and any OBSERVERS.

Advantages of lasers
Lasers do not burn and cost of a laser should not be factored in when we make decisions to revise tissue

- Excellent hemostasis: risk of bleeding significantly reduced
- Bactericidal: little chance of any type of infection
- Has Photobiomodulation, (LLLT) or Low Level Laser Effect: reduces inflammation, improves healing
- No need to place infant into the OR or sedation

Electrosurgery

- A significantly lower cost than a laser.
- Often a lower cost than most other wavelengths of lasers.
- The electrosurgical electrode (wire) may be bent to meet the clinical contour need, allowing easy smoothing of soft tissue, such as pontic areas that require contouring, or palatal areas that have irregularities.
- Electrosurgery electrodes cut on their side as well as their ends, which affords easy access for contouring or cutting deeply into soft tissue.
- Electrosurgery cuts extremely rapidly when compared to a diode laser.
- When on the proper setting, hemostasis is almost immediate.
- Assuring the electrode is cleaned frequently while operating, the cutting consistency, speed, and depth of cuts are very good.
- After cutting, the wound is nearly painless.
- Electrosurgery electrode tips can be modified into a pencil-like shape, allowing extremely narrow and precise cuts.

The disadvantages of electrosurgery in dentistry are:

- You must anesthetize patients undergoing electrosurgery.
- Patients don’t care for the burning flesh smell during cutting, which is stronger than when a diode laser is used.
- The burning flesh taste produced in the mouth by electrosurgery remains for a significant period of time.
- Because of the fast cutting potential of electrosurgery and the low tactile sense while cutting, overcutting of tissue may be experienced.
- Because of high heat production while cutting, electrosurgery should not be used around implants. This can cause loss of osseointegration of implants.

Laser delivery systems

Flexible Quartz Fiber for the Erbium Lasers

Bare optical fiber for the shorter wavelength diodes
Articulated Arms

Articulated Arm: hollow tubes with 45 degree highly reflective mirrors with little loss of laser energy.

Comparing Soft tissue lasers in a Pediatric dental Practice

Which laser is going to best meet your patient’s needs for oral surgery?

Biolase
Er, Chromium: YSGG @2780 nm

Erbium: YAG @ 2940 nm

LightScalpel
CO\textsubscript{2} 10600nm
diode

Solea
CO\textsubscript{2} 9300 nm
diode

Xlase
1064nm
diode

Hard & Soft tissue Lasers

Soft tissue only lasers

Understanding your Erbium lasers

1. The Erbium family consists of two very close wavelengths
   a. Erbium: YAG @ 2940 nm
   b. Erbium, Chromium: YSGG @2780 nm

2. Delivery is either by Fiber or an Articulated arm

3. Soft tissue surgery is completed without the need for water due to the high water content of the soft tissue.

4. Tissue ablation, excision or incision is by photo-acoustic activity rather than photothermal, which causes the primary chromophore - OH (water) within the tissue to explode.

5. Free running pulsed (FRP)

6. Non-contact

7. Control power by adjusting Hz and Mj

$50000-$85000

The Erbium Family

2780 nm & 2940 nm

Erbium: YAG @ 2940 nm

Biolase
Er, Chromium: YSGG @2780 nm

Hoya
T4M(Fotona)

How the erbium family of lasers produce their laser beams

Free running Pulsed

Erbium and Nd:YAG
Understanding your diode laser

1. Diode vaporize soft tissue by a photothermal effect
2. Tissue is heated and vaporized, excised or incised by direct contact of the laser tip to the tissue. (tissue depth up to 1 mm)
3. The two desired tissue interaction of laser energy are absorption and scattering which increases absorption by increasing the number of target chromophores potentials.
4. Primary targeted tissue is pigmented tissue (tissues that contain hemoglobin and/or melanin).
5. The 1064 and 980 wavelengths are more highly absorbed in water than lower wave lengths such as the 810 nm
6. Delivery is by fiber or replaceable fiber tips (adds to cost)
7. Lower cost and easier portability
8. Continuous wave and gated or pulsed wave

$5000-$18000

Preparing your laser tips & fibers for surgery

Erbium
1. Quartz tips can be reshaped and polished
2. Sapphire tips are hotter than quarts at same settings and may not be polishable
3. Use tipless handpiece

Diode fiber
1. Fibers must be cleaved prior to each procedure and may need additional cleaving if the procedures are long or difficult.

CO2 uses tipless contra angle and straight handpiece

Understanding your diode laser

Fiber initiation

Our goal when using the diode laser is to initiate the laser fiber and create a "hot tip" which will generate sufficient thermal energy at the laser’s tip to cause immediate tissue removal limited to the desired surgical area.

The success of tissue removal when using your diode laser is the carbon-rich black ink or char placed at the tip of the diode laser fiber glass tip for the purpose of initiating or activating the fiber.

During this surgery, it is imperative to keep treatment contact intervals in any one spot relatively short (1 to 2 seconds), since limited exposure to the tip will minimize any collateral damage to the peripheral tissues.

If the contact exposure time is too long (more than 2 to 3 seconds in one area), the ability of the tissues to dissipate heat is reduced. When using the contact mode a large percentage of the near-infrared photons (most diodes, the primary emission of the laser) are absorbed by the (initiated) blackbody tip and carbonized coagulum (the soft tissue accumulation on the tip).

Therefore the laser’s penetration and absorption of these primary (single wavelength) infrared photons generated from the diode laser—is sufficiently reduced.

The "hot tip" offers us certain advantages over other surgical modalities, since this allows for adequate cauterized tissue within its immediate periphery when used correctly. In general it is not recommended to perform soft tissue surgery generating over 2 watts in the CW mode with diode lasers. Most ablation surgery should be gated or pulsed to allow for proper tissue cooling and to prevent excessive heat being placed into the tissue.

Continuous-Wave (CW) Operation

Gated (Pulsed) Mode
**Carbon Dioxide Lasers**

Soft tissue @ 10,600 nm  
$30,000+

For CO2 lasers the tissue penetration depth is .01mm this short depth enables the best precision and hemostasis in removal of soft tissue.

**Dual Hard and Soft tissue laser @9300nm**

1. Delivery system is by an articulated arm
2. Soft tissue surgery is completed with water off
3. Hard tissue surgery requires water to be on
4. Super pulsed Continuous wave
5. Variable foot pedal with Hz 0-10,000 pulses per minute
6. Highly absorbed in both water and hydroxyappitite
7. Primary target : Hydroxyappitite
8. Laser plume photothermal with plasma particles
9. Non-contact
10. Control power by using pulse duration, power settings & variable foot pedal

**Extremely important concept**

Co2 & Erbium lasers  
Diode lasers

**The effect of pulse duration on tissue ablation and control of bleeding**

Hemostasis can be attained by using Erbium lasers having long pulse durations which allow for good control of bleeding.

1. Pulse durations longer than 700 usec provide residual thermal energy for coagulation.
2. Pulse durations in the range of 50-100 usec are precise and appear to accelerate hard issue ablation and reduce patient discomfort.

**Soft tissue procedures in pediatric and orthodontic practices**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>CO2</th>
<th>Diodes</th>
<th>Erbium</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maxillary lip-tie</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>2. Lingual tongue-tie</td>
<td>yes</td>
<td>yes</td>
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</tr>
<tr>
<td>3. Biopsies</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>4. Herpes labialis</td>
<td>yes</td>
<td>yes</td>
<td>*yes</td>
</tr>
<tr>
<td>5. Aphthous ulcers</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>7. Venous lake lesion removal</td>
<td>yes</td>
<td>yes</td>
<td>n/a</td>
</tr>
<tr>
<td>8. Mandibular frenum revision</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>9. Caries exposure</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

**The Key to Success**

Always use the least amount of energy you need to accomplish the goal of your treatment.

**Soft tissue procedures in pediatric and orthodontic practices**

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</thead>
<tbody>
<tr>
<td>10. Phase three orthodontics</td>
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<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>a. Gingival recontouring</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<td>b. Gingivectomy</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>11. Alternative to mandibular</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<td>cleft grafting/ frenectomy</td>
<td></td>
<td></td>
<td></td>
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<td>12. Periodontal therapy</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<td>13. Pulp therapy</td>
<td>yes</td>
<td>?</td>
<td>yes</td>
</tr>
<tr>
<td>14. Exposure of unerupted teeth</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>15. Crown lengthening</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>16. Pericoronal flap problems</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

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Suggested Settings for soft tissue surgery

*Be careful of preset factory settings

**Solea 9300 CO2 laser**

1. Pulse duration @ 14-40/spot size .25-.5 mm and power set to 40 % air and water off with variable foot pedal

**Erbium:YAG 2940 nm LightWalker/Powerlase AT Spa**

1. Surgical settings for excision of soft tissue 20-30 Hz and 55-100 mj using longer pulse durations (LP 600 msec)
2. 1064 nm xlace laser

1. Surgical settings for excisions f soft tissue pulsed or gated at 24 msec on 18 msec or 200/100 off 300u fiber 1.5-3.0 w (in most cases actual power will remain below 1.5 w)

*Be careful of preset factory settings*

**Maxillary lip-tie frenectomy**

Typical initial settings when local is used: 64 pulse duration, water off. Use the variable power foot control 0 to 40 %, 5 spot size.

No scaring, no orthodontics and not waiting until age 9-12

Preoperative post-op

2006 2007 2010

24 months po 5 days post surgery

28 year old female

Lawrence Kotlow DDS 2016
Ankyloglossia

1 week post surgery

Lawrence Kotlow DDS 2016

Ankyloglossia

1064 laser

LK

Lawrence Kotlow DDS 2016

Ankyloglossia

Lingual frenectomy

Children with a tongue tie have to contend with difficulties which may only be discovered as they grow older.

1. These can include:
   - Inability to chew age appropriate solid foods
   - Gagging, choking or vomiting foods
   - Persisting food fads
   - Difficulties related to dental hygiene
   - Persistence of dribbling
   - Delayed development of speech
   - Deterioration in speech
   - Behavior problems
   - Dental problems starting to appear
   - Loss of self confidence because they feel and sound ‘different’
   - Strong, incorrect habits of compensation being acquired

The specific challenges an adult with a tongue tie may face include:

- Inability to open the mouth widely affects speech and eating habits.
- Inability to speak clearly when talking fast/loud/soft
- Clicky jaws
- Pain in the jaws
- Migraine
- Protrusion of the lower jaws, inferior prognathism.
- Multiple effects in work situations.
- Effects on social situations, eating out, kissing, relationships
- Dental health, a tendency to have inflamed gums, and increased need for fillings and extractions
- Sensitivity about personal appearance
- Emotional factors resulting in rising levels of stress
- Tongue tie in the elderly often makes it difficult to keep a denture in place.
Lingual frenum revision with local and suturing

Six days post-op

Thick tissue required local anesthetic.

Suture placed to prevent reattachment

Erbium

Excision of oral growth due to traumatic occlusion during orthodontics

4 days post

Excision of oral growth due to traumatic occlusion during orthodontics : video

Biopsies

Biopsy of mucocele

Biopsy of mucocele

local anesthetic

sutures

PowerLase AT

Six days post-op

Biopsy

Biopsy

Biopsy
Mucocele & Maxillary lip-tie surgery: Female BD 2/6/06
Lip-Tie Revision-2/3/11
Mucocele 1/27/11
Combined Er:YAG/1064

Typical initial settings 24-64 pulse duration, water off. Use the variable power foot control 0 to 40%. Limit power (Hz) setting to 40%, .25-.5 spot size.

Biopsy of mucocele

Herpes labialis

1064 laser

Herpes Labialis

Aphthous Ulcers

Aphthous Ulcer Treatment
Aphthous Ulcer treatment

Start pulse at very low level 15-24. Ask patient when he or she just begins to feel warmth and when you begin to see white pitting. No water, power less than 40%. Two minutes no la or topical.

The photothermal effects of laser energy

Tissue welding using Erbium lasers

Carbonization
Vaporization
Tissue welding
Coagulation & protein denaturing
Bacteria deactivation
Tissue warming

Photothermal heating effects in soft tissue

Removal of venous lake lesions

Diode: Removal of *venous pool 8yr old female

980 nm or 1064 .6w 300u/200u fiber cw

14 days post
3 months post

Tissue welding

Tissue welding of split lip

Immediately after Laser treatment
Approximately 48 hours post treatment
19 days post treatment

Rcurrent Aphthous Ulcer Stomatitis
Changing dentistry and improving our patient’s quality of life

Dear Dr. Kotlow

Our son _______ was born in 2005, he is now 10 years old. Around age 2 he started to develop mouth sores, he would break out with anywhere between 2-7 sores at times. There have been times where he has received up to 10 at one time. The sores became constant to where he would always have sores in his mouth. There was no break from us. Initially he would receive a fever upon break out that would last up to 5 days and was even diagnosed with scarlet fever at one point.

We brought him to multiple specialists over the years he has been treated with prednisone and other anti-inflammatory prescriptions with minimal success. Chris was seen by an ENT who suggested removing his tonsils and adenoids, the procedure was done at age 4 and it did not help with the sores in his mouth.

We have tried gluten free diets, cutting off all acidic foods and drinks again with minimal success. Further more he weighs 67 pounds, at times will not eat due to the sores in his mouth.

In 2012 we moved to Albany. We heard about you from friends and laser dentistry. Our friends had mentioned our situation to Dr. Kotlow and you felt you could help. We waited until he had a bad break out and contacted your office. We were seen right away. He had roughly 7 sores in his mouth, the largest the size of a dime on his lower lip. It took approximately 5 minutes to complete the laser procedure. Our son claimed instant pain relief and within days the sores were gone where normally they were there for weeks.

Our son has seen Dr. Kotlow roughly 5 times a year for this over a three year period. Each time the same results. It is the only thing that has truly worked. And as Dr. Kotlow indicated the out breaks have lessened and the size of the sores has decreased. He still gets them but they are not as bad and not as frequent.

It has helped my son’s confidence, appetite, self esteem and decreased the amount of pain and discomfort he was feeling. We believe this is the one treatment we can count on to help our son.
Venous Lake lesions

Use the lower settings to close down aberrant vessels for about two minutes, just until the patient feels warmth. No local, topical used. Then slowly remove tissue until you can remove blood clot.

Mandibular frenum revisions
(alternative to gingival grafting)

Periodontal problems: mandibular frenum release

Mandibular frenectomy

Typical initial settings topical only 12-19 pulse duration, water off. Use the variable power foot control 0 to 40%. 5 spot size.

Mandibular frenum revisions

1064 laser with using topical only

Mandibular frenectomy (OFD)

1064 laser with using topical only
Gingivectomy or recontouring: Crown & Bridge

31 pulse duration/power 20-30/no water .75 spot size

Gingival reduction to expose dental caries

15-25 pulse duration/power 5-15%/no water .25-.5 spot size

Pericoronal flap problems

Typical initial settings 14-100 pulse duration, water off. Use the variable power foot control 0 to 40%. .25-.5 spot size

Operculectomy

Exposure of tooth removal of soft tissue for orthodontic binding One week post surgery

Pericoronal pain One week post surgery
**CO₂ and Erbium**

- Lasers are an effective alternative for treating pulps with the additional benefits of providing pulp therapy without the need to introduce chemicals into children’s systems.

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Pulp therapy in primary teeth

**Pulpotomy**

Typical initial settings: 50 pulse duration, water 100. 20 sec per canal 3x. Use the variable power foot control 30-40%. 5 spot size.

8/30/2002

10/30/2007

8/30/2002

10/30/2007

11/11/2013

1/20/2016

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**Phase III orthodontics**

Orthodontists using lasers may need to consider the effect of doing their own soft tissue surgical procedures and how it could affect referral sources.

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Crownlengthening for orthodontist bracketing
Exposure of crown or crown lengthening for orthodontic bracket placement

Exposure of tooth under soft tissue

Typical initial settings: 24-64 pulse duration, water off. Use the variable power foot control 0 to 40%. Limit power (Hz) setting to 40%, .25-5 spot size.

Exposure of crown or crown lengthening for orthodontic bracket placement

Topical only: 15 Hz / 100 mj

Exposing teeth for Orthodontic Bracket placement

1064nm laser 24/18 300u 1.2w

Lawrence Kotlow DDS

Gingivectomy during or immediately after orthodontic treatment

CO2 @ 9300nm

Intercepting the decalcification process
Lip-tie release and gingivectomy

Gingivectomy during or immediately after orthodontic treatment

Cut first and finish using your laser
Due to all lasers creating a photobiostimulating effect once the laser is used you can use your conventional instruments and then finish the procedure using your laser

Removing hyperemic tissue

Gingival reshaping after orthodontic removal of brackets
Gingival reshaping after orthodontic removal of brackets

![Image of gingival reshaping](image)

Torus removal : Er:YAG

Photos courtesy of Dr. Don Coluzzi

**Additional non-traditional pedo-ortho procedures**

- Periodontal disease treatments
- Fiberotomy
- Implant recovery
- Endodontics: PIPS(lares)
- Apicoectomies
- Closed flap crown lengthening
- Torus removal

Apicoectomy : Erbium 2970nm

THANK YOU