Laser

Mihaly Vaszilko
MD,DMD,Phd
Oral and maxillofacial surgeon,
plastic surgeon

Qualities

- Parallelism – could point to the Moon
- Unicolored – bandwidth is small in each used wavelength. The radiated laser light's wavelength is similar to the absorption badwidth of the live tissues
- Continuous or impulse mode: big capacity impulses have a different impact: heat-conduction is irrelevant, therefore it's possible to create painless micro-burns (f.e.: hair removal)
- Penetration depth: the laser enters the tissue based on the wavelength and the type of the tissue (f.e. infrared goes a lot deeper than the visible light)

History of Laser Utilization

- Used for almost the past 100 years
- First therapies - simple conventional lamps controlled with a filter
- In the past, lasers have used sunlight exposure as a way to treat acne due to its initial anti-inflammatory effects. However, this has proved to be potentially carcinogenic due to the exposure of UVA (aging) and UVB (burning) waves
- Has become a more common modality in the last decade

Lasers

Low-level laser therapy (LLLT) 0,5-500mW:

- Helium-Neon laser (He-Ne 632 nm)
- Infralasers
  - Gallium-Arsenide Diode laser (GaAs 904nm)
  - Gallium-Aluminum-Arsenide Diode laser (GaAlAs 830nm)

High-level laser therapy (HLLT) 1W-25W

- CO2
- Nd:YAG
- Er:YAG

Application

• Treatment of Herpes and aphtas: reduces pain and healing period Advice: 5-8 J 3-4 times weekly

•Treatment of Gingivitis, parodontitis, periimplantitis: 7-10 J 3-5xweekly

• Nerve regeneration: Based on the theory of photobiomodulation, regenerates injured nerves, vessels and improves wound-healing.

• Tooth whitening

• Endodontics

• Temporomandibular joint disfunktion: It seams more useful in types of myofascial pain

• Operative wound healing is increased f.e. in BRONJ (it’s also useful pre and postoperatively

Soft Laser Therapy

Low power laser, which can penetrate deeper without causing thermical injury.

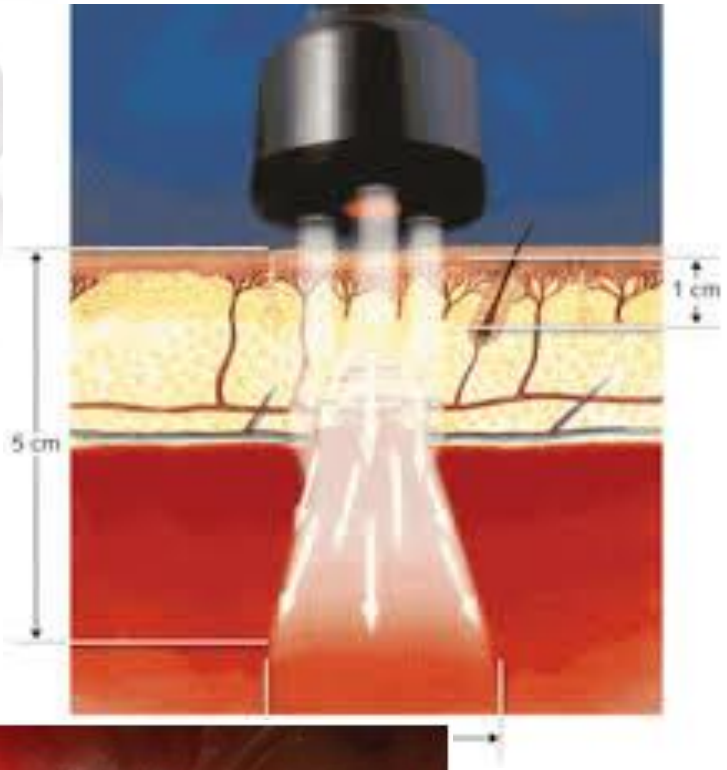
- 445-660-970 nm-: orientating to the hemoglobin-melanin-lipid panel
- Decreases the PGE2 level, through the blocade of the COX-2 enzym: 0,4-1,9 J dose, 5x21,2 mW/cm2
- Inhibition of Fibroblast metabolism, inhibition of nociceptive nerve transmission over 20 mW/cm2

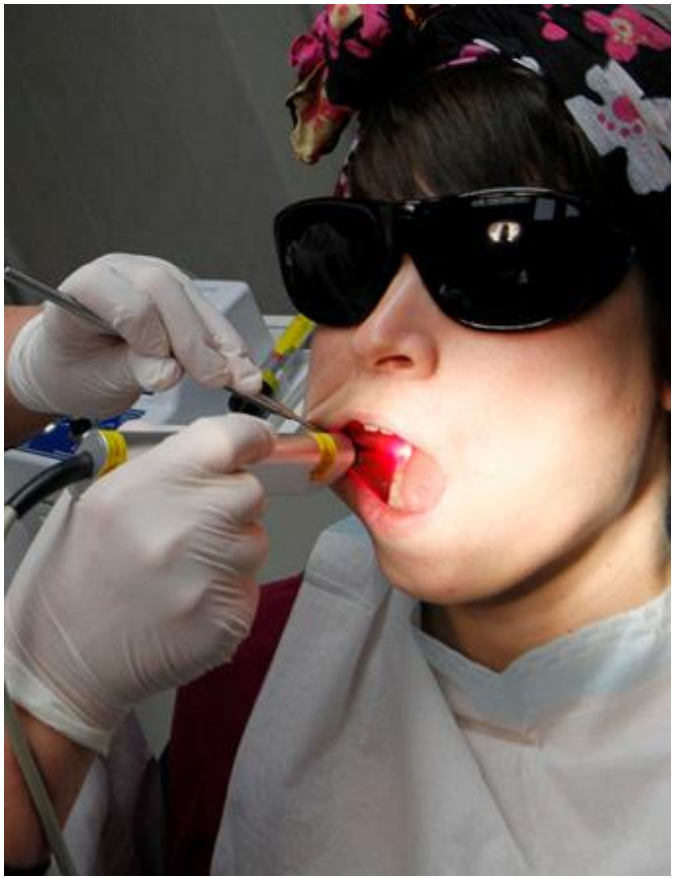
→ Stimulates proliferation, fibroblast growth, exchange of places and transformation into myofibroblasts, reduction of pain, incapacitation of the creation of inflammatory mediators

LL-Laser

Application:
- TMJ dysfuntion
- Neurological disorders
- Wound healing disorders
- Herpes infection
- Postoperative wound treatment
- Pulpotomy
- Mucositis
- Ulceration


Bright Therapy


1 cm
5 cm



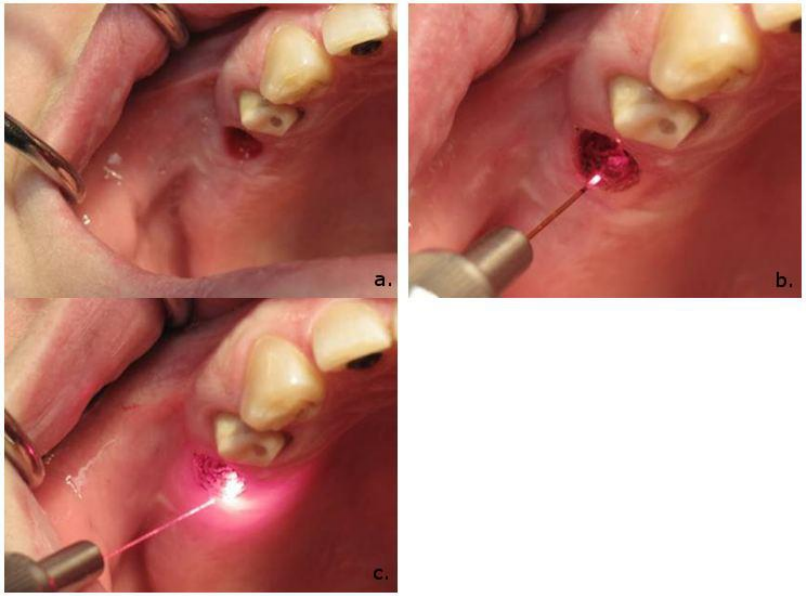
Diode laser

- **Wavelength** :800 és 810 nm, 900–980 nm , 1450nm
- **Indikation:**
- 800-810 nm: *Fotoepilatio* (again the hair)
- 810 nm:absorptio in the *hemoglobin* and *melanin*
  >*Laserknife*
  >*Dekontaminatio* on the dentis/surface of the implant/
  >Soft tissues (correction of gingiva,circumcisio,, frenulectomie, aphta and herpes

Pulsed Dye Laser(PDL)

- Emits a wavelength of 595 nm (yellow visible light).
- Yellow light is applied to the skin to destr
  thereby creating oxygen because its chromophore is oxyhemoglobin.
- AE - hyperpigmentation..
- **100% of patients reported an 80% decrease in inflammatory lesions.**
- @ 3 months - Patients still were improving.

Periimplant mucositis



Gingivectomia

Frenulectomia

High Level Laser

- CO2
- Er YaG
- ND YAG

Leukoplakia

Fibroma

Skin-Resurfacing

Frenulum labii sup.


Leukoplakia


Nd:YAG-Laser

Neodymium-Yttrium-Aluminium-Granat-Laser

- **Wavelength**: 1064 nm
- **Function**: continuusly, impulsusway (Q-Switched) laser
- continuusly:

  nagy behatolási mélység a szövetekben és egy *nemspecifikus koagulációs* hatás > nagy hőfejlődés > *vaporisatio* > kiterjedt vérellátású expanzív elváltozások és szövetablatiók végrehajthatóak kismértékű következményes vérzéssel (hűtés!!)

- **impulzusway Nd:YAG-Laser**:

  nanosekundum hosszúságú impulzusokkal dolgozik, alapkoncepció a *szelektív fototermolízis*> lehetőség nyílik a pigmentek, színanyagok és egyéb célstruktúrák *hullámhosszfüggő szelektív károsítására*> metallózisok, tetoválások kezelése> nincs termikus károsodás

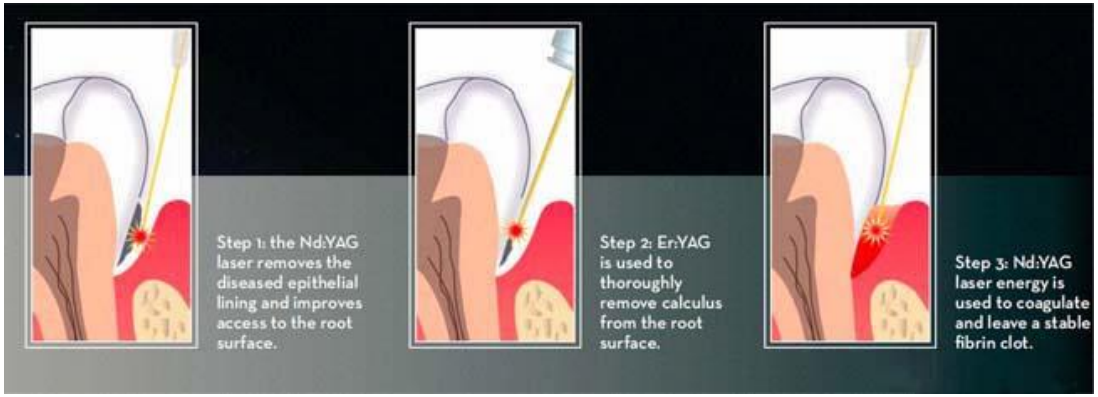
- *jó baktericid hatás* > fertőzött gyökércsatornák kezelése az endodontiában(0,5 mm behatolási mélység a dentinbe)

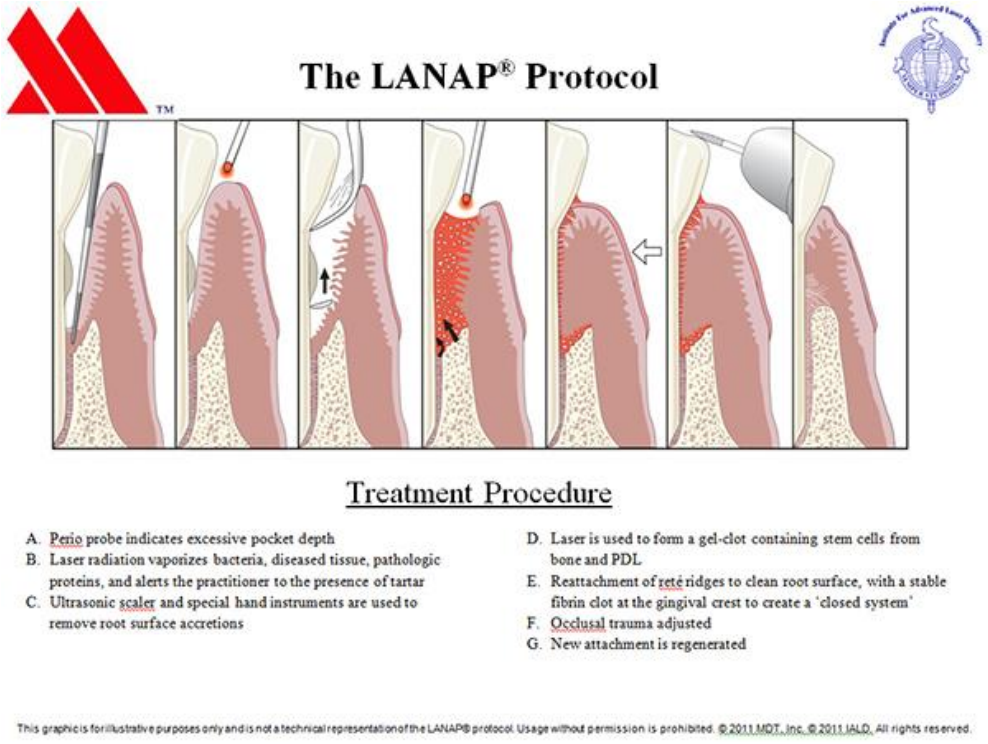
  >parodontális megbetegedések

  LANAP (Laser Assisted New Attachment Procedure;

  http://hwcdn.net/p7e8u7v6/cds/MDT-Demo-MPEG4-128kb.mp4)

Q-switched Nd:YAG Laser

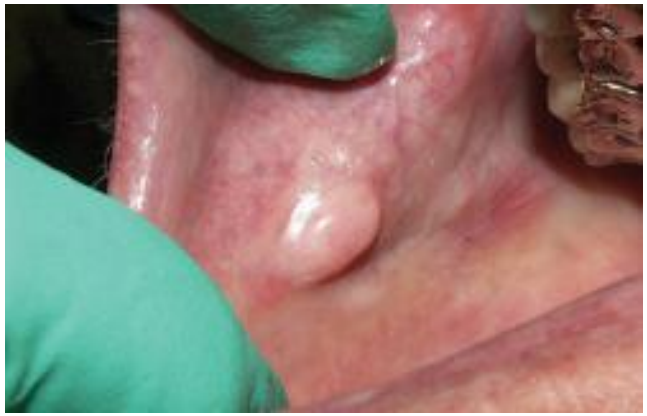




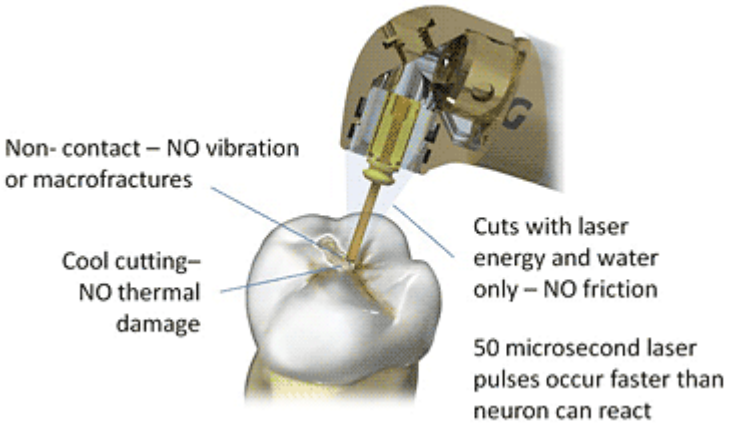
Er:glass 1540 nm

- It penetrates 0.4 to 2 mm and also has a target of intracellular water.
- 20 patients over a two-month period w/ treatments every 2 weeks for a total of 4 treatments.
- Benefits
  - There was a 70% decrease in lesion count after the first and third months.
  - Patients also reported a decrease in skin oiliness.
- AE – pain (cooling spray used)

Fibroma with Er:YAG-Laser



Cavitation with laser



Parodonttotic treatment

Endodontia

- *Dekontamination:*
  - Nd:YAG- or diodelaser
  - (Er:YAG-Laser, Er,Cr:YSGG-Laser , KTP-Laser)
- Problems:
  - Difficult morphológic strukture

    > the laser penetration in the dentin just 0,5 mm

STEP 1
Access Preparation

STEP 2
Conventional

STEP 3
Cleaning & Enlargement

STEP 4
Disinfection

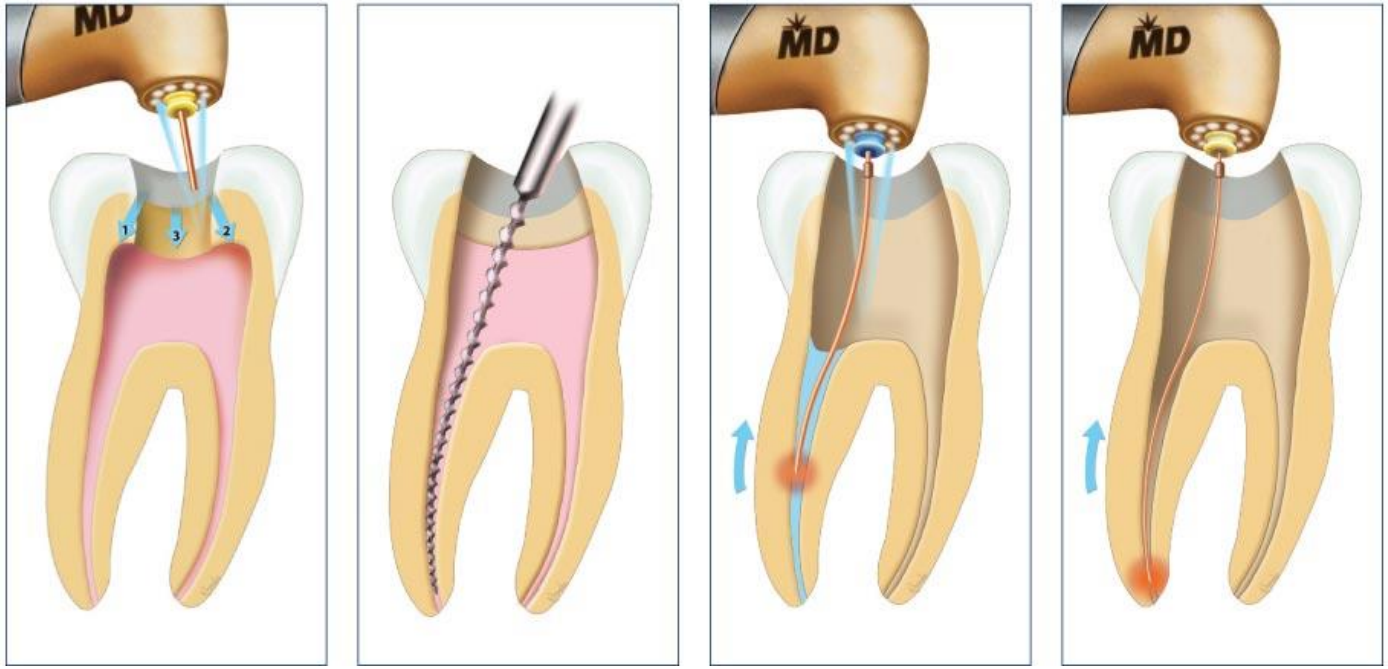



Fig. 14


Fig. 15

Parodontology

• a tasakokban és környező lágyrészekben nagyszámú baktérium, főleg anaerobok fordulnak elő

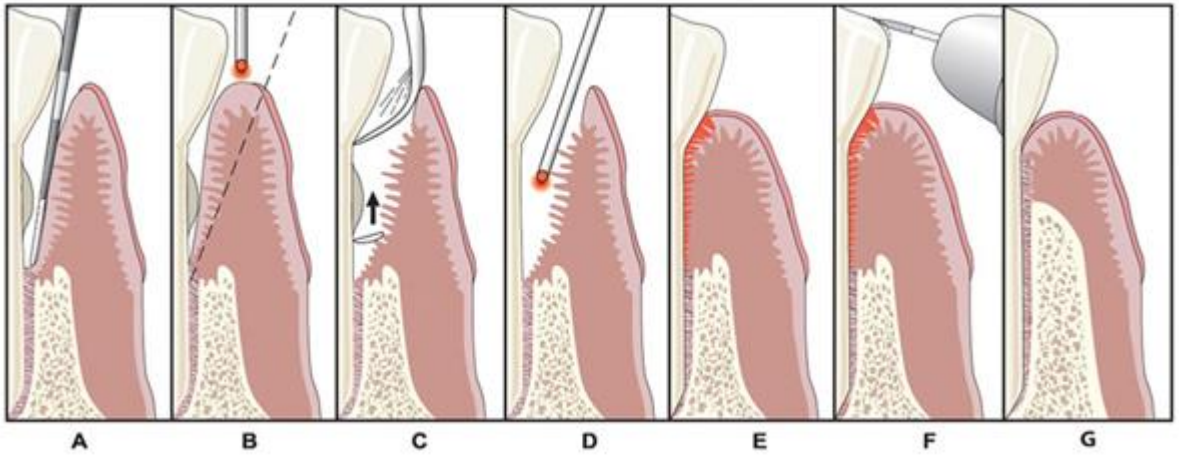
• antibactericid effect:

  – Diódelaser
  – Nd:YAG-Laser
  – KTP-Laser

With parodontotic treatment

•Konkrementumremoving: with Er:YAG-Laser or Er,Cr:YSGGrel (termomechanic ablatio)

•Recall 3-6 months!


A
B
C
D
E
F
G

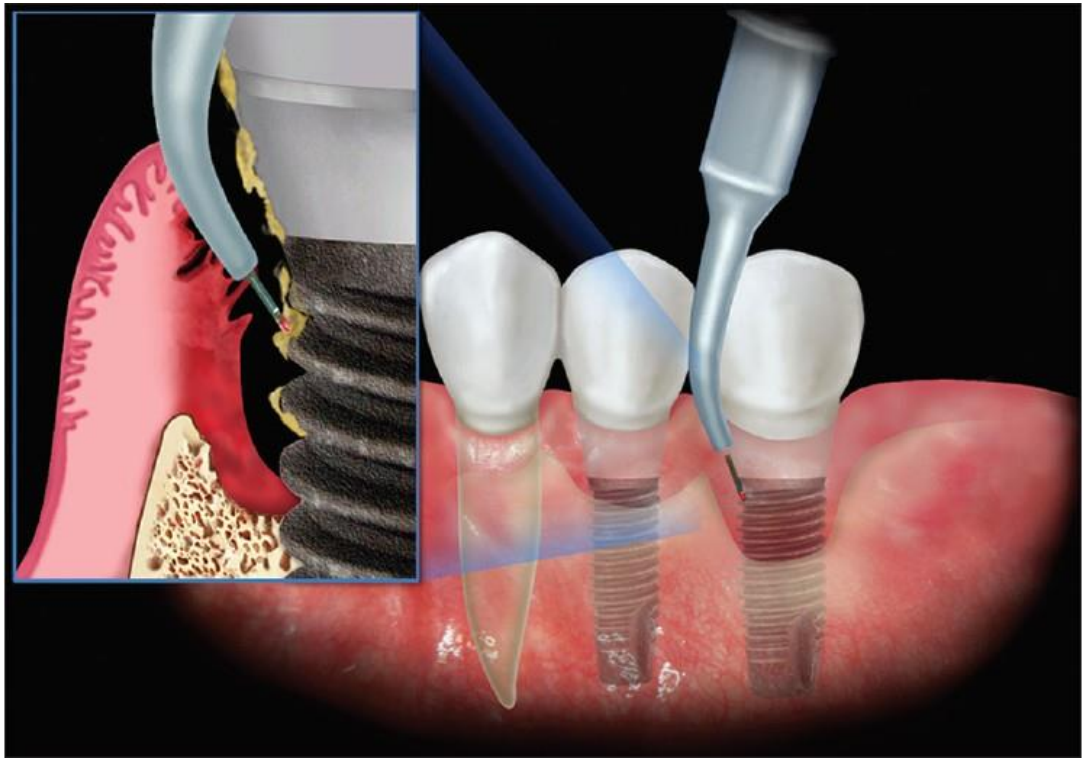
Periimplantitis

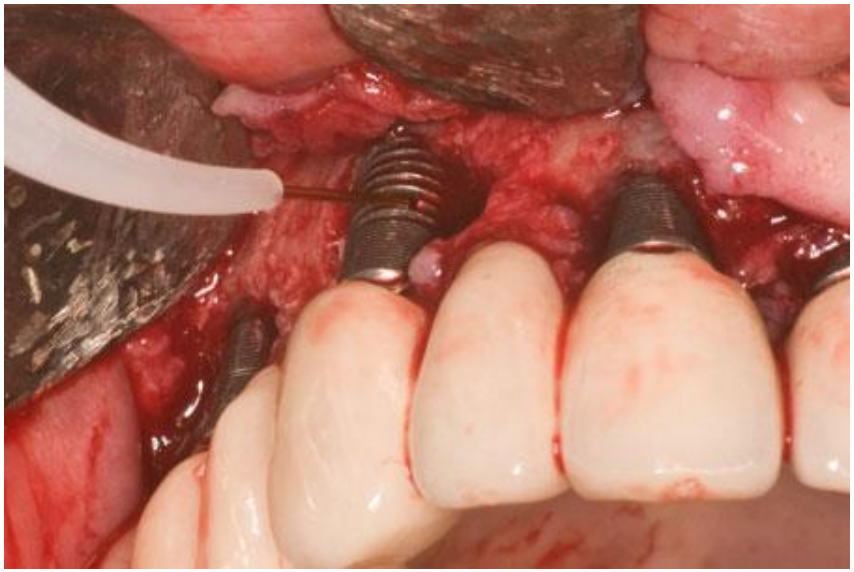
- tasakelimináció a gyulladt szövetek eltávolításán és az implantátumfelszín lézeres tisztításán/dekontaminálásán keresztül

- **Non-ablativ**:

Diodelaser, CO2-Laser

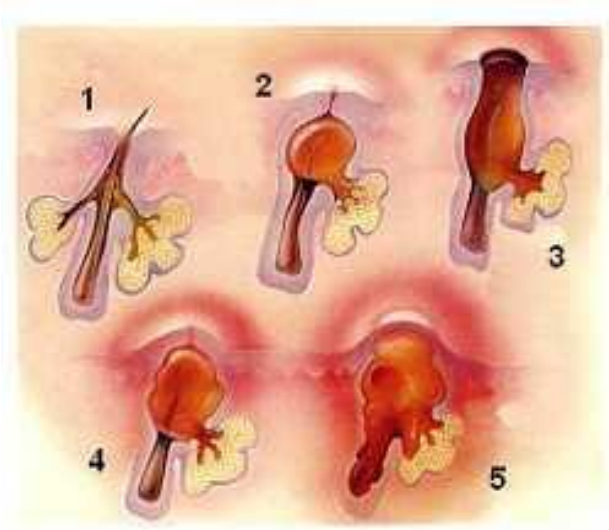
Ablativ:Er:YAG-Laser






a
b
c
d

Pathophysiology – How Acne Develops

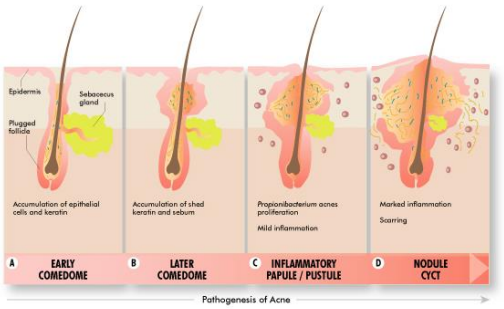


- 1 - Androgens stimulate sebum production and proliferation of keratinocytes in hair follicles.
- 2 - Sheets of desquamated keratin obstruct the follicle opening, which forms the precursor to acne
- 3 - This results in sebum accumulation and swelling of the follicle.
- 4 - *P. acnes* colonize and proliferate in the plugged follicle
- 5 - This causes the hydrolyzation of sebum triglycerides into free fatty acids. This further plugs the follicle and pro-inflammatory mediators causes inflammation of the follicle and surrounding dermis.

Traditional Treatment Methods

- Antibiotics - reduce inflammation caused by acne
- Topical Agents - unplug follicles and kill bacteria
- Accutane - decrease oil production

Acne vulgar



- areas of skin with multiple non-inflammatory follicula papules or comedones and by inflammatory papules, pustules and nodules in its more severe forms.
- affects the areas of skin with the densest population of sebaceous follicles; these areas include the face, the upper part of the chest, and the back
- a prevalence of 70-90% among teenagers
- **Caused by:**
  - **Propionibacterium acnes (P. acnes)**
  - Staphylococcus epidermidis

Mallefet P et. Al, The mechanism of wound healing, Personal Care Magazine 2008, 9, 75-83 (

How Lasers Work

- *P. acnes* produce a type of chromophore, a molecule that is absorbed into the skin, called a porphyrins.
- When these porphyrins are excited by the absorption of light (photoactivation), they form free oxygen radicals.
- This causes membrane damage and cell death, which in turn kill the bacteria within (*P. acnes*).
- Each chromophore has a specific absorption spectrum of its own. Porphyrins are absorbed the most at light wavelengths near 400 nm. The highest absorption occurs at around 415 nm (blue visible light), called the *Soret band*.
- Porphyrins are well absorbed into the skin at the Q bands (purple & red visible light) between 450-700 nm.

1450-nm Diode Laser

- Penetrates to the level of mid-dermis
- Causes thermal damage to the sebaceous gland resulting in the destruction of sebocytes that contain *P. acnes*.
- Benefits
  - More than half showed a 65% reduction in lesions.
  - Significant decreased lesion count in back acne
  - After 6 months, five of the patients did not need additional acne treatments.
- AE – pain (Cooling spray used to preserve epidermis) and hyperpigmentation

Er:glass 1540 nm

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- 20 patients over a two-month period w/ treatments every 2 weeks for a total of 4 treatments.
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  - Patients also reported a decrease in skin oiliness.
- AE – pain (cooling spray used)

Laser Acne Treatment

Mechanism of Laser Acne treatment:

Laser can act on acne bacteria killing them by heat
Laser and act on overactive sebaceous (oil) glands, shrinking them by heat
Ideally laser should act on both.

Mild Acne

Moderate Acne

Inflammatory Acne

Cystic Acne

Acting on bacteria:
- Photodynamic Therapy (Blue Light Treatment)
- Q-switched lasers
- LP lasers indirectly, by heating the surrounding

Shrinking of the oil glands:
- Diode lasers (980, 1450,…)
- Crystal lasers (1064, 1320, 1540,...)
- IPL (…- 1200)

Cases of active acne treatment with Fotona laser

Nd:YAG Treatment of Acne with Fotona lasers

Fluence:50J/cm^2

Pulse duration 14 msec

Spot size 6 mm (S11 Scanner)
Frequency: 1.5 Hz
Single session

(5 years no reoccurance)

(no pre-treatment needed,
(no anesthesia, cold air cooling)

Courtesy of R. Sult, USA

Courtesy of R. Sult, USA

Nd:YAG Treatment of Acne

Before

After

Courtesy of R. Sult

Nd:YAG Treatment of Acne

2 years, 3 Physicians, 7 different prescriptive medications, no result

Fluence:50J/cm^2, pulse duration 14 msec, spot size 6 mm (S11 Scanner)
Frequency: 1.5 Hz,
Single session (7 years, no reoccurance)

Courtesy of R. Sult, USA

(no pre-treatment needed,
(no anesthesia, cold air cooling)

Courtesy of R. Sult, USA

Er:YAG treatment of Acne

Courtesy of R. Sult, USA

Before

After 8 Weeks

1st pass: VSP 140 mJ, 5mm R11 handpiece.
followed by 2 passes SP 1300 mJ, 5mm

Application of BLT anesthetic cream for 20 minutes
No reoccurrence in 6 months 1 Treatment

Nd:YAG: Treatment of Rosacea

Courtesy of R. Sult, USA

Before

12 weeks after 1-Tx

3 Years & 2 months later
with no further treatment

(Presented after 15 years of failed Standard medical treatments)

Fluence: 50 J/cm^2, pulse duration 14 msec,
spot size 6 mm (S11 Scanner – top hat beam profile)
Frequency: 1 Hz. Cold air cooling

Single Session

Nd:YAG: Treatment of Rosacea

Courtesy of R. Sult, USA

Before

12 weeks after 1-Tx

3 Years & 2 months later
with no further treatment

(Presented after 15 years of failed Standard medical treatments)

Fluence: 50 J/cm^2, pulse duration 14 msec,
spot size 6 mm (S11 Scanner – top hat beam profile)
Frequency: 1 Hz. Cold air cooling

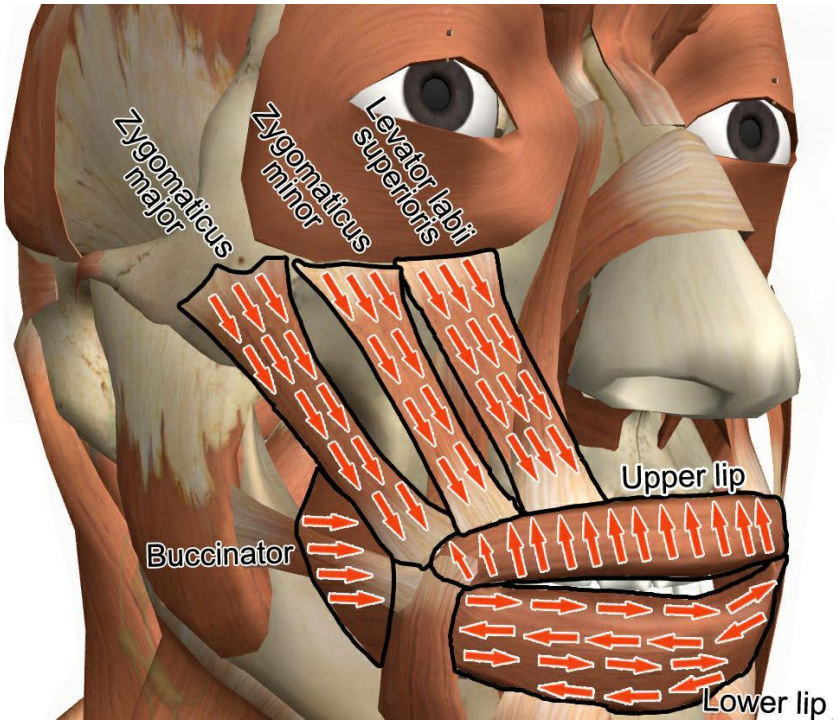
Single Session

1step SmoothLiftin™

Er:YAG

Fotona 4D
Non-invasive laser face lifting

Areas treated inside the mouth



Fotona4D

Before & After

4D, courtesy of dr. Gaspar

Fotona4D

Before & After

4D, courtesy of dr. Gaspar

Foto

choose perfection

Fractional skin resurfacing

F-Runner, 22 J/cm2,
5% coverage

Courtesy of dr. H. M. Omparkash, India