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COMPREHENSIVE BROCHURE

THE ERBIUM LASER IN YOUR EVERYDAY DENTAL AND DERMAL PRACTICE



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1. INTRODUCTION

NEW HARMONY BOTH FOR DENTISTS AND PATIENTS.

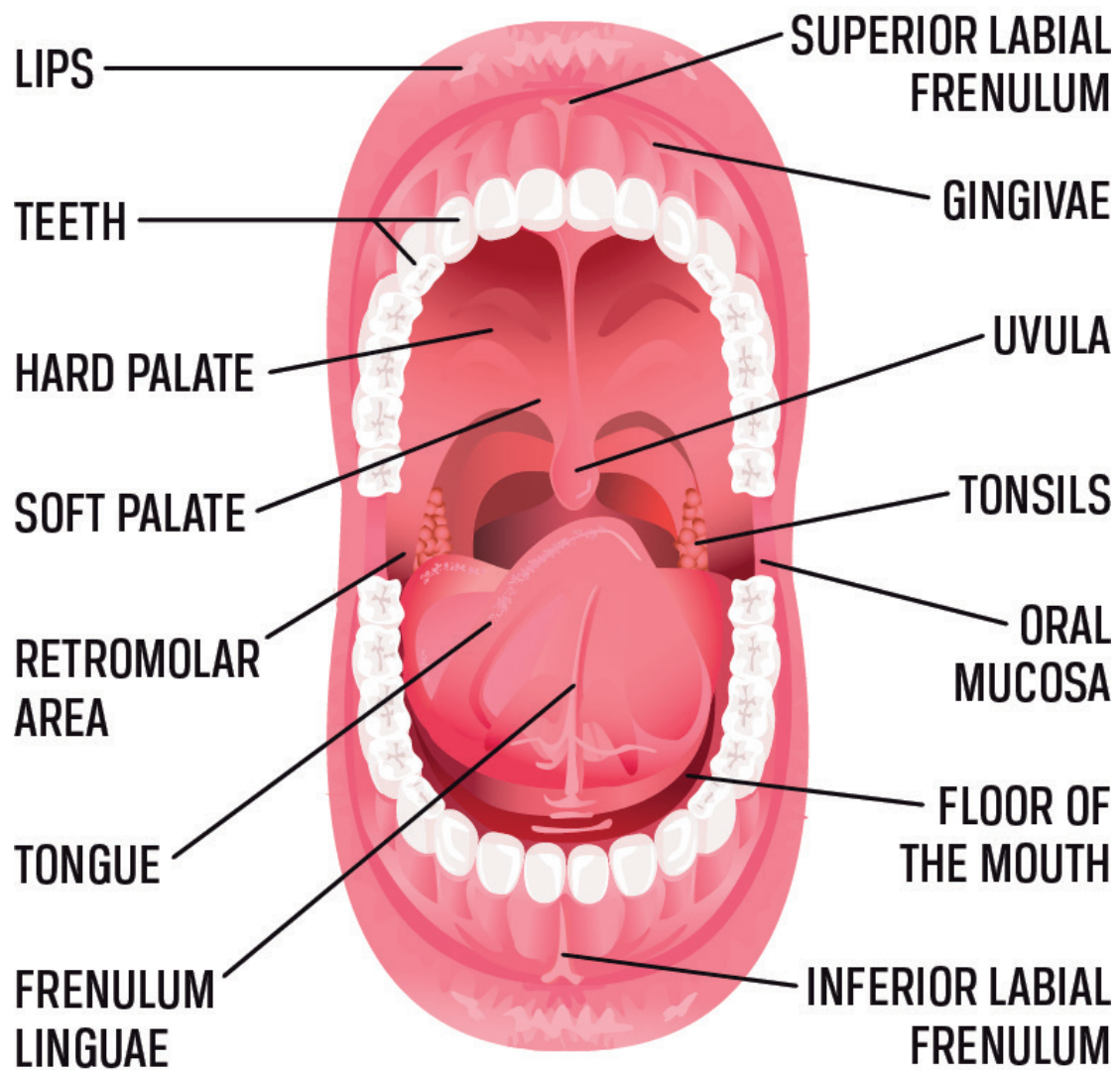
Many new technologies on the dental market today promise to radically change the way you practice dentistry: but how many of these technologies actually improve patient comfort?

Erbium laser technology can control bleeding and will reduce the use of anaesthetics, since patients will feel less pain during surgery and no vibration whatsoever. With a single instrument you can perform soft and hard tissue surgery, as well as bone surgery, and stimulate healing at the same time. Thanks to all of these qualities the erbium laser will improve the dentist's economical and practical efficiency, and help patients face their visit to the dentist's serenely.

EXTRAORDINARY IN YOUR DAILY ROUTINE.

Imagine working without causing pain, and being able to control bleeding during and after surgery. Imagine facing a complex surgical procedure in total safety. Imagine your patient's expression when you tell them the turbine won't be necessary for that severe tooth decay.

You'll feel more relaxed, and your patients will be surprised at how pleasant a visit to the dentist can be. You'll save time and resources, and your patients will exit the studio amazed at the quality and speed of your work.

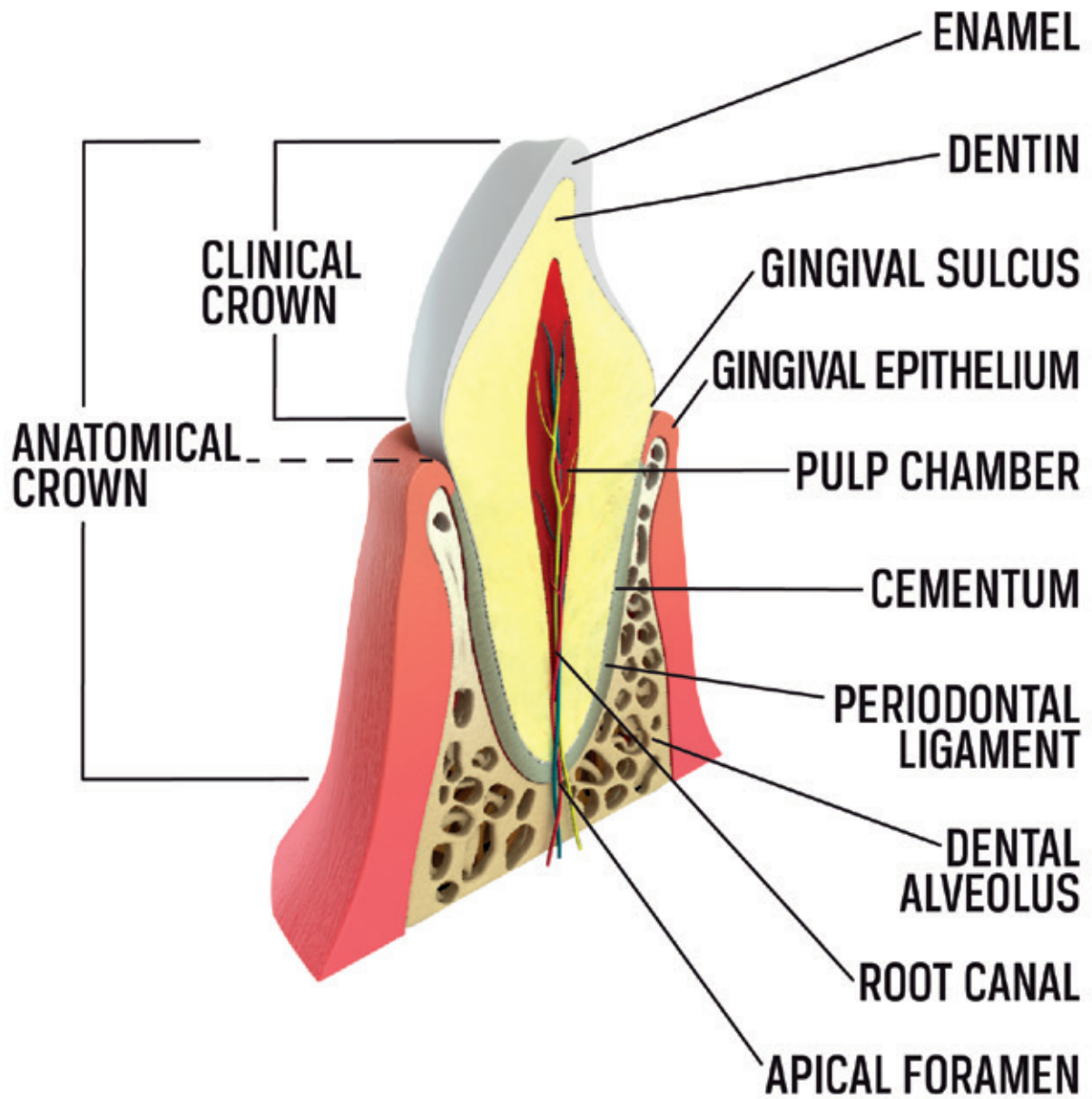


2. THE ORAL CAVITY

2.1 THE BRANCHES OF DENTISTRY

Dentistry is the branch of medicine that treats disorders of the oral cavity. Since the oral cavity is composed of various elements, such as teeth, gums, muscles, bone, dental care can focus on a single element and not on the total. Given that these issues are often very different, dentistry has been divided into several sections:

- **ENDODONTICS** (root canal treatment, inside of the tooth)
- **CONSERVATIVE** (care of the crown, visible part of the tooth)
- **PERIODONTOLOGY** (treatment of gum, tissue around the tooth)
- **SURGERY** (surgery on bone or tissue)
- **IMPLANTS** (insertion into bone of retentive implant)
- **PROSTHODONTICS** (artificial replacement of natural teeth)
- **GNATHOLOGY** (troubleshooting articulating)
- **ORTHODONTICS** (restoration of proper occlusion)
- **PEDODONTICS** (dental care for children)



2.2 TEETH

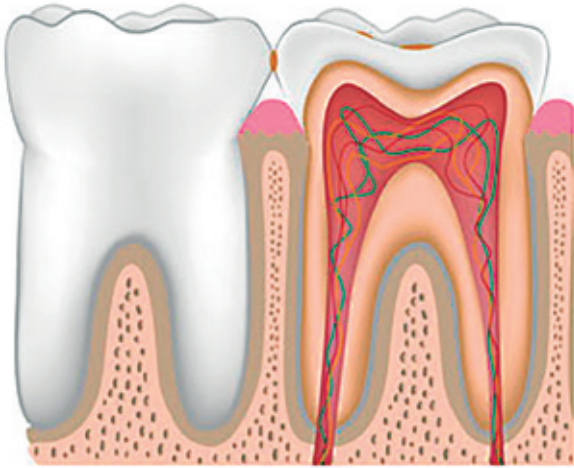
The human tooth is composed essentially of two components: the crown is the visible part while the root is in the dental cavity, inside the bone. Crown and root are separated by the neck. Inside there is the pulp cavity. The teeth are composed of three calcified tissues: enamel, dentin, cement and a soft tissue, the pulp.

Tooth structure includes the following elements:

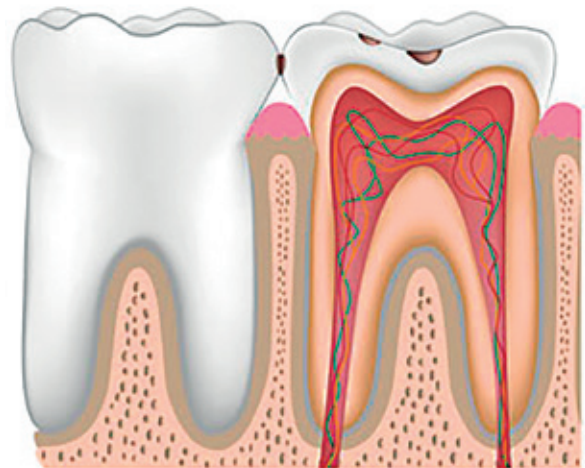
1. The enamel, which completely covers the tooth crown and is the hardest substance present in the human body (almost like quartz) and is the most mineralized of all tissues of the organism. It consists for 97% of calcium salts and only 3% of organic substances. Whereas cement and dentine have a limited capacity or regeneration, enamel cannot be repaired physiologically.
2. The dentine, body and main mass of the tooth, with a tissue similar to the bone, is made from collagen fibrils cemented together with tribasic calcium phosphate. It is located under the enamel and the cement, and it covers both the pulp and the radical canals. (It is neither as hard or resistant to caries as enamel is.)
3. The pulp, or pulp canal, is the nerve centre of the tooth and contains the nerve and vascular tissues that extend both in the root and in the crown. In the crown this cavity is called the pulp chamber and it contains the pulp chamber, while the root of the root canal contains the pulp canal. The pulp canal communicates with the outside of the root by the apical foramen through which blood vessels and nerves pass.
The root canals are in equal number to that of the roots and their diameter decreases towards the apex; from the main channels a secondary channel may arise all the way to the apex.
4. The cement is a hard and rough substance that covers the root.

The tooth is also supported and surrounded by:

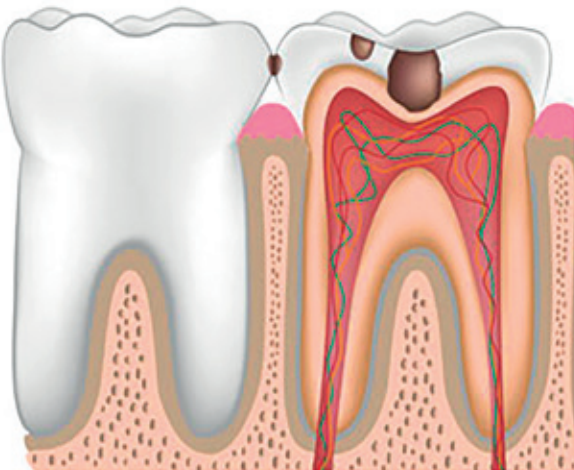
1. The bone, in which the alveolus is located and the tooth implanted.
2. The gum, which firmly adhering to the neck of the tooth, protects both the alveolus and tooth roots from the onset of bacterial plaque (The gum, when red or swollen, is the signal of an inflammation taking place).
3. The ligament, or the periodontium, is composed of thousands of tiny fibres that anchor and cushion teeth; one end is fixed to the cement, and the other to the surrounding bone.



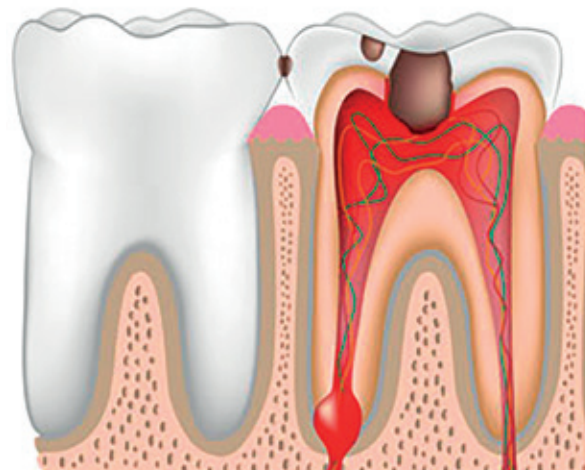
STAGE I
Surface decay on enamel.



STAGE II
The caries enters the dentin.



STAGE III
Caries spreads into the pulp.



STAGE IV
Caries affecting deep structures.

G. V. Black's classification of dental caries.

L	B/L	B/L	F	F	F/L	B/L	B/L
Class I		Class II	Class III	Class IV	Class V		Class VI

2.3 TOOTH DECAY

The cause of caries, or tooth decay, is bacterial break down of the hard tissues of the teeth (enamel, dentin and cementum) that develops in the presence of both simple sugars (especially sucrose) and bacteria. The bacteria present in the oral cavity feed on the sugars eaten and produce lactic acid, a substance that can destroy dental enamel. Once the enamel is corroded, the bacteria come into contact with the dentin and can consequently penetrate the entire dental formation.

- **STAGE I:** the caries lesion involves the enamel
- **STAGE II:** the caries lesion perforates the enamel and moves its way through the dentin
- **STAGE III:** the caries spreads into the pulp, causing pain and inflammation
- **STAGE IV:** the caries affects the deepest parts of the tooth structure causing abscesses, cysts or granulomas.

CARIES CLASSIFICATION

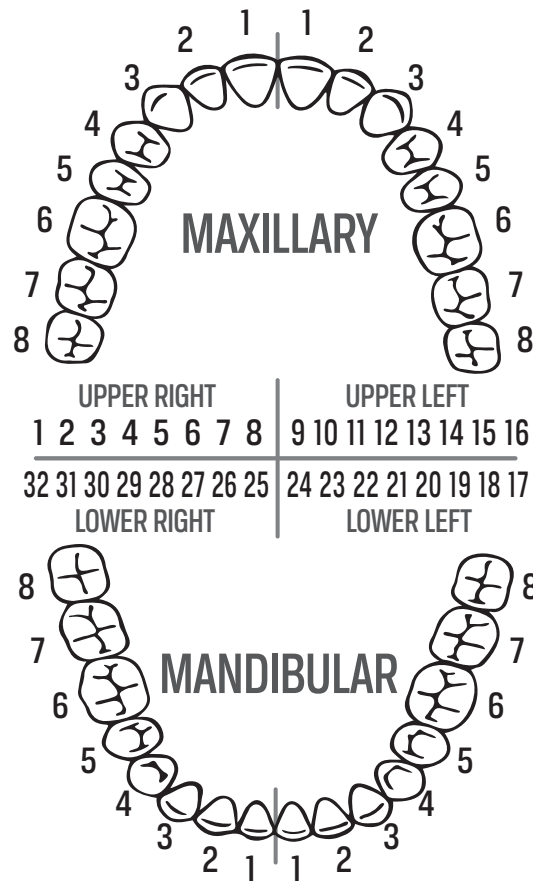
Caries can be classified by location, etiology, rate of progression, and affected hard tissues. These forms of classification can be used to characterize a particular case of tooth decay in order to more accurately represent the condition to others and also indicate the severity of tooth destruction. In some instances, caries are described in other ways that might indicate the cause.

G.V. Black classification:

- **Class I** - occlusal surfaces of posterior teeth, buccal or lingual pits on molars, lingual pit near cingulum of maxillary incisors
- **Class II** - proximal surfaces of posterior teeth
- **Class III** - interproximal surfaces of anterior teeth without incisal edge involvement
- **Class IV** - interproximal surfaces of anterior teeth with incisal edge involvement
- **Class V** - cervical third of facial or lingual surface of tooth
- **Class VI** - incisal or occlusal edge worn away due to attrition

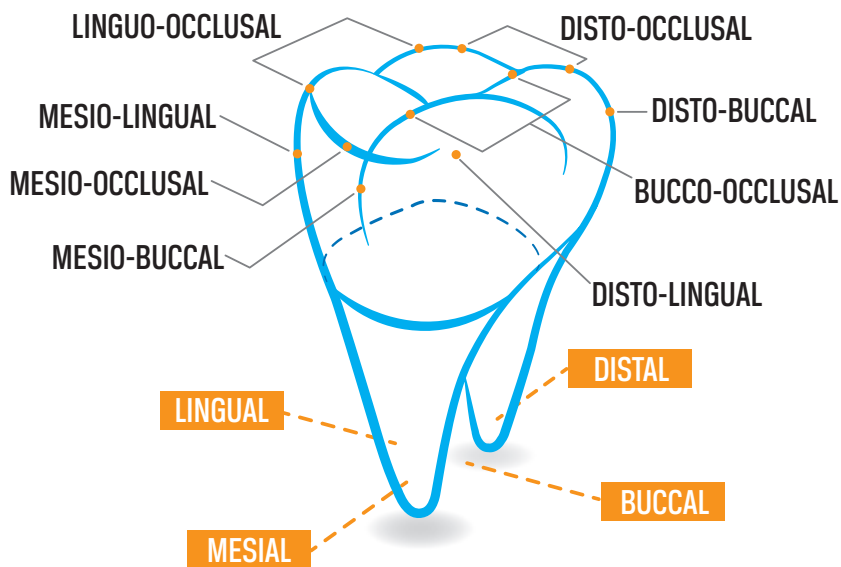
CARIES TREATMENT

Caries must be treated by removing the infected tissue and replacing it with other adequate materials, usually composites. The removal can be carried out with rotating instruments, turbines or with the erbium laser, in this case without contact or annoying vibrations. It is important that the removal be complete in order to avoid possible recurrence, creating at the same time a cavity adequate to receive the filling material.



NOMENCLATURE OF MORPHOLOGICAL ELEMENTS

To identify the position of each morphological element of the tooth, a terminology that refers to the different planes of the oral cavity is used: VESTIBULAR, LINGUAL, OCCLUSAL, MESIAL, DISTAL.



2.4 TOOTH GLOSSARY

TOOTH NUMBERING SYSTEM

By international convention, standardized by the World Health Organization (WHO), the mouth is ideally divided into four areas by two planes perpendicular to each other, one mesial that divides the dental arches in two half-arcs and one occlusal that is imagined passing between the two arches.

1 = deciduous and permanent central incisor

2 = deciduous and permanent lateral incisor

3 = deciduous and permanent canine

4 = 1st premolar permanent and 1st molar deciduous

5 = 2nd premolar and 2nd deciduous molar

6 = 1st permanent molar

7 = 2nd permanent molar

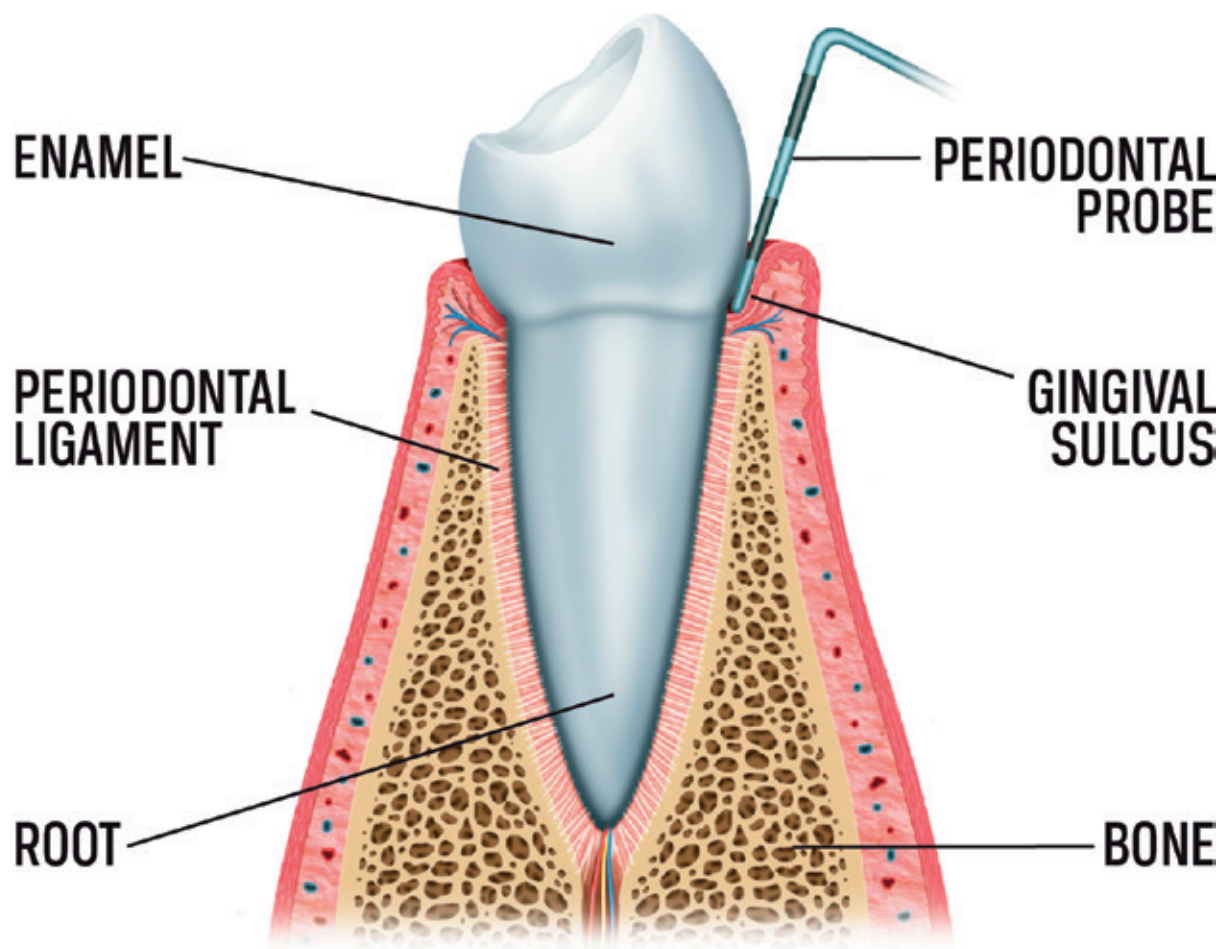
8 = 3rd permanent molar

ANATOMICAL PARTS OF THE CROWNS

CUSPS: is an occlusal or incisal eminence on a tooth; premolars possess, in general, two cusps, and four or more molars.

RIDGE: any linear elevation on the crown of a tooth.

GROOVES: a linear channel or line; when the grooves are extremely deep they are named FOSSA.



Vestibular – lingual section of an upper central right incisor with its supporting tissue.

2.5 THE PERIODONTIUM

Periodontics is the branch of dentistry that treats periodontal diseases, namely that cures diseases and biological function of the tissue surrounding the tooth.

The buccal mucosa, in the part that covers the alveolar bone, is called gum. The gum around the tooth at the neck level is very vascularized and includes the trigeminal nerve. The part of the gingiva which fills the spaces between the teeth creates the gingival papillae.

The teeth are set in the alveoli of the bone in which they are connected by fibres that support and ensure a physiological mobility.

Fibres connect the cement (lining tissue of the dental roots) to the alveolar bone, a bone of spongy type covered by a periosteum to which the gingiva attaches. In the alveolar bone, there are alveoli in which the roots of the teeth are articulated. The surface of the alveoli is covered by a perforated bone tissue through which vessels and nerves (cribriform plate) pass.

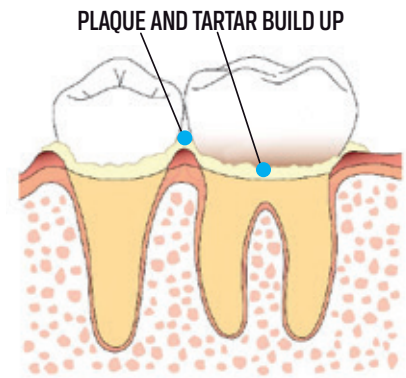
In order to provide a viable and healthy support structure of the tooth, the function of these structures is interdependent, but from the anatomical point of view are distinct.

GINGIVITIS Gingivitis is the inflammation of the gum with no loss of attachment.

REVERSIBLE SITUATION with removal of the trigger factor it is possible to return to a physiological situation.

- Organization of bacterial plaque
- Colonization of the gingival sulcus

Inflammation: swelling, redness and bleeding, possible pain.

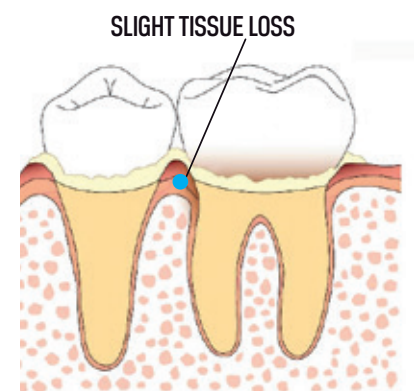


PERIODONTITIS Periodontitis is an inflammation with loss of the attachment on connective level and formation of periodontal defect (pocket) and can have different degrees and location.

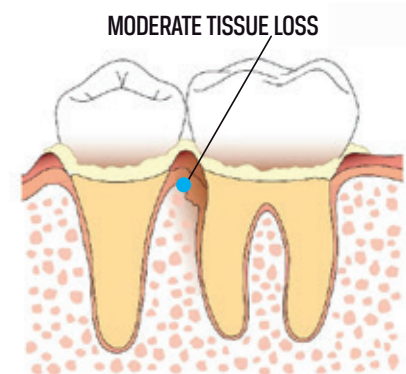
IRREVERSIBLE SITUATION

Outcomes can be treated but it is not possible to return to an initial situation.

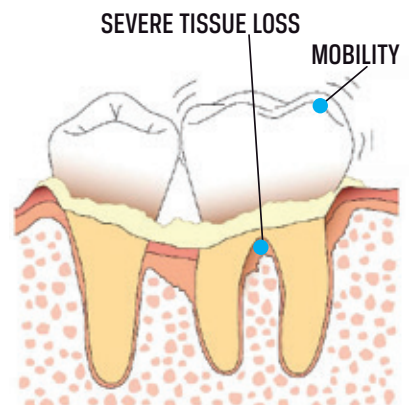
- migration of the bacteria into the deeper tissues
- release of enzymes and degradation of the connective fibres



- persistence of inflammation and inflammatory condition
- invasion of deeper tissues with involvement



- progressive reabsorption of bone tissue support
- possible pain and periodontal abscesses
- increasing mobility and migration with subsequent loss of teeth



The typical disease of the periodontium is gingivitis / periodontitis, i.e., inflammation and detachment of the gingiva from the tooth, with the consequent loss of stability. It presents gingival inflammation without bone resorption. It is characterized by a change in the colour and texture of the gums, that becomes swollen, reddish, glossy and bleed easily.

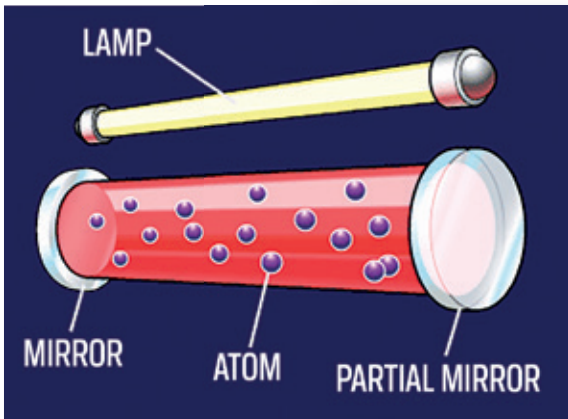
Periodontitis is, in most cases, the extension to the deep tissues of inflammatory changes of gingivitis. These alterations lead gradually to the creation of periodontal pockets (gum detached from the tooth), the gingival recession and, at the last stage, the loss of the tooth (periodontal disease).

Treatment of periodontal pockets consists in trying to fit the bone or replace it with other bio-compatible products (synthetic bone, hydroxyapatite, natural bone, etc.). Tissue regeneration is to return to the original tissue compromised by disease or by the intervention of the dentist. In recent years, periodontal surgery, because of its strong invasiveness and scarce predictability, has been replaced by minimally invasive and non-surgical therapies.

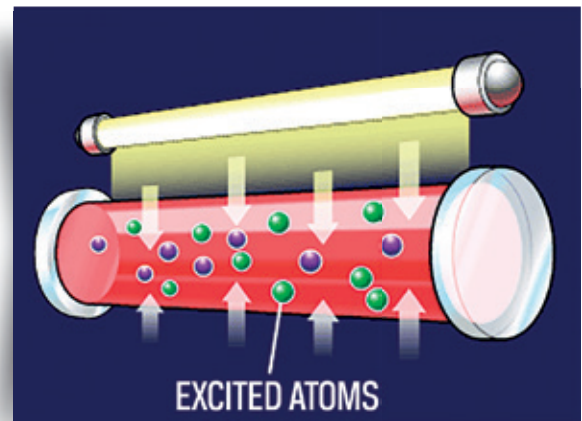
Hundreds of research papers have demonstrated how the use of the diode laser for tissue biostimulation and periodontal pockets decontamination, is today the best technique to reduce the pocket and regenerate the connective tissue, so to avoid many diseases such as periodontitis and periodontal disease.

ORAL HYGIENE

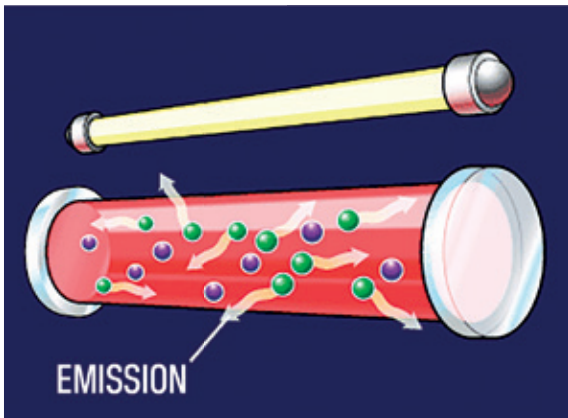
Oral hygiene means prevention and prophylaxis (cleaning in the studio). It is normally performed by a "dental hygienist", a profession that is gaining importance within the dental practice.



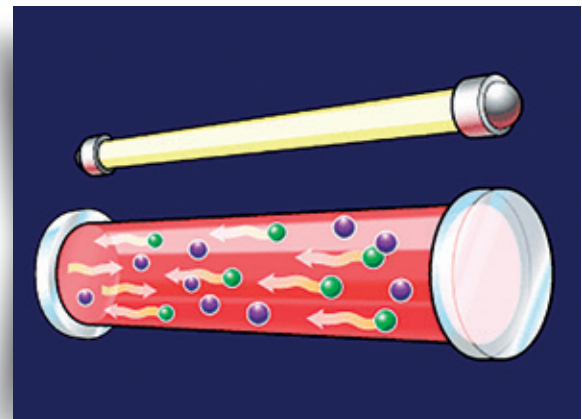
Components of the optical cavity of a laser



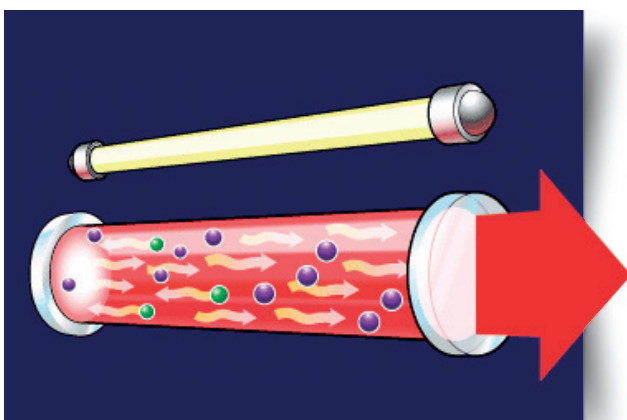
1. The lamp excites the atoms of the active material



2. The material starts emitting photons in all directions



3. The optical cavity mirrors align the movement of the photons



4. The photons exit the optical cavity through the partially reflecting mirror with all the characteristics of a LASER.

3. WHAT IS A LASER?

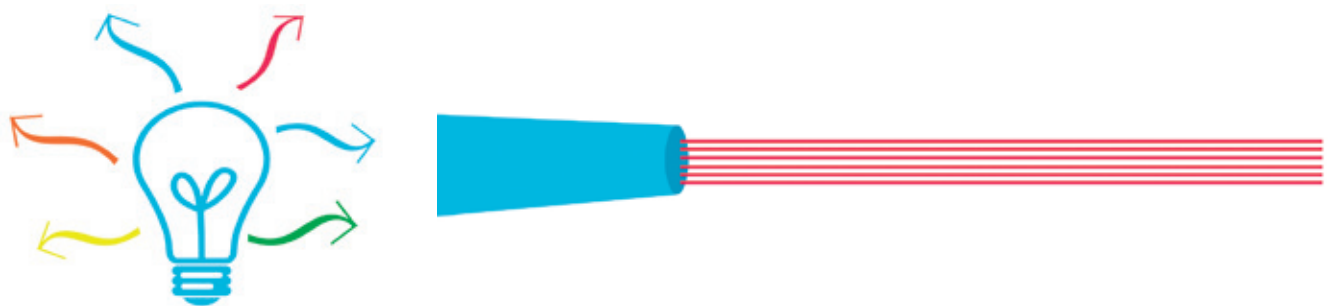
3.1 LASER LIGHT

The LASER (acronym of Light Amplification by the Stimulated Emission of Radiation) is a special instrument that can be applied in many different fields. Lasers have specific features that make them different from ordinary sources of light:

MONOCHROMATIC: a light bulb emits many different wavelength whereas a laser will emit photons at a single wavelength, so that its application is very specific and the interaction selective.

COHERENT: all photons in the laser beam travel with the same space and time undulation.

POLARIZED: all photons in the laser beam travel in the same direction.



Compared to other sources of light, the laser is monochromatic, coherent and polarized.

3.2 LASER COMPONENTS

To stimulate the emission of light with these characteristics, three elements are necessary:

1. an **ACTIVE MATERIAL** (the erbium laser uses a solid state rod of Er:YAG) capable of producing photons with a specific wavelength and increase their energy at each passage.
2. a **SOURCE OF ENERGY**, such as a lamp or electricity, also known as optical pump, that can increase the energy of each photon so that stimulated emission may occur.
3. an **OPTICAL CAVITY:** an arrangement of mirrors that can perfectly line up each electron until they reach the energy and coherence necessary to become a laser beam

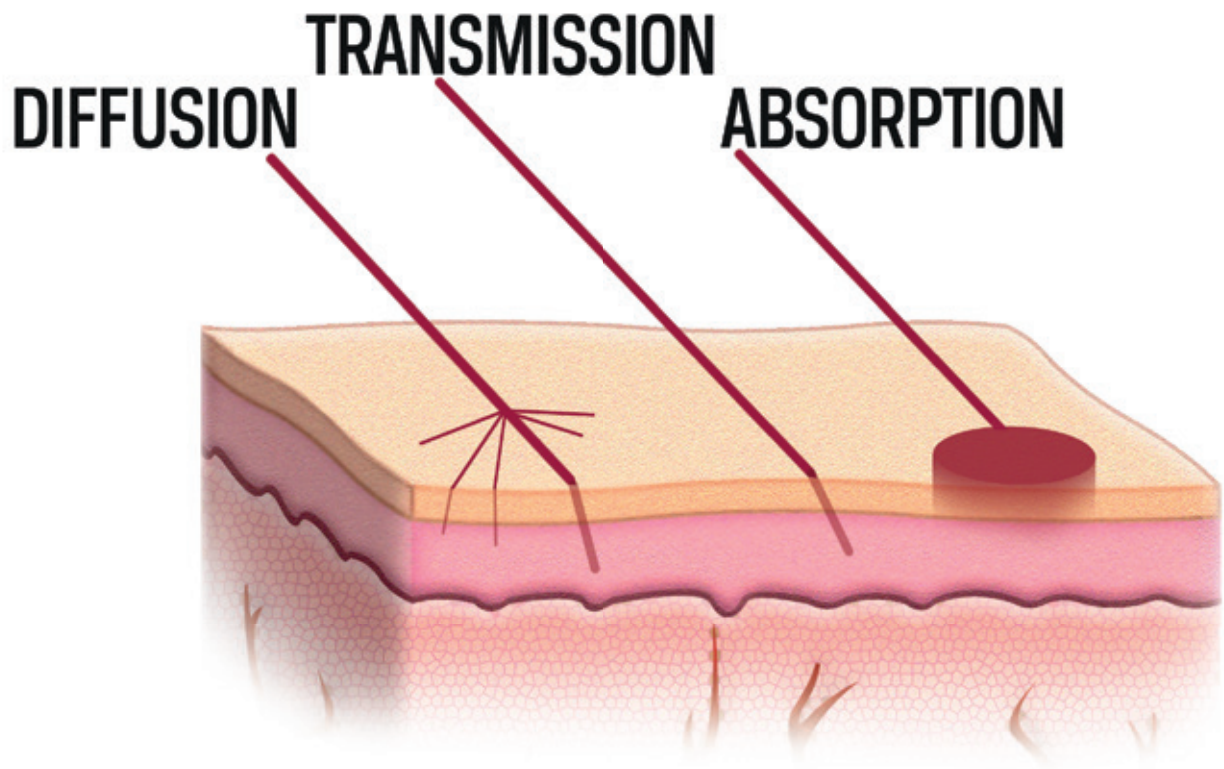


PHOTO-THERMAL EFFECTS ON TISSUE ACCORDING TO THE TEMPERATURE REACHED:

40°-45°C	Vasodilatation and endothelial damage.
50-60°C	Enzyme activity stops – protein denaturation. Collagen is more resistant. Increase in blood viscosity.
80°C	Perivascular and intraparietal collagen shrinks.
100°C	Vaporization of interstitial and intracellular fluids.

4. LASER-TISSUE INTERACTION

4.1 LASER EFFECTS ON TISSUE

Biological tissue interacts with laser light mainly by absorbing its energy, but other important phenomena must be taken into account:

- **DIFFUSION:** energy will be dispersed in the tissue in the form of heat and will not contribute to the main effect of laser such as ablation or vaporization. It is important to evaluate its effects in the areas surrounding the point of application of the laser beam. With the erbium laser diffusion of energy is predominant and generally involves the penetration of heat between 2 and 8 mm into the tissue.

- **TRANSMISSION:** energy that passes through tissues without any interaction. It is important to evaluate the underlying presence of other materials that may instead absorb the laser beam.

- **ABSORPTION:** energy that induces a transformation in the tissue, mainly through its change into heat. Chromophores are materials capable of absorbing the energy of specific wavelengths. In the oral cavity water, hydroxyapatite, haemoglobin and melanin are the main elements that can absorb laser energy.

Since biological tissue is composed 80-90% of water, the 2940nm wavelength of the erbium laser is very effective on soft tissue: effective vaporization occurs with very little heat diffusion in the surrounding area. Also small blood vessels are perfectly coagulated.

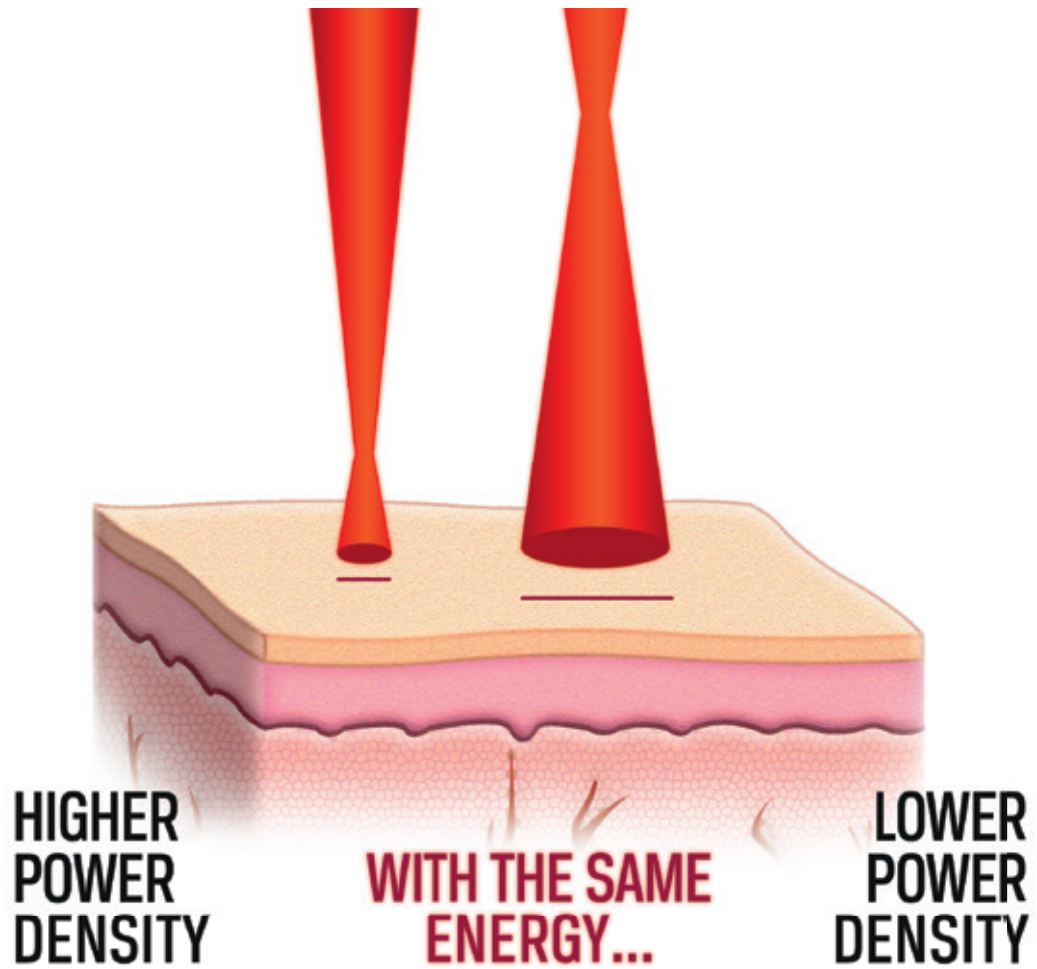
The absorption of laser energy by a tissue depends on factors linked to the laser beam:

- wavelength
- laser emission mode (pulsed or continuous)
- time of exposure
- power density

and on factors linked to the tissue:

- degree of vascularization
- tissue tension
- presence of chromophores
- optical and thermal conductivity

POWER DENSITY



CONTINUOUS EMISSION



PULSED EMISSION



4.2 VARIABLES

The main laser tissue interaction consists in the transformation of radiant energy into thermal energy. In order to obtain the desired effects on biological tissue, it is possible to increase or decrease the energy distribution by modifying these variables:

POWER: W (watt) – the total power of the laser beam can be increased or decreased.

TIME: exposure time to laser light for each treatment.

POWER DENSITY: W/cm^2 – it is the amount of power in the laser beam divided by the area of the beam on the irradiated surface. With the same power emission, as the size of the laser spot decreases, the power density increases. As the surface increases the power density on that area will decrease. This will radically change the effect: with the same energy but with different power densities it is possible cut, coagulate or biostimulate. If using a focused laser it will be possible to concentrate all the energy in a small area. When a laser is unfocused the irradiated surface is greater.

EMISSION MODE: laser emission can be continuous or pulsed.

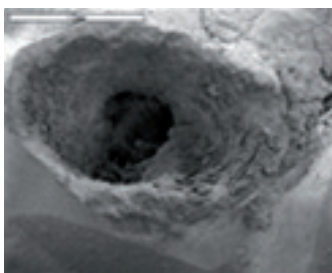
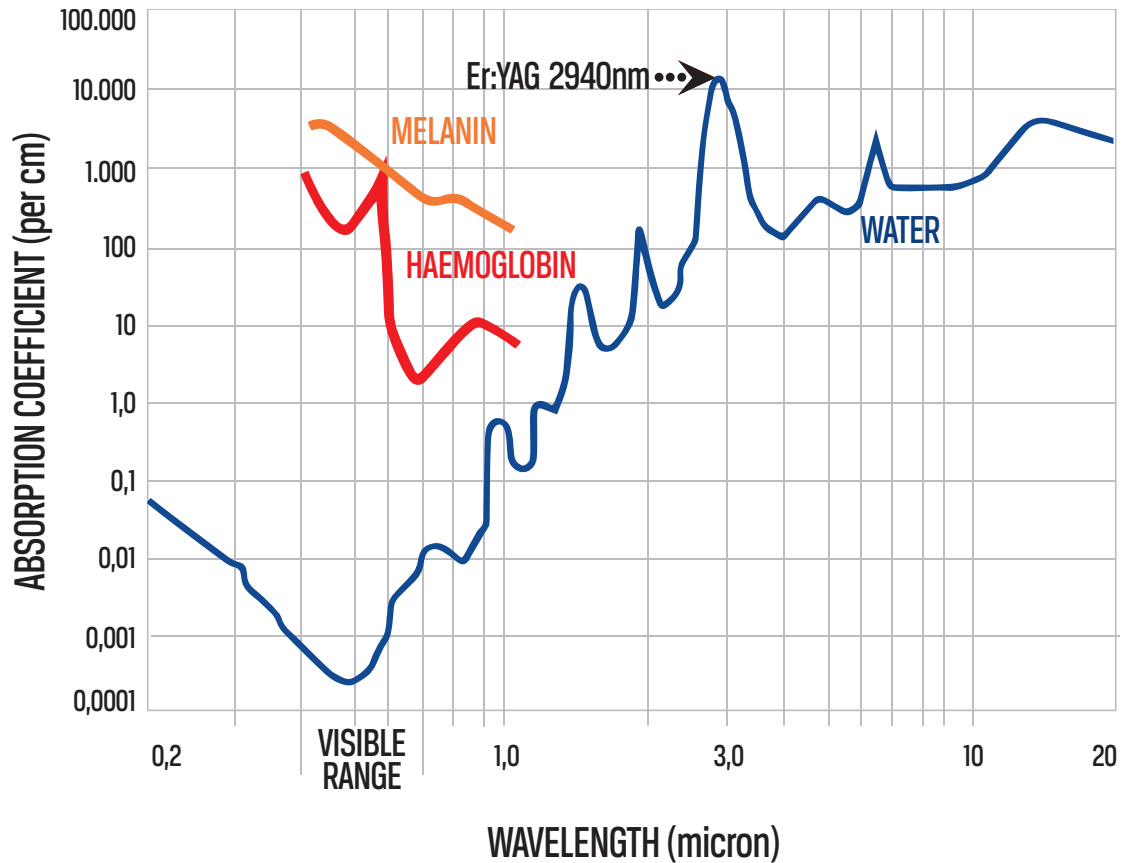
CONTINUOUS WAVE EMISSION means that laser energy is delivered without interruptions. This mode is ideal for quick incisions and no bleeding.

PULSED EMISSION creates a succession of laser pulses separated by pauses. In the pulsed mode the average power emission is therefore lower than the peak power created by each pulse, proportionally to the ratio emission time T_{on} /pause T_{off} . The pulsed mode is not as fast in cutting procedures but it can avoid the charring of tissue, since it allows time for the tissue to cool off in between pulses. This cooling-off time is a very important aspect of what is referred to as THERMAL RELAXATION TIME.

FREQUENCY: Hz (Hertz) - measures the number of pulses per second. The combination of frequency and T_{on} – T_{off} values characterized pulsed emission. This leads to two important clinical advantages:

1. during the T_{off} interval, the heat accumulated in the tissue can dissipate (thermal relaxation).
2. during surgical procedure less anaesthetic will be necessary.

ABSORPTION COEFFICIENT OF WATER, MELANIN, HAEMOGLOBIN AGAINST WAVELENGTH



ENAMEL AND DENTIN UNDER SEM EXAMINATION: the surface treated with the turbine is fractured compared to the area treated with the erbium laser.



Er: Yag laser

Turbine and diamond bur

The other fundamental benefit of the erbium laser is that it does not create any vibrations or cause micro-fractures as common turbines do. The erbium laser used on enamel shows uneven edges, melting and recrystallization of fissures, just as acid etching does. The surface of enamel seen with a SEM microscope has a smooth surface with open dentinal tubules, without any layer removal. Intertubular dentin is removed in greater quantity compared to peritubular dentin because it contains a greater amount of water.

4.3 EFFECTS

All of the variables mentioned above lead to different effects on biological tissue:

VAPOURIZATION, ABLATION, CUTTING – these effects require high levels of energy usually emitted by focused lasers. Pulsed emission mode can avoid excessive heat build-up on the surrounding tissue.

DECONTAMINATION – BIOSTIMULATION – PHOTO COAGULATION – these effects occur with less energy over a wider surface (low power density), so that more heat is transferred to the tissue, using continuous or extended pulses.

4.4 WHY 2940 nm

The Pluser Erbium laser wavelength is 2940nm. The high power density that the erbium laser can develop leads to photomechanical and photo-thermal effects on the surface of targeted tissue. Compared to other medical lasers, the erbium laser is primarily absorbed by the epithelial cells on tissue. Its effects are therefore concentrated at a 0.1- 0.5 mm depth from the surface. It is the only laser that can be effectively used on hard tissue, since the combination of the water and air spray avoids an increase in temperature of the dentinal pulp and on the surface.

THE ERBIUM LASER AND HARD TISSUE

The 2940nm wavelength is greatly absorbed by water and hydroxyapatite. For this reason the erbium laser is used on both soft and hard tissue. The water contained in these tissue types absorbs the laser's energy and is vaporized. This causes an increase in pressure that determines the onset of micro-explosions that lead to tissue removal (photoacoustic effect).

The water and air spray that accompanies laser emissions allows effective and comfortable treatment on teeth, bone and soft tissue. The nebulization of water creates an interface between the surface of the tooth and the handpiece: when the beam crosses this interface, the water particles split and are driven with force toward the surface with enough energy to cut hard tissue containing hydroxyapatite and enamel (photomechanical effect). The tiny bubbles that form below the surface break the structure of the vacuoles because of the increase in pressure. The erbium laser will not cause overheating thanks to the cooling effect of the air and water. The photothermal, photoacoustic and photomechanical effects of the erbium laser together make it an indispensable and effective instrument for soft and hard tissue surgery in dentistry.

DISCOVER THE GREAT REVOLUTION, NOW.



pluserlaser.com

5. APPLICATIONS

5.1 DENTAL TREATMENTS

tooth - bone - gum



TOOTH



caries removal – cavity preparation I-V – dentin removal

PLUSER's high power (12W) means it can work just as fast as a turbine, and with numerous advantages: the absence of vibrations makes visits to the dentists much more tolerable for patients; laser cutting does not create any fractures in the tooth's structure that cause it to weaken over time. Since decayed tissue contains more water than dentin (25% instead of 20%), its removal with the laser is selective and will not cause damage to the pulp, with the proper amount of energy. According to the principles of Minimally Invasive Dentistry, the infected tissue must be removed but the adjacent layer of dentin must be conserved since it still can potentially re-mineralize. The conservation of healthy tissue is especially important when treating deciduous teeth since they are thinner, or in the case of permanent teeth that have recently erupted, on which secondary dentin has not yet been deposited. A bur normally has a diameter greater than 1,5 mm whereas a laser beam has a diameter inferior to 1 mm. This characteristic allows greater precision and therefore greater conservation of healthy tissue. The bactericidal properties of laser light also plays a role in decontaminating the infected site, thus reducing the risk of future complications. The erbium laser can also remove most existing filling materials thanks to its selectivity and the proper power setting.

enamel removal – etching –sealing grooves- reconstructions

Brackets, veneers, groove sealing and reconstructions require etching the enamel. Compared to conventional acid etching, the erbium laser can prepare the tooth's surface with greater ease and control, especially in the case of paediatric or non-collaborating patients. In order to apply brackets on scarcely erupted teeth or in the case of gingival hyperplasia, linked to medication and lack of oral hygiene, great precision is necessary. In such cases, the laser can also remove the excess tissue that surrounds included canines, create opercolectomies around the second molar, or treat canker sores caused by orthodontic devices.



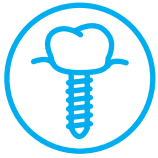
desensitization – sealing grooves without etching and composites - dental erosion – melting

Patients that suffer from dentinal sensitivity have a greater number of open dentinal tubules with a greater diameter. Laser treatment used in combination with a fluoride gel is extremely effective in the treatment of sensitive necks and dyes, if compared to the use of the product alone. Through SEM observation, it is possible to notice that after four to six months the dentinal tubules are still sealed. The laser beam's energy favours remineralization and closes the tubules.

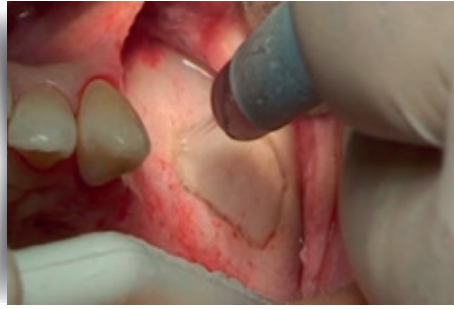
It is also possible to seal grooves without the use of etching and composites: the erbium laser can vitrify the cavity floor through melting. In the case of dental erosion, laser treatment will make teeth more resistant to acid.

endodontics – direct pulp capping

The erbium laser is a precious ally in endodontics: it can clean the smear layer on the dentinal walls, remove bacterial biofilm and decontaminate root canals thanks to the photo- acoustic effect generated by the laser in the square pulse mode. The high peak power and affinity of the erbium laser to water create this important phenomenon in the irrigating solution. The acoustic wave created by the laser is propagated through the solution, and in the root canal in all directions, even in tight spaces. The thermal effect is minimal and the decontamination and cleanliness are optimal.

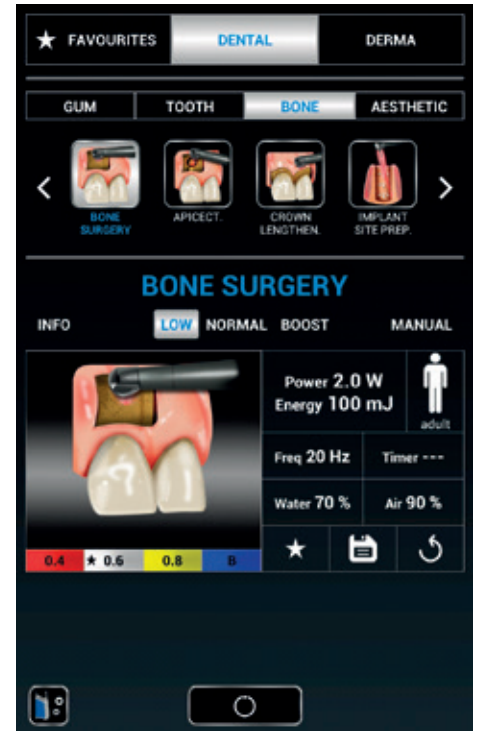


BONE



bone surgery – sinus lift - split crest implant site preparation - apicoectomy

The erbium laser is a cutting edge tool for complex surgical procedures that involve bone, such as sinus lift, split crest and implant site preparation. Laser cutting of bone tissue is much simpler and less traumatic for patients: it is possible to create a gingival flap and bone incision quickly and with more accurate osseous margins than with rotating instruments. The laser also has bactericidal properties and does not cause heating on the targeted tissue thanks to the air and water spray. The instant vaporization of the water contained in the tissue respects the biological properties of the residual bone, without charring or protein denaturation.



GUM



gingivectomy – crown lengthening – curettage - opercolectomy – implant uncovering

The progressive ablation of gum tissue with the erbium laser, layer by layer, often does not require the administration of anaesthetics, thanks to the pulsed mode, the scarce penetration depth and minimal heat build up. In crown lengthening, it is possible to vaporize the gingival margin without affecting the



underlying bone. In most cases anaesthetics are not necessary. In order to test the patient's sensitivity it is advisable to begin with lower power settings. Opercolectomies involve the removal of the gum tissue that surrounds unerupted wisdom teeth. The use of the laser instead of the scalpel causes much less pain and much less swelling. In the case of implant uncovering the laser is an important tool: since there is no interaction between the 2940nm wavelength and the implant itself, and no overheating, it can be used in close proximity to the implant for decontamination and treatment of the surrounding tissues.

surgery – fibroma removal - frenectomy – oral lesions – vestibuloplasty

The removal of oral lesions, frenectomies or fibromas require precision cutting. The coagulating effect of the laser decreases bleeding for a clear operating field and fast healing. The application of stitches is usually not necessary. The labial frenulum is the vertical band of oral mucosa connecting the lip of the residual alveolar ridge near the midline of both the maxillary and mandibular arches. The lingual frenulum is the vertical band of oral mucosa connecting the tongue with the floor of the oral cavity and the alveolar or residual alveolar ridge. A frenectomy partially removes or repositions the frenulum, in order to stabilize dental positions or alleviate traction. Patients are usually quite young, so the laser is much better tolerated, since it does not cause pain. The tissue will be instantly vaporized and no stitches are required.

canker sores – cold sores – therapy

The erbium laser is a useful tool for healing herpetic lesions: a few seconds of lasing will immediately interrupt pain and decontaminate the surface, speeding up healing.

depigmentation – amalgam stain removal

Over-pigmentation of gums can occur naturally or because of the presence of materials such as old fillings made of amalgam. The erbium laser removes the residual melanocytes and other pigments present on the gum through ablation. Healing will proceed quickly and without complications.

5.2 DERMAL TREATMENTS

dermal surgery - aesthetics - resurfacing



DERMAL SURGERY



The BOOST handpiece can perform dermal surgery thanks to its precision and manageability. The presence of air and/or water makes surgery more tolerable for patients. **Xantelasma, seborrheic warts, nevi, cysts** and other small skin lesions can be removed directly in your studio.



AESTHETICS



The full field handpiece can treat skin lesions over a wider surface as in the case of **acne, scars, lentigo and melasma**. The SMOOTH pulse can balance the level of ablation and coagulation necessary, according to the desired effect: more ablation for surface removal or coagulation for greater collagen stimulation in the derma.



RESURFACING

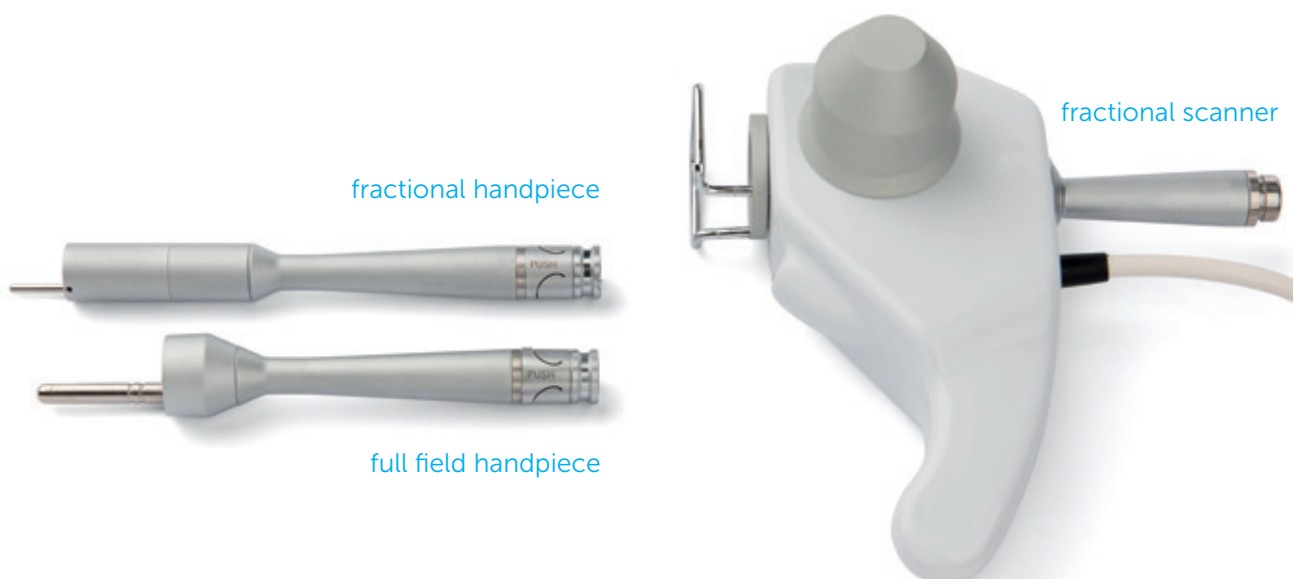


Fractional resurfacing is the gold standard for the treatment of stretch marks, wrinkles and ageing.

The **fractional scanner** and the **fractional handpiece** divide the laser pulse into many micro-spots for an ablative treatment. The depth of the ablation is selectable: this guarantees less pain, no bleeding and faster recovery compared to chemical peeling or CO₂ lasers, with the same rejuvenating effect. The DEEP pulse can increase the penetration of the laser without damaging the surrounding tissue, by avoiding the formation of craters that damage the skin with the use of a normal pulse. To apply the fractional pulse on smaller surfaces such as around the eyes or lips, the **fractional handpiece** is also available.

Post-treatment recovery is fast and patients can return to their normal activity almost immediately. For optimal results 4 to 6 sittings are recommended, depending on the starting condition. Usually anaesthetics are not necessary, but some patients may require it if they have a low pain threshold.

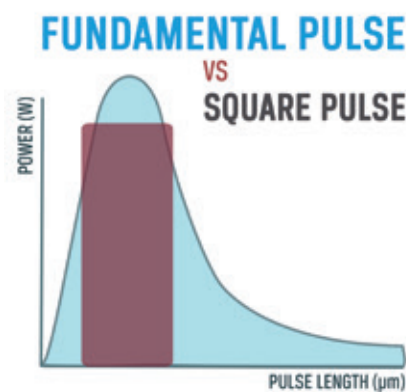
On the other hand, conventional laser resurfacing completely vaporizes the treated area, whereas fractional resurfacing leaves the skin between the ablated micro spots undamaged. In the case of complete ablation, it is necessary to anesthetize the patient because treatment is painful and may result in bleeding; only one sitting is required but post-op recovery will last months and normal activity will be necessarily delayed.



5.3 PLUSER'S PULSE SYSTEM

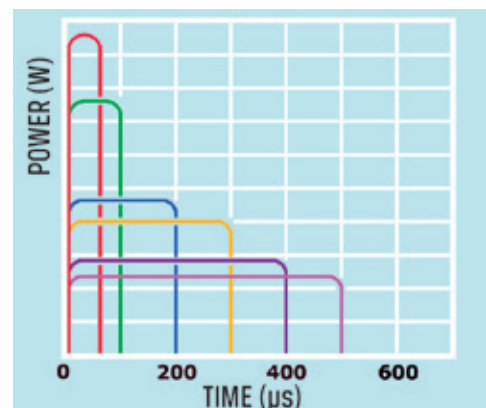
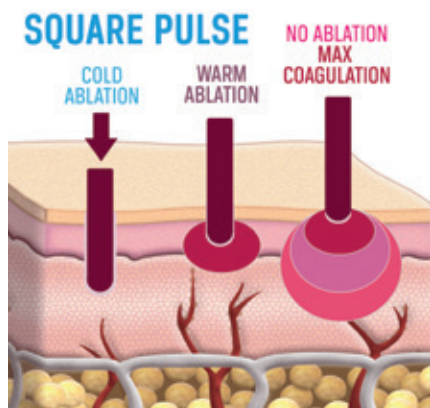
FUNDAMENTAL PULSE for dental applications

Pluser's laser source was designed to create two different pulses: **Gaussian** and **Square**. The **Gaussian** pulse is ideal for dental applications because it guarantees tissue preservation and is well tolerated by patients: the energy is distributed gradually in order to reduce stress and pain. The **Square** pulse is especially useful in dermatology because it can progressively release heat to coagulate and stimulate the dermis.



SQUARE PULSE controls the degree of ablation and coagulation on skin

Pluser's **MSP** (Multiple Square Pulse) technology transforms the fundamental pulse into a square pulse with a selectable duration. At the same power values, a longer pulse will have a lower peak power. With a time span of around 100µs, the laser will have a cold ablation effect, since it will not have enough time to spread heat to the surrounding tissue with such a short impulse. Longer pulses will give off more heat and induce coagulation in vessels during surgery and stimulate the deeper parts of the derma such as collagen, with a minimally ablative effect.



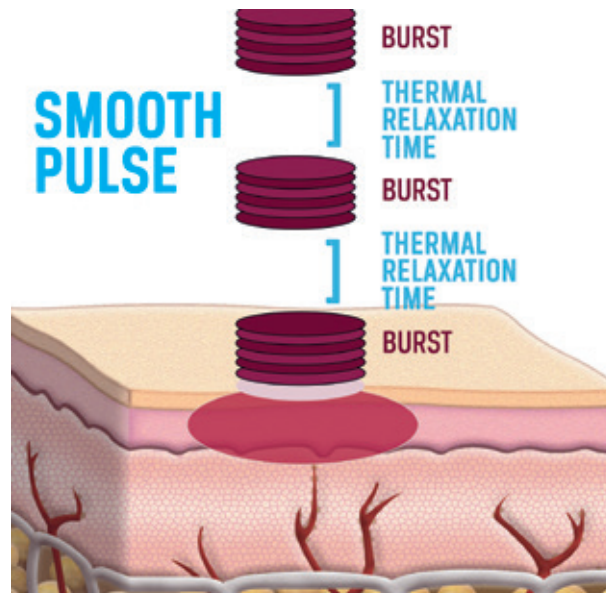
SMOOTH PULSE MODE non-ablative rejuvenation

The **SMOOTH** pulse is complementary to the full field handpiece. Its function is to preserve the epidermis and smoothen the skin by stimulating collagen. The **SMOOTH** pulse deposits the energy necessary to induce the shrinkage of collagen by passing the epidermis, with a minimally ablative effect. The faster the heat transfers to the tissue, the more effective the treatment will be.

The **SMOOTH** pulse is regulated by two parameters:

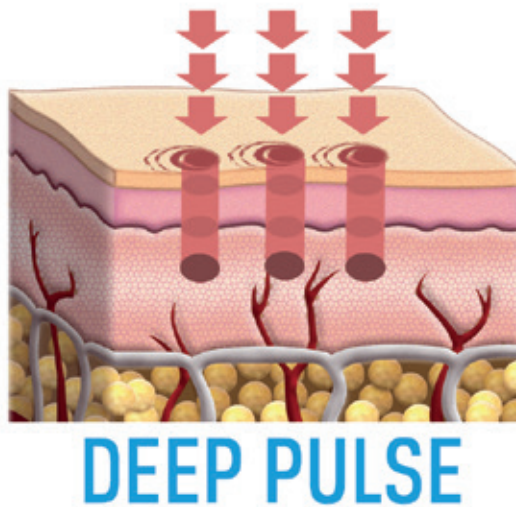
1. Number of consecutive impulses (**BURST**) selectable from 5 to 10.
2. Thermal Relaxation Time (**TRT**) is the time between bursts i.e. the time necessary for the tissue to dissipate heat build-up. (selectable from 200 μ s to 500 μ s).

With multiple impulses between 400 μ s and 600 μ s, low fluence (2,5 - 4J/cm²) and 10-30Hz frequency, the laser is below the ablation threshold: it will deposit heat in the underlying layers. Thermal relaxation time is higher towards the surface and decreases in the deeper layers, so that heat will build up more in the collagen area (250-300 μ m) rather than the surface.

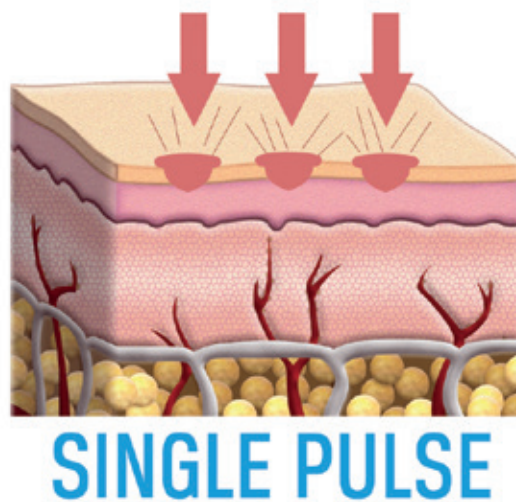


DEEP PULSE MODE for fractional resurfacing

The **DEEP** pulse is designed for deep ablation, without thermal effects. It splits the fundamental pulse into a maximum of six micro-impulses: the greater the number of micro-impulses the greater the penetration depth into the derma. It is especially useful in fractional resurfacing because it avoids the formation of craters on the skin that normally occur with single impulses.



VS





6. PLUSER LASEREVOLUTION

THE 10 TEMPTATIONS OF PLUSER.

- 1 Fast and precise cutting:** The BOOST freebeam handpiece technology does not require tip changes: it operates without contact therefore reducing the risk of cross contamination.
- 2 Double impulse:** Pluser is the only laser that lets you choose the pulse shape: the Gaussian pulse for comfort in dentistry and the square pulse for effective treatments in dermatology.
- 3 Complete set of tools:** Pluser is a versatile, modular platform that allows fast handpiece and tip changes for different advanced applications, thanks to the easy-click connection system.
- 4 Built-in video guide:** The colour touch screen gives fast access to numerous preset treatments and clinical videos of many treatment procedures to help guide you step by step.
- 5 From dentistry to dermatology:** Pluser is a cutting edge tool for dermal surgery and skin rejuvenation thanks to its specific handpieces and treatment protocols.
- 6 Scanner-ready:** Pluser is designed to be fitted directly with a fractional scanner. It is the ideal tool for skin resurfacing, with excellent results and faster healing.
- 7 Optic fibre:** Flexible, practical and extremely durable: Pluser's optic fibre delivery system lets you operate freely, with greater comfort and efficiency.
- 8 Wireless footswitch:** Avoid messy cables in your work place: the wireless pedal allows you to power laser emission without wires.
- 9 Wi-Fi direct:** Pluser's Wi-Fi connection allows software upgrades, content upload and technical service, at any time.
- 10 100% Made in Italy:** Pluser is a CE certified medical device, designed and manufactured entirely in Italy.

YOUR FUTURE IS HERE, **NOW!**

For your educational needs, Doctor Smile is a partner of **Master Class Academy**, a non profit higher education institute dedicated to offering top level knowledge in the medical field, especially in the use of laser and other technology. Thanks to its world wide base of academic collaborations, Master Class Academy has a global approach to education that aims at bringing state of the art information to medical doctors in every country.



The Academy's objectives:

- to Promote excellency in the medical field
- to broaden the use of technology especially in the medical field
- to connect and network research institutions and associations with the same objectives as the Academy
- to organize conferences and events, courses and scientific debates on a national and international level and promote and organize post graduate courses, that include credits where applicable.
- develop technology and knowhow in medical science and high tech medical devices
- contribute to publishing clinical and technical research
- promote debates and diffuse information through an internal database, newsletters, online webpages, press releases, etc.

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7. EDUCATION

EVOLUTION MEANS KNOWLEDGE.

Doctor Smile, in collaboration with Master Class Academy, offers courses at various levels held by our skilled laser tutors that include the analysis of a wide array of clinical cases and hands on practical sessions.

More information and the course agenda are available at www.masterclassacademy.it





MORE INFO

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