***Oral surgery***

***DR. shiab***

***22-4-2014***

**LASER IN ORAL SURGERY**

The laser in general is one of treatment modalities that can be used to provide to the patient a definitive treatment.

The most common used treatment that provide definitive treatment is the conventional surgery (blade surgery), but the conventional surgery sometimes is inappropriate specially for specific lesions with specific presentations. for example a patient with lesion on the posterior part of the tongue it is very difficult and inconvenient for the patient and the operator, for this reasons we have other treatment modalities likechemotherapy,radiotherapy, laser and photodynamic therapy.

So the LASER is acronym that stands for :

L>>light

A>>amplification

S>>stimulated

E>>emission

R>> radiation

SO the light ( normal photon with normal energy ) will be amplified ( get energy) by sort of electrical stimulation or which called “stimulated emission radiation”.

In laser we cut a tissue with coagulation or without coagulation, or we blade the superficial structure .for example if a patient come with leukoplakia we apply a laser on it with specific characteristics and it will remove the superficial area only.

So the laser will be faster than the conventional surgery and more comfortable in terms of healing and post. Operative complication ( pain ,bleeding ,swelling ,..etc). That will reduce the anxiety and the fear of the patient from drilling and the noise of the suction .also there will be no need for needle for anesthesia or needle for suture, and there is increase visualization for surgical site . HOWEVER it is specially indicated for patient with specific lesion and specific presentation.

The doctor shows us a slide aboutHemangiomaaffecting the orbital area.

Note: Hemangioma present at birth and start to involute with the time. We wait until the school age and we treat the rest of the lesion before he go to school for his psychological situation.

The most commonly used surgery in maxillofacial surgery is CO2 LASER.

There are different types of laser.

How does the laser work??

It is amplification of lights by times of electrical stimulation.so the electrical stimulation connecting to the power supply .when the power supply is on the electrical stimulation start between cathode and anode. In the tube we have an active medium which consist of atoms and electrons which present in resting state without energy. When the electrical stimulation pass through this active medium that will lead to activate the resting photon and electrons (with energy). Here again in this tube there is a gas flow it could be CO2,argon, ER:YAG , ND:YAG, copper laser . This gas will stick with this active electrons (e.g.: co2 active electrons) this active electrons are the laser .these active electron will be concentrated by a group of reflecting mirror to produce a laser beam or active electron concentrated at one point. Now we have active electron (laser)if it pass through a tissue or anything it may make a difference .

Keep in mind that not all tissue can be affective by these active electrons. There is something called chromophore, which means those tissue which can absorbs the laser beams, if the tissue absorbs the laser beam, the laser will affect the tissue. If the tissue cannot absorb the laser beam there will be no effectiveness. SO for that reason the type of the tissue will determine the type of the laser .for example CO2 laser has an affinity to the tissue containing water like skin, mucosa. SO the skin and mucosa called chromophores for co2 or ER: YAG laser. And if we want to treat a vascular lesion or pigmented lesions, thereis a chromophore lesion for ND: YAG laser or copper laser

Again chromophore with is tissue that can absorb laser beams. Any tissue containing of water (like leukoplakia, lichen planus which don’t contain a hemoglobin or pigmented lesion) are chromophore for co2 and ER:YAG laser. So for that reason we say that the most common use laser is co2 because the most tissue in counter is skin and mucosa. and if the lesion contain melanin or blood are chromophore to copper , argon and ND:YAG laser.

So the Grotthuss-Draper law state that it has to have absorption of these chromophores to enhance the effect of laser .Without absorption there will be an effect of laser .so if you put the argon laser on skin it will not effect on it .

Photodynamic therapy has the same mechanism, so if we have lesion on the skin, we bring light with specific wave length, and when we apply the light to the lesion ,we may also injure the normal tissue, so for that reason we inject the patient with specific material that has two main properties:

First : it is selectively absorbs by the material itself (e.g. if the material is highly absorbs by the hyperkeratotic cell it will go to the area of leukoplakia and absorb it )

Second: the material will be selectively affect by specific light with specific wave length.

So when we apply the light with specific wave length to the lesion there will be an interaction (ablation or vaporization). So itwill make ablation the lesion only, because the material is only on the lesion.

So when we want to treat a Hemangioma we will apply a copper, ND: YAG laser because the tissue is chromophores to this laser.

Now what I want to do to the lesion, ablation, blading OR resurfacing??

So if I you are intending to do an incision, you need a laser with deep penetration and effect. If you need just affect the superficial area( resurfacing or ablation for lichen planus for example) you need just superficial effect for the laser.

**SO HOW TO ACHIEVE THIS??**

We have many icons in the laser device which are:

***Power density or energy density***: which are measures of the amount of the laser power apply to the tissue over specific time. If you **increase** the power density or energy density you are achieving **deep penetration** and effect, you intending to **cut and incise** the tissue. And if you intend to **superficial effect** you need to **decrease** it.

***Spot size (focused on defocused):***if you intend to **incise** the tissue you need a **focused** spot size, and if you need **superficial effect** you need **defocused** effect.

**Thermal relaxation time:**is the time to needed by the tissue to dissipate 50% of the absorb heat generated by laser. The laser when enter the tissue it will convert to heat or chemical interaction. The heat will vaporize the cells or it will make chemical reaction with the cell, for example, make damage to the cell membrane or denaturant the protein. So some types of laser produce heat, the time with needed to dissipate 50% of the absorbs heat this called Thermal relaxation time. On another way, if the Thermal relaxation time of the mucosa is 3 sec , and you apply the laser for less than 3 sec, that mean you are not exceeding the thermal relaxation time, that will not produce a heat in the tissue. Where there is no heat in the tissue there is no lateral thermal damage or coagulation. But if you exceed theThermal relaxation time 4sec you will produce lateral thermal damage which will lead to coagulation necrosis . So it you want to **cut and coagulate** you need to exceed theThermal relaxation time. And if you want to cut only like superficial effect like in leukoplakia and we will not exceed the Thermal relaxation time .

The final effect that achieve by the laser will be control all the previous factors.

So if you want deep penetration we will increase power density, energydensity, focused spot size, and exceeding theThermal relaxation time if coagulation is needed.

And if I want to make ablation for superficial area I will decrease thepower density ,energy density ,defocused spot size, with or without exceeding the Thermal relaxation timeif the coagulation is needed.

So if we want to make gingivictomy I will make cut. So I need laser with increasingpower density, energy density ,focused spot size, and exceeding the Thermal relaxation time.

But if we want to make gingivoplasty (resurfacing and re contouring of the gingiva), so I need laser with decrease power density ,energy density ,defocused spot size, with exceeding the Thermal relaxation time ( maybe some capillaries there)

Note : Homeostasis only achieve in using co2 laser for capillaries less than 0.5 mm. but more than 0.5 mm will need electro coagulation and other method like ligation for the capillaries.

ER:YAG laser is chromospheres for tissue containing water. And has also a unique effect which is a bactericidal so it is suitable for periodontal application and RCT to sterilize the canals, but the depth of penetration is less than CO2, for that reasons it is not good in providing homeostasis

ND:YAG laser : specially for tissue containing melanin and hemoglobin , like pigmented or vascular lesion. The co2 laser is faster than ND:YAG laser but with less depth of penetration. The ND:YAG laser has the highest depth of penetration among all the lasers.

The port wine stain distributed over specific nerve so we apply argon laser on it.

If you are not exceeding the thermal relaxation time the sample will be appropriate for histopathology .

The laser can cut and seal in mucosa, how we can seal by exceeding the thermal relaxation time.

Sometimes the orthodontics refer to expose the impacted canine. but the apically position flap to preserve the attach gingiva is better than excise the gingival by laser

The crown lengthening is one of imp. surgery in periodontics , full mucoperiosteal flap, deep curettage ,reposition the gingiva and cut the gingiva to specific length .

For premalignant lesion , resurfacing or ablation by the use of specific laser with decrease the power density ,energy density ,defocused spot size, without exceeding the Thermal relaxation.

TMJ lesion , diskotomy>> remove the disk .. diskoplasty >> reshape the disk… synovictomy >> to remove the synovial membrane posterior attachment contraction.

We open two incisions one for endoscope with camera and the other for laser.

Also with mucoseal,

Operculectomy to excise the operculum one for treatment modalities for pericorinitis but it always fail so the best treatment is to extract the wisdom .

Epulus fissuratam ,the surgical will lead to high expose area that will lead to heal with secondary generation and will be inconvenient for the patient ,so you can cut these fissure and cut them in the same time and it will be more convenient to the patient.

Laser in dental implant. we can use it in two main areas.

First: to treatment failing implant by sterilization of the implant.

Second : in second stage implant, before we put the gingival former we cut the tissue that cover the implant by laser.

Note :two stage implant, we put the implant in the bone then we suture in after two month we tale a radiograph and see if we have osteointegration ,if yes we cut the gingiva and but what we called gingival former to reshape the gingiva.

The laser can affect the lesion and can affect your eye or any tissue or can stimulate any gases specially Nitrous oxide or nitrogen gases in order not to stimulate by the laser.

You have to wear goggles or eye glasses to protect your eye .

It is better to specify one operator for the machine. To minimize the risk for other and get more experience.

Done by:

DINA AL- MEFLEH