English Summary

The word ***LASER*** is an acronym for ***L***ight ***A***mplification by ***S***timulated ***E***mission of ***R***adiation.

The following are the characteristics of laser light in comparison with the ordinary light:

1. Monochromaticity = one wavelenghth = one color, while ordinary light shows polychromaticity = different wavelenghths = many colors.
2. Collimation = directionality (narrow cone of divergence), while ordinary light emitted in all directions.
3. Cohernce = highly ordered in space and correlatd in time, while ordinary light is incoherent.
4. High power laser beam with high efficiency, while for ordinary light is very low.
5. The power density (irradiance) at the focal spot is extremely high many orders of magnitude higher than the ordinary light.
6. The laser beam can be focused onto a spot whose diameter is of the order of laser wavelength.

The laser system has the following functional elements:

1. Active lasing medium.
2. Excitation (pumping) mechanism.

3. Feedback mechanism (resonator).
4. Output coupler.
5. Delivery system.

When the human tissues are irradiated with a beam of laser light, it is partially transmitted and partially attenuated by reflection, scattering, or absorption through the material. Since most of tissues consist of water, the thermal properties of tissues resemble those of water.

The laser tissue thermal interaction:

0 - 60° heating and warming.
60 - 65° coagulation.
65 - 90° denaturation
90 - 100° dehydration.
100 - 300° vaporization.
300 - 400° carbonization.

The laser can be classified according to the following characteristics:

1. *Lasing (active) medium*: into solid, liquid, gas, or semiconductor lasers.
2. *Wavelength*: into UV, visible, or IR lasers.
3. *Temporal behaviors*: into continuous wave (CW), or pulsed lasers.
4. *Safety*: into class I, IIa, IIb, IIIa, IIIb, or IV.

As an example for laser types:

- CO_2 laser.
- He – Ne laser.
- Dye lasers.
- Ho: YAG laser.
- Semiconductor laser.
- Argon laser.
- Excimer lasers.
- Nd: YAG laser.
- Er: YAG laser.

Laser can be used in medicine in:

- cardiothoracic surgery.
- dentistery.
- dermatology.
- Gastroenterology.
- General, vascular, and microsurgery.
- Gynaecology and obstetrics.
- Neurosurgery.
- Oncology.
- Ophthalmology.
- Otolaryngology and head and neck surgery.
- Orthopaedic surgery.
- Physiotherapy.
- Rheumatology.
- Urology.

As regard to the use of lasers in orhopaedic surgery specially in arthroscopic meniscectomy, the Ho: YAG laser can be used in arthroscpic laser meniscectomy if its outcome; immediate or longterm is better and safer than the conventional arthroscopy.

The setup for arthroscopic Ho: YAG laser meniscectomy is the same as that for conventional arthroscopy, in addition to the laser system, delivery optic fiber, and the various degrees handpieces.

The technique for arthroscopic Ho: YAG laser meniscectomy is generally depending upon creating a flap tear which is reduced or ablated with laser radiation whatever the type of tear; cicumferential (complete, incomplete, concealed, or detached bucket-handle), partial-thickness posterior horn, degenerative, shattered, radial, discoid meniscus, or meniscal cyst.

As ***2.58 kJ*** of energy ablate ***1mm^3*** of water-rich tissue and thermal relaxation time is few tenths of a second for ***1mm^3*** water, the suggested treatment parameters for arthroscopic laser ablation of the meniscus: for ablation; *energy* (joules): 0.5 - 2.5, *pulse repetition rate* (Hz) 5 - 15, power (Watts) 5 - 25.

The advantages of arthroscopic laser meniscectomy is: easy manipulation specially in small and tight spaces, less articular surface scuffing, less postoperative pain and effusion, shorter recovery of range of motion, and haemostasis.

The following hazards had been reported during the use of laser:

- Eye hazards.
- Inadvertant exposure.
- Aiming beam hazards.
- Patients hazards.
- Surgical staff hazards.
- Airborne contaminants.
- Skin hazards.
- Surface reflection.
- Service hazards.
- Surgeon`s hazards.
- Bystander`s hazards.

Some reported complications were:
Haemoarthrosis, synovitis, neuritis, fistula, and osteonecrosis.

The meniscus was studied from several points of view:
Anatomy (gross, and arthroscopic), histology and microanatomy, vascular and neuroanatomy, biochemistry, nutrition, Physiological movements, mechanical properties of its material, and function.

Identification of meniscal injury, mechanism and classification (anatomical and arthroscopic), pathogenesis, diagnosis (history, symptoms and signs, clinical examination, and investigations).