

HOLMIUM LASER



The word LASER is an acronym. It is produced by picking up the first alphabet of the following 5 words. “Light Amplification of Stimulated Electronic Radiation”. The first practical demonstration took place in 1954 and it was called as MASER (first alphabet M for Microwave). In 1960 the first laser was produced by activation of Ruby Crystal. Within one year it was used in ophthalmology for photocoagulation.

Subsequently, by exiting different types of elements different lasers were produced. Each laser has different characteristics, absorption and wavelength. Lasers are extensively used in defense and industry.

Electromagnetic radiation spectrum stretches from the very narrow wavelength (gamma rays) to long wavelength (TV, radio and microwaves). The visible light is in the center of this electromagnetic spectrum (0.4 to 0.7 microns).

Laser is the most powerful beam of light. The laser is a bundle of light energy that is collimated, monochromatic and coherent.

In a laser beam all the rays travel in a single direction (Collimated). There is no diversion even over a long distance. Ordinary light waves spread and loose intensity rapidly.

Laser light has one color or a very narrow range of colors (Monochromatic). Ordinary light is a combination of 7 colors that form the rainbow (VIBGYOR).

In a laser beam all the light waves move in phase together in time and space. (Coherent). Each crest and valley are matched all through out.

Lasers have different wavelengths. Those, which fall in the visual spectrum, are visible to the naked eye. Others are not. Commonest example of visible laser is the frequently used laser-pointer which is the Helium-Neon laser (HeNe laser). Other examples are Argon and KTP lasers. Most of the other lasers are not visible to the naked eye. For those that are not visible to the naked eye, a helium beam is incorporated along with the main laser. This makes the target clearly visible.

Most powerful laser that is available today is the CO² laser (wavelength 10.6 μ). It is invisible. It is mainly used for treatment of areas that are easily accessible, such as skin & ENT ailments. The delivery system is very cumbersome. CO² laser has a very high absorption coefficient. Therefore the depth of penetration is less than a millimeter with no effect on deeper tissues. Hence it is very precise in its cutting property. CO² laser is the best laser for its cutting operations. But it has very poor coagulation properties. It can't be passed through a flexible glass fiber.

Neodymium : YAG (ND YAG) is an invisible laser (wavelength 1.06 μ). ND YAG laser has low absorption coefficient. Hence it penetrates tissues deeply making it clinically very useful for its coagulating properties. It is very poor in its cutting properties. It is incapable in crushing stones. Hence it did not become popular in Urology. It can be transmitted through a flexible glass fiber.

Holmium : YAG laser is the second most powerful laser (wavelength 2.14 μ) and capable of generating high energy in kilowatt range. It is a pulsed laser and can be delivered through a flexible glass fiber. It has a short absorption length in the tissues (one millimeter). It is precise in its power of cutting just like the CO² laser. In addition it has an additional feature of producing coagulation of the blood vessels over another millimeter. Thus Holmium laser is a unique laser that has both the properties - excellent cutting as well as coagulation – in a single burst of energy release. In addition it capable of crushing any type of stone – soft or very hard.

To summarize: the properties of Holmium laser are:

1. It can be delivered through a tiny glass fiber. Hence it can be used through various endoscopes – both rigid & flexible - that are passed inside the human body.
2. Its cutting range is just one millimeter and coagulation effect is another millimeter. Hence it can be used for very precise cutting of tissues. Beyond that distance there is no effect on the tissues. Thus it is a unique laser that can cut and coagulate at the same time.
3. It capable of crushing any type of stone – soft or very hard.

Because of these very important properties, Holmium laser is rapidly gaining popularity amongst the medical fraternity.

Both CO² and Holmium laser can drill a hole in a steel plate.

Initially Holmium laser was introduced for use in arthroscopic surgery. But soon it was realized that it is capable of crushing all types of stones also. By increasing its power, it can very quickly and effectively cut soft tissues, simultaneously coagulate the blood vessels. Instrument manufacturers have now produced Holmium laser machines that can generate up to 100 watts of energy.

Holmium laser is equally effective in other surgical applications. Notable among them are arthroscopy, ENT surgery, laparoscopy, and in fact in endoscopic surgery where one needs to use cutting, coagulation and crushing (gastroduodenoscopy, under vision crushing of pancreatic stones through ERCP, colonoscopy, & bronchoscopy). Thus in a multi-disciplinary setup Holmium laser is definitely more cost effective.

There is no other single energy that can rapidly cut tissues, coagulate the blood vessels and crush any type of stone. It is obvious that it is rapidly gaining popularity all over the world. Only deterrent factor is its initial cost. Maintenance cost is very low indeed. But as the demand increases, the cost is bound to come down gradually.

Applications in Urosurgery

Treatment of urinary stones:

Holmium laser is one of the most powerful intracorporeal lithotripsy tools. It has the advantage of being used through most slender small gauge endoscopic devices. This allows minimal access procedures such as the ureteroscopy and percutaneous nephrolithotomy to be done with least trauma to the tissues. There is virtually no bleeding and results in painfree faster recovery.

Treatment of prostatic disorders:

Holmium Laser Enucleation of Prostate(HoLEP) is the new gold standard of removal of prostatic adenoma in cases of Benign Enlargement of Prostate (BEP).

The advantages of the use of this technique are minimum bleeding (conventional techniques such as the Transurethral Resection of Prostate-TURP and open enucleation of prostatic adenoma involves the risk of excessive bleeding and risks of blood transfusions). **This technique allows patients to have a speedier recovery with shorter hospital stays.**

Highest Power 100 Watt Lumenis Holmium Laser... An Evolution in Laser Lithotripsy

- ▶ Literally transforms stones into dust
- ▶ Vaporizes stones with high repetition rate of Lumenis High Power 100 Watt Holmium Laser
- ▶ Works well on all stone compositions with precise control
- ▶ Small fibers used with either flexible or rigid scopes
- ▶ Fibers are flexible to allow endoscopic treatment of stone diseases throughout the urinary tract
- ▶ Minimal stone movement
- ▶ More effective in removing embedded stones
- ▶ Virtually no bleeding
- ▶ Greater than 95% success with single treatment
- ▶ New joint AUA-EAU guidelines support ureteroscopy or SWL for stones in all locations



*VersaPulse PowerSuite
100 Watt Holmium Laser*