

5.6 LASER INSTRUMENTS FOR SURGERY

Laser light is different from regular light. The light from the sun or from a light bulb has many wavelengths and spreads out in all directions. Laser light, on the other hand, has a single wavelength and can be focused in a very narrow beam. This makes it both powerful and precise. Lasers can be used instead of blades (scalpels) for very careful surgical work, such as repairing a damaged retina in the eye or cutting through body tissue.

Types of lasers

Lasers are named for the liquid, gas, solid, or electronic substance that's used to create the light. Many types of lasers are used to treat medical problems, and new ones are being tested all the time. Nowadays, 3 kinds of lasers are commonly used in cancer treatment: carbon dioxide (CO₂), argon, and neodymium: yttrium aluminum garnet (Nd:YAG).

i. Carbon dioxide (CO₂) lasers

The CO₂ laser is mainly a surgical tool. It can cut or vaporize (dissolve) tissue with fairly little bleeding as the light energy changes to heat. This type of laser is used to remove thin layers from the surface of the skin without going into the deeper layers.

ii. Argon lasers

The argon laser only goes a short distance into tissue. It's useful in treating skin problems and in eye surgery. It's sometimes used during colonoscopies (tests to look for colon cancer) to remove growths called polyps before they become cancer. It can be used with light-sensitive drugs to kill cancer cells in a treatment known as photodynamic therapy (PDT). (You can learn more about this in our document titled Photodynamic Therapy.

iii. Nd:YAG (Neodymium: Yttrium-Aluminum-Garnet) lasers

Light from this laser can go deeper into tissue than light from other types of lasers, and it can make blood clot quickly. Nd:YAG lasers can be used through thin

flexible tubes called endoscopes to get to hard-to-reach parts inside the body, such as the swallowing tube (esophagus) or large intestine (colon). This light can also travel through optical fibers, which can be bent and put into a tumor to heat it up and destroy it.

iv. Other lasers used in medicine

Some newer types of lasers – the erbium: yttrium aluminum garnet (Er:YAG); holmium: yttrium aluminum garnet (Ho:YAG), copper vapor, and diode lasers – are also being used in medical and dental treatments.

Lasers have some advantages (pros) and disadvantages (cons) compared with standard surgical tools.

Pros of laser surgery

- Lasers are more precise and exact than blades (scalpels). For instance, the tissue near a laser cut (incision) is not affected since there is little contact with skin or other tissue.
- The heat produced by lasers helps clean (sterilize) the edges of the body tissue that it's cutting, reducing the risk of infection.
- Since laser heat seals blood vessels, there is less bleeding, swelling, pain, or scarring. Operating time may be shorter.
- Laser surgery may mean less cutting and damage to healthy tissues (it can be less invasive). For example, with fiber optics, laser light can be directed to parts of the body through very small cuts without having to make a large incision.
- More procedures may be done in outpatient settings. Healing time is often shorter.

Cons of laser surgery

- Fewer doctors and nurses are trained to use lasers.
- Laser equipment costs a lot of money and is bulky compared with the usual surgical tools used. But advances in technology are slowly helping reduce their

cost and size.

- Strict safety precautions must be followed in the operating room when lasers are used.
- For example, the entire surgical team and the patient must wear eye protection.
- The effects of some laser treatments may not last long, so they might need to be repeated. And sometimes the laser cannot remove all of the tumor in one treatment, so treatments may need to be repeated.

