

## **SUMMARY**

Laparoscopy is used to look inside the abdomen and pelvis to see the organs. It is performed through a small incision (cut) in the umbilicus (belly button) under general anesthesia. A long, thin, lighted telescope-like instrument is placed through this cut, and instruments are also placed into the vagina to manipulate the uterus. A second small cut may be made over the pubic bone through which a thin instrument is placed in order to move the pelvic organs and look at them carefully.

It often requires more small cuts above the pubic bone (usually two or three). It also requires a series of specialized instruments for operating through these small cuts. This will include the laser or electrocoagulator. With operative laparoscopy, there are no major incisions, and the abdomen is not opened. Because of this, the patient can frequently go home the same day after surgery. This greatly reduces the cost of the surgery, and patient to return to work and her normal activities sooner. The amount of pain involved is also much less.

The energy sources used in operative endoscopy include the following types: electro surgery source, laser source, ultrasonic source, cryocoagulation source and infrared coagulation source.

Electrosurgery is the direct transfer of radio frequency energy between an active electrode and dispersive electrode in order to elevate the tissue temperature for the purpose of cutting, fulguration and desiccation. Coagulating current causes tissue desiccation and its main effect is haemostatic. The current is characterized by intermittent periods of electrical inactivity. The cutting mode is a continuous current that causes actual explosion of the cell membrane. Many endoscopic surgeons use a blended current with a mixture of cutting and coagulation current.

The electrosurgery source include monopolar and bipolar. Monopolar system refers to current flow from one active electrode through the patient, who is entirely included in the circuit, and exists via dispersive electrode to the generator. Monopolar system have proved advantages of being quick and effective in dissection. It is effective at haemostasis due to its greater penetrability so, it might be suitable to the deeply seated vessels.

In bipolar units, both the active and return electrodes are housed within the same instrument so the current flows only through the tissue between the two blades of the electrode and return to the generator without passing through the whole body. No remote dispersive electrode is required.

#### **Argon beam coagulation**

Like the standard electrocautery units, the beam coagulator uses high-frequency oscillating current to generate coagulating heat. The argon beam coagulator differs from standard electrocautery in that it uses a spray of ionized argon gas as the active electrode rather than a metallic blade, this spray allows even, efficient, and broad application of the coagulating current to the tissues.

Electrosurgical injuries occur during laparoscopic operations and are potentially serious. The overall incidence of recognized injuries is between one and two patients per 1.000 operations. Sometimes there are no immediate clinical evidence of the injury the time from injury to onset of symptoms can vary from 18 hours to 14 days.

Electrosurgical devices are powerful tools and, when safety used, have tremendous potential to affect positive patient outcomes. In order to prevent patient complications and maximize safety, it is imperative that staff is adequately trained in the use of electrosurgical equipment. That

they follow safety policies, procedures, and manufacturer's instructions on the use of all equipment; and that all electrosurgical equipment is properly maintained and in working order. Inspection of the equipment and the patient is very important. Always confirm the power setting verbally between the operator and user.

**Laser energy source:**

Laser is a device that produces a highly directional beam of a special kind of light which can be focused to a very small spot. It is a synonym of the words; light amplification by stimulated emission of radiation. This kind of radiation has an extremely high concentration of energy.

The surgical effects of the laser are due to localized heating when the tissues absorb the light. As tissue begins to heat, it blanches white as it coagulates, then shrivels as it desiccates, and finally turns to steam and vapor as it is vaporized above 100 degrees C. The heat-generating effect of the lasers is used for surgical applications. Lasers produce heat that is localized and produce desired surgical effects with associated haemostasis. There are five types of lasers primarily being used for surgical applications. They are carbon dioxide (CO<sub>2</sub>), Nd: YAG (Neodymium: YAG), argon, Ho: YAG (Holmium: YAG) and the KTP (produced by altering the infrared output of the ND: YAG laser with a KTP crystal). These lasers are used in two basic ways. One is a noncontact method whereby the laser light is absorbed by tissue and heat is generated. The other is the contact method by which the laser heats special fire tips and this heat is in turn transferred to the tissue by contact with the fibre.

**Laser Hazards:**

Laser light is absorbed by body tissue. If the beam is powerful enough, the absorbed energy can cause injury. The skin and eyes are the most sensitive tissue to laser light. The amount of light absorbed depends on the wavelength of the beam. The more light absorbed, the greater the injury, in studying lasers, we are concerned with the optical spectrum region of the EM spectrum. The wavelength range is 100 nm-10000nm. Again, the optical spectrum includes, ultraviolet, visible, and infrared light.

Laser use during laparoscopy is a useful and generally safe tool for the treatment of gynecological diseases. Lasers have allowed sophisticated surgery to be performed, in some instances, with better results than could be obtained with laparotomy or other laparoscopic techniques. By virtue of the nature of lasers, as well as the increased complexity of surgery for which lasers are often used, the risk of injury must be carefully considered. A complete understanding of laser use and safety will minimize the risk of injury and allow the surgeon to optimize its application in the laparoscopic treatment of disease.

**Ultrasonic energy source:**

Ultrasonic energy is an efficient alternative to electrosurgery and the basis for an efficient surgical instrument. The device cuts and coagulates by using lower temperatures than those used by electrosurgery or lasers. No electricity goes to or through the patient. The ultrasonically activated scalpel (UAS) is characterized by its ability to cut and coagulate tissues simultaneously with relatively low heat and limited lateral thermal injury. The USA has been used routinely in a number of general surgeries including laparoscopic surgeries, open surgeries of the lung and liver.

The ultracision harmonic scalpel and laparoscopic coagulating shears use high-frequency ultrasound energy and can be used as a substitute for electrosurgery, lasers and steel scalpels in both laparoscopic and conventional gynaecological surgery. Its unique mechanism of action allows cutting and coagulation without causing a significant rise in temperature at the tissue level. Its safety has been tested extensively in animal experiments and there is now ample evidence to suggest that it produces less thermal damage in vitro compared to electrosurgery and lasers.

The many advantages demonstrated by this instrument over other energy sources used in laparoscopic surgery should make it more popular in forthcoming years.

### **Cryo coagulation energy source:**

Cryo surgery avoids the use of the scalpel and obviates the need for suturing. Cold protein coagulation by cryosurgery leaves the body repair mechanisms to separate the devitalized tissue. In this process there tends to be a release of cytokines encouraging regeneration and an enhancement of local immune mechanisms.

Cryosurgery is being evaluated in the treatment of a number of cancers, including prostate cancer and cancer that affects the liver (both primary liver cancer and cancer that has spread to the liver from another site). Researchers also are studying its effectiveness as a treatment for some tumors of the bone, for brain and spinal tumors, and for tumors in the windpipe that may develop with non small cell lung cancer. In addition, some researchers are using cryosurgery in combination with other – cancer treatment such as radiation, surgery, and hormone therapy.

**The advantages of cryosurgery include**

1. Minimal haemorrhage.
2. Fibrous walls of vessels remain intact.
3. Can be repeated without an accumulated effect.
4. May induce immunostimulation following the release of tumour antigens.
5. Easy technique.

**Infrared energy source*****Infrared coagulation:***

A technique in which abnormal tissue is exposed to a burst of infrared light (type of radiation). This causes blood in veins in the tissue to coagulate (harden) and the abnormal tissue to shrink.

Energy is delivered to the target site in a controlled dosage through use of an internal proprietary sensor. Infrared energy passes through a solid quartz glass light guide to a disposable tip applicator for rapid and complete hemostasis with no tissue adherence. It is safe and easy to use, no smoke and no odor of particulated matter. Infrared coagulation is a readily mastered therapy that is well tolerated by patients.

***The advantages of infrared coagulation include:***

1. The depth of tissue destruction can be finely tuned by adjusting the exposure time.
2. Brief coagulation time (approximately 1 second), allowing for quick outpatient.
3. Suitable for blood staunching.
4. No effect on cardiac pacemakers.
5. Can be used during pregnancy.
6. Can be sterilized by gas (60°C) or liquid.