Laparoscopic Dissection techniques

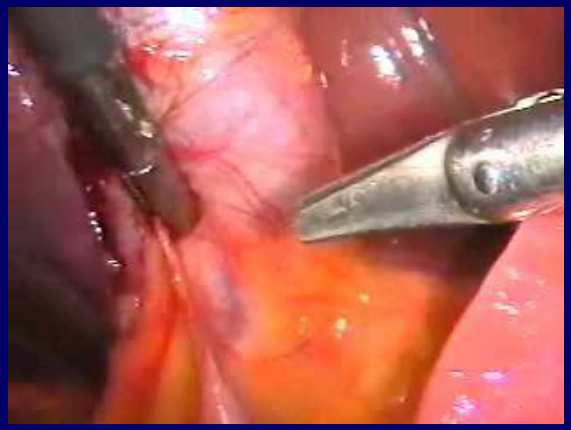
R.K.Mishra

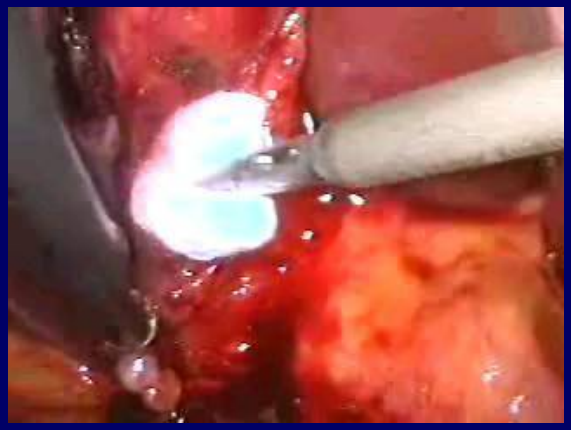
“Heat cures when everything fails”

…Hipocrates.

Mode of Laparoscopic dissection

- Electrosurgery
- Blunt dissection
  - Pledget
  - Instrument
- Sharp dissection
  - Knife
  - Scissors





Electrosurgery

- Most convenient way of dissection in MAS combined with most risky method of dissection
- Most of the complication is due to use of energised instrument (1-2%)

Properties of Electricity

- **Current = Flow of Electrons**
- **Circuit = Pathway for flow of electrons**
- **Voltage = Force that causes electron to flow**
- **Resistance = Obstacle to the flow of electron**

Electro cautery and Electro surgery

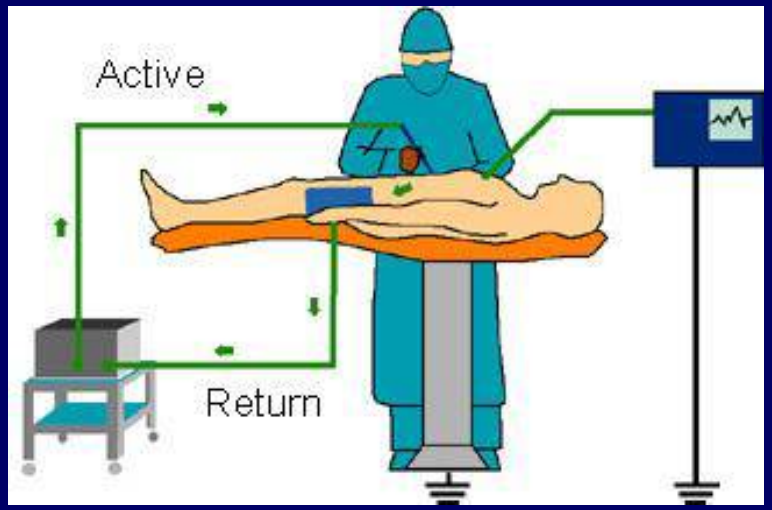
Electro cautery

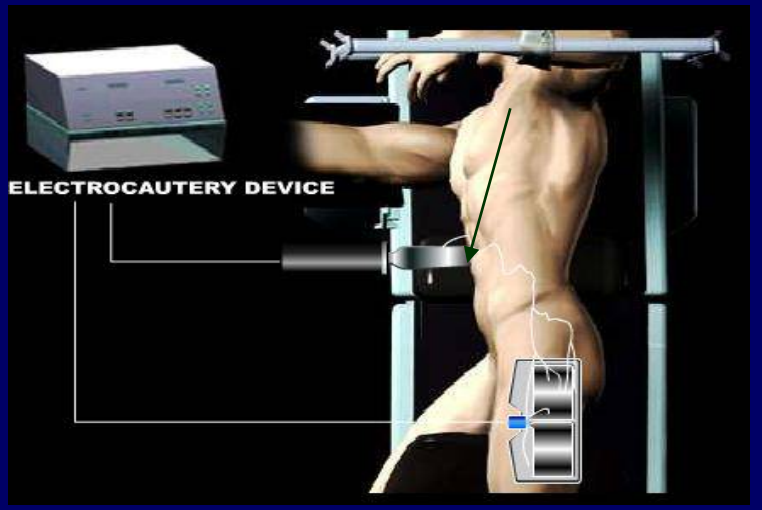
- **Direct current through a high resistance metallic conductor**
- **It is essentially application of heat and burning of tissue**

Electro surgery

- **High Frequency Alt. Current through living tissue**
- **Manipulation of electrons to produce heat within the cells to destroy the tissue**

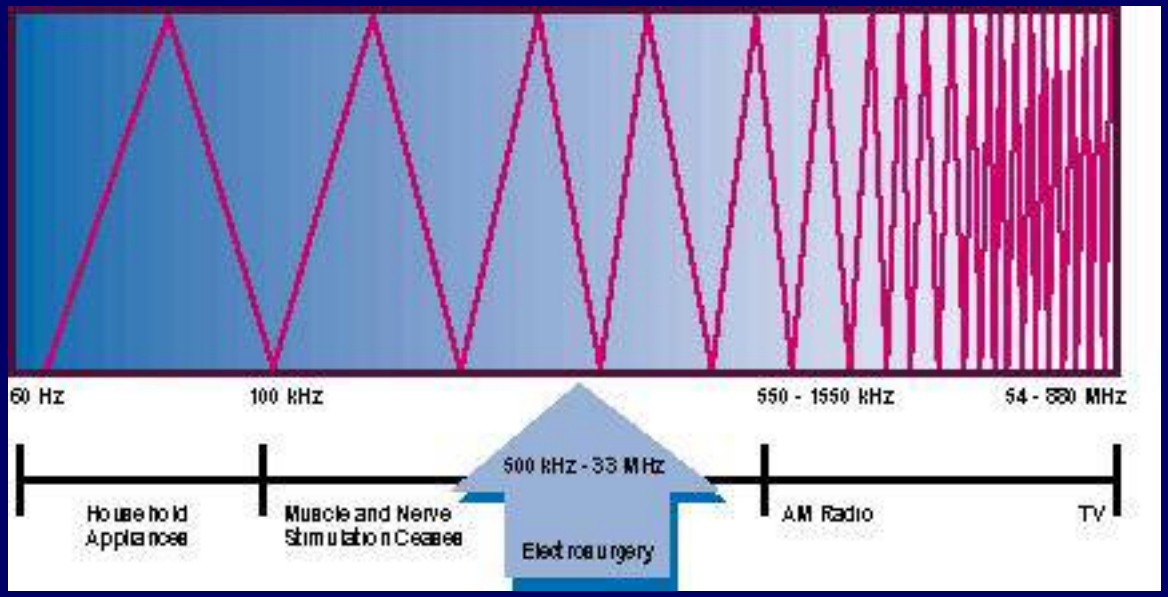
Principles of Electrosurgery





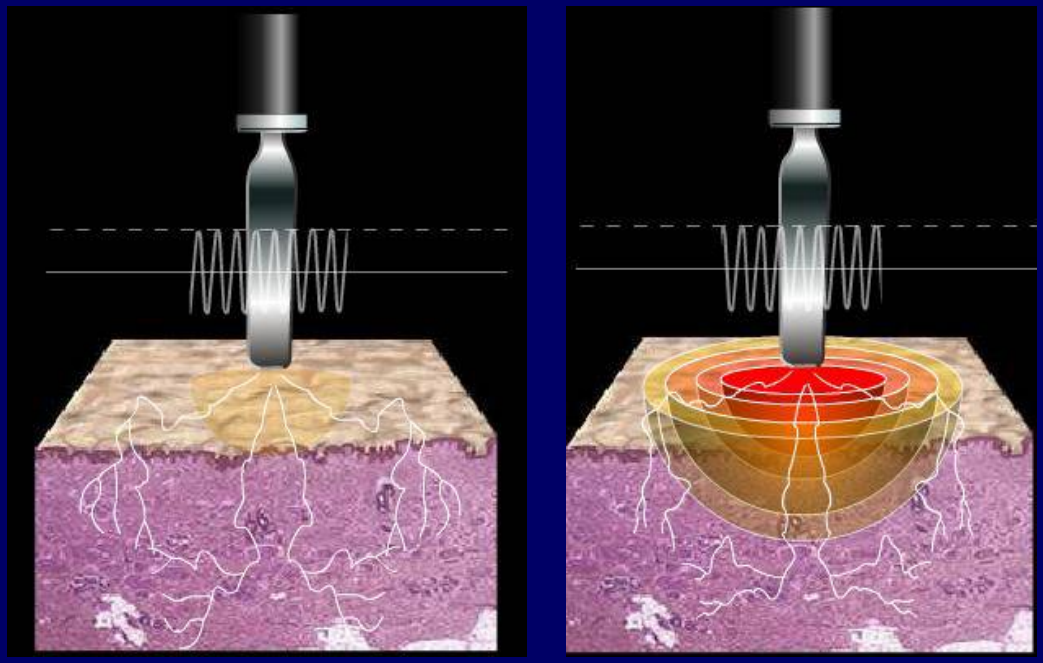
- The circuit is composed of the generator, active electrode, patient, and patient return electrode.
- The patient's tissue provides the resistance, producing heat as the electrons overcome the resistance.

Principles of Electrosurgery



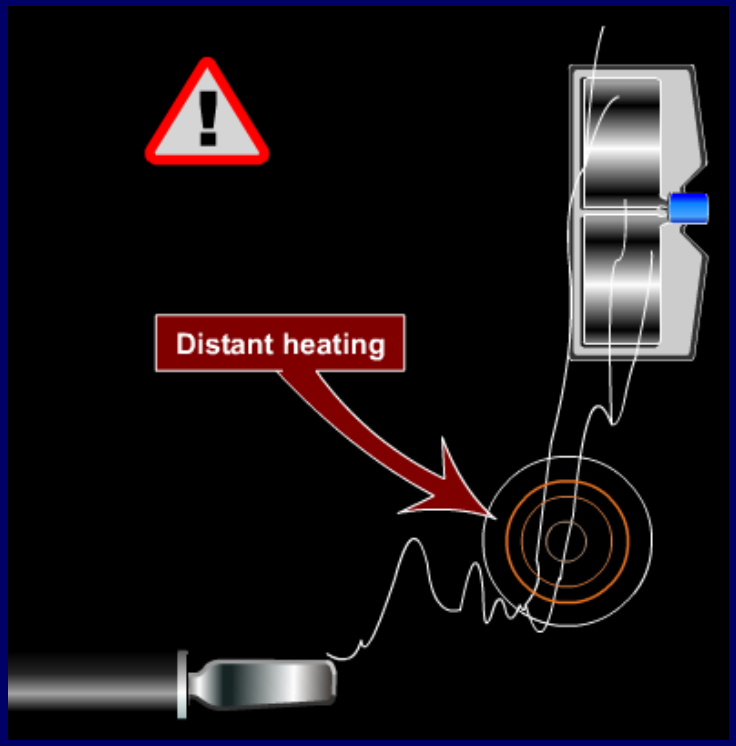
- Standard electrical current alternates at a frequency of 50 cycles per second (Hz).
- Nerve and muscle stimulation cease at 100,000 cycles/second(100 kHz),
- Electrosurgery can be performed safely at frequencies above 100 kHz.

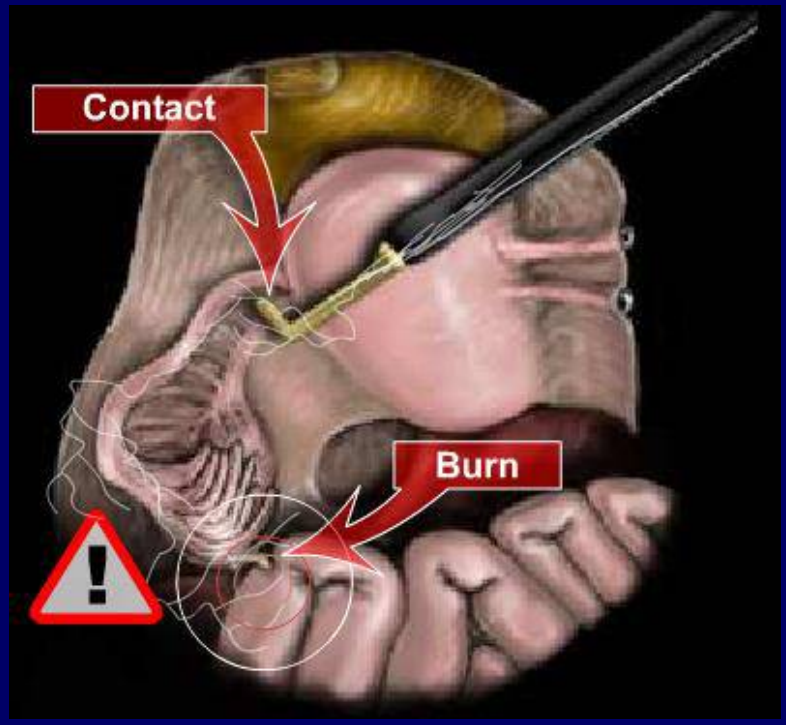
Patient Return Electrodes



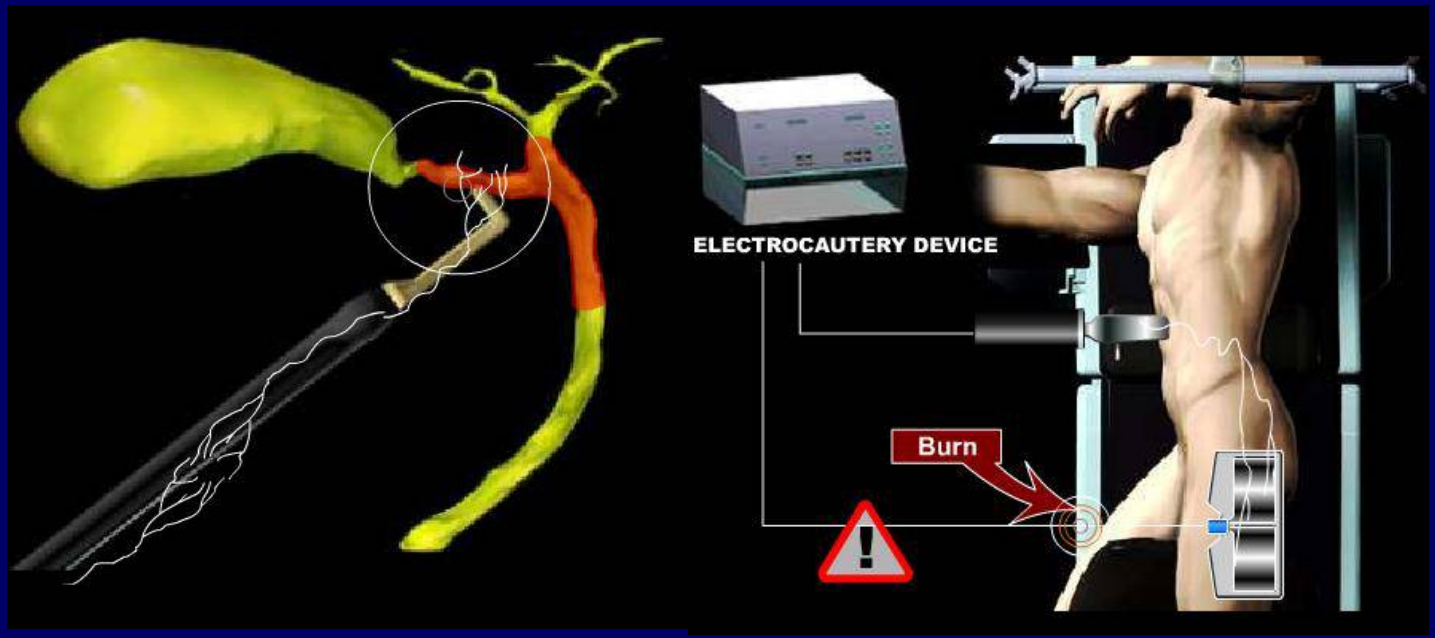
BURN = INTENSITY OF CURRENT X TIME / AREA

Remote Heating



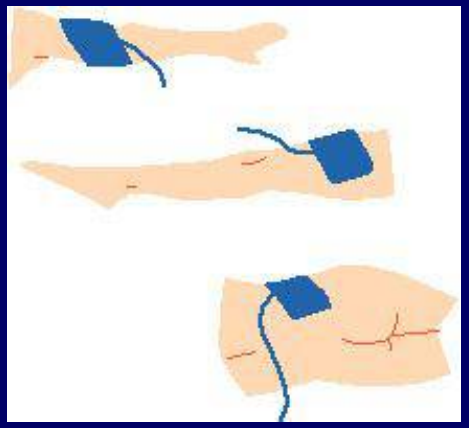


Remote Injury



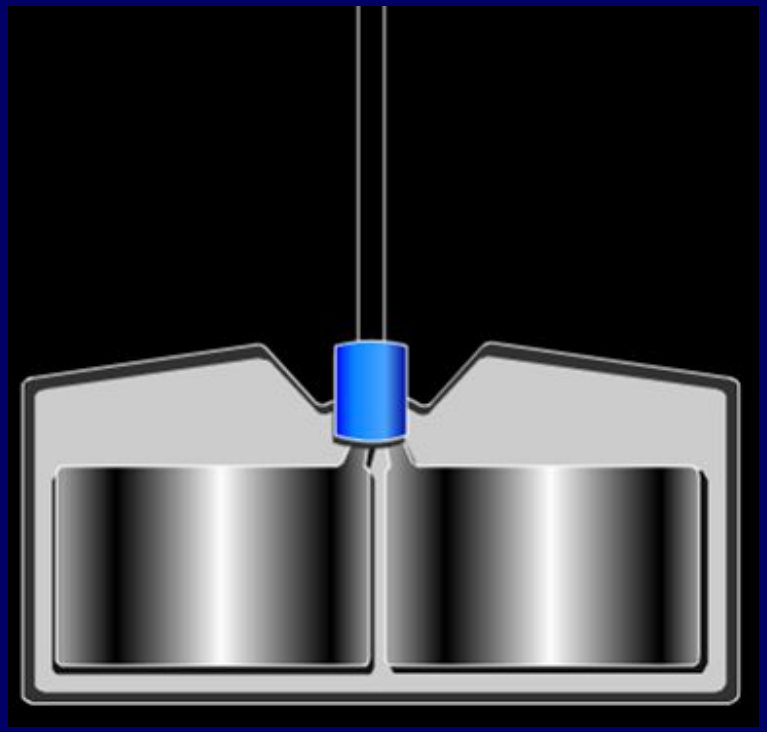
Patient Return Electrodes

- **Assess Pad Site Location**
- **Choose**:
  Well vascularized muscle mass
- **Avoid**:
  Vascular insufficiency
  Irregular body contours
  Bony prominences
- **Consider**:
  Incision site/prep area
  Patient position
  Other equipment on patient

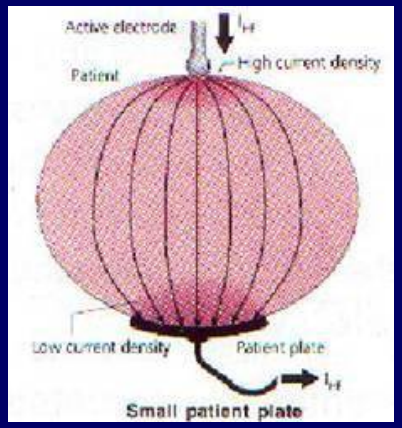


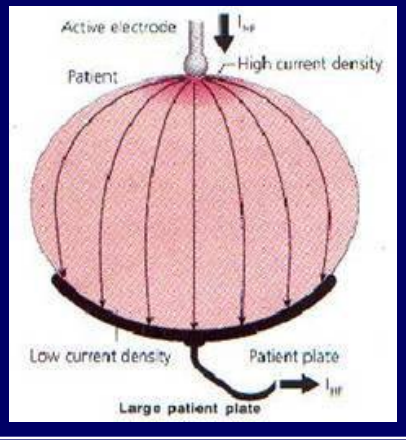
Patient Return Electrodes Injury

Size of Patient return Plate

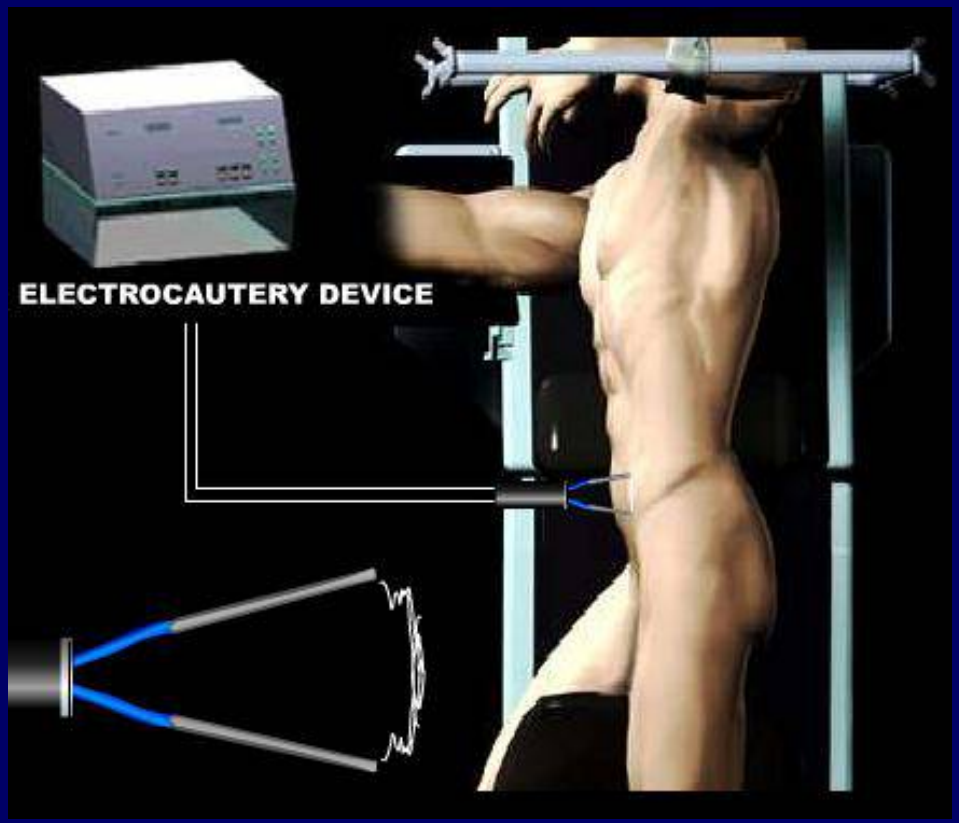


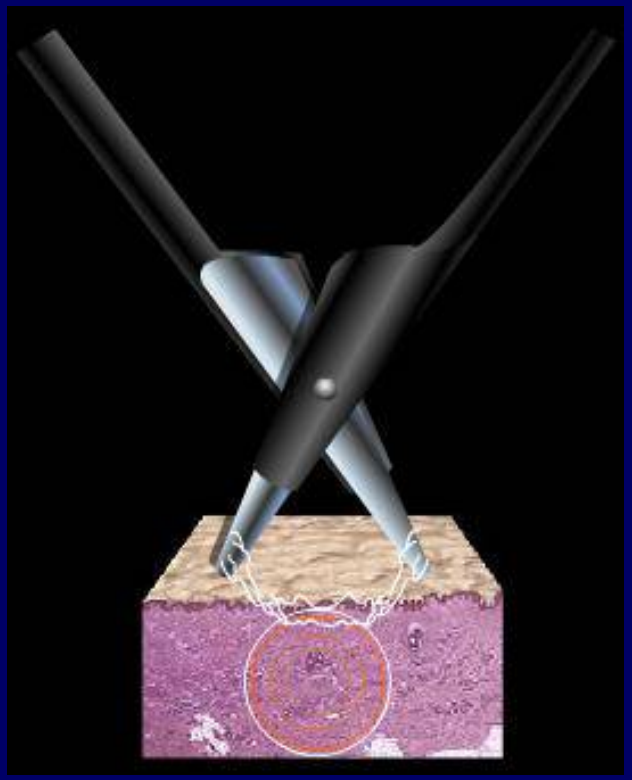
It Should be more
than 100 square cm.



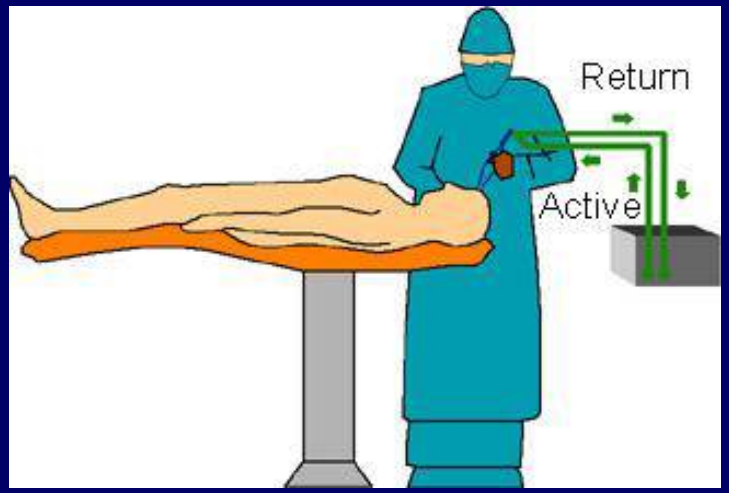


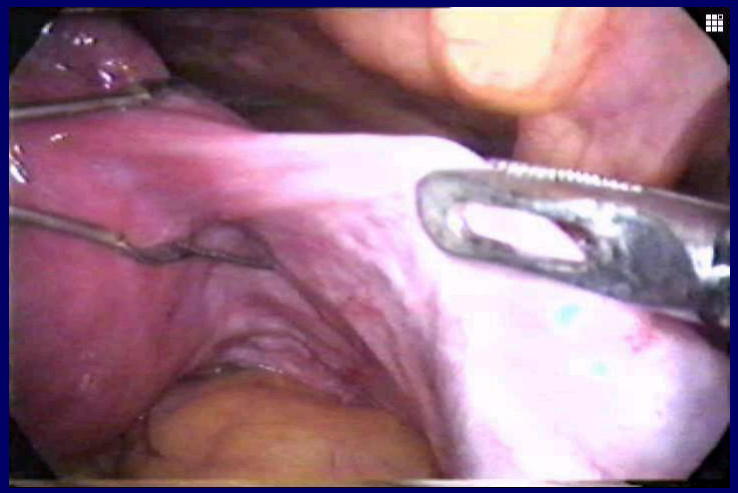
Bipolar





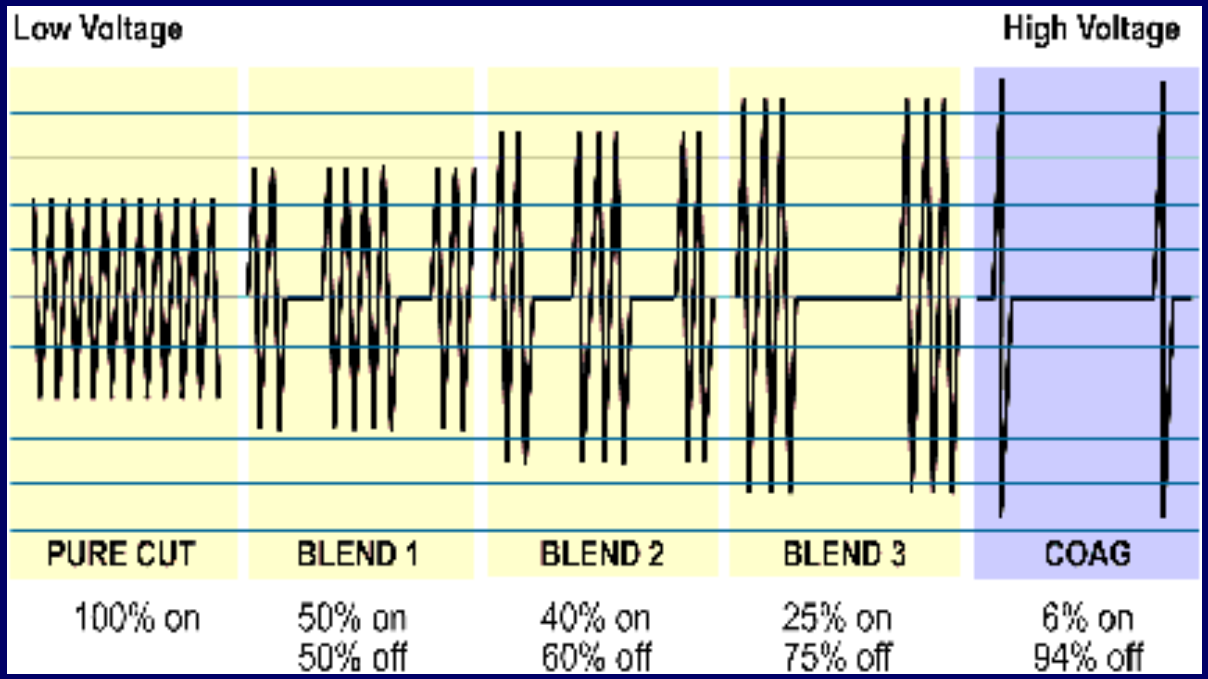
Bipolar Electrosurgery



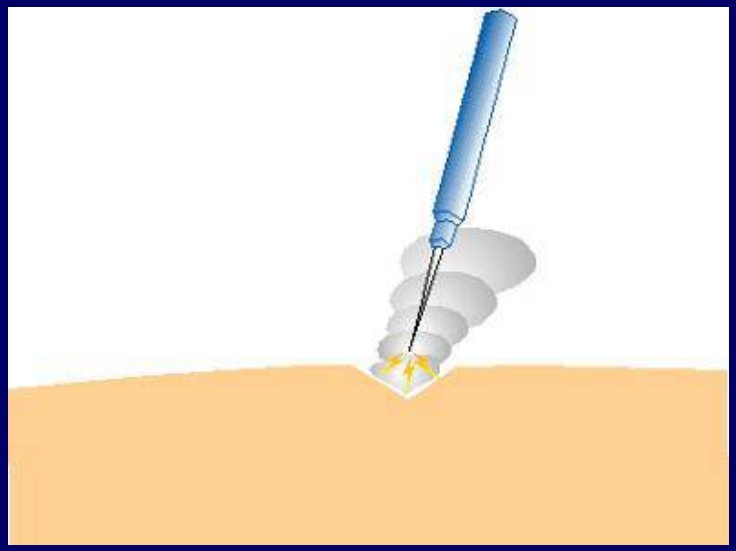


- **Active output and patient return functions are both are at the site of surgery.**
- **Current path is confined to tissue grasped between forceps.**
- **Return electrode should not be applied for bipolar procedures.**

Waveform with settings of Electrocautery



Electrosurgical Cutting

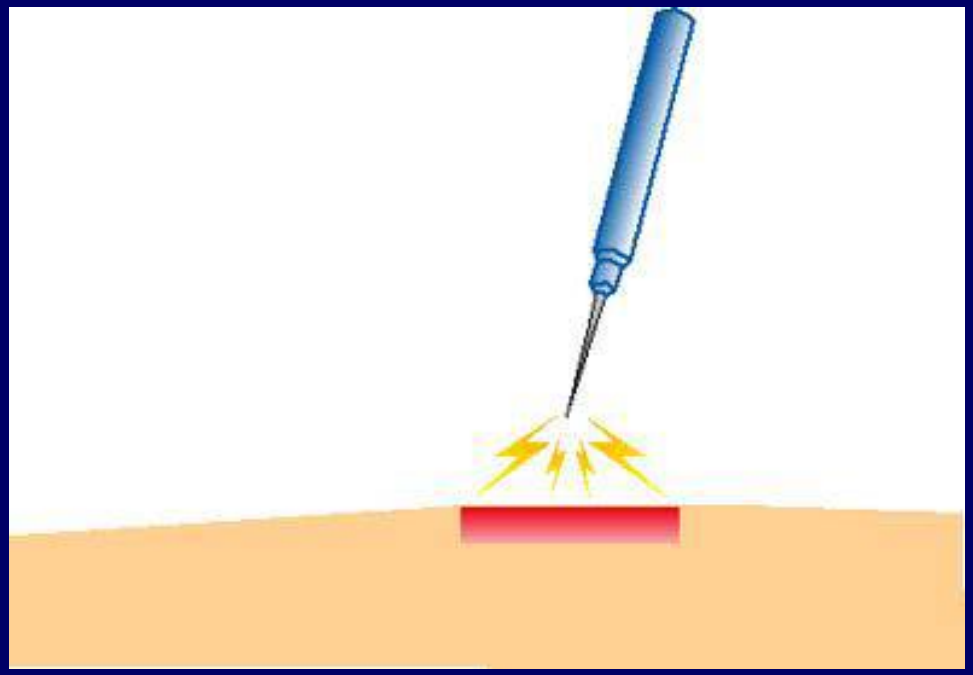


Direct touch with tissue should be avoided to achieve maximum effect

Sparking with Cutting wave form

Electrosurgical Tissue Effects

Direct touch with tissue should be avoided to achieve maximum effect



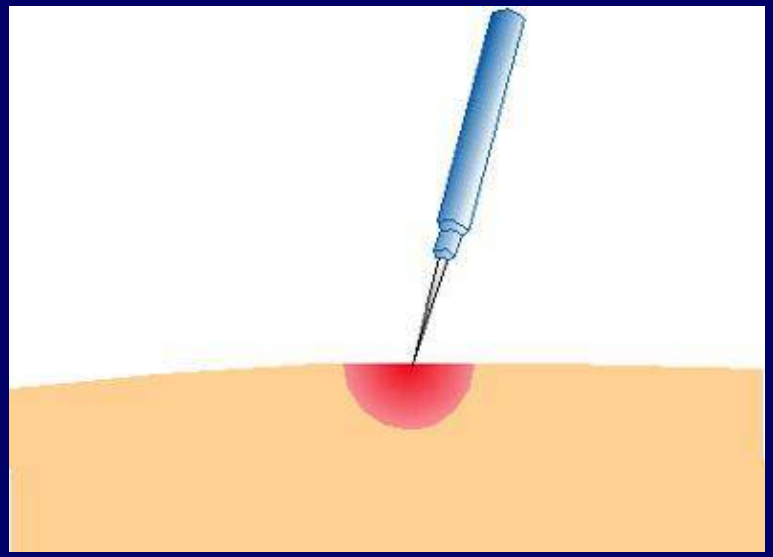
- Fulguration

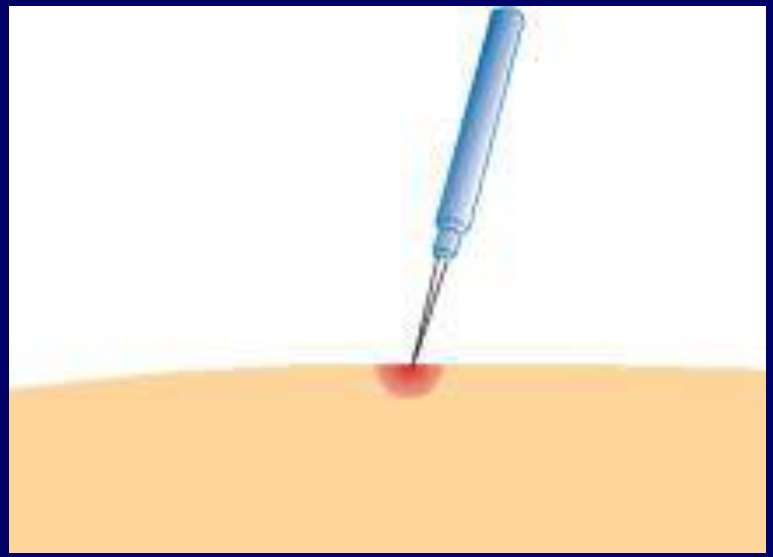
Sparking with Coagulation wave form

Electrosurgical Tissue Effects

Desiccation

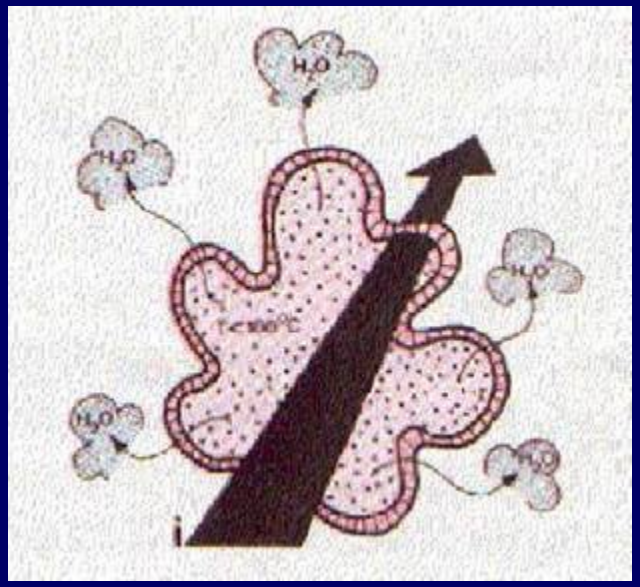
Electrosurgical desiccation occurs when the electrode is in direct contact with the tissue

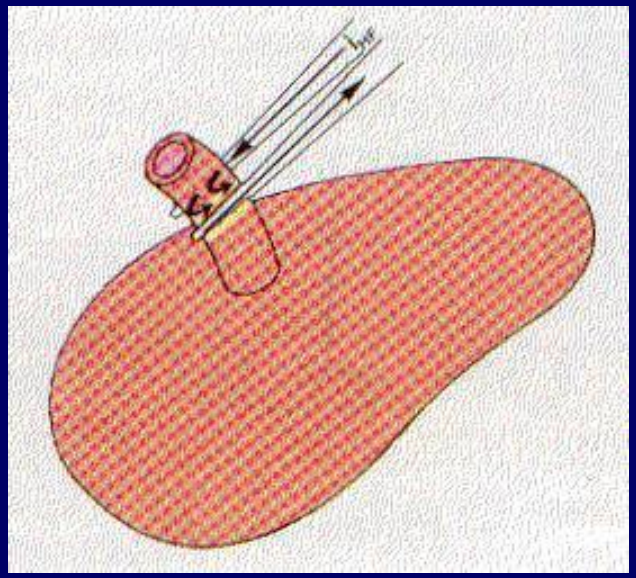




You may "cut" with the coagulation current. Likewise, you can coagulate with the cutting current by timing the electrode in direct contact with tissue.

Desiccation

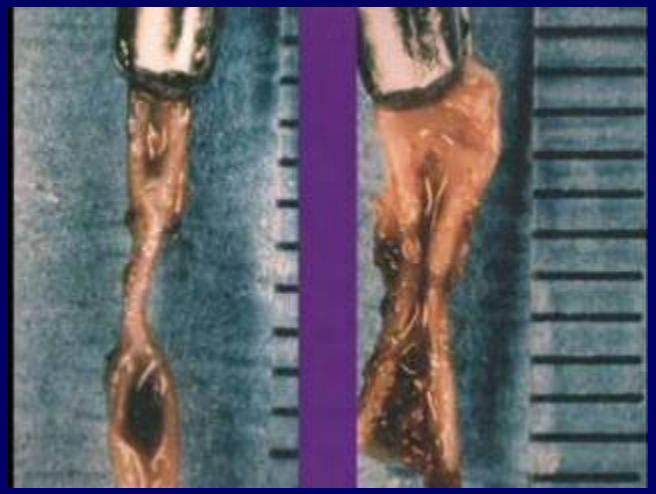




Desiccation seals

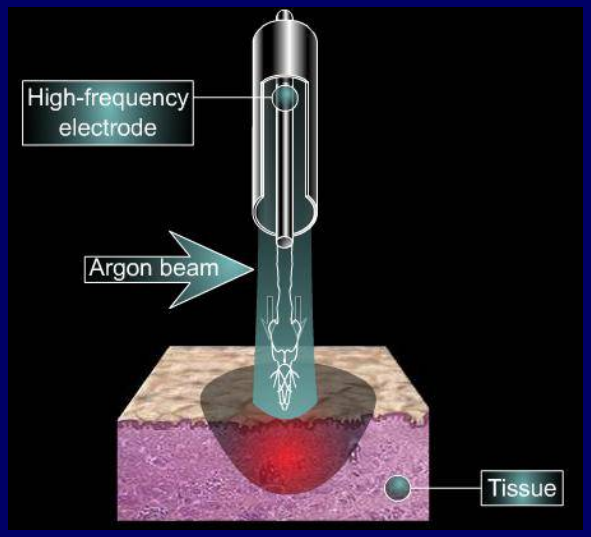
Variables Impacting Tissue Effect

- Waveform
- Power setting
- Size of the electrode
- Time
- Manipulation of the electrode
- Type of tissue
- Eschar



Argon-Enhanced Electrosurgery

- Argon-enhanced electrosurgery incorporates a stream of argon gas to improve the surgical effectiveness of the electrosurgical current.



Properties of Argon Gas

- Inert
- Non-combustible
- Easily ionized by RF energy
- Creates bridge between electrode and tissue
- Heavier than air
- Displaces nitrogen and oxygen

Benefit of Argon enhanced electrosurgery

- Less smoke, odours
- No contact in coagulation mode
- Reduced drag and tissue adhesion to electrode in contact
- Less tissue damage
- No eschar

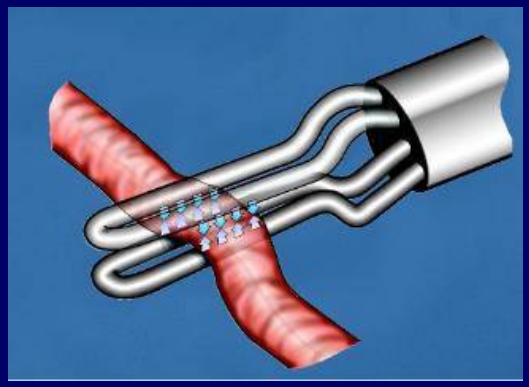
Tripolar Electrosurgery

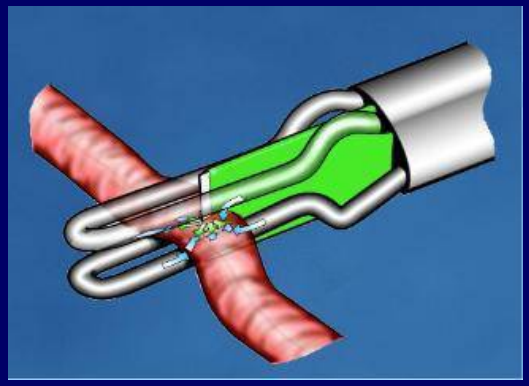
Cutting can be achieved

Tripolar Electrosurgery

4 functions in one and the same instrument namely:

- Dissecting,
- Grasping,
- Bipolar Coagulation and
- Bipolar Cut.





Harmonic Scalpel

Mechanical energy at 55,500 vibrations / sec.
Disrupts hydrogen bonds & forms a Coagulum
Temperature
- **HS - 80 - 100 ° C**
- **Electro coagulation - 200 - 300 ° C**

↓Collateral damage, ↓ tissue necrosis

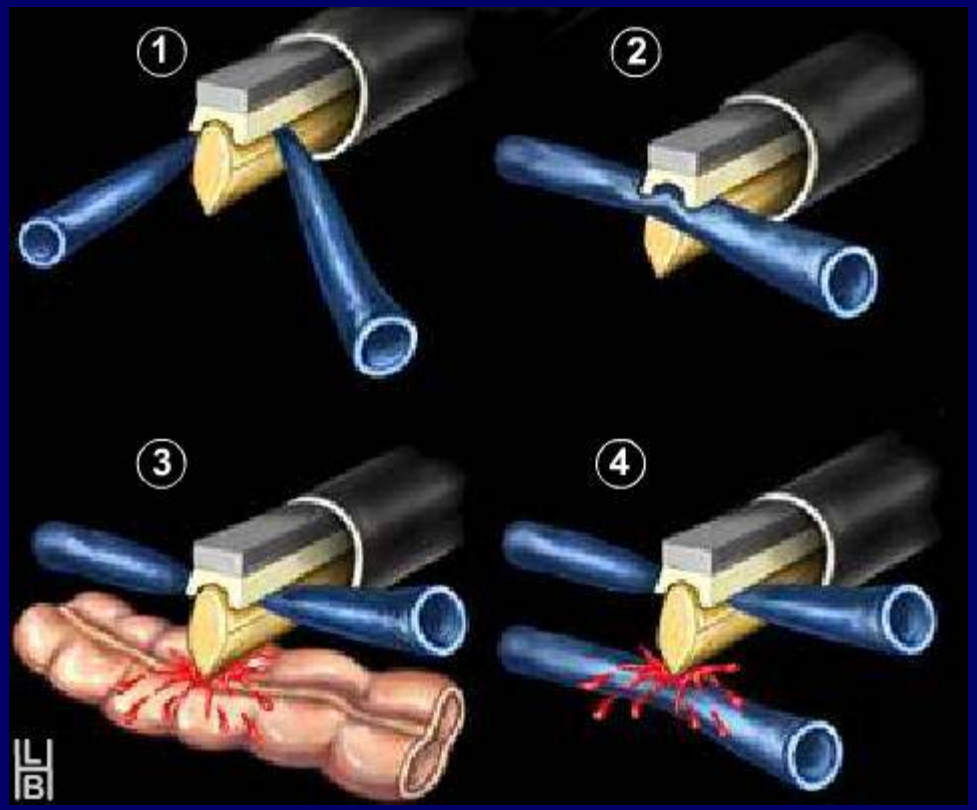
Ultrasonic Generator

Hand Piece

Harmonic Scalpel

Piezo-electric Hand Piece

Injury by Harmonic



Tissue response electrosurgical generator

- It can be used with confidence on vessels up to 7 mm
- It is Bipolar causes minimal thermal spread, confining Its effect to the target tissue
- Unique energy output results in virtually no sticking and charring
- Minimize need for multiple applications

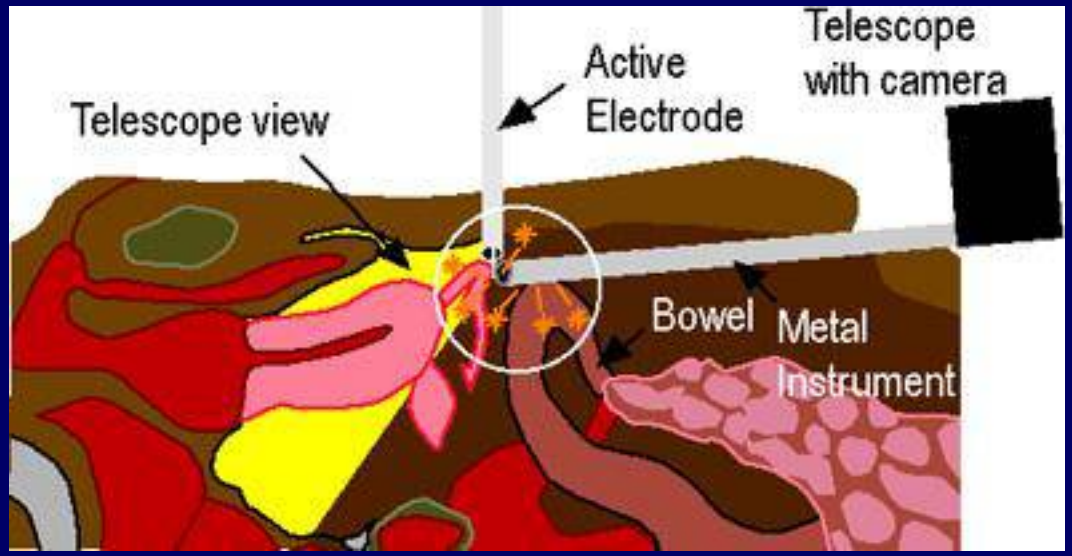
Ligasure

Ligasure

Safety Considerations in MAS

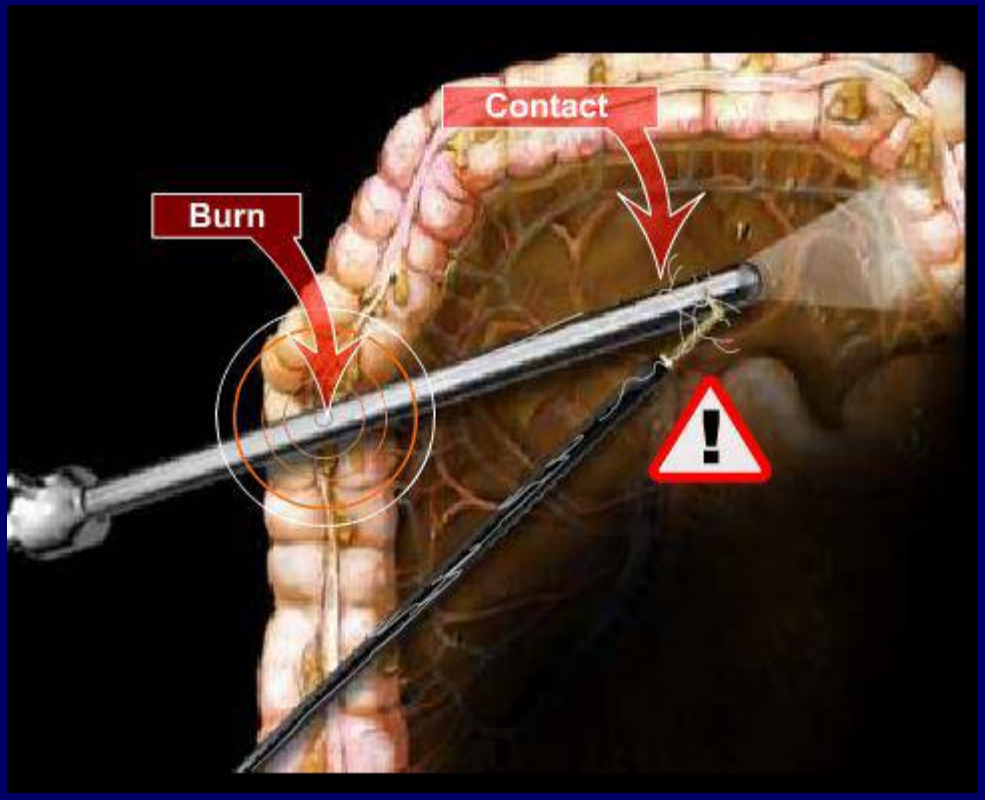
- Overshooting
- Overcooking
- Direct Coupling
- Insulation Failure
- Capacitive Coupling

Direct Coupling



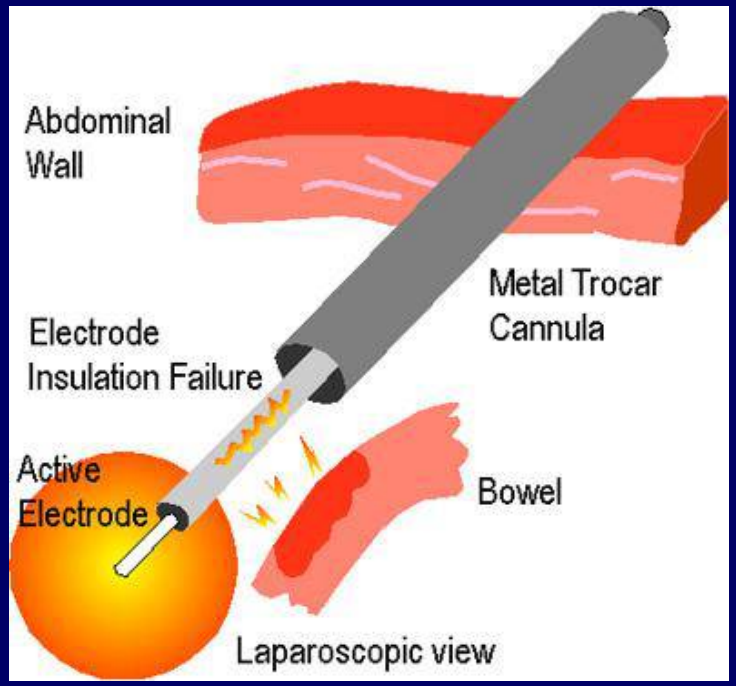
Do not activate the generator while the active electrode is touching or in close proximity to another metal object.

Direct Coupling



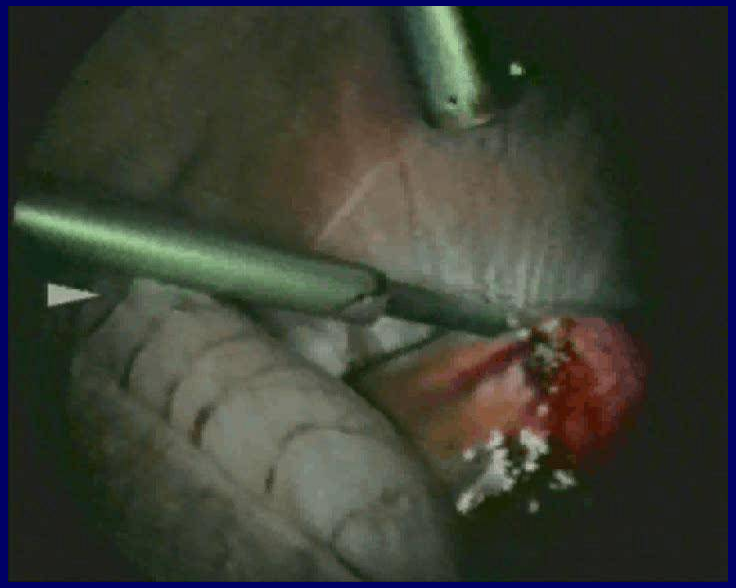
Direct Coupling

Insulation Failure

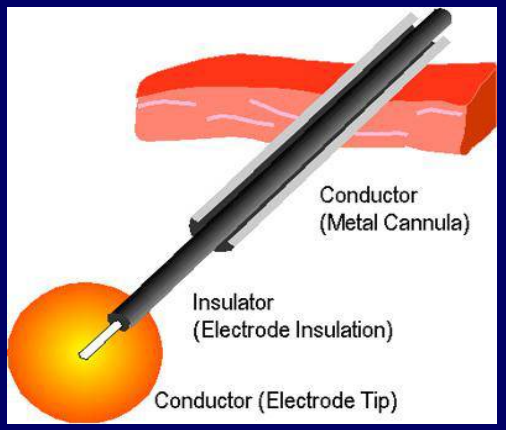


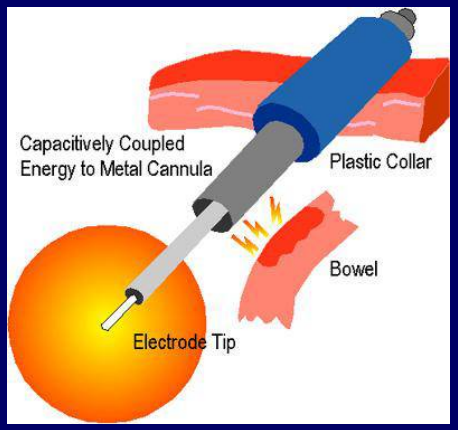
Insulation Failure

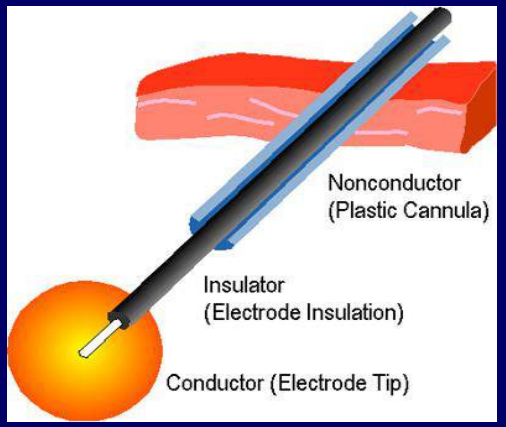
Insulation Failure



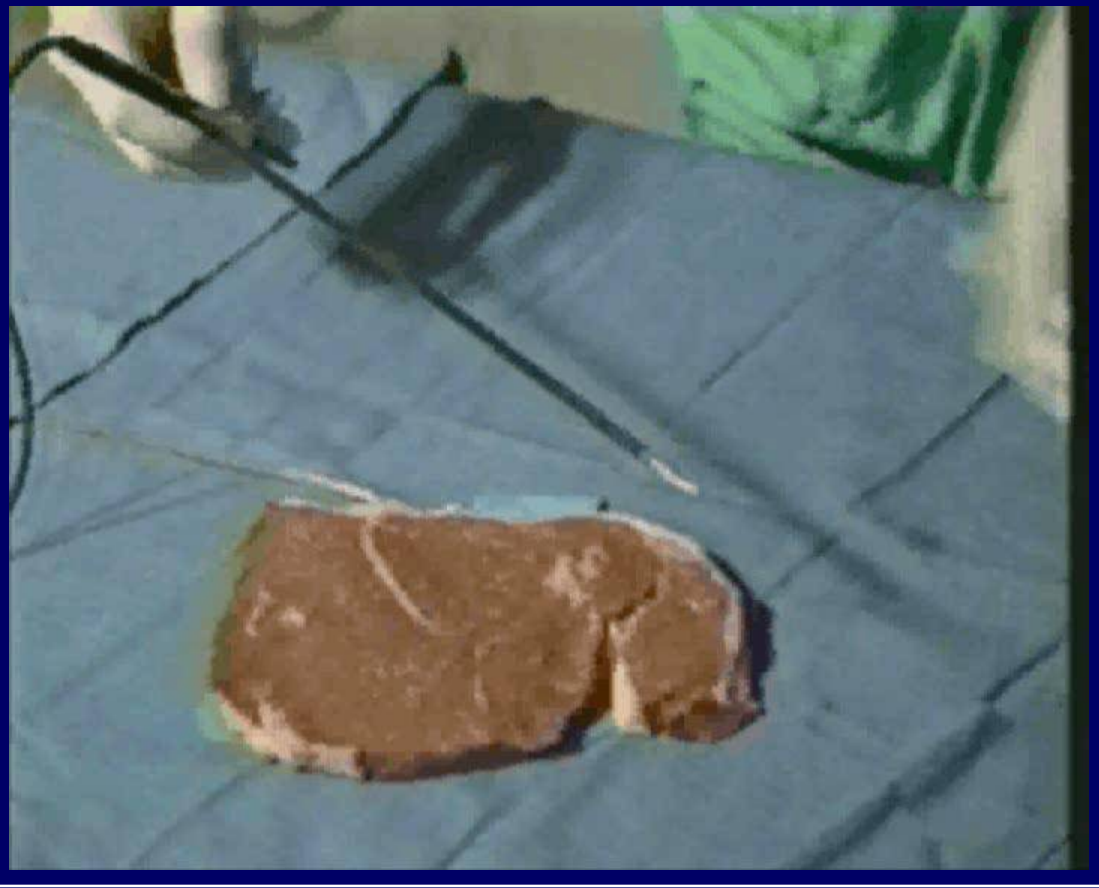
Capacitive Coupling



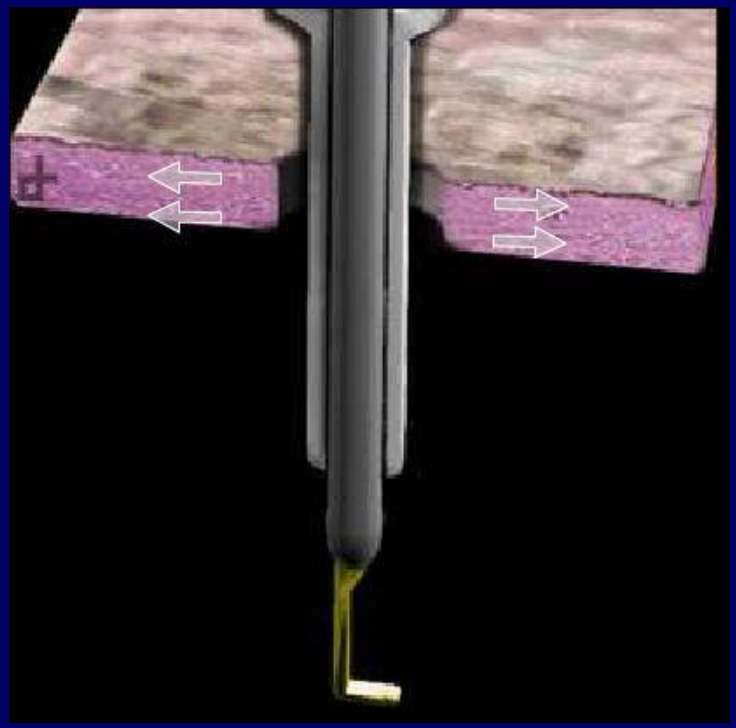


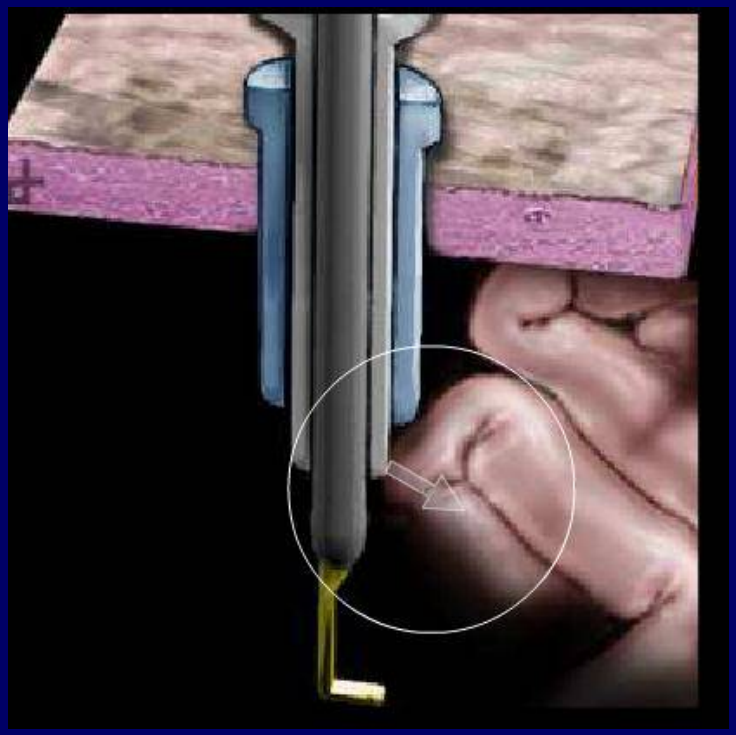


Capacitive Coupling

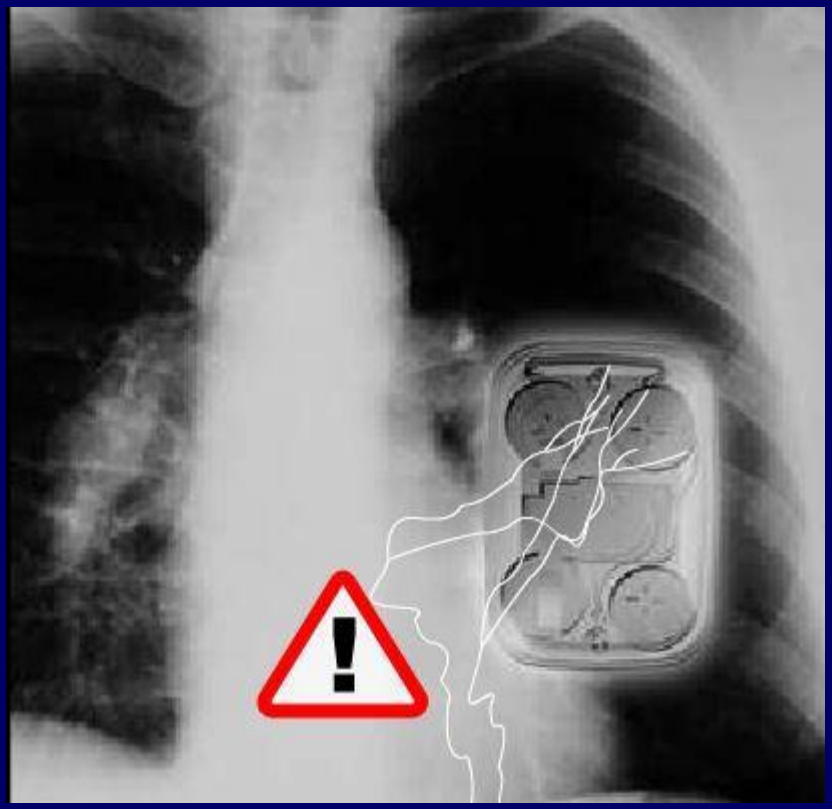


Capacitive Coupling

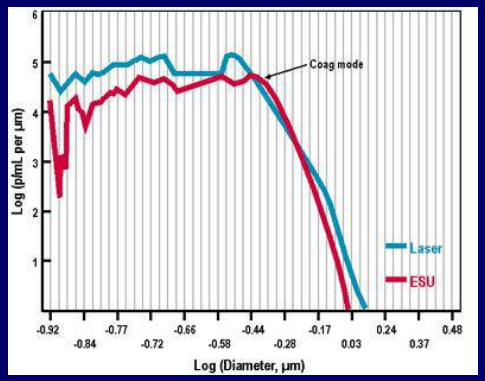




Risk to Pacemaker



Risk to surgeon



- **Burn if inadvertently he or she is a part of circuit**
- **Surgical Smoke** Viral DNA, bacteria, carcinogens, and irritants are known to be present in electrosurgical smoke.

Recommendations

- Inspect insulation carefully
- Use lowest possible power setting
- Use a low voltage waveform (cut)
- Use brief intermittent activation vs. prolonged activation
- Do not activate in open circuit
- Do not activate in close proximity or direct contact with another instrument
- Use bipolar electrosurgery when appropriate
- Select an all metal cannula system as the safest choice. Do not use hybrid cannula systems that mix metal with plastic
- Utilize available technology, such as a tissue response generator to reduce capacitive coupling or an active electrode monitoring system, to eliminate concerns about insulation failure and capacitive coupling.

"If it counts, count it"

Albert Einstein

Thank You

Prof. Cuschieri as our guest in India