Laparoscopic Dissection techniques

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“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

\[ BURN = \text{INTENSITY OF CURRENT} \times \text{TIME} / \text{AREA} \]
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 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
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
Safety Considerations in MAS

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

Abdominal Wall

Electrode Insulation Failure

Metal Trocar Cannula

Active Electrode

Bowel

Laparoscopic view
Insulation Failure
Insulation Failure
Capacitive Coupling

- Conductor (Metal Cannula)
- Insulator (Electrode Insulation)
- Conductor (Electrode Tip)
- Nonconductor (Plastic Cannula)
- Insulator (Electrode Insulation)
- Conductor (Electrode Tip)
- Capacitively Coupled Energy to Metal Cannula
- Plastic Collar
- Bowel
- Electrode Tip
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.
Thank You

“If it counts, count it”

Albert Einstein

Prof. Cuschieri as our guest in India