# Electrosurgery Techniques in Laparoscopicsurgery

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## Limitations of Electrocautery

- Use of electricity to heat a metallic object (인두)
- High impedance-high current density-heat
- No current flow through the object
- Cannot cut tissue & lateral thermal damage
- Cannot spark to tissue
- Limited to small bleeders
- Extreme heat causes tissue adherence to heated electrode
- Modern electrosurgery: High frequency surgery (above 100,000 Hz)

## Primary Functions of Electrosurgery (Electrical Circuit)

### 1. Bipolar

- Coagulate bleeders: using low power: get precise coagulation without damaging the surrounding tissues
- Cut tissue: developing technology

### 2. Monopolar

- Two modalities
  : Cutting current (vaporize water in the cell: disruption)
  : Coagulating current (slower heating and disruption)
  : Mixed current
- Coagulate bleeders
  : Desiccate (coagulative thermal tissue damage)
  : Fulgurate (not in contact: spark coagulation)
- Erbe model (Voltage-regulated system)
  : High cut & endocut
  : Soft coag, Forced coag, and Spray coag

## Complications of Electrosurgery

1. Hazards of electrosurgery
   - Explosion of combustible mixtures (anesthetic gases and bowel gas)
   - Interference with instruments and pacemakers
   - Stimulation of excitable tissues (ventricular fibrillation)
   - Accidental radio frequency burns (protein denaturation occurs in the temperature range of 55 to 60 C)
2. Mechanisms of stray of current
   - Insulation breaks in electrodes
   - Capacitive coupling through the intact insulation of the active electrode to surrounding cannulas or other instruments
   - Direct coupling (unintended contact) between the active electrode and other metal instruments or cannulas within the abdomen
3. To decrease the complication
   - Use of low voltage as possible (L mode)
   - Safety features: auto stop system
   - Use of bipolar diathermy as possible

## Guidelines in Laparoscopic Surgery

1. Avoid using over 30 W
   - Use the lowest power setting that achieves the desired surgical effect and use a low voltage waveform (pure cut or desiccate) to lessen the damage
2. Use only the coagulation mode & use electrode geometry/tension
   - Smaller contact: cutting/larger contact: coagulation
   - Tissue on tension to achieve cutting
   - Use thin wire electrode to cut
   - Use fulguration not contact with the tissue (less than 60 W)
3. Switch should be activated for short periods only
4. Do not use hybrid trocar (capacitive coupling of RF may cause burn)
5. Do not activate the generator in an open circuit condition