Electrosurgery and Argon Plasma Coagulation in Endoscopy: An Art and Science

CSGNA
2018
Objectives

1. Discuss the basics of electricity and how it’s adapted for use in the human body.

2. Describe how Electrosurgery is used therapeutically and the variables that affect it.

3. Discuss how to provide safe electrosurgical care to patients.

4. Describe the basic principles and components of Argon Plasma Coagulation (APC) and how it’s applied safely in clinical applications.
Electrocautery vs. Electrosurgery…

…there is a difference

**Electrocautery:**
- Uses direct current.
- Often used inaccurately to describe “Electrosurgery”.
- Current does not enter the patient’s body – only the heated wire tip comes in contact with tissue.

**Electrosurgery:**
- Uses High-Frequency Alternating Current (AC).
- The AC Circuit must be completed: includes the electrosurgical generator, active electrode, the patient and return electrode.
How cauterization all started...

Various tools were heated with fire -17th century.
History - Hemostasis by cauterization

These devices were comprised of a metal wire, heated by means of an electrical galvanic (direct) current - used for coagulation and separation of biological tissue and was referred to as *galvanocautery*. 
In 1978, Dr. Glover published an article on the use of thermal knives in comparison to other modalities and stated, “There is no group of instruments in the surgical armamentarium that is used as frequently and understood as poorly as Electrosurgery units.”
Basics of Electrosurgery

- Uses an alternating courant 350kHz
- Efficient ESUs convert 60Hz to a clean/pure 350kHz
  - Friction caused by the oscillating electrons results in the desired thermal energy
  - Which passes between two electrodes (poles)
As the electrons encounter impedance, the electrical energy is converted into heat, resulting in tissue effect.

- Tissue Impedance varies with water content
Electrosurgery Basics - Electrosurgery Variables & Thermal/Tissue Effect

**CURRENT (I = Amps)** - Flow rate of electrons through the electrical circuit, measured in amps (I).
- The diameter (x-sectional area) of the hose impacts the amount of water that can fit through. Larger diameter, lower resistance, lower pressure = higher flow rate (I).

**VOLTAGE (V = Volts)** - Pressure or Force applied to the current
- Amount of pressure controlled by faucet/pump

**RESISTANCE (R = Impedance)** - opposition to flow of electrons (current)
- Narrower diameter = higher resistance (R) = higher pressure (V)

**POWER (P = Watts)** - the rate at which electrical energy is transferred by a circuit in a given time
- Depends on Current (amount of water) and Voltage (the pressure of water)… A by product of V & I
  - \( P = V \times I \)

**Energy (J = Joules)** - the ability to do work (or transfer energy)
- Clinically we want to dose the least amount of energy into the patient.
Thermal Effect on tissue
- when High Frequency Current is applied

The heat created \( (Q) \) as per Joules law \( (Q = P \times t) \)

\[
Q = I^2 \times R \times t = \frac{V^2}{R} \times t
\]

\( I = \frac{V}{R} \); \( V \) is directly related to \( I \)

Time \( (t) \), \( V \) & \( R \) has a direct effect on thermal tissue effect.

The heat created \( (Q) = \) Current \( (I) \) travels in/through a conductor with a resistance \( (R) \) over a period of time \( (t) \)

<table>
<thead>
<tr>
<th>Temp</th>
<th>Tissue Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>104°F</td>
<td>Reversible cellular trauma</td>
</tr>
<tr>
<td>120°F</td>
<td>Irreversible cellular trauma</td>
</tr>
<tr>
<td>158°F</td>
<td>Coagulation (Desiccation)</td>
</tr>
<tr>
<td>212°F</td>
<td>Cutting</td>
</tr>
<tr>
<td>392°F</td>
<td>Carbonization</td>
</tr>
</tbody>
</table>

Temp above approx.
1 Hypothermia 40°C
2 Desiccation 60°C
3 Desiccation 100°C
4 Carbonization 150°C
Voltage quickly raises cell water temperature to the boiling point. Cell water turns to steam. Cell explodes, separating from adjoining cells. Cleavage plane is created = clinical “CUT”, with NO mechanical force.

Cutting requires a spark – a minimum of 200 volts needed for spark. Efficient Cutting requires a 100% duty cycle; means no stalling. Maximize current density (finer tipped instruments), es resistance/heat. The extremely rapid vaporization of the intracellular liquid leads to the rupturing of the cell membrane.

- Amplitude modulated Waveform with spikes of high voltage, followed by rest periods.
- This allows the cellular proteins to slowly denature (dehydrate).
- Coagulation occurs due to shrinking.

Hemostasis due to shrinking.

Voltage = the driving force that pushes current forward. Higher voltages increase the depth of thermal injury, OR can facilitate the desired endoscopic effect (particularly hemostasis). Inadvertent thermal complications are minimized by

- Coagulation vs Cut @ the cellular level

- Voltage quickly raises cell water temperature to the boiling point.
- Cell water turns to steam.
- Cell explodes, separating from adjoining cells.
- Cleavage plane is created = clinical “CUT”, with NO mechanical force.

Amplitude modulated Waveform with spikes of high voltage, followed by rest periods. This allows the cellular proteins to slowly denature (dehydrate). Coagulation occurs due to shrinking.

Voltage = the driving force that pushes current forward. Higher voltages increase the depth of thermal injury, OR can facilitate the desired endoscopic effect (particularly hemostasis). Inadvertent thermal complications are minimized by

Hemostasis due to shrinking.

Voltage = the driving force that pushes current forward. Higher voltages increase the depth of thermal injury, OR can facilitate the desired endoscopic effect (particularly hemostasis). Inadvertent thermal complications are minimized by

Hemostasis due to shrinking.

Voltage = the driving force that pushes current forward. Higher voltages increase the depth of thermal injury, OR can facilitate the desired endoscopic effect (particularly hemostasis). Inadvertent thermal complications are minimized by

Hemostasis due to shrinking.
Electrosurgical Unit (ESU) – microprocessor controlled

Constant Voltage (Power Adjusts) vs. Constant Power (Voltage Varies)
What feature may be most important in Endoscopic electrosurgery...Constant Power or Variable Power Dosing (constant V)?

*During polypectomy, tissue resistance is initially low and current flows easily into the tissue. However, progressive tissue desiccation increases the resistance (impedance) to current flow. Conventional Constant Power ESUs maintain constant power output, but as tissue changes occur, there can be significant fluctuations in voltage.*

Some modern ESUs are capable of monitoring changes in voltage, during the delivery of electrosurgical energy. Some ESUs are capable of keeping voltage constant while power more efficiently fluctuates to the lowest effective output, based on impedance within the circuit. This results in the most reproducible and consistent target tissue effects during electrosurgery.
Electrosurgical Unit (ESU)

‘92 Coag Constant Power (Voltage Varies) vs. ‘04 Coag Constant Voltage (Power Adjusts)
Technology

Cut & Coag modes with Voltage Regulation (Power Dosing)

• The voltage remains constant and controlled, so that the tissue effect is consistent, regardless of changes in tissue resistance (muscle, fatty tissue).

• With voltage regulation, the power automatically adjusts based on the impedance and conductivity of the tissue, as well as other influencing circuit variables in order to achieve the desired reproducible tissue effect.

Max watts = 25

$P_{\text{max}} = 23\text{W}$

$P_{\text{avg}} = 3\text{W}$
**Electrosurgical Unit (ESU) – Old vs. New Technology**


The VIO System is the first modular-built electrosurgery unit (introduced in 2002). There are new modes and upgrades for cutting, coagulating and devitalizing tissue.

ERBEJet is now available in Canada with HybridKnife & HybridAPC

ERBE VIO dynamic initial Cut based on desiccation/impedance level (ability for current (3 amps) to create a spark), using either 700Vp or 500Vp. With VIO you can adjust **Cut length to 4 different options** (Cut duration = 1-4) & **Coag length to 10 different options** (Cut Interval = 1-10) Vs. ICC has one high ~ 650Vp:
- 650Vp might be too high in delicate ERCP or Advanced Submucosal microsurgery
- 650Vp might be too low in fibrous/sessile polyps

VIO platform has 4 different Cut length options (Cut duration = 1-4) & Coag length to 10 different options (Cut Interval = 1-10)
Spark Regulation – « Peak Power System » (PPS)

- patented spark generation (increases Peak Power) and recognition
- calculates in real-time when micro-electric arcs become present and determines the intensity of the arcs. With the introduction of the VIO® 300 D (2004), the “spark on” can be limited to a few milliseconds, depending upon the duration chosen.
- Rapid spark production with limited ‘on’ time can decrease thermal spread, which is extremely important while working in delicate areas such as the right colon or the ampulla of Vater.
Technology

A continuous 100% Hf duty cycle = True Pure Cut

A pure-cut current, allows effective electrosurgical cutting at the cellular level during flexible endoscopy (no sticking).

Lower duty cycles might require higher voltages, which could increase the risk of perforation.
Electrosurgical Unit (ESU)
- Choose a Power Setting or Tissue Effect in Cut/Coag?

Therapeutic Relevance – Settings/Waveform Choice
- Depends partially on your clinical goals… Where (wall thickness).

- There is NOT a specific Power setting that can effectively address all of these polyps
  - Need to select a specific tissue effect (thermal spread)
- What are your treatment goals?
TECHNICAL BACKGROUND
- Current Density & Thermal/Tissue Effect

What is the impact of Current Density

Contact Surface Area ( Resistance / Heat / Current Density)
= Power needed to create the same amount of heat for a desired tissue effect

In Micro-Surgery, Current Density is your friend!

Contact Surface Area ( Resistance / Heat / Current Density)
= Power (Energy) dosed through the tissue (to the return electrode)
= Safety for the patient

The increase in tissue temperature is directly related to the amount of electrical energy absorbed by the tissue (QE). This amount (QE) can be expressed by the equation:

- \[ Q = I^2 \times R \times t = \text{heat created} \]
- \[ QE = (\text{Current}^2 \times \text{Resistance}) / \text{tissue contact Surface Area} \]
The increase in tissue temperature is directly related to the amount of electrical energy absorbed by the tissue.

Current densities during polypectomy at various levels of a polyp stalk. The density of the monopolar current administered through the snare (and, hence, the rise in temperature) varies according to cross-sectional areas.

- Narrower cross-sectional area = Quicker cutting response
  - Means less energy is dosed through the muscularis
  - After adequate hemostasis is achieved consider making the snare as tight as possible; to decrease the cross-sectional area (increasing current density)
Clinical Principles

- Variables Affecting Electrosurgical Effect
Clinically Significant Post-endoscopic Mucosal Resection Bleeding (CSPEB)

What clinical situation is preferred?

a) Intra-procedure bleeding?
b) Post procedure bleeding?

The elegance of an effective electrosurgical cut is achieved by dosing the least possible amount of power/energy into the patient, as quickly (shortest time) as possible with the minimal mechanical force (less chance of distorting cutting plane).
William S Halsted of John Hopkins University put forward a set of principles in the 1890’s for achieving the best results in surgery. Now, more than 100 years later, they still form the basis of modern surgical craftsmanship. As the “Tenets of Halsted”:

- Gentle handling of tissues;
- Strict aseptic technique;
- Sharp anatomic dissection of tissues;
- Careful hemostasis, using fine, non-irritating suture material in minimal amounts;
- The obliteration of dead space in the wound; and
- Avoidance of tension.
Surgical Environment
- Open & Laparoscopic Procedures
Surgical Environment

- Endoscopic Procedures
- Thickness of cutting plane (several mm), within loose tube

Fig. 33.5  En bloc endoscopic mucosal resection (EMR). A, Lesion involving the mucosal layer. B, Marking of incision around the lesion with a needle-knife from the distal to proximal edge. C, Submucosal injection of sodium hyaluronate below the lesion and around the lesion from the distal to proximal edge. D, Incision of marked area around the lesion with a needle-knife from the distal to proximal edge of lesion. E, Snare excision of entire lesion. F, Retrieval of lesion with Roth net.
Spraying with 1% indigo carmine and lesion marking with Flex-Knife.

Infiltation of submucosa and removal of the anterior part of the lesion with Hook-Knife.

Anterior and lateral excision.

Removal of a large flap of lesion.

Complete polyp removal.

Follow up at 6 weeks.
Endoscopic challenge…

To effectively/elegantly cut something you're not holding in place.

How do you effectively apply the Tenets of Halsted Endoscopically?...

- Gentle Counter traction in a hollow lumen.

Traction is achieved using:
- injection (elevation)
- gravity
- water (floating mucosa)

- while maintaining the plane of your cut/not distorting the anatomical structure
- By not using mechanical force to cut.
  - Let the electrosurgical CUT wave form do the cutting
Clinical Principles - Polypectomy Techniques
- ASGE Guidelines

A polyp needs to be removed and sent to the lab for evaluation.

- Did you get it all?
- Don’t just ablate the surface!
  - Worry about buried glands/cells that can mutate below the surface
- Is there a margin?

The type of current used has the potential to affect the quality of histological interpretation. GI pathologists blinded to the polypectomy technique evaluated 148 polypectomy specimens (78 blended current, 70 ENDO CUT current) and concluded that polyps resected with ENDO CUT had better overall quality, primarily because of improved ability to evaluate the margin of the specimen (75.7% vs 60.3%, P < .046).


Residual lesion rates can be as high as 46%, primarily due to piecemeal resection...

Clinical Principles - Colorectal Cancer
- What we know

Diagnosed when neoplastic cells cross into the muscularis mucosa.
Normal Epithelium can take ten years to mutate into a carcinoma; but, has also been found to mutate in as little as 2-3 yrs.
  • Interval cancer rate post polypectomy of 20-40% in 3 yrs.

[Diagram of colorectal cancer stages with depth measurements:]
- Mucosa: 3-4 mm
- Submucosa: 250 m
- T0: 500-1000 m
- T1a: 2000-2500 m

[Legend: High Grade Dysplasia, Intramucosal Carcinoma, Curable with endoscopic therapy]
Clinical - Tips for basic Polypectomy or EMR

- Adjust settings according to particular conditions (e.g. low power settings for small bowel and cecum).

- If polypectomy snare sticks in a polyp, increase cutting intensity & current density.

- Do not touch metal parts, such as clips, with snare when applying current.

- Do not touch the scope with metal parts of endotherapy instruments.

- Watch out that snare tip does not accidentally touch the bowel wall opposite to mucosectomy.

- Avoid deep coagulation of muscle layer (risk of late perforation).

- Before applying current, make sure that the muscularis propria is not entrapped in the snare loop.
Argon Plasma Coagulation (APC)

APC is a non-contact monopolar application for hemostasis and thermal destruction
What is Argon Plasma?

Argon
- Nobel gas
- Present in air (1%)
- Non-flammable
- Non-toxic
- Ionizes easily

Plasma
- Ionized, heavier than air, electrically conductive gas
- Ionization by way of high voltages
Argon Plasma Coagulation (monopolar) offers particular advantages for non-contact, endoscopic applications as it can be applied enface or tangentially, enabling less accessible areas to be easily treated.

The voltage required for ionization of gas is 4000 V.
Argon Plasma Coagulation – APC Advantages

Non-contact application - *No sticking to delicate tissue*.

Varied probe Diameter & Length – for Bronchoscopic, colonic & enteroscopic applications.

Thinner, more flexible eschar.

Widespread areas can be treated.

- Applications can be –
  - Axial
  - Radial
  - Retroflexed
  - Circumferential
Argon Plasma Coagulation – APC Use

Purge probe at least twice before placing in the scope channel.

Advance the tip of the probe until one “E” is visible on the monitor - depth perception; at this point, use scope articulation and movement for APC treatment.

- Leave the probe stationary within scope – move the SCOPE.

APC probe tip must always remain in the clinicians field of vision.

Activate only when the tissue being treated is within the field of view.

Proximity to tissue: 1 - 5 mm.
### Factors Influencing the Tissue Effect

<table>
<thead>
<tr>
<th>Factor</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Duration of Activation</td>
<td>Very Important</td>
</tr>
<tr>
<td>2. Power Setting</td>
<td></td>
</tr>
<tr>
<td>3. Probe Distance</td>
<td>Less Important</td>
</tr>
</tbody>
</table>

### Thermal Tissue Sensitivity

1. Stomach
2. Rectum
3. Esophagus
4. Colon
5. Duodenum/Small Intestine
6. Right Colon/Cecum

Less Sensitive: Stomach, Rectum, Esophagus

More Sensitive: Duodenum/Small Intestine, Right Colon/Cecum
• When the application time over the same area is increased, the depth of the tissue being affected will increase.

• The physician should treat with an activation time to correspond with the desired thermal effect and anatomical location.
Argon Plasma Coagulation – Power or Effect Setting

In general:

- **Lower output settings** – are used for treatment of very small superficial areas, or in applications with very thin-walled tissue structures.

- **Higher output settings** – are used for treatment when devitalization is required, or for the reduction of tissue.
Probe distance can influence thermal tissue effect based on the mode chosen:

- **FORCED APC**
- **PULSED APC**
  - Effect 1
  - Effect 2
- **PRECISE APC**
**Argon Plasma Coagulation – APC Modes**

**Forced** - continuous application of energy

**Precise** - automatic adjustment control which adjusts the argon plasma regardless of the impedance. Superficial coagulation effect using a low-energy output per unit of time. Time-out feature.

**Pulsed Effect 1** – 1 pulse per second

**Pulsed Effect 2** - 16 pulses per second
Argon Plasma Coagulation – An important factor affecting thermal effect
- Mode Chosen… Modulation/Algorithm
Areas of Application:

- Superficial hemostasis.
- Thermosensitive areas and/or within thin-walled structures.
- Devitalization and reduction of lesions or tissue remnants that are superficial in nature.
- In situations where maintaining the probe distance from the tissue is difficult, e.g., enteroscopic intervention.

Angiodysplasia
PRECISE APC Effect 5

Fig. 28: GAVE syndrome before (a) and after (b) treatment.
**FiAPC Probes** (filter integrated APC probes) – A filter is built into every disposable APC probe. This filter prevents the backflow of contaminants into the system from the patient and conversely prevents the flow of contaminants into the patient. This feature is patented.

Old APC probes have a cable adapter that needs to be reprocessed (brushed through (manually cleaned/disinfected) & Sterilized between uses. Not simply a wipe down between cases.
Gastroenterology Uses reported in Clinical Literature

- Radiation Induced Proctopathy
- Watermelon Stomach (GAVE)
- Treatment (Ablation) of Residual Adenomatous Tissue
- Stent Shortening (e.g. migrated stents)
- Strictures
- Exophytic Benign or Malignant Tumors
- Oozing from Vascular Lesions (e.g. Angiodysplasias, Arteriovenous Malformations (AVMs), Telangiectasias)
Argon Plasma Coagulation
– Clinical Applications – Residual Tumour Ablation

Adenoma of Cecum
Adenoma Injected
Adenoma Snared (piecemeal)
APC Ablation of Residual Islands & Margin

Long term clinical study results show 50% reduction in re-growth of adenomatous polyps after tissue treatment with APC.


STSC – Snare Tip Soft Coag

- may miss several residual areas doing STSC on a polyp (not validated for ablation)
- Risk of inflammatory response due to energy dosed with circumferential contact coagulation.

“There was a trend toward deeper necrosis with STSC”

**Sa1580**
Argon Plasma Coagulation Compared With snare Tip Soft Coagulation in an In-Vivo Porcine Model of Endoscopic Mucosal Resection
Nicholas G. Burgess*1,2, Farzan F. Bahin1,2, Maria Pellise1, Rebecca Sonson1, Rafael Perez-Dye3, Shahrir Kabir4, Vishnu Subramanian5, Hema Mahajan3, Duncan J. Mcleod3, Michael J. Bourke1,2
1Department of Gastroenterology and Hepatology, Westmead Hospital, Sydney, NSW, Australia; 2Faculty of Medicine, University of Sydney, Sydney, NSW, Australia; 3Department of Animal Care, Westmead Hospital, Sydney, NSW, Australia; 4Department of General Surgery, Westmead Hospital, Sydney, NSW, Australia; 5Department of Tissue Pathology, Westmead Hospital Institute of Clinical Pathology and Medical Research, Sydney, NSW, Australia

Introduction: Endoscopic Mucosal Resection (EMR) is now a well-established and effective method for the management of sessile polyps and laterally spreading tumours (LSTs). There are few studies of adjunctive thermal therapies such as argon plasma coagulation (APC) and snare tip soft coagulation (STSC) for the ablation of marginal defect tissue. Small studies examining APC have shown that recurrence may be variably reduced, but criticisms of APC include that it is poorly controllable, that the ablation depth varies, and that it may leave patchy areas of residual mucosa explaining the recurrence that occurs despite treatment. STSC has not been studied in clinical settings to reduce recurrence, but it may have advantages as it is endoscopically easier to control and may provide a more consistent ablative effect. Aims To examine depth of injury and ablation consistency associated with adjunctive thermal therapies for the prevention of marginal recurrence (APC or STSC).

Methods: Standardised EMR of porcine mucosa was performed by a single operator. Submucosal injection of a solution of succinylated gelatin (Gelofusine) and indigo carmine was followed by two intersecting 15mm snare resections. Resections were randomised to Erbe VIO 300D EndoCut Q (Effect 3) or Erbe 100Cforced coagulation current (250W). The lateral margins of each defect were treated with APC or STSC. Porcine colons were surgically removed at 72 hours post EMR. Pathological resection specimens and porcine colonic defects were assessed by 2 expert gastrointestinal pathologists blinded to the treatment modalities. Study size was calculated based on previous porcine studies suggesting a 20% difference in muscularis propria involvement by inflammation or necrosis. Ethical approval was obtained from the Western Sydney Local Health District animal ethics review board. Results: 88 resection defects were created in 12 Landroc-Duroc cross pigs (mean weight 60kg). 2 defects were incorrectly sectioned so were not analysed. 174 tissue sections were assessed comparing APC (87) with STSC (87) ablation. APC treatment did not differ from STSC treatment for deep involvement of the colon wall by acute inflammation (6.9% vs 9.2%, p=0.58) or chronic inflammatory infiltrate (62.1% vs 64.6%, p=0.75) although there was a trend towards greater depth of deep necrosis with STSC (4.6% vs 12.6%, p=0.059). A non-viable necrotic margin was present in 38.6% treated with APC versus 47.1% treated with STSC p=0.17. Conclusion: Depth of thermal injury did not differ between APC and STSC in an in-vivo porcine model of EMR however there was a trend toward deeper necrosis with STSC.
Clinical Applications – APC – Gastroenterology Uses found in Clinical Literature


ERBE - HybridAPC

HybridAPC is a multifunctional probe that uses a high pressure water system (ERBEJET2) and the ERBE Argon APC system. With this 2-in-1 probe, it’s possible to elevate and ablate the targeted mucosa without having to change the instrument.

- Especially useful for the treatment of Barrett’s esophagus.
Clinical Applications – Pulmonary APC Uses reported in Clinical Literature


- Granulation Tissue
- Bleeding/Hemoptysis
- Exophytic Tumors
- Stent Over-growth/In-growth
Clinical Safety Considerations…

...let’s discuss further.
Clinical Safety – Important Considerations for Endoscopy

- Use the lowest possible output settings, as well as the shortest activation times.
- Confirm gas flow (with APC use) and settings prior to activation.
- Continuously monitor for signs of over-distention.
  - Brief and repeated aspirations should be routinely performed throughout the procedure.
Clinical Safety – Important Considerations for Endoscopy

APC is a non-contact modality

*Fig. 20a*: The probe is too close to the tissue, which may result in an undesirable thermal effect and/or submucosal emphysema; *Fig. 20b*: The distance of the probe is sufficient, leading to a more even distribution of current.

*If an ‘Axial’ probe is too close to the tissue, an undesirable thermal effect or submucosal emphysema may occur.*
Avoid APC activation in close proximity of metal objects

- The APC probe should not be activated if the tip is in close proximity to metal objects.
- Unintended thermal injury of the surrounding tissue may occur.
- Metal objects may receive unintentional damage.
- Exceptions - “trimming” of migrated metal stents.
Potential Complications

• Risk of Bleeding

1.5-2% all polypectomies (Ginsberg, 2008)

Increased risk if polyp >1cm, multiple polyps, large defect, NSAIDs, cecum/ascending (Bourke 2011)

Intervention

Epinephrine solution, clips, thermal (APC – for superficial, Bipolar Probe, Coag Grasper). Extreme cases angiographic embolization, surgery.

Potential Complications

- Perforation

EMR reported perforation rate 0.3-0.5% (ASGE, 2008)

Disruption in the dyed SM plane post resection often indicates thermal damage to muscularis propria. Can inspect specimens and defect for firm white discs (Target Sign) (Bourke, 2011)

Intervention

Small….clip (Boston, Cook, Olympus, Vantage), Ovesco OTSC, OvertStitch Apollo

Large….surgery to prevent peritonitis

“Although surgery has been the standard practice to manage perforations, application of clips and loops has emerged as a useful option to close lesions less than 10–15 mm in size.” (Monkemuller 2009)
Clinical
- Gastric ESD

Gastric ESD (B.H. Min- Dig. Endos.)
Clinical – The Future Now

EMR/endoscopic submucosal dissection using ERBE HybridKnife
Clinical Video - ESDH (Endoscopic Submucosal dissection with HybridKnife)

Endoscopic submucosal dissection with a water-jet HybridKnife (ESDH) of mucosal and submucosal lesions in the upper GIT

Horst Neuhaus, M.D.
Evangelisches Krankenhaus
University of Duesseldorf
Germany
Fig. 7.14  (a, b) Illustration of knife position relative to the mucosa and muscularis in an anterior POEM during tunnel dissection (a) and myotomy (b). (c, d) Illustration of knife position relative to the mucosal and muscularis in a posterior POEM during tunnel dissection (c) and myotomy (d). The knife is much closer to the mucosa in anterior POEM (possibly resulting in higher rates of mucosal injury). In posterior POEM, the myotomy is on the same side of the tunnel as the knife and endoscope, possibly resulting in faster myotomy by forward advancement of endoscope and knife and minimal if any lateral movement of the knife. In contrast, in anterior POEM, incising the muscle at 2 o’clock position, the diametrically opposed position to that of the endoscope and knife (退出the endoscope at 7 o’clock position) can only be done by interrupted lateral cuts hooking and cutting individual muscle bundles which result in large lateral swings of the knife from the muscle at 2 o’clock position to the knife’s neutral position at 7 o’clock, very close to the mucosa which may suffer “counter-coup” injuries.
Applications in hybrid technology:

**Submucosal tunneling and endoscopic resection (STER)**
- for therapy of submucosal benign tumors with HybridKnife T-Type, I-Type

**Per Oral Endoscopic Myotomy (POEM)**
- for therapy of achalasia with HybridKnife T-Type, O-Type, I-Type

**Endoscopic mucosal resection (EMR) or ESD**
- for therapy of early-stage carcinoma in the gastrointestinal tract using the flexible probe
WHO IS ERBE – The Gold Standard everybody tries to compare too… we’re just like ERBE?
– Not Really


5th generation - Christian Otto Erbe

The VIO System is the first modular-built electrosurgery unit (introduced in 2002). There are new modes and upgrades for cutting, coagulating and devitalizing tissue.

ERBEJet is now available in Canada with HybridKnife & HybridAPC

“Imitation is the sincerest form of flattery that mediocrity can pay to greatness.” - Oscar Wilde
Thank You!