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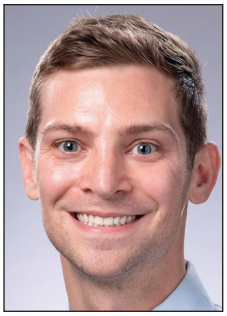

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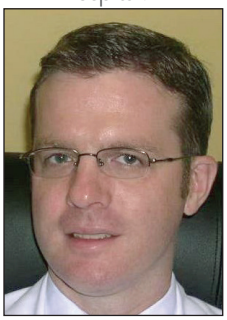

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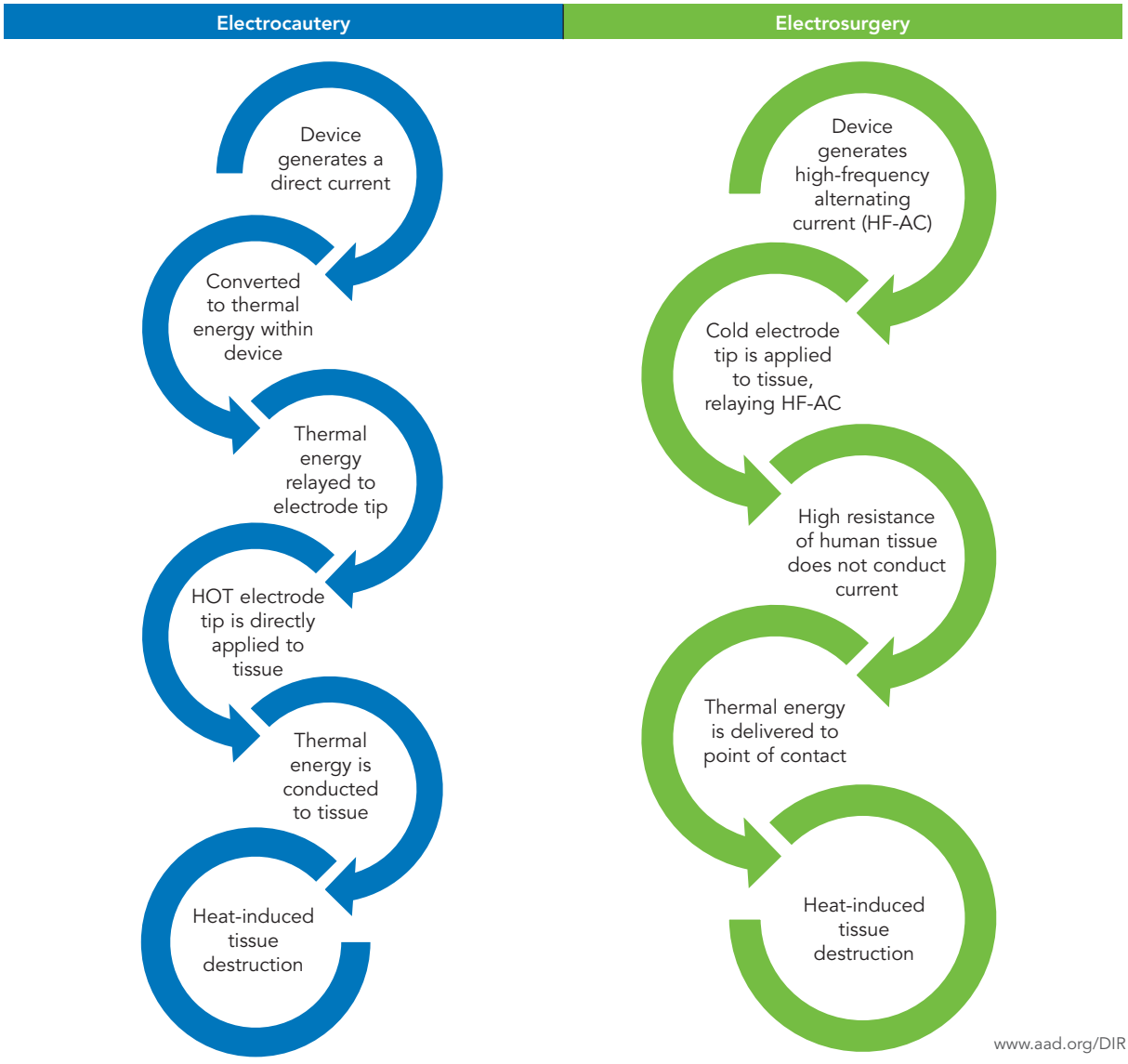
Electrical hemostasis

By Michael J. Visconti, DO, Zac Zheng, DO, and Kent J. Krach, MD, FAAD

Definitions					
	Electrode tip temperature (Before contact the skin)	*Electrical energy form (i.e., type of current)*	*Current flows...*	*Relies on human tissue for energy conversion?*	*Implantable device electromagnetic interference*
Electrocautery	Hot	Direct current	To the device tip	No	Not present *No current passing to skin*
Electrosurgery *Electrodesiccation* *Electrofulguration* *Electrocoagulation* *Electrosection*	Cold	Alternating current	To the skin	Yes *Electrical energy converted to thermal energy on skin*	Present *Biterminal forceps reduce risk of interference*



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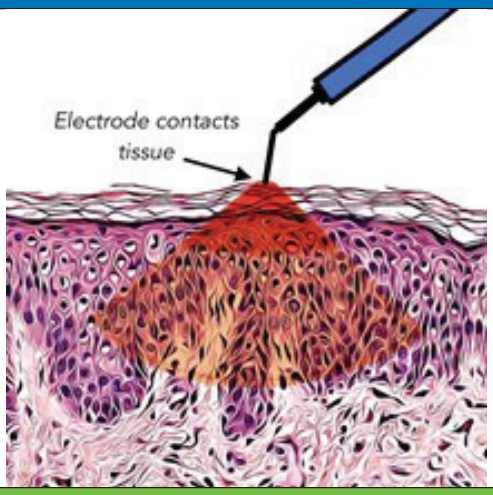
Electrosurgical modalities

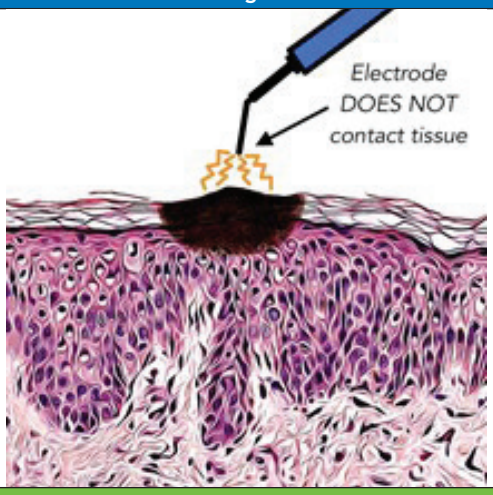
Electrodesiccation



MONOTERMINAL

- LOW amperage / HIGH voltage
- **DIRECT contact**
  - Slow heating of tissue
    - Dehydration/water loss
- Superficial ablation
  - NO significant protein denaturation

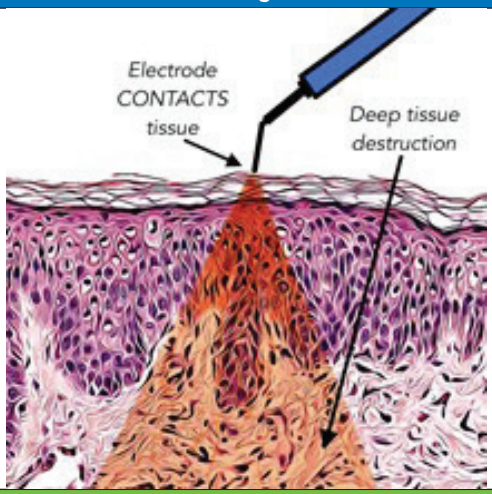
Electrofulguration



MONOTERMINAL

- LOW amperage / HIGH voltage
- **NO DIRECT contact = less controllable damage**
  - Electrical probe is held at distance
    - Produces spark gap
- Superficial ablation
  - More limited/superficial compared to electrodesiccation

Electrocoagulation



BITERMINAL

- HIGH amperage / LOW voltage
- Moderately damped waveform
  - Less cutting, more coagulation
- **DIRECT contact**
  - Slow cellular heating
    - Intracellular fluid evaporation, coagulum formation, protein denaturation
- Penetrates deeper compared to electrodesiccation --- Deeper tissue destruction/hemostasis

Electrosection

BITERMINAL

- **HIGHEST current of all modalities**
- HIGH amperage / LOW voltage
- Undamped waveform
  - Pure cutting through tissue
- **DIRECT contact**
- Blended mode
  - Utilized with electrocoagulation
    - Mixture of hemostasis and cutting

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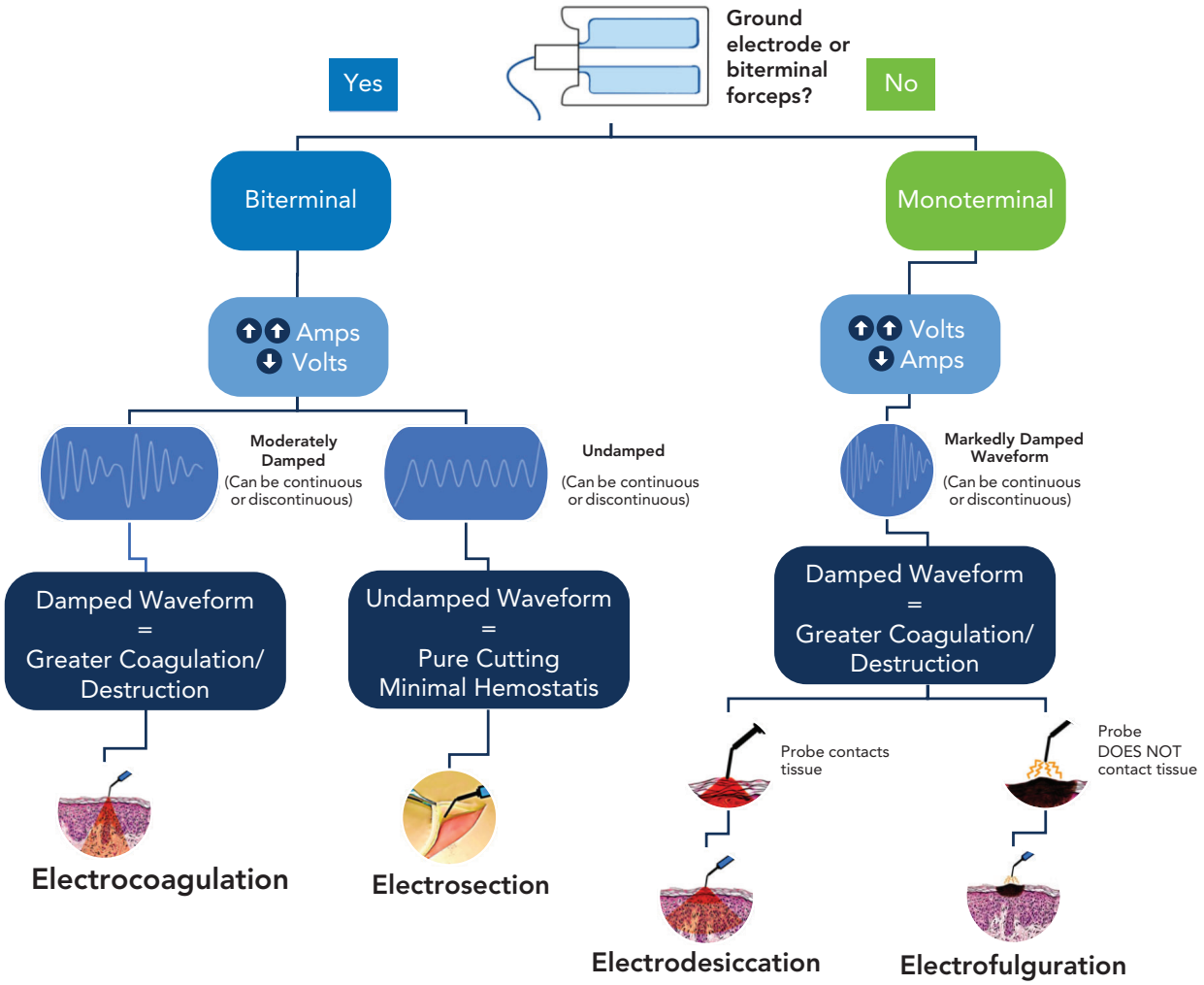

Summary of electrosurgical modalities

Type	*Current*	*Terminal*	*Voltage*	*Amperage*	*Waveform*	*Tissue destruction*
Electrodesiccation	Alternating	Monoterminal	High	Low	Markedly damped	Modest
Electrofulguration						Modest / Superficial
Electrocoagulation		Biterminal	Low	High	Moderately damped	Moderate / Deep
Electrosection					Undamped	Minimal
Electrocautery	Direct	-	-	-	-	Moderate

Adapted from Review of Dermatology, 2017.

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Electrical hemostasis risks & precautions		
	Risks	*Precautions*
Pacemaker or ICDs	Skipped beats, misfires, bradycardia, asystole, reprogramming/resetting High-frequency electrosurgery devices can interrupt signal	Consider preoperative cardiology consult Avoid electrosection Utilize electrocautery & biterminal forceps (minimizes current leak) Short bursts (<5 sec) Lower power Avoid cutting current Avoid local use around device
Fire hazard	**Flammable agents:** Alcohol Ethyl chloride anesthesia Supplemental oxygen Aluminum chloride **Bowel gas (methane)**	**Topical preparations:** Utilize non-alcoholic cleansers (chlorhexidine, povidone-iodine) Allow adequate time for evaporation of alcohol prep **Supplemental oxygen**: Discontinue use during electrical hemostasis **Bowel gas:** Cautious use in perianal area
Non-cardiac electrical stimulators	Spinal cord stimulators Deep brain stimulators Vagal and phrenic nerve stimulators Gastric stimulators Cochlear implants/hearing aids **Overall, data available on interactions is lacking*	Usually equipped with an "OFF" function compared to ICDs Similar precautions to **pacemakers or ICDs**
Thermal injury	Touching grounding element (metal) Inadequate contact between patient and dispersive electrode plate Channeling current through small area	Pre- and intra-operative counseling on grounding element contact

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Electrical hemostasis risks & precautions		
	Risks	*Precautions*
Channeling	Tissue damage distant from local site secondary to high-frequency current transmitted along nerve bundles	Avoid high-power settings when not medically necessary Biterminal forceps Increasing cross-sectional area of current flow (i.e., wrapping a saline-soaked sponge around mass with a narrow base)
Plume smoke	Similar mutagenic potential to cigarette smoke (benzene H-cyanide) HPV exposure after electrodesiccation Aerosolizes HSV, HPV particles	Portable smoke evacuation system Smoke evacuator held 2 cm from operative site Mask/eye protection Sterile sleeves/tips

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2. Alikhan A, Hocker TL. *Review of Dermatology*. Elsevier; 2017.
3. Robinson JK, Hanke CW, Siegal DM, Fratila A. *Surgery of the Skin*. Philadelphia: Elsevier; 2015.