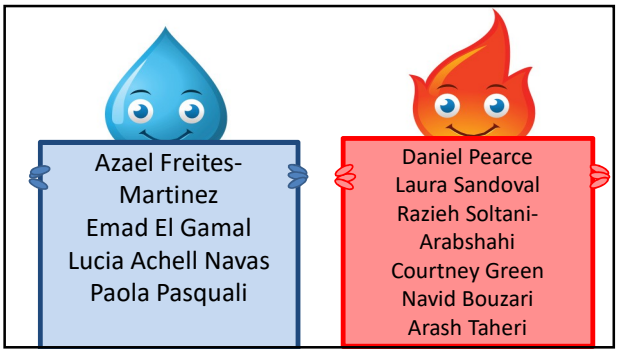
W005: **Hands-on: Fire and Ice! Electrosurgery and Cryosurgery**

HANDOUT CRYOSURGERY

02/19/2018

Azael Freites-Martinez
Emad El Gamal
Lucia Achell Navas



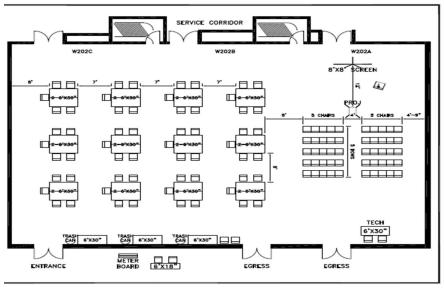
SOME RULES

Fill PPPP: Participant Pre- and Post-Assessments

Hand out available on website

No photographs, No recording

Evaluation forms

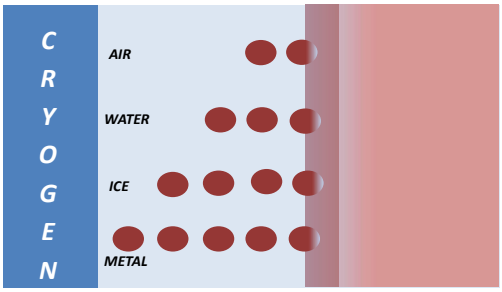


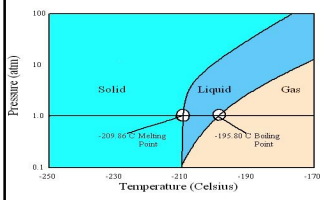
1	Why electrocoagulation/electrosurgery? How does it work?	5 min	Daniel J Pearce
2	Why cold? How does it work	5 min	Paola Pasquali
	PRACTICE	20 min	ALL FACULTY
3	How to use fire in a more efficient and safer way	5 min	Laura Sandoval
4	How do we apply cold: most common techniques	5 min	Azael Freites-Martinez
	PRACTICE	20 min	ALL FACULTY
5	When do we use fire? Common applications (benign lesions)	5 min	Razieh Soltani-Arabshahi
6	When do we use cold: common applications (benign lesions)	5 min	Emad EL Gamal
	PRACTICE	20 min	ALL FACULTY
7	Fire for premalignant and malignant lesions:	5 min	Courtney Green/Navid Bouzari
8	Cold for pre malignant and malignant lesions	5 min	Paola Pasquali
	PRACTICE	20 min	ALL FACULTY
9	Closing/special applications: it is time for fire?	5 min	Arash Taheri
10	Closing/special applications: or is it time for cold?	5 min	Paola Pasquali
	PRACTICE	30 min	ALL FACULTY

Pasquali P

1. Cryosurgery is a surgical procedure

2. Heat extraction

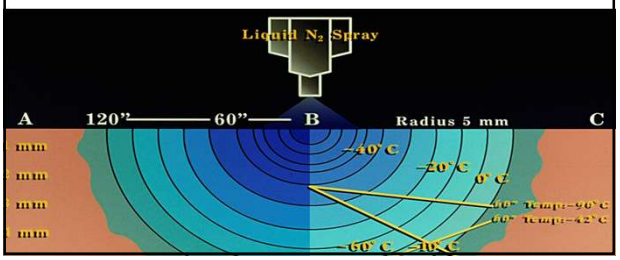




Temperature of common cryogens	
Liquid Nitrogen	-196°C
Argon gas	–187°C
Nitrogen gas N_2O	-88 °C
Carbon dioxide gas CO_2	-78 °C
Organic compressed gases	-55 to -75°C

3. KERATIN is a bad conductant

4. The temperature decreases from the center out in **isotherm**.



5. Mechanism of damage

	MECHANISM	TIME of CYCLE	LOCATION
Direct Injury	Extra- and Intracellular ice crystal formation + coagulation necrosis	Freezing phase	Center of the cryoinjury
Vascular Injury	Microcirculatory failure+ Ischemic necrosis	Thawing phase	Periphery of the cryoinjury
Apoptosis	Cell death by apoptosis	Up to 8 hours after rewarming	Periphery of the cryoinjury
Immunological	T-cell response mediated by dendritic cells	Late event	Whole body

6. Different cells, different sensitivity to cold

Table 2.3 Sensitivity of tissue and cells to col

Cells/tissues	Lethal tempe
Osteocyte	–2 °C
Melanocyte	–4 °C
Keratinocyte	–35 °C
Adenocarcinoma cells	–40 °C
Sarcoma cells	–60 °C
Endothelium	–15 °C to 40

Take Home message

- Cryosurgery is a surgical procedure
- Heat extraction depends on material interposed between tissue and cryogen
- Keratin is a bad conductant
- The temperature decreases from the center out in **isotherm**
- Mechanism of damage
- Different cells, different sensitivity to cold

Freites A

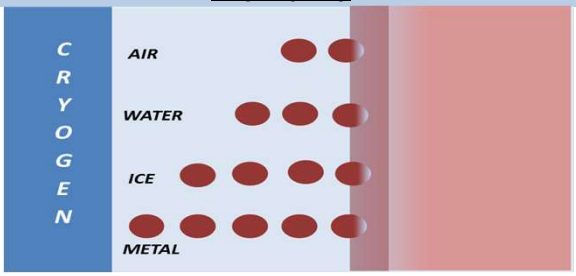
Techniques

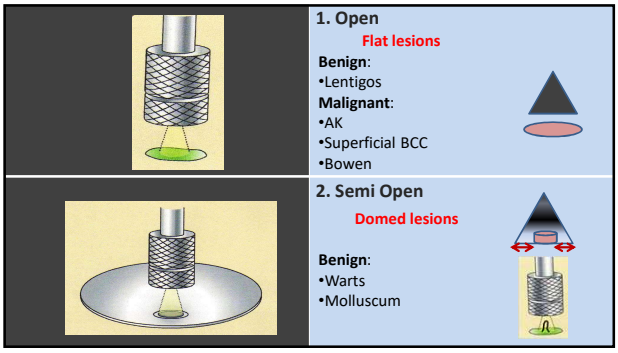
1. **Open** or Spray
2. **Semi open** or Cone
3. **Close** or Probe
4. **Semi close** or Chamber
5. **Tweezer**
6. **Intralesional**

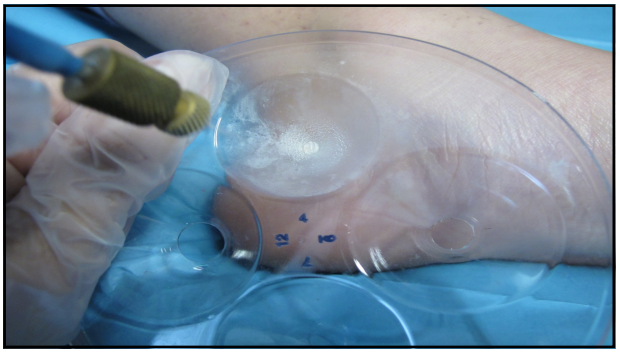
- Cryobiopsy: Cryoshave

1. Open or Spray technique

Cryospray

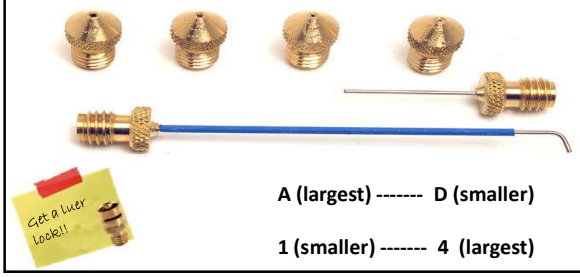



1. Open
Flat lesions
Benign:
•Lentigos
Malignant:
•AK
•Superficial BCC
•Bowen
2. Semi Open
Domed lesions
Benign:
•Warts
•Molluscum



1. Open or Spray technique

Tips/Apertures



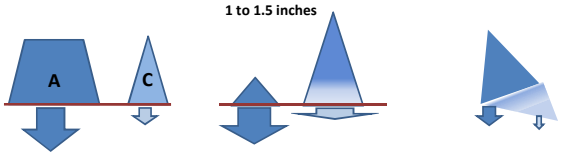
A (largest) ------- D (smaller)

1 (smaller) ------- 4 (largest)

1. Open or Spray technique

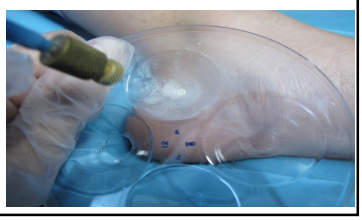
Cryospray

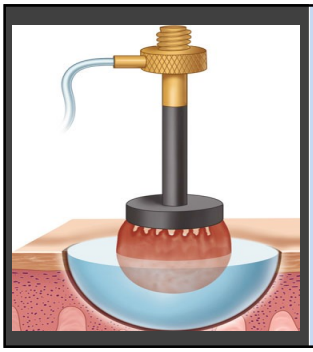
Orifice aperture → **Distance** → **Inclination**



2. Semi open or Cone technique

Disc/Cones





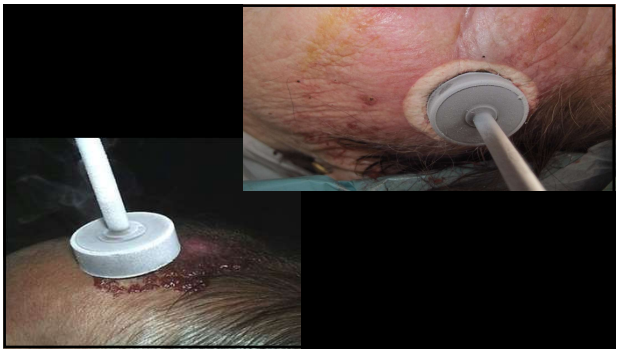
3. Close or Probe

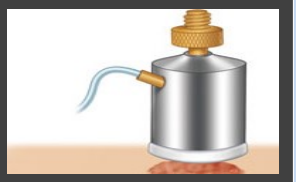
Benign:
- Vascular tumours
- Sebaceous hyperplasia

Malignant:
- BCC
- SCC
- Palliative treatment

3. Close or Probe technique

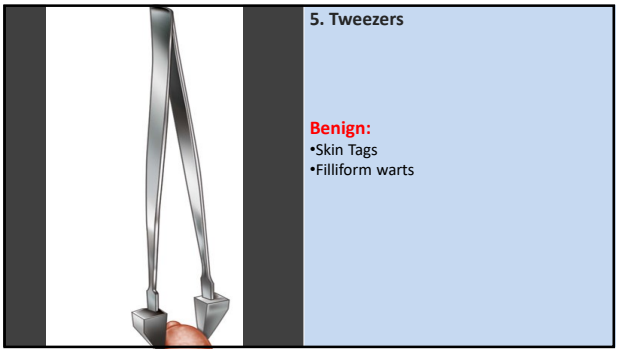
Probes





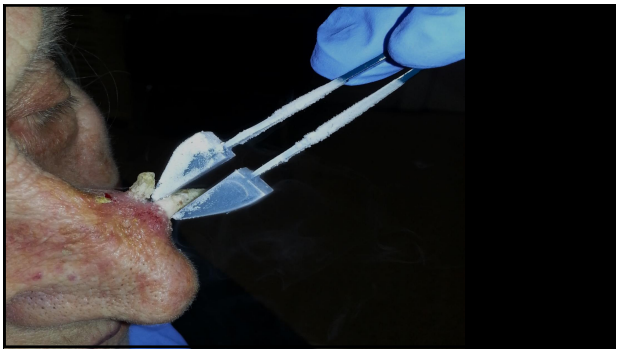
4. Chamber OR Semi closed

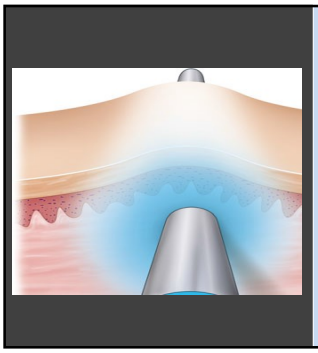
Malignant:
- Large BCC
- SCC
- Palliative treatment



5. Tweezers

Benign:
- Skin Tags
- Filliform warts

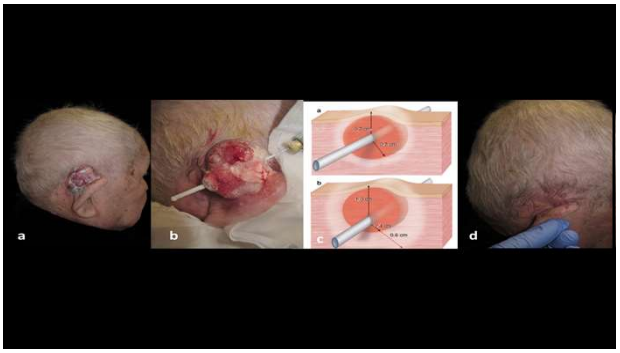




6. Intralesional

Benign:
- Keloids

Malignant:
- Palliative, large tumours

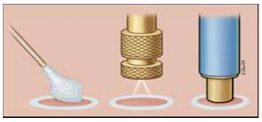


Take Home message

- Select the best technique for each lesion
- Probes: for vascular lesions and skin cancer
- Probes: the more the better
- Tweezers: grasp exophytic lesions

El Gamal E

Over the past 50 years, much experience has been gained in the use of cryosurgery to treat skin lesions.



Most benign skin lesions can be treated successfully with any of several treatment modalities

- Cosmesis, cost, and patient convenience may make one treatment modality more desirable than another.
- Cryosurgery has advantages over the other modalities.
  - Preparation time is short
  - Treatment requires no expensive supplies
  - Injectable anesthesia.
  - The risk of infection is low, wound care is minimal, and suture removal is not needed.

- The margin size depends primarily on the thickness of the lesion
- Margins for most benign lesions can extend as little as 1 to 2 mm beyond the visible pathologic border.

Recommended Cryosurgical Techniques

TYPE	TECHNIQUE	FREEZE TIME (SECONDS)*	NUMBER OF FTCS	MARGIN (MM)	NUMBER OF TREATMENT SESSIONS	INTERVAL (WEEKS)†
Actinic keratosis	OS	5	1	1	1	
Cherry angioma	P	10	1	< 1	1	
Common warts	OS	10	1	2	3	4
Cutaneous horn	OS	10 to 15	1	2	1	
Dermatofibroma	P/OS	20 to 30	1	2	2	8
Hypertrophic scar	OS/P	20	1	2	1	
Ingrown toenail‡	OS	20	1	2	2	8
Keloid	OS/P	20 to 30	1	2	3	8
Myxoid cyst	OS/P	20	1	< 1	1	
Oral mucocele	P	10	1	< 1	1	
Pyogenic granuloma	OS	15	1	< 1	1	
Sebaceous hyperplasia	P	10	1	< 1	3	4
Skin tags	F/OS	5	1	2	1	
Solar lentigo	OS	5	1	< 1	1	

- A single 20- to 30-second freeze-thaw cycle is advised,
- 1- to 2-mm margin should be obtained.
- Retreatment in eight weeks may be necessary.
- Significant clinical improvement,
  - visible flattening of raised dermatofibromas
  - lightening of pigmentation (80-90% px)

POST OPERATIVE CARE

Immediate Events	Events after 24-48 hour	Late events
• Transient edema • Discomfort/Pain • Evanescent wheals • Edema	• Bulla formation • Exudation	• Mummification/crust formation • Healing • Post-operative redness • Hyper/hypopigmentation • Pseudoepitheliomatous hyperplasia

COMMON PITFALLS

- LN SPATTERING
- Edema
- Bleeding
- Pain/Syncope
- Insufflation of subcutaneous tissue
- Permanent changes in pigmentation
- Infection

Take Home message

- Discuss with your patient pros and cons
- Cryosurgery is cheaper, faster, versatile, low risk of infection, no anesthesia is required
- The best treatment is the one you only need to do once. Still, for benign lesions, it is best to undertreat than over-treat

Achell L

Cryobiology 58 (2009) 1–11

Contents lists available at ScienceDirect

Cryobiology

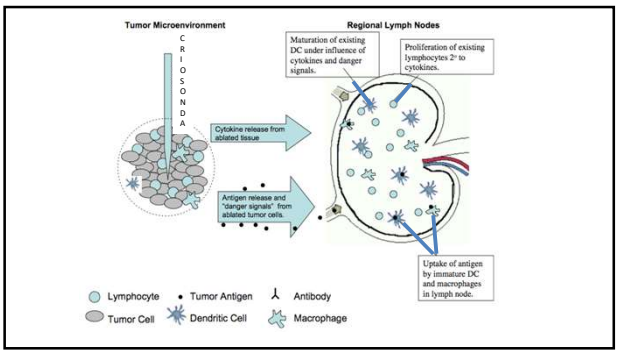
journal homepage: www.elsevier.com/locate/ycryo

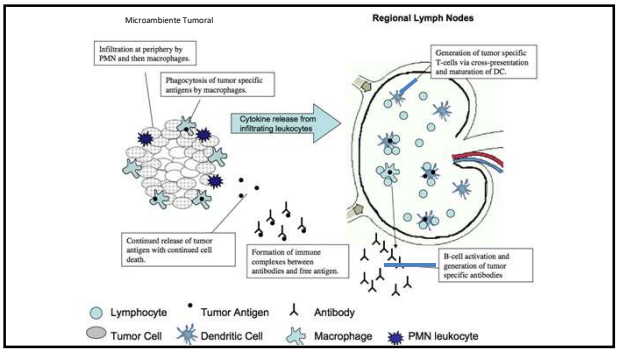
Review

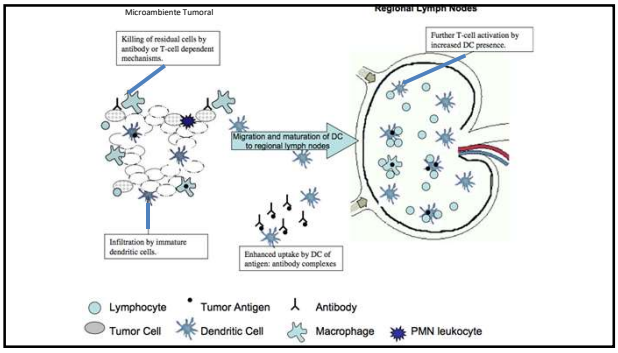
Cryo-immunology: A review of the literature and proposed mechanisms for stimulatory versus suppressive immune responses

Michael S. Sabel *

Division of Surgical Oncology, University of Michigan Comprehensive Cancer Center, Department of Surgery, 3304 Cancer Center, 1500 East Medical Center Drive, Ann Arbor, MI 48109, USA



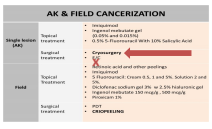




AK & FIELD CANCERIZATION		
Single lesion (AK)	Topical treatment	• Imiquimod • Ingenol mebutate gel (0.05% and 0.015%) • 0.5% 5-Fluorouracil With 10% Salicylic Acid
	Surgical treatment	• **Cryosurgery** • E/C
Field	Topical Treatment	• Retinoic acid and other peelings • Imiquimod • 5 Fluorouracil: Cream 0.5, 1 and 5%. Solution 2 and 5%. • Diclofenac sodium gel 3% w 2.5% hialuronic gel • Ingenol mebutate 150 mcg/g , 500 mcg/g • Piroxicam 1%
	Surgical treatment	• PDT • **CRIOPEELING**

Single lesion (AK)

CRYOSURGERY

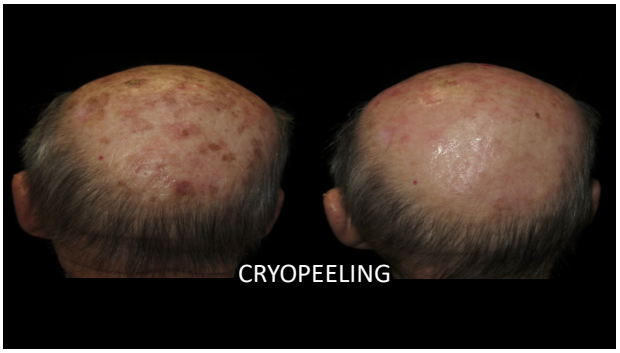


CONDITIONS

Correct diagnosis: clinical-DMS-CM
Select lesion:
- Size

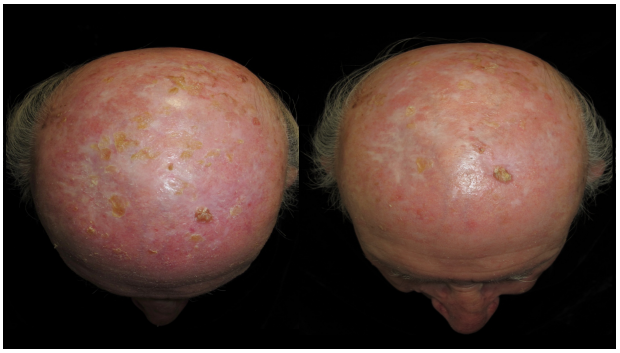
Correct technique:
- Distance
- Time
- Temperature

Field Treatment
Cryopeeling



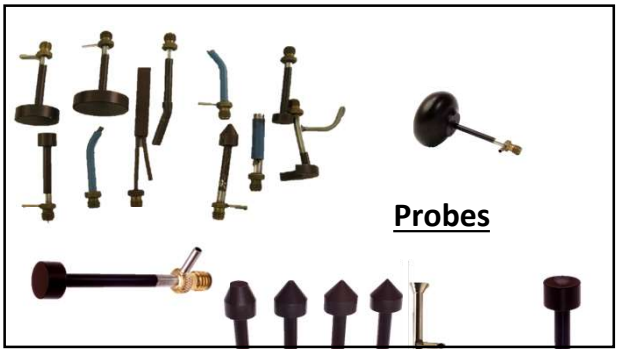
Combination treatment

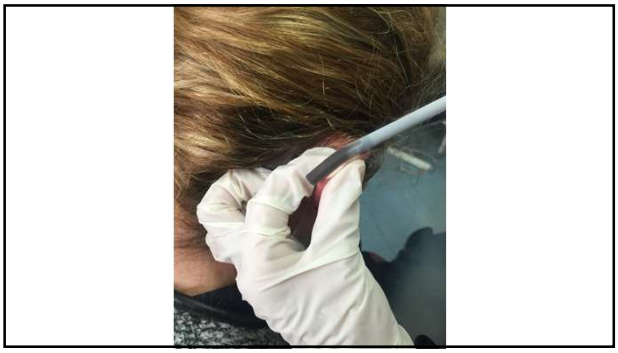
CRYO+ 5 FU
CRYO + Imiquimod
CRYO + Sodium Diclofenac
CRYO + Ingenol Mebutate
CRYO + Piroxicam

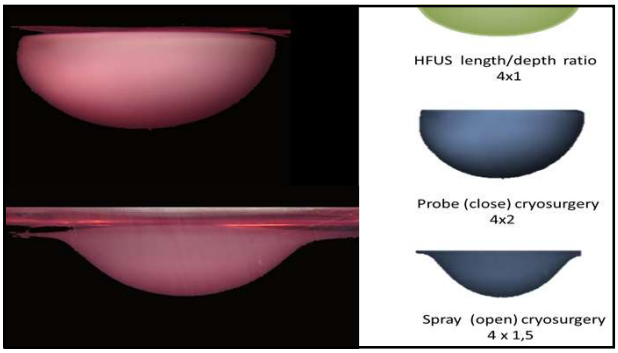


Malignant Lesions

Histologic subtype	Anatomical area	Skin type	Tumor thickness
BCC SCC well / mod diff. Lentigo Maligna Palliative Treatments	Eyelids Earlobes Nose	Lighter better than darker	HFUS 20-22 MHz






HFUS length/depth ratio
4x1
Probe (close) cryosurgery
4x2
Spray (open) cryosurgery
4 x 1,5

Take Home message

- For single AK: one FT cycle
- Cryopeeling is an option for field cancerization
- Select malignant tumors for best cryosurgical results
- Get as much knowledge about the tumor you are planning to treat
- Better probe than spray

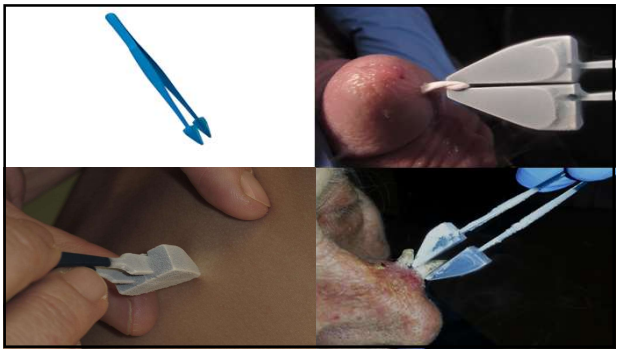
Pasquali P

Cryo-biopsy

Cryotweezers

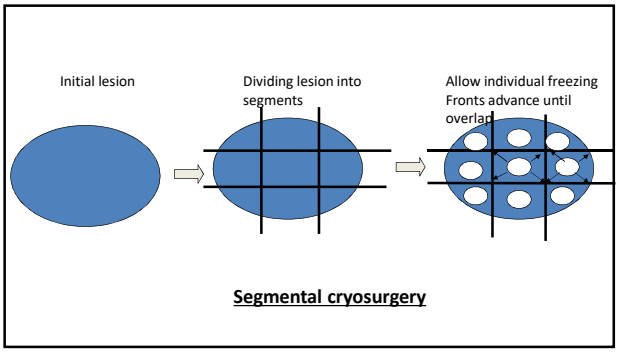
Cryosurgery in palliative treatment

CoolLifting, Cryolypolisis

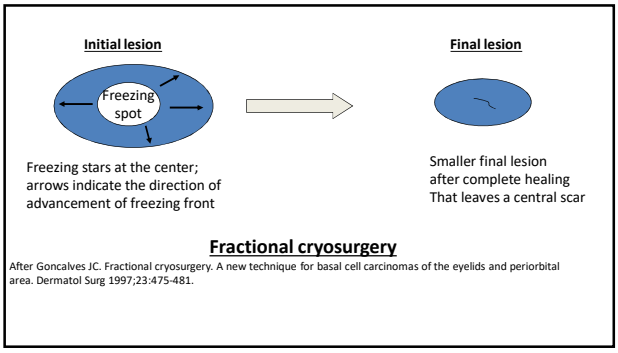


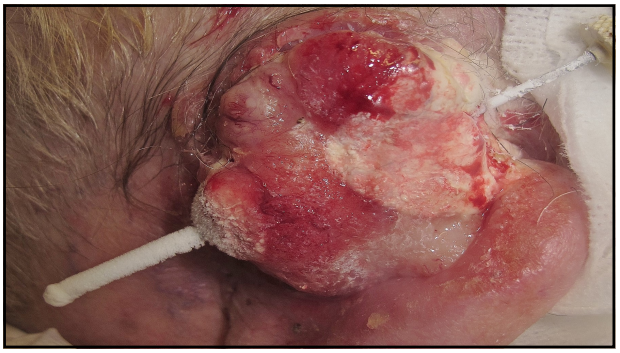
Cryosurgery in palliative treatment

- Open, Close, Semi-close, Intralesional
- Segmental Cryosurgery
- Fractional Cryosurgery
- Immunocryosurgery

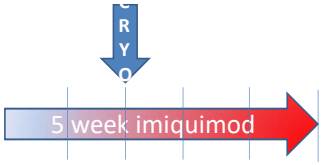


Segmental cryosurgery

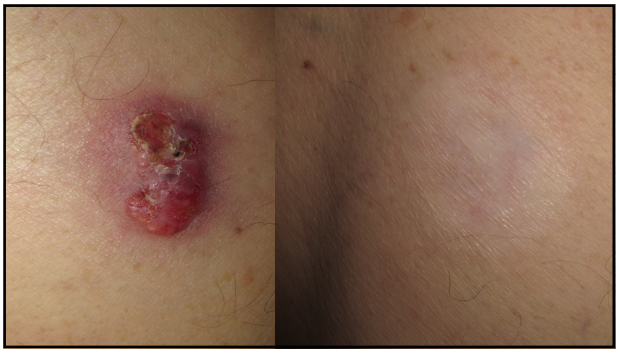

Initial lesion
Freezing spot
Final lesion
Freezing stars at the center; arrows indicate the direction of advancement of freezing front
Smaller final lesion after complete healing That leaves a central scar
Fractional cryosurgery
After Goncalves JC. Fractional cryosurgery. A new technique for basal cell carcinomas of the eyelids and periorbital area. Dermatol Surg 1997;23:475-481.

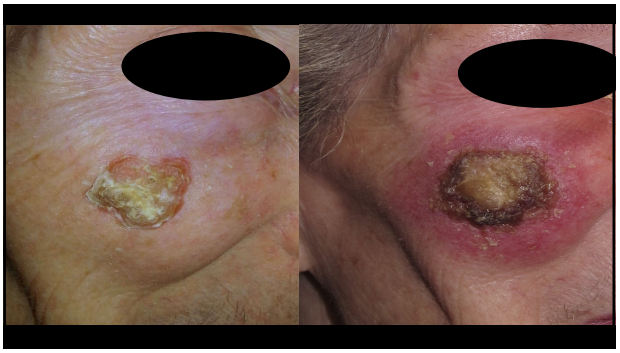


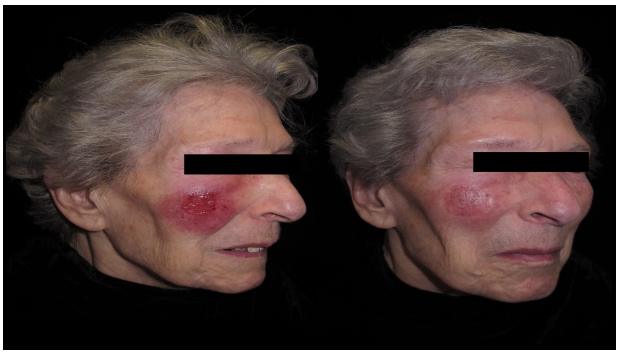
Immunocryosurgery



Acta Derm Venereol. 2014 Jan;94(1):38-44. Gaitanis G, Bassukas ID. Immunocryosurgery for non-superficial basal cell carcinoma: a pro-spective, open-label phase III study for tumours ≤ 2







Cryo pen, CoolLifting, Cryolypolisis

CoolLifting

The Cool Lifting gun is a treatment which combines hyaluronic acid and a powerful carbon dioxide flow.

Cryolypolisis

Cryolipolysis is a medical treatment used to destroy fat cells. Its principle relies on controlled cooling to near 4° Celsius (approx. 39° Fahrenheit) for the non-invasive localized reduction of fat deposits in order to reshape body contours.

Nearly 100% of patients who received cryolipolysis developed erythema, oedema and dysaesthesia in the treatment sites
Discomfort (96%), pain (55%) and bruising (9.5–50%) were commonly observed.

Generally, cryolipolysis result satisfaction was similar to that for RadioFrequency (about 70–100%), and were both overall superior to that
of HIFU (high-intensity focused ultrasound), which had multiple reports of satisfaction below 60%.

Because no LLLT (low-level laser therapy) studies which measured satisfaction performed

Kennedy J, Verne S, Griffith R, Falto-Aizpurua L, Nouri K. Non-invasive subcutaneous fat reduction: a review. J Eur Acad Dermatol Venereol. 2015 Sep;29(9):1679-88. doi: 10.1111/jdv.12994. Epub 2015 Feb 9.

Singh SM, Geddes ER, Boutrous SG, Galiano RD, Friedman PM.
Paradoxical adipose hyperplasia secondary to cryolipolysis: An underreported entity? Lasers Surg Med. 2015 Aug;47(6):476-8. doi: 10.1002/lsm.22380. Epub 2015 Jun 19.

Take Home message

- Cryosurgery in palliative treatment is an excellent option for large malignacies that cannot be treated by other modalities
- Immunocryosurgery is an alternative to both superficial and nodular BCC, large LM and palliate treatment
- CoolLifting, Cryolypolisis