Cryosurgery

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SCHOOL OF MEDICINE

AMERICAN ACADEMY OF FAMILY PHYSICIANS

Learning Objectives

1. Explore cryosurgery as a method for destroying benign and malignant lesions.
2. Evaluate the risks, benefits, complications, indications and contraindications of cryosurgery.
3. Demonstrate proficiency in cryosurgery.

Thanks to Our Vendors

- The vendors have graciously provided instruments and supplies for the workshop, but this cannot be taken as an endorsement by the presenters or the NMAFP. Any decisions regarding purchases or future use of equipment are your responsibility.

Cryosurgery

- Destruction of cells by necrosis from freezing and thawing in a controlled manner
- Selectively destroys cells, leaving a fibroblast matrix intact from which re-epithelization occurs with little or no scar formation

- Cryotherapy
  - Cancer TX
  - NON-FDA-approved spas

Advantages of Cryosurgery

For the Physician

- Procedure can be performed quickly
- Technique easy to learn
- Multiple lesions treated at same session

Advantages of Cryosurgery

For the Patient

- No injections of local anesthetic
- No sutures to remove
- Pain is tolerable (less so for children)
- Wound care is simple – Adhesive bandage prn
- Postoperative complications minor, wound infection a rarity

Efficacy of Cryosurgery

- Lesion
  - Warts (hands)
  - Actinic keratosis
  - Basal cell carcinoma
  - Squamous cell cancer
- Cure rate
  - 54% Cochrane 2012
  - 97% Zouboulis CC, Rohrs H.
  - 90-95% AHRQ
  - 90-95% AHRQ

Zouboulis - [Cryosurgical treatment of actinic keratoses and evidence-based review]. *Hautarzt* 2005;56:353-358.

AHRQ Systematic review of the literature

Disadvantages of Cryosurgery

For the Patient

- Postoperative pain, hypopigmentation, blistering
- May require several office visits
- Numbness due to peripheral nerve injury for several months post-treatment
- Healed cryolesions prone to sunburn
- Rarely scarring

Absolute Contraindications

- Proven sensitivity or adverse reaction to cryosurgery
- Melanoma or suspected melanoma

Relative Contraindications

- Extremities in Raynaud's disease
- Conditions where cryoglobulins likely
  - myeloma, lymphoma
  - chronic hepatitis B
  - collagen vascular disease
  - ulcerative colitis
  - post-streptococcal glomerulonephritis
- Eyelids

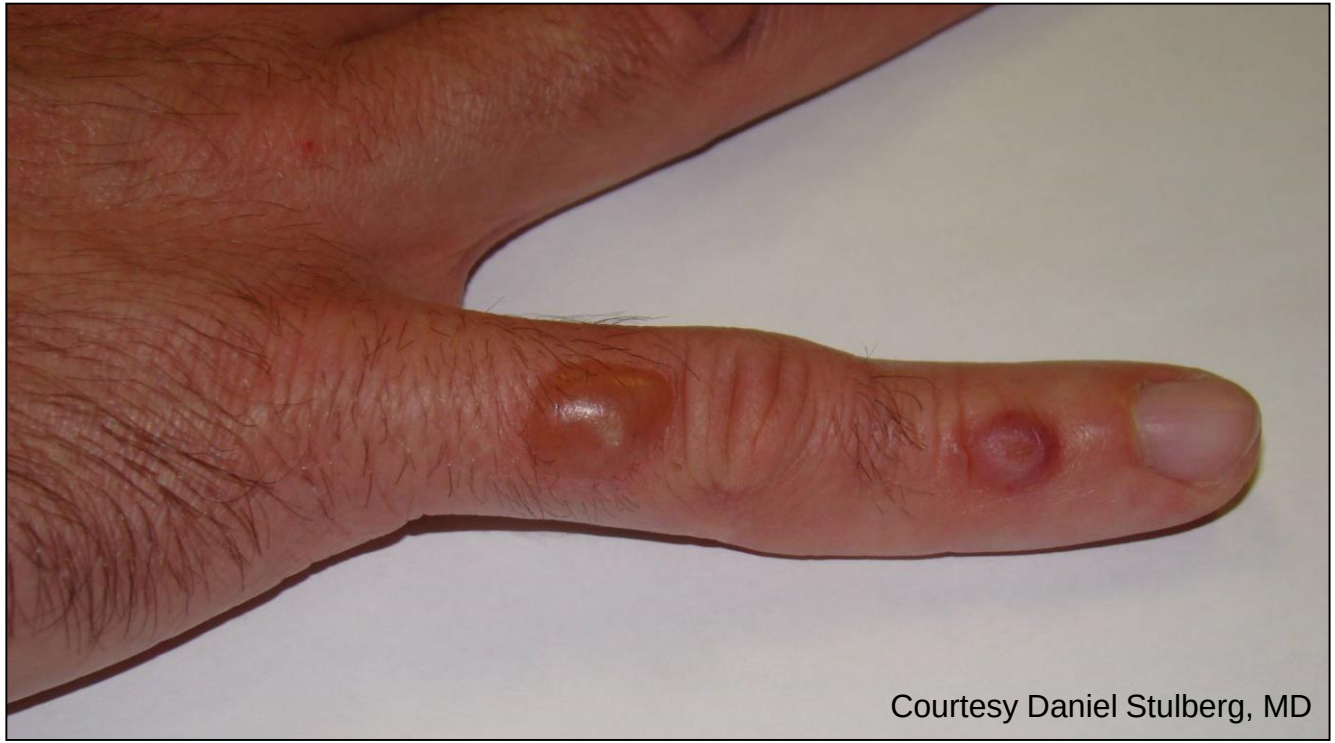
Complications

- Immediate and routine
  - pain, edema, blistering, intradermal hemorrhage
- Immediate, less common
  - headache if scalp or forehead freeze
  - syncope
- Delayed and rare
  - infection, hemorrhage, pyogenic granuloma

Complications

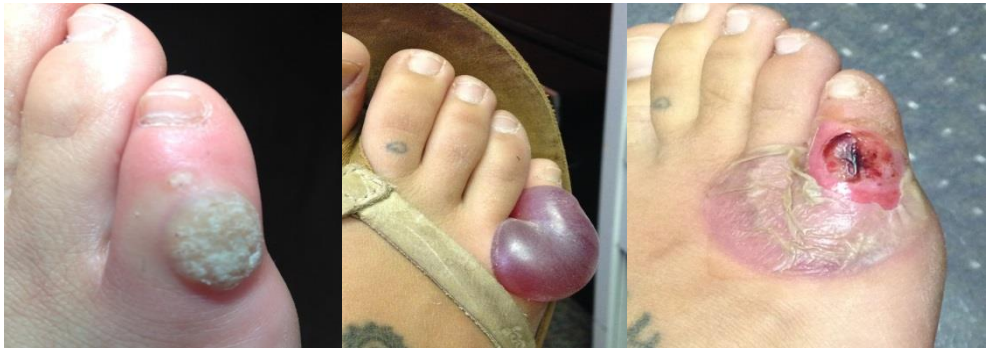
- Prolonged and Rare
  - hyperpigmentation
  - hypertrophic scars
  - neuropathy
- Permanent
  - hypopigmentation - common
  - atrophy
  - alopecia

Blistering – “Normal Complication”

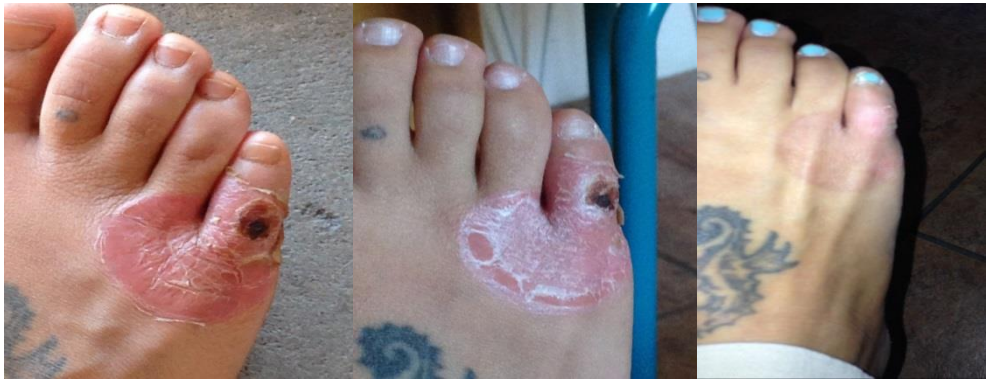


Excessive Blistering

Day
0, 5, 8



Day
17, 21, 90



Photos courtesy Daniel Stulberg, MD

Freezing Methods

- Swab applicator
  - liquid nitrogen
  - refrigerant dispensers
- Spray method
  - liquid nitrogen
  - nitrous oxide
- Cryoprobes using
  - liquid nitrogen
  - nitrous oxide
  - carbon dioxide
  - refrigeration

Methods and Temperatures of Cryosurgery

• Liquid nitrogen	-196	degrees C
• Nitrous oxide spray	- 95	degrees C
• Nitrous oxide	- 89-95	degrees C
• Carbon dioxide	- 70	degrees C
• Refrigerant dispenser	- 72-90	degrees C
• OTC spray	- 20-23	degrees C

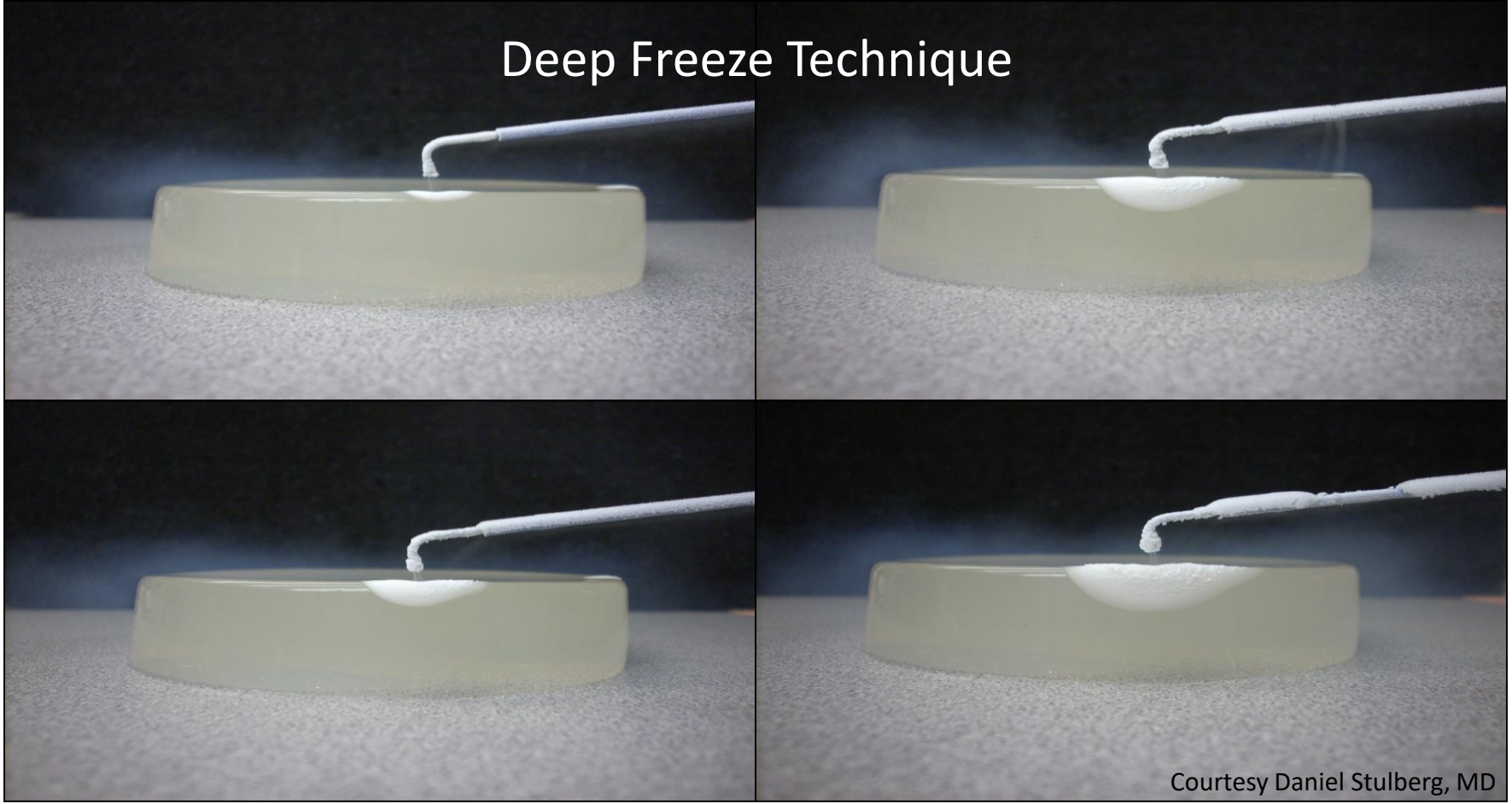
Effects

- Melanocyte death at -5 degrees C
- Keratinocyte death at -50 degrees C
- Rarely scars, but hypopigmentation can occur
- Erythema and edema in response to cell death, peaks at 24-48 hours

Controlling Freeze

- Frozen areas turn white = “freeze ball” or “ice ball”
- Depth of DEEP freeze approx. 1 X radius of freeze
- Lethal Zone
  - Tissue temp < -50 C.
  - 2-3.5 mm inward from outer margin ice ball
- Freeze 1-3 mm beyond lesion edge

Deep Freeze Technique



Courtesy Daniel Stulberg, MD

The How-To Basics

- Review different equipment
- General rules, times, “Do’s and Don’ts”

Liquid Nitrogen

- Application with cotton swab
- Dip repeatedly in cup and apply to area
- Can wrap additional cotton
- Can twist to finer point
- Tedious

Courtesy Daniel Stulberg, MD

Caveat

- Cotton tipped swabs do not deliver the liquid nitrogen at the same cold temperature as the spray

Liquid Nitrogen Spray

Courtesy Daniel Stulberg, MD

Liquid Nitrogen: Guns

Brymill Cry-Ac

10, 16 oz.
$765
12 hr. 24 hr.

Courtesy Daniel Stulberg, MD

Nitrospray – Premier

10, 16 oz.
$680
12 hr. 24 hr.

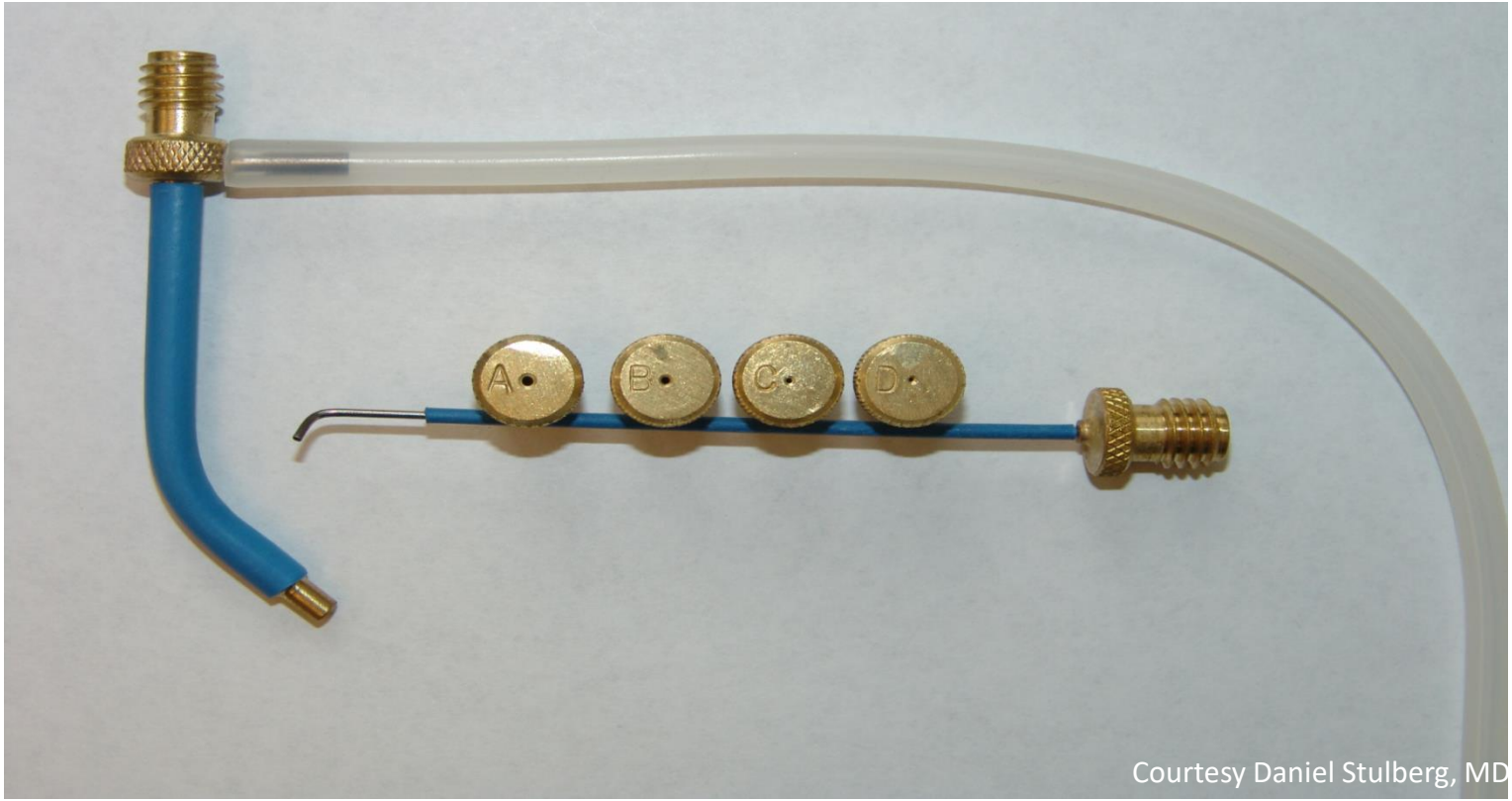
Courtesy Daniel Stulberg, MD

Wallach

10, 16 oz.
$702
24 hr.

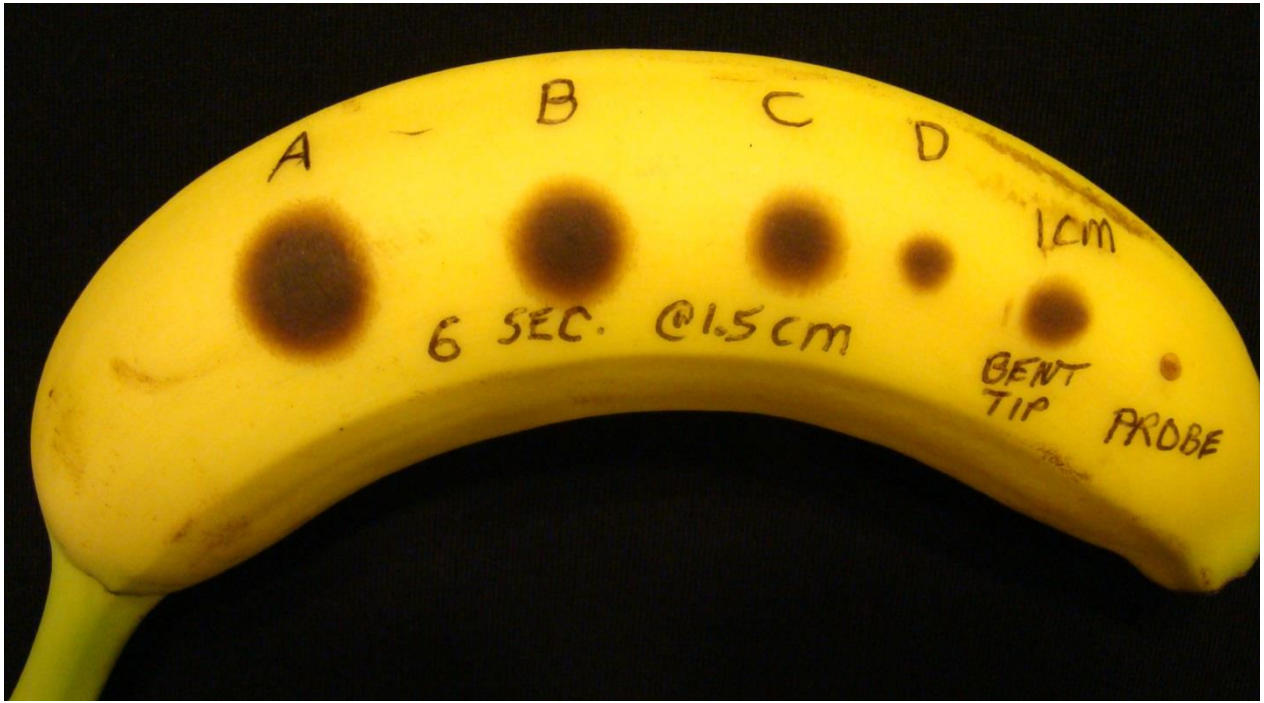
Courtesy Daniel Stulberg, MD

Tips and Apertures

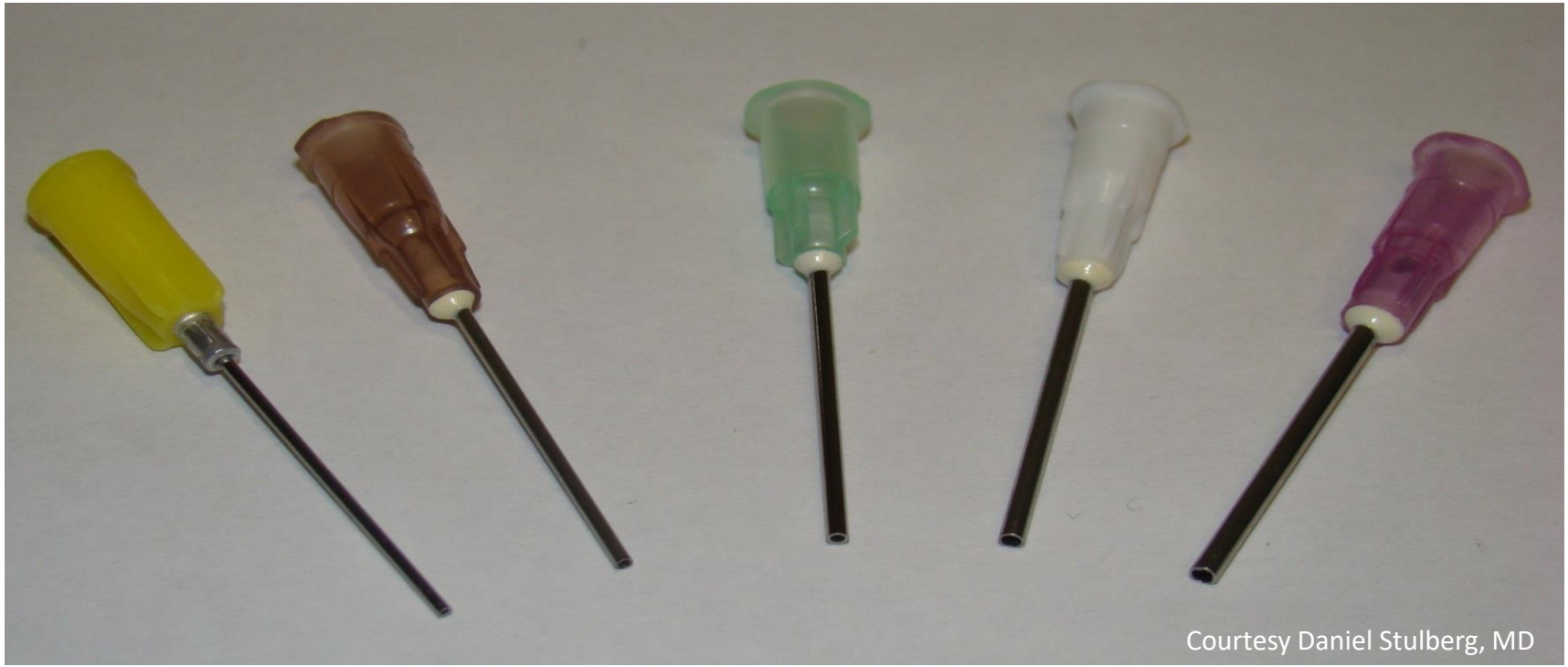


Courtesy Daniel Stulberg, MD

Tip Sizes and Effects

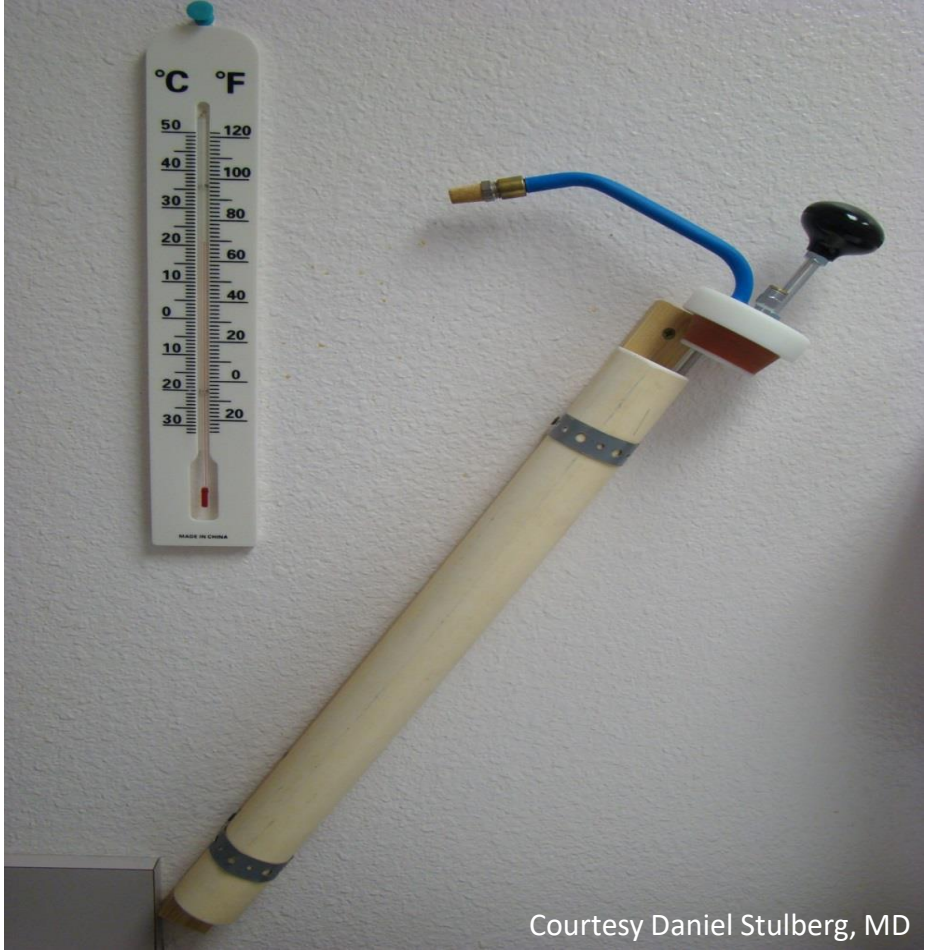


Luer Lock Tips



- Dewar - Storage container
- Fill tube - $445
- Ladle - $78
- Direct pour - Caution!!!
- Valve - $705

Courtesy Daniel Stulberg, MD



Courtesy Daniel Stulberg, MD

Courtesy Daniel Stulberg, MD

Valve System


Courtesy Daniel Stulberg, MD


Courtesy Daniel Stulberg, MD

Liquid Nitrogen: Tanks

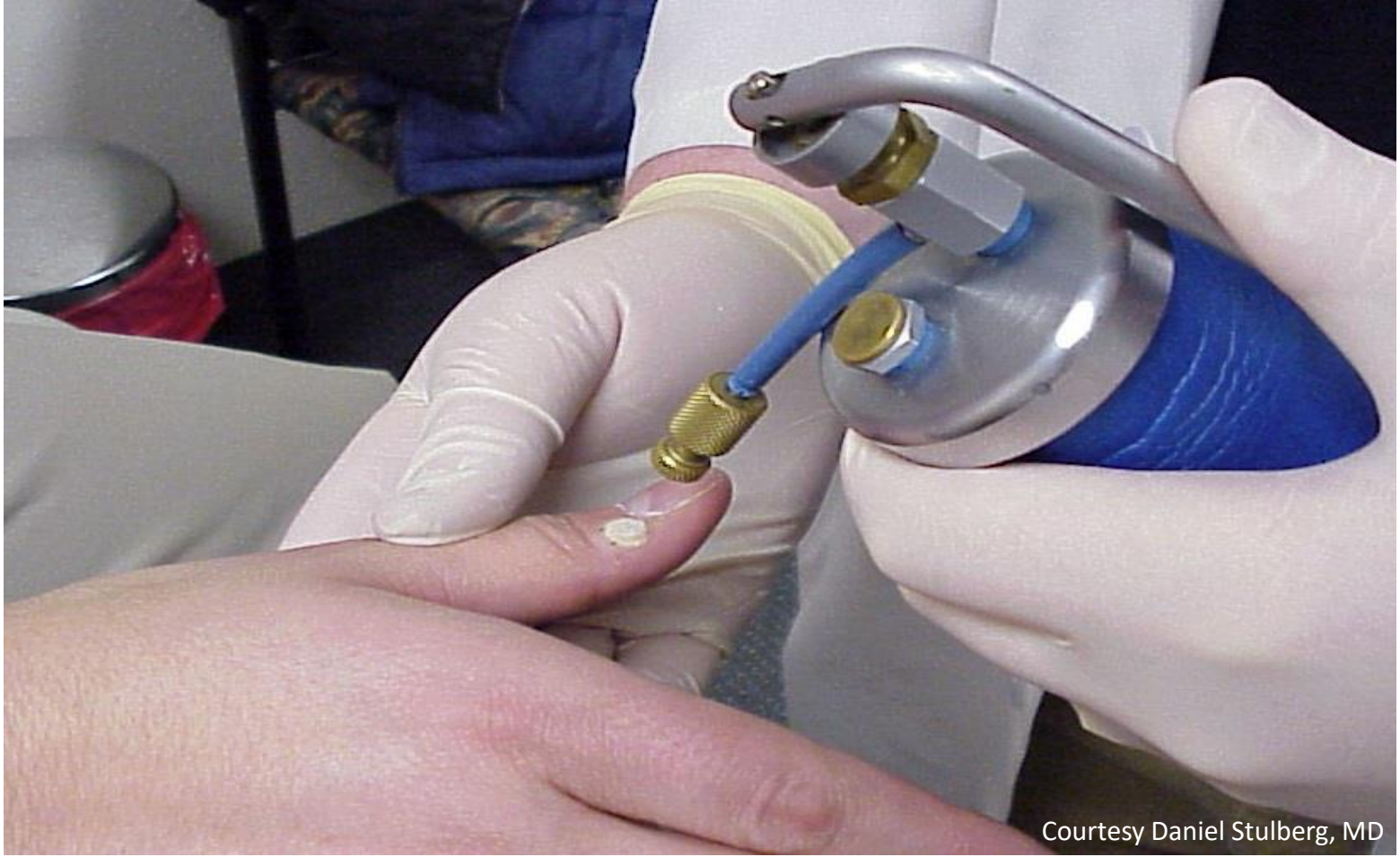
- Storage tanks = Dewar
- Delasco.com (one example 2015) online pricing
  - 5 L $643
  - 20 L $880
  - 50 L $1420
  - $40-60 to fill
- Some have 360-day holding time

Liquid Nitrogen Generator

- $9,500 produces and stores 1 liter in 3 hours
- $13,500 produces 8 liters/day and auto transfers to Dewar
- http://homemadeliquidnitrogen.com/

Spray Technique - Liquid Nitrogen

- Place tip of Cryogun about 1-2 cm from lesion
- Directed perpendicular to treatment site
- Observe time, ice ball and halo diameter
- Freeze time
  - not start of spray
  - start once frozen


Courtesy Daniel Stulberg, MD

Spray Techniques - Finer Points

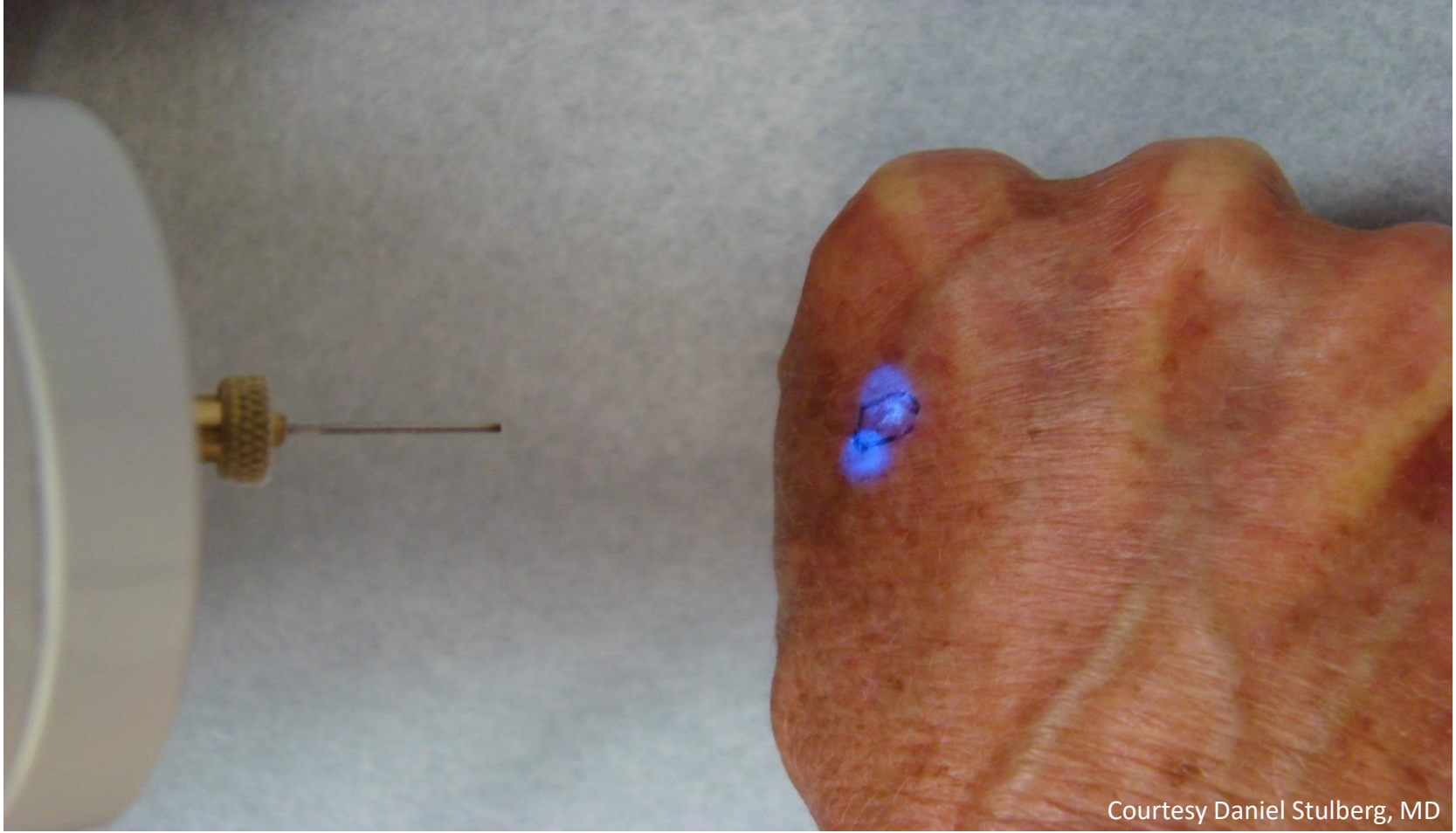
- Continuous spray
- Pulse spray – for deeper freeze
- Spiral
- Back and forth
- Spray shield – commercial or improvised

Using Spray Shield

Courtesy Daniel Stulberg, MD

Cry-Ac Tracker

- Infrared temperature sensing
- Blue
- Green
- Red



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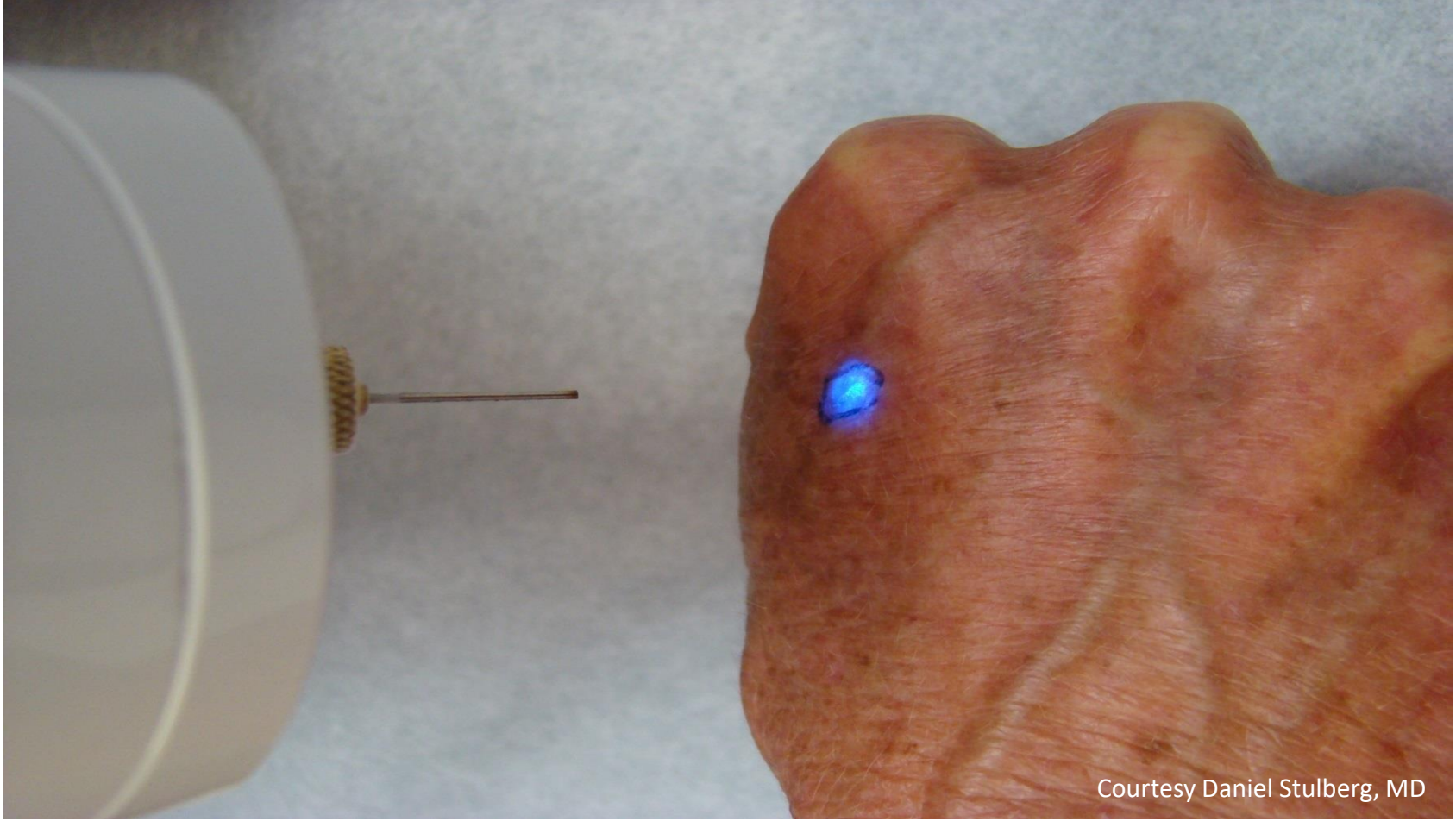
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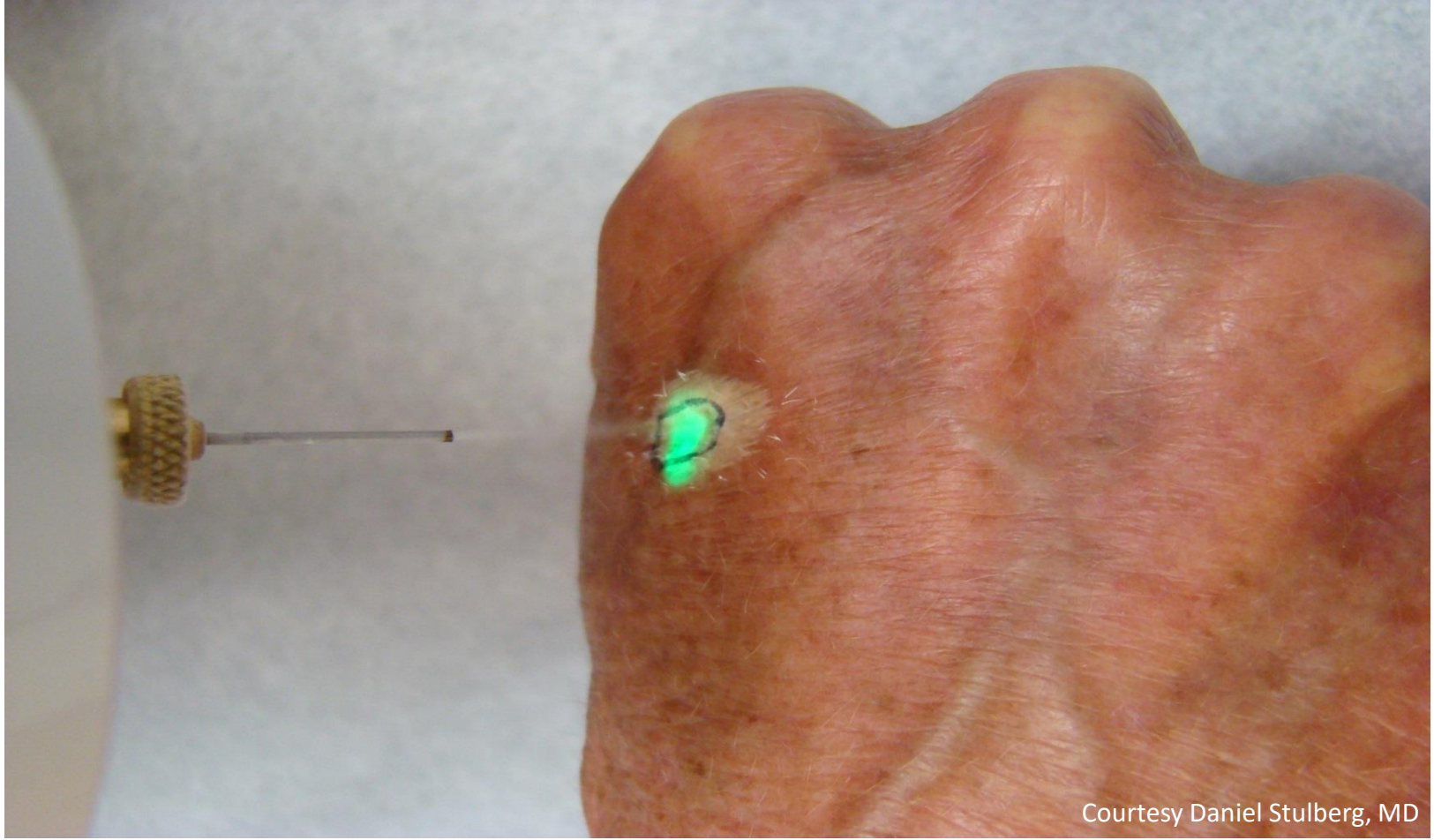

Courtesy Daniel Stulberg, MD

Courtesy Daniel Stulberg, MD

Compressed Gas

- Akin to air conditioning
- Cold transmitted through probe placed in direct contact with skin

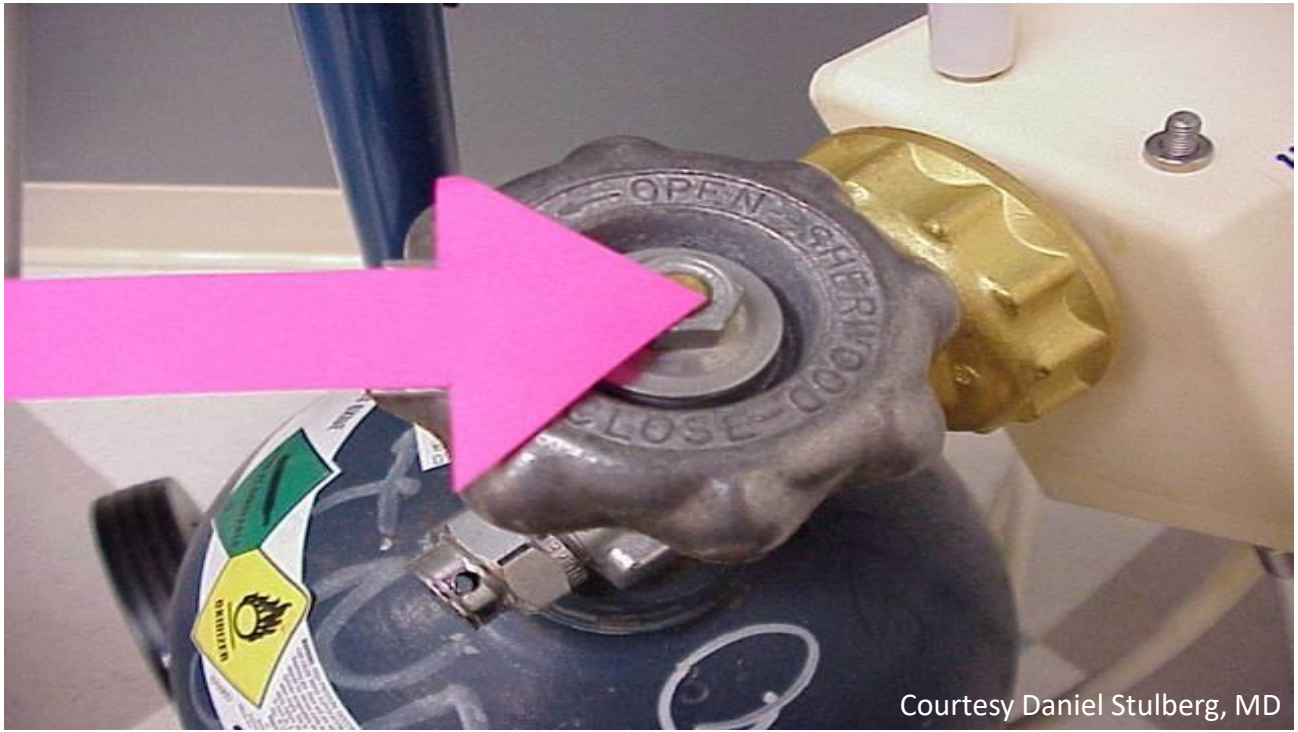
Nitrous Oxide or Carbon Dioxide

- Less cold than Liquid Nitrogen
  - need longer freeze
- Equipment needed
  - cryotherapy unit with gun, tips, tank, regulator and evacuator tube ($1500-2500, tank refill $85 with prescription General Air)
- Can be used for cervical cryotherapy

Cryo-Unit With Compressed Nitrous Oxide

Courtesy Daniel Stulberg, MD

Valve Off to Prevent Bleeding

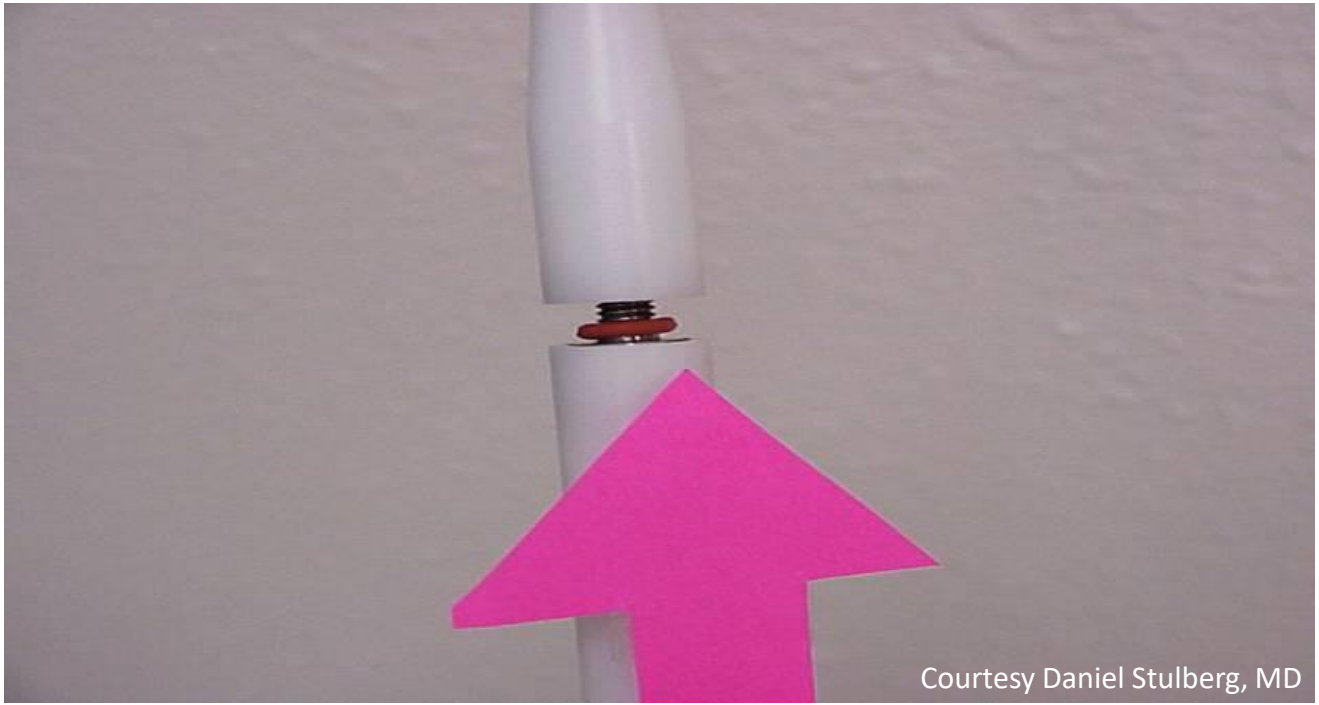


Courtesy Daniel Stulberg, MD

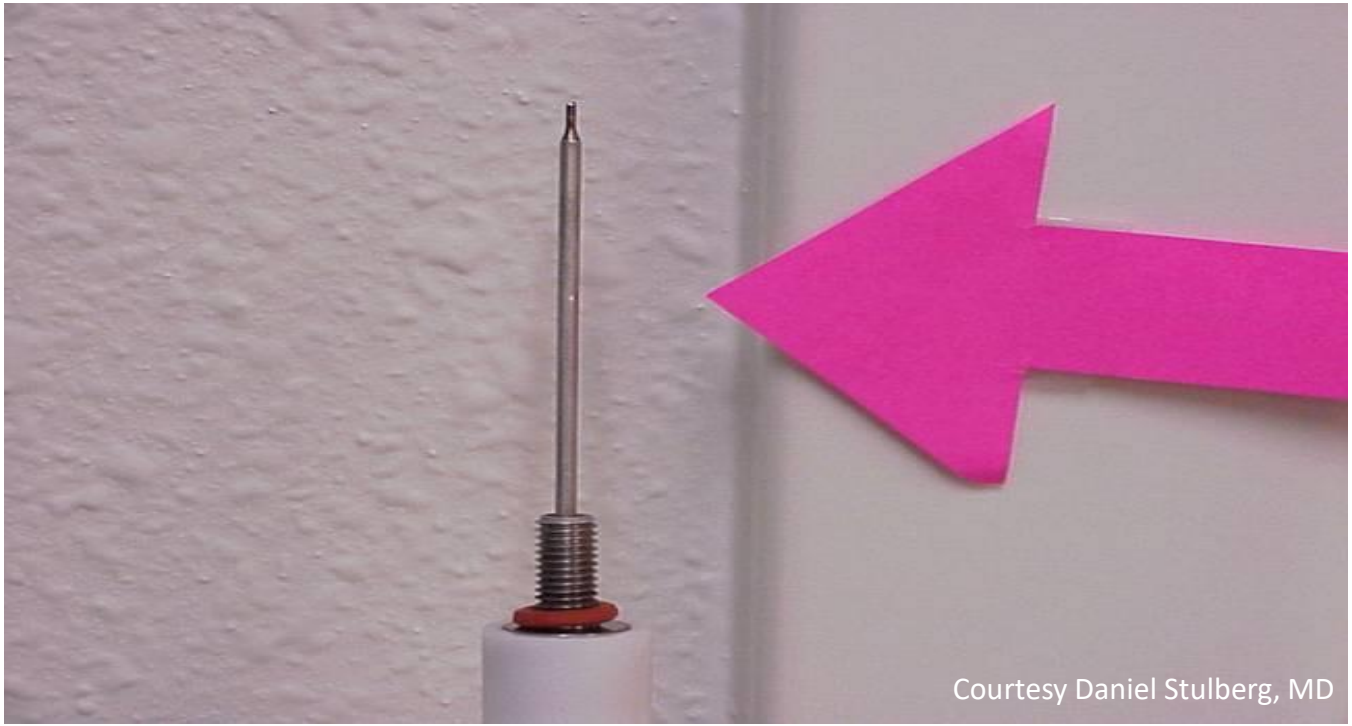
Pressure Check

Courtesy Daniel Stulberg, MD

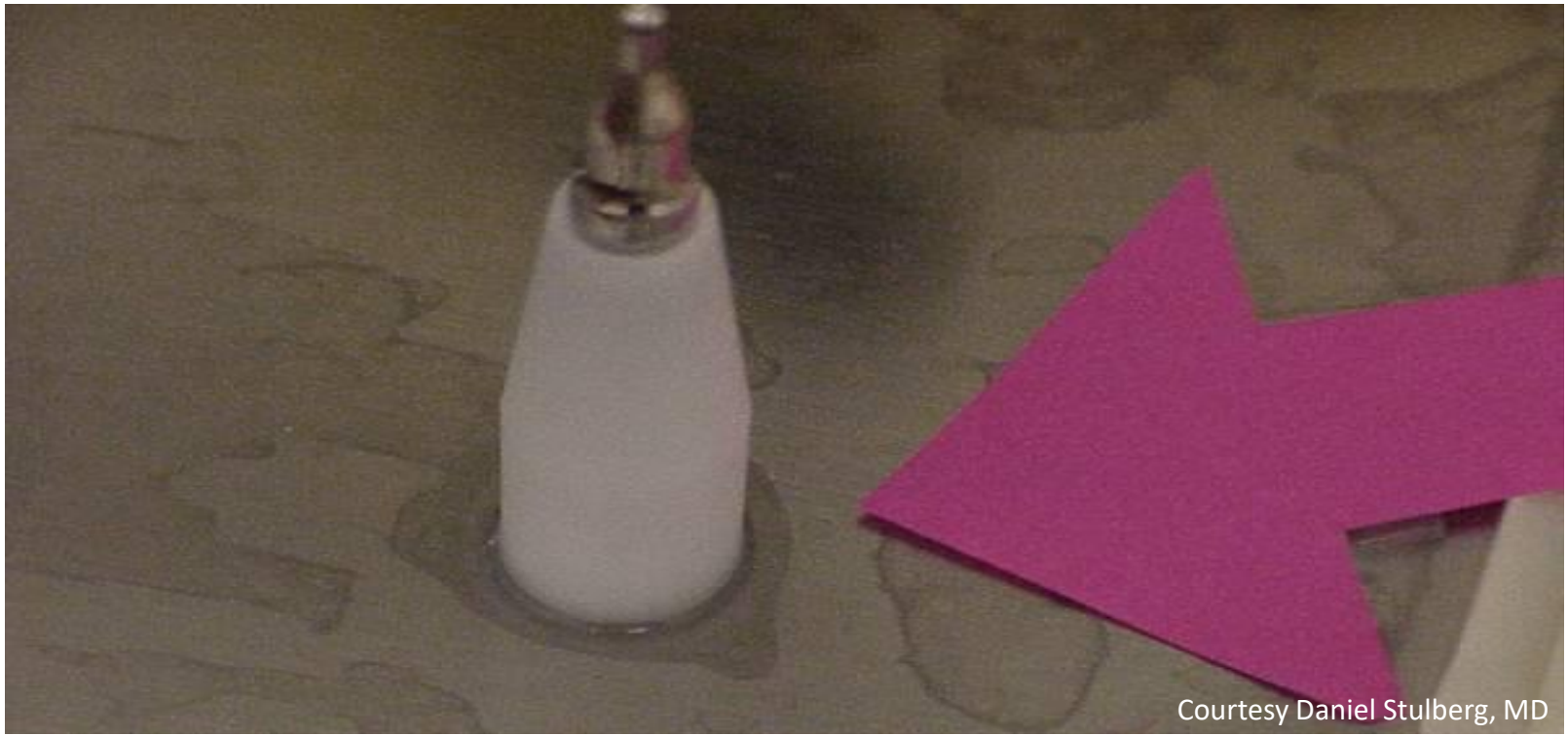
Washer With Changing Tips



Fragile and Expensive to Repair



Know cleaning methods for your unit



Courtesy Daniel Stulberg, MD

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Multiple Tip Sizes

Nitrous Oxide Cryo-gun - Method

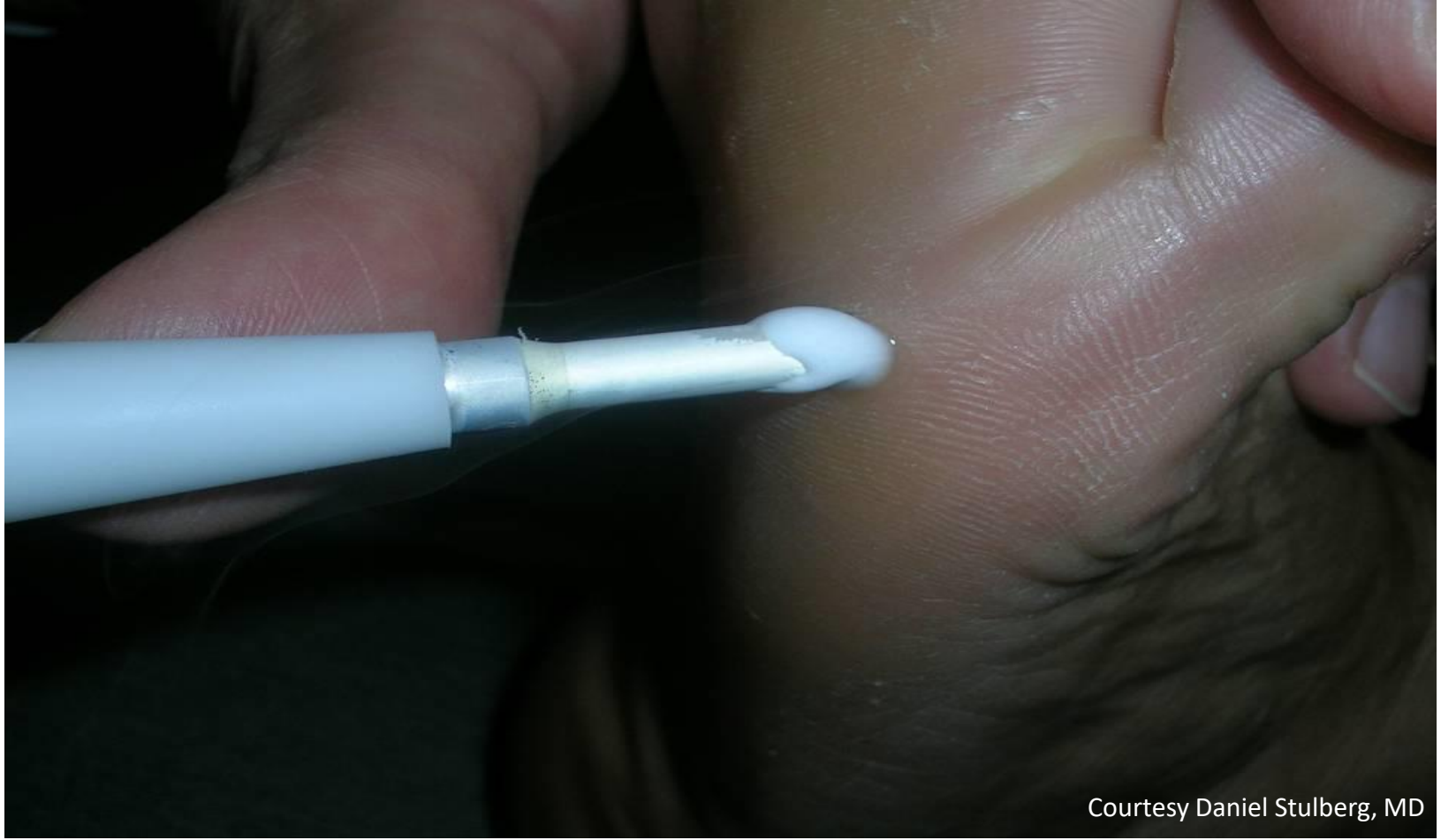
- Select tip with size and shape corresponding to the lesion
- Avoid geometric patterns
- Place thin layer of water soluble gel on lesion or tip

Nitrous Oxide

- Lower tip to surface while still room temp, activate (pull trigger and hold)
- When ice ball forms, place traction on skin to confirm solid freeze
- Let tip fully thaw before removal – Quick release function
- Freeze times are longer for nitrous oxide than liquid N_2

Nitrous Oxide

- Freeze - thaw - freeze cycle is recommended
- Second freeze - usually lesser duration than first
- “Round robin” pattern if multiple lesions
- Total approximate freeze time
  - superficial lesions: 15-30 sec (SK and AK)
  - full thickness benign: 15-45 sec
  - wart (after keratin removed): 30-45 sec
  - Avoid as treatment of skin cancer



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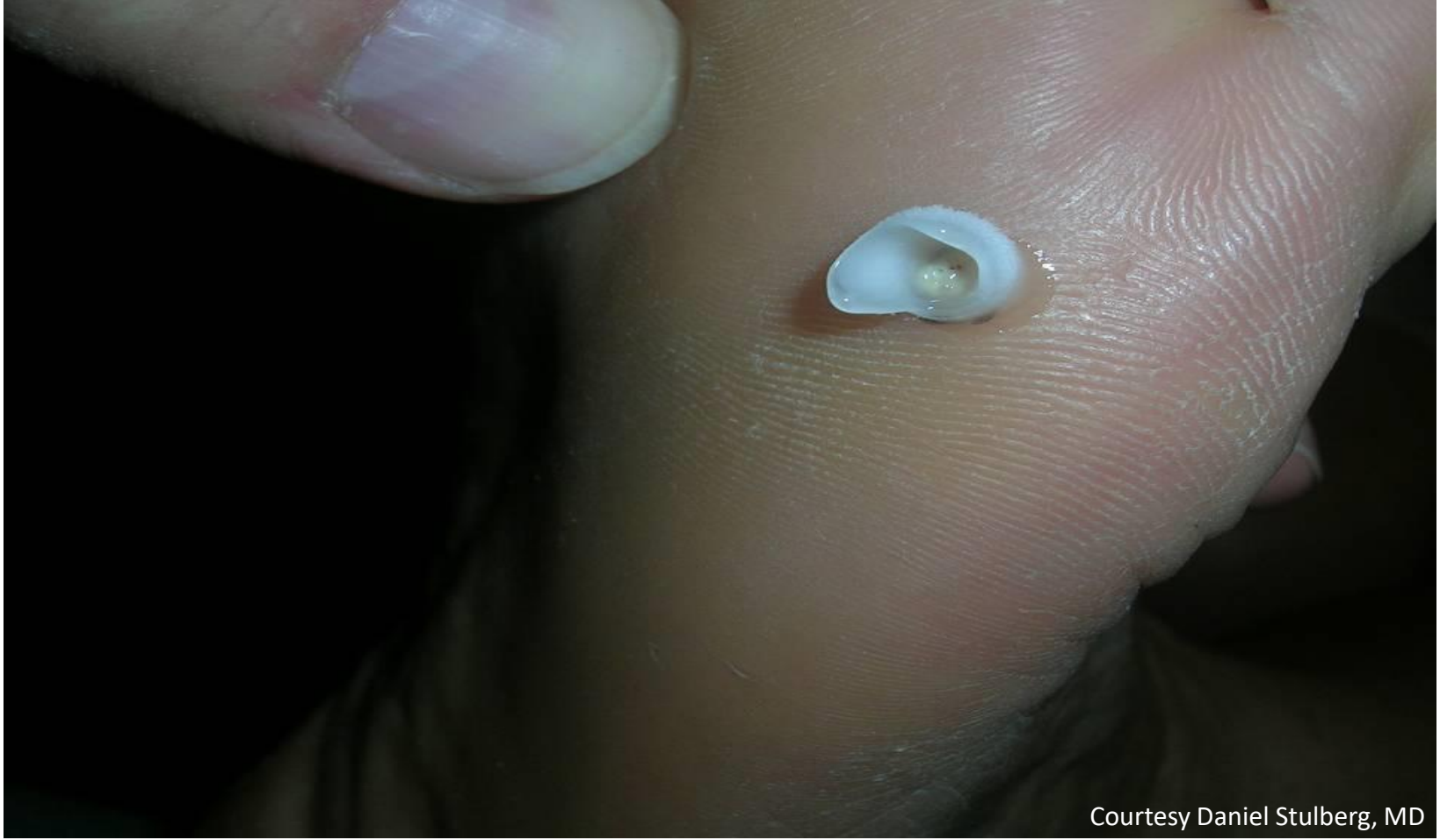

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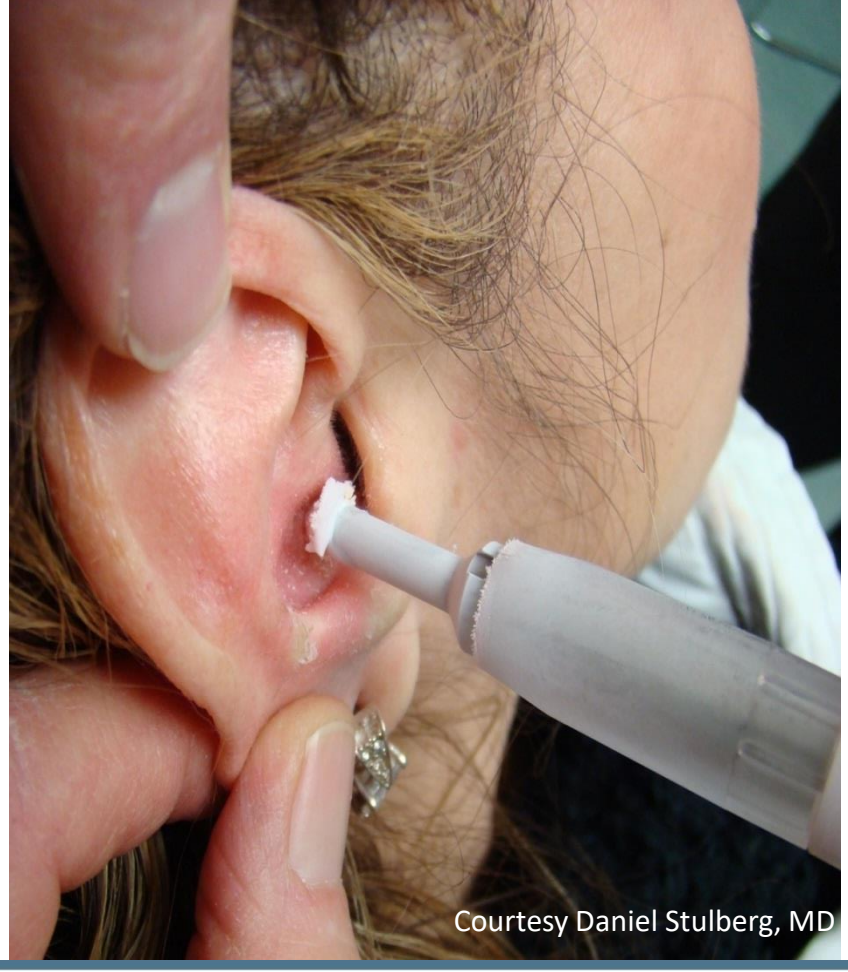
Courtesy Daniel Stulberg, MD

Cervical Cryotherapy Brief Notes

- Large flat tips
- 3-5-3 minutes or 5 mm Ice ball
- Avoid freezing vaginal sidewalls
- Higher recurrence in multiquadrant disease

Nitrous Oxide

- Oct 1992 NEJM study of women dental assistants exposed to five or more hours of N_2O per week had reduced fertility and increased miscarriage
- Use scavenger tube to safely vent the exhaust N_2O outside from treatment area if small room or prolonged use

Refrigerant Spray

Courtesy Daniel Stulberg, MD

Refrigerant Spray

- Histo-Freeze, Verruca-Freeze, Ice Out
  - Evaporate at -70 degrees C
- OTC (Wartner) Dimethyl-ether and propane
  - Evaporate at -57 degrees C

Refrigerant Spray

- Advantages
  - no storage tank
  - initial cost low ~$269
  - very portable for off site use
- Disadvantages
  - longer freeze times
  - not good for malignant lesions

Refrigerant Spray - Technique

- Choose a speculum cone the size of lesion
- Press speculum firmly around lesion
- Spray enough refrigerant to fill speculum 1/8 to 1/4 inch
- Allow to evaporate – 20-25 sec

Courtesy Daniel Stulberg, MD

Refrigerant Spray - Technique

- CAUTION - Hold cone steadily and firmly or the chemical will run out away from the lesion
- Also can use swab adapter


Courtesy Daniel Stulberg, MD

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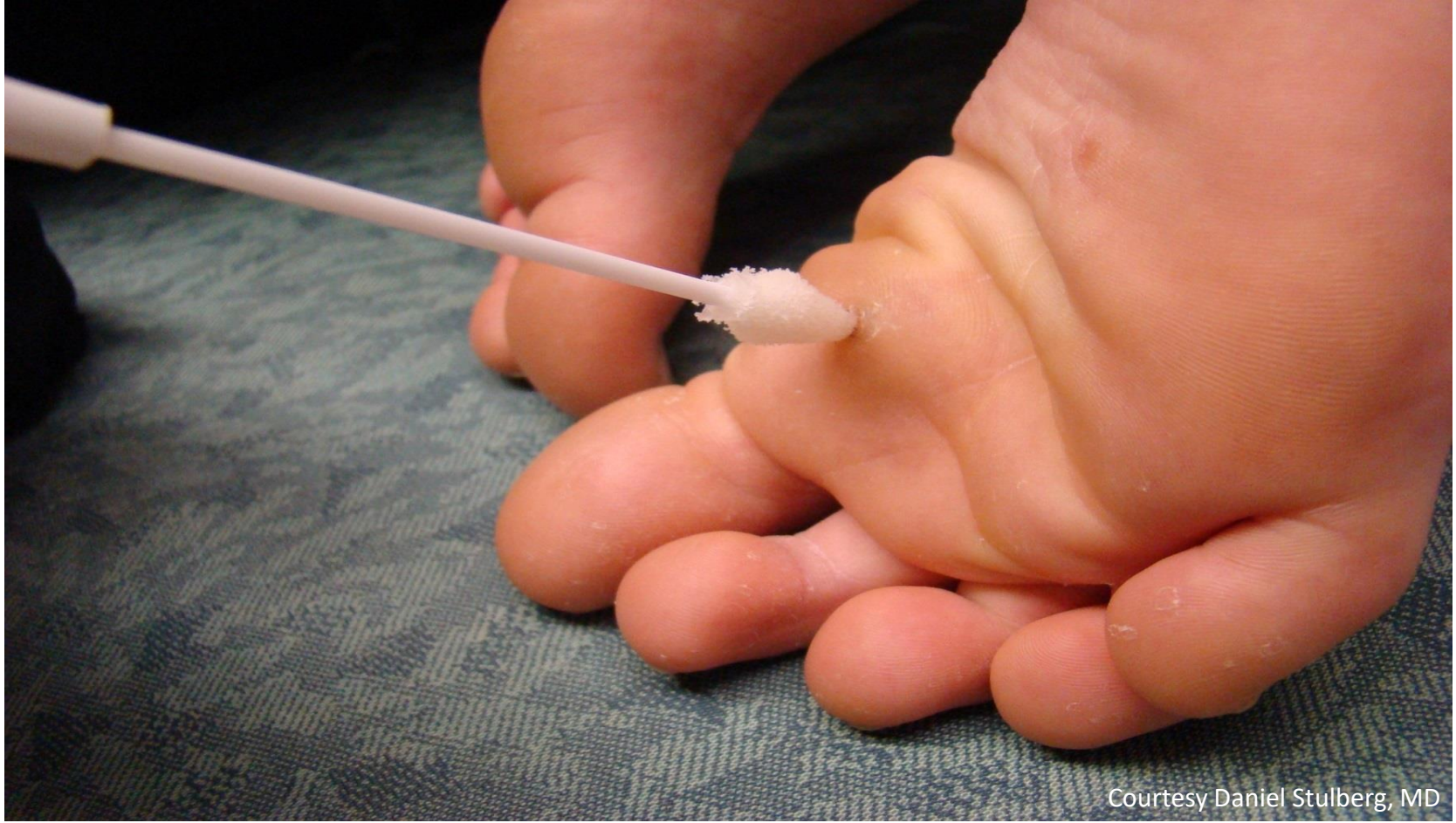
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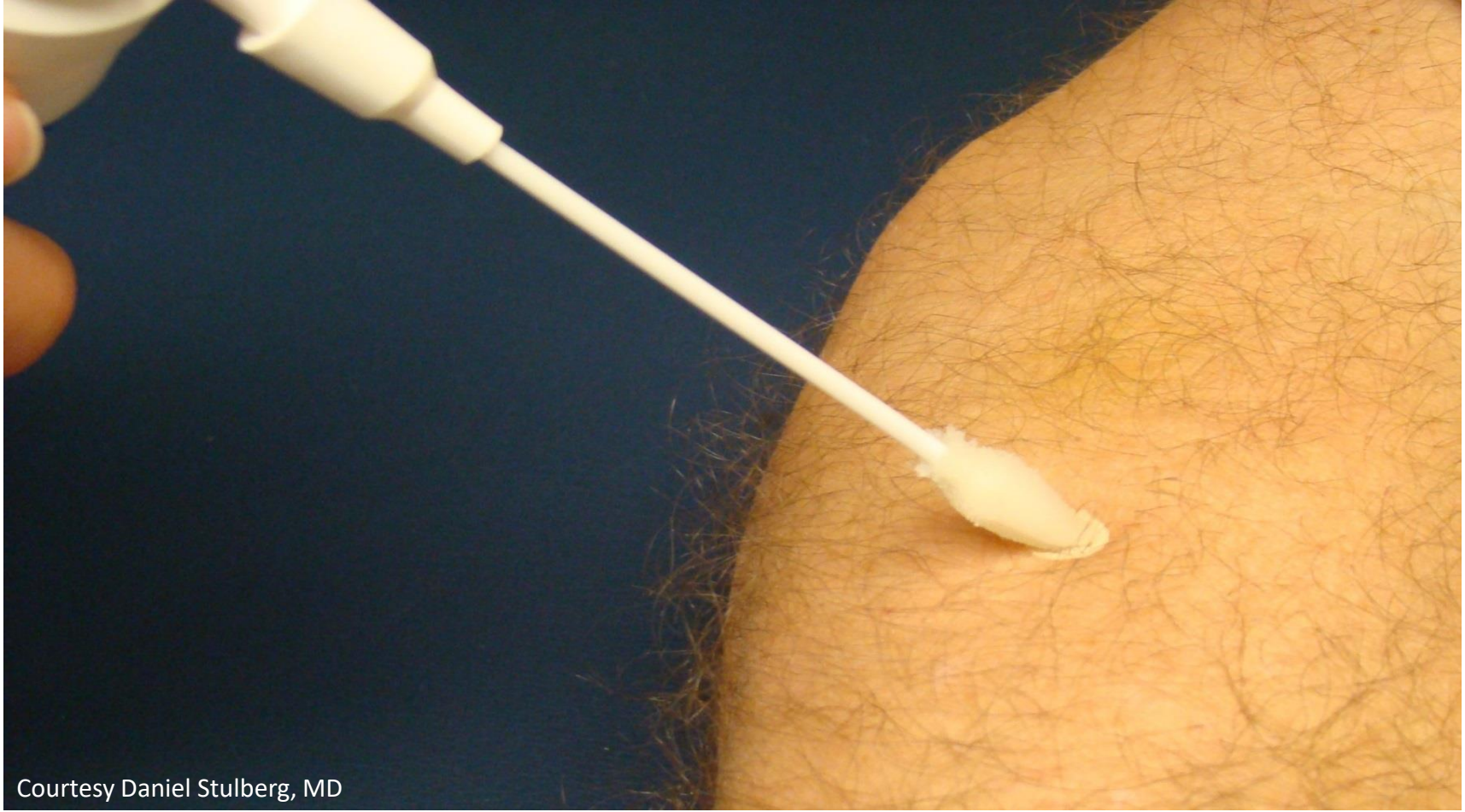


Courtesy Daniel Stulberg, MD

OTC Cryo Units

Courtesy Daniel Stulberg, MD

Courtesy Daniel Stulberg, MD

Wartner

- Slide desired foam tip onto applicator
- Push into dispenser for 2-3 seconds
- Apply to common warts for 20 seconds
- Apply to plantar warts for 40 seconds
- Less time for smaller lesions
- ?70% success rate

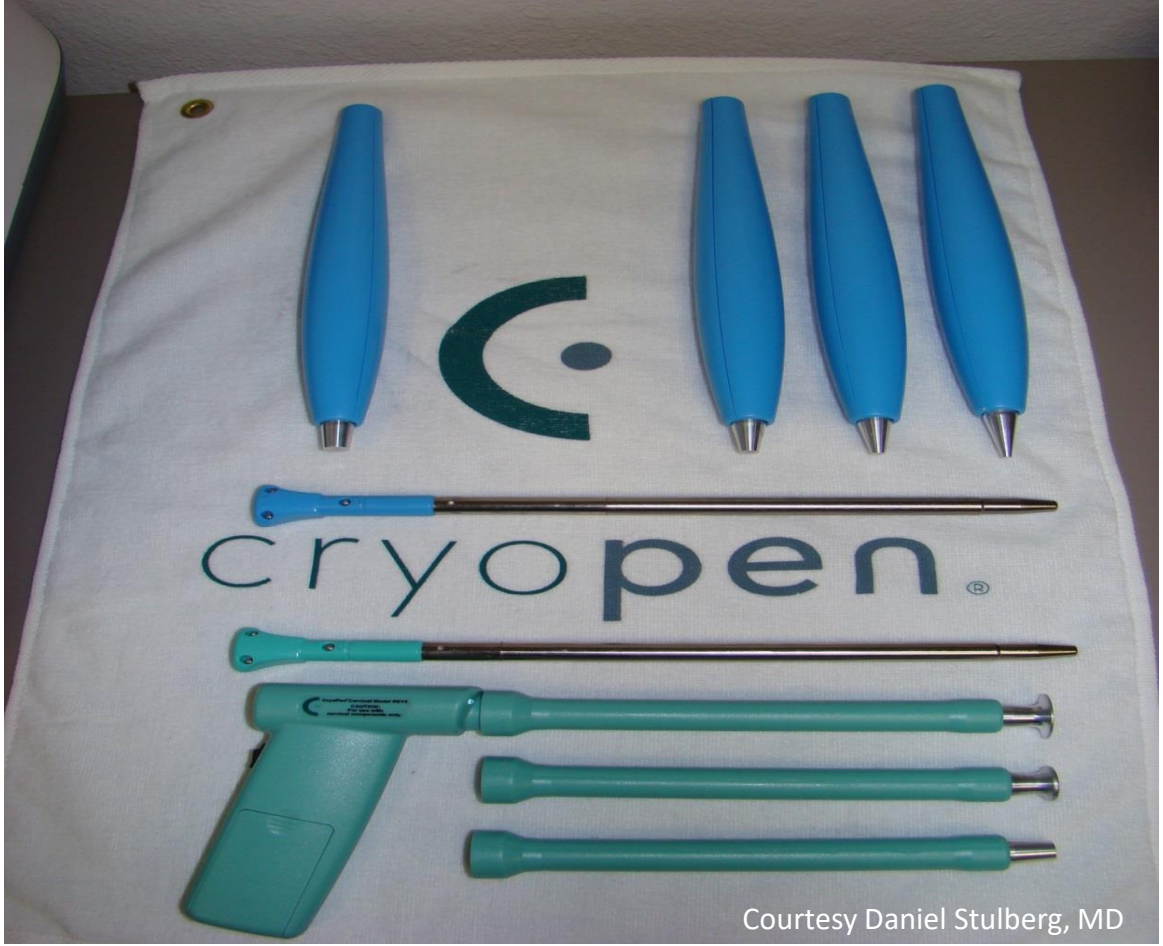
2013 Non scientific review of Amazon

CryoPen - Electric

Courtesy Daniel Stulberg, MD

CryoPen

- Check probe for adequate temperature
- Insert core into Pen
- Apply to lesion till 1-3 mm ice ball
- Can use KY jelly if very dry or verrucous
- Insert core into alcohol before returning to chill well



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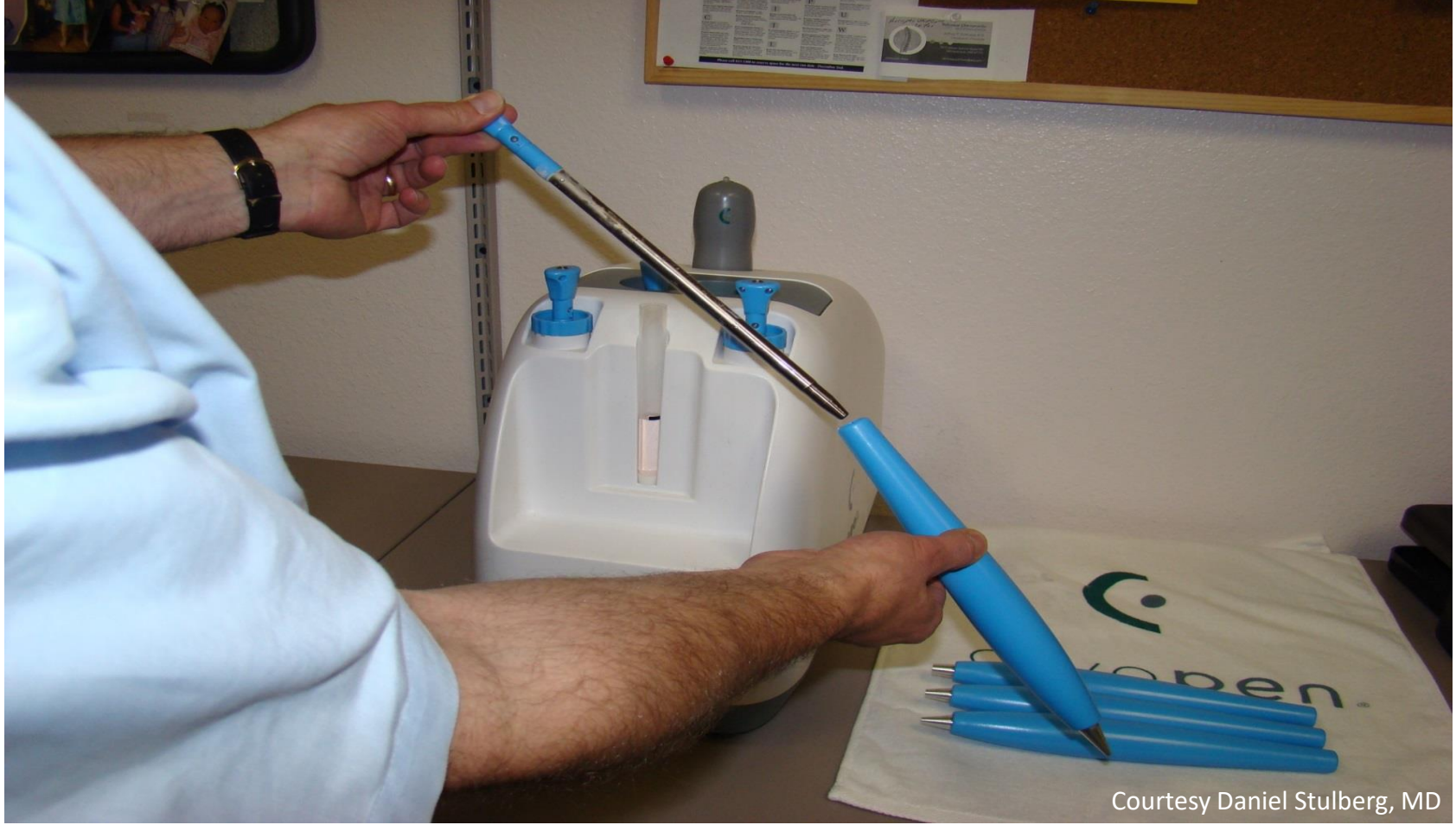

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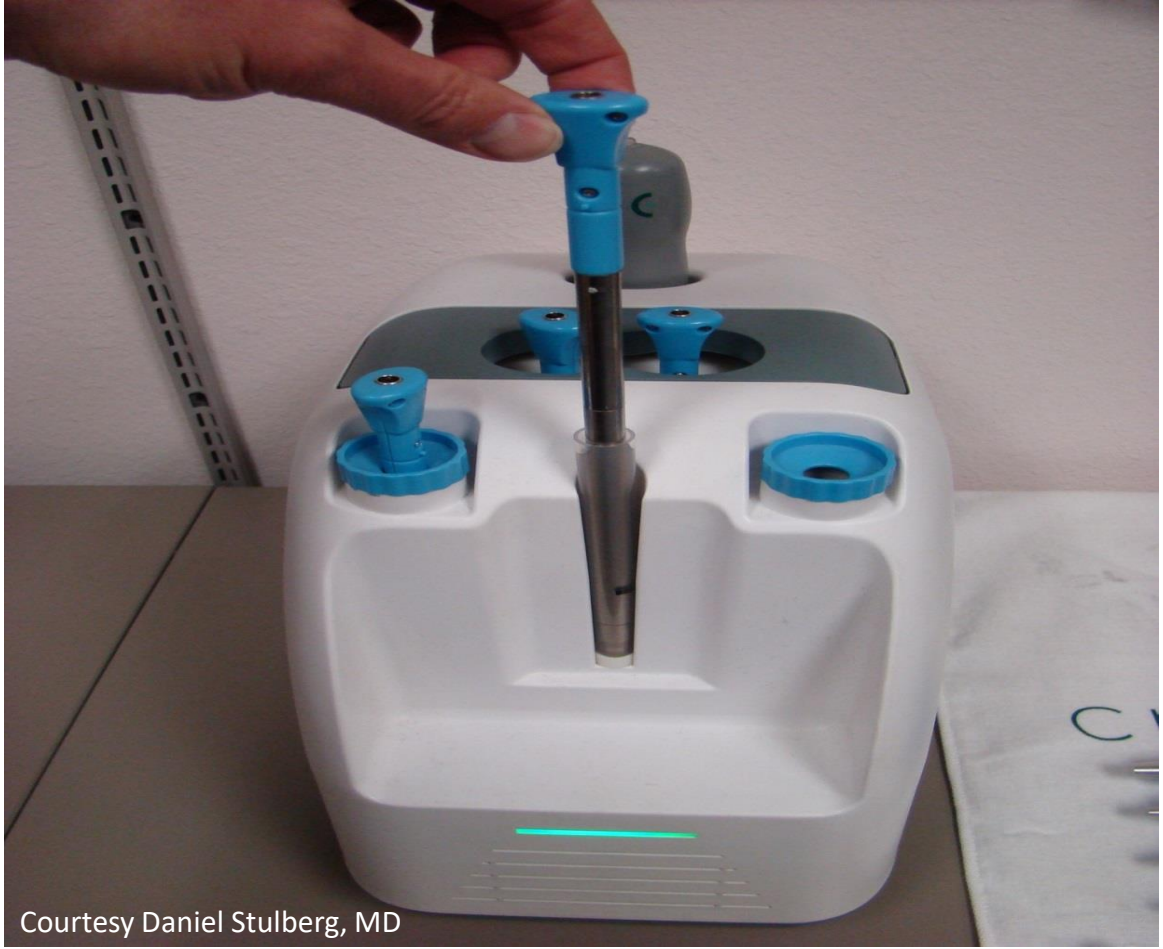


Courtesy Daniel Stulberg, MD

CryoProbe

- CryoProbe
- Model B $1,295
- Model C $1,995 includes starter cartridges
- Model X $2,995 includes starter cartridges

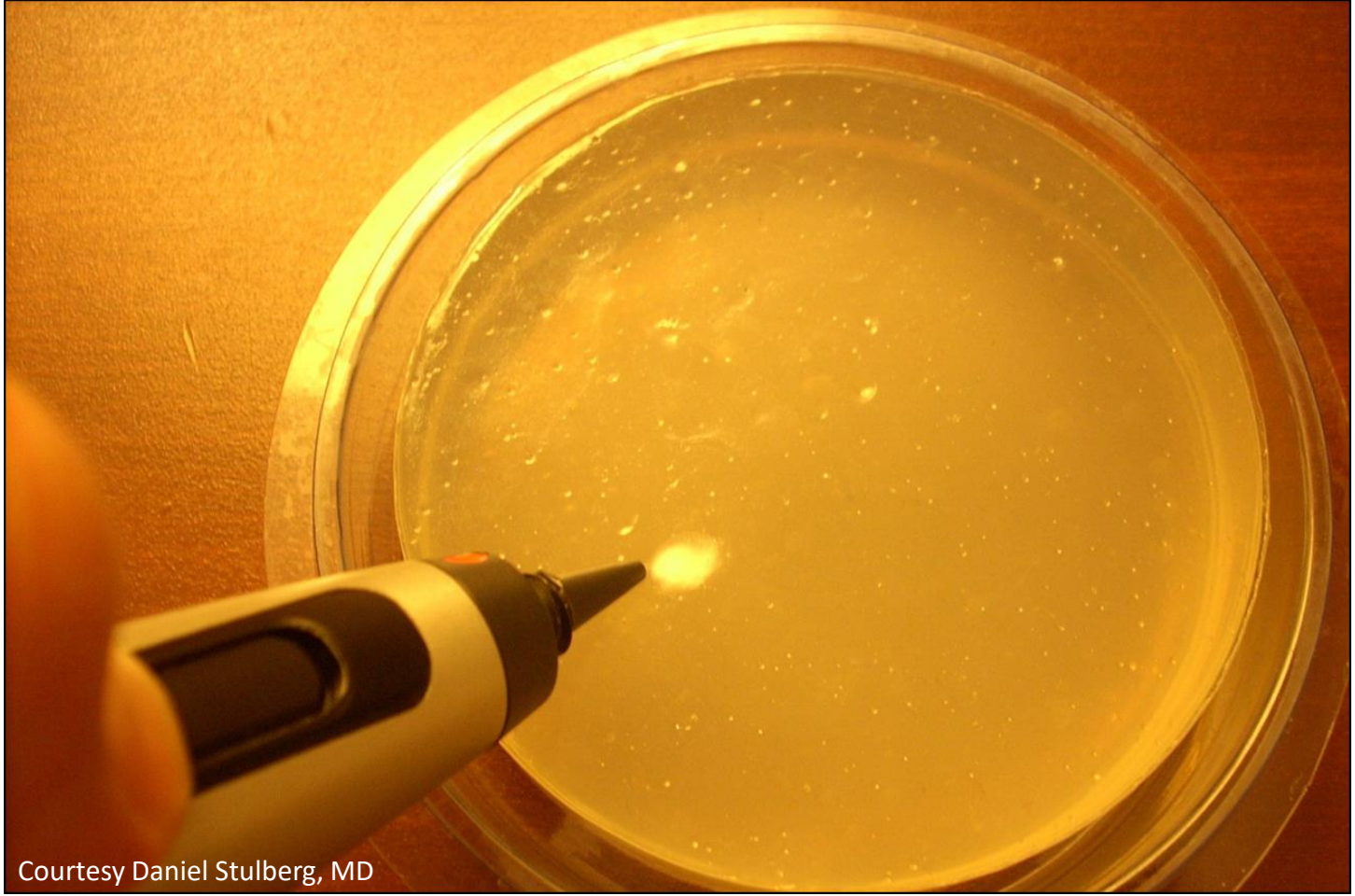
Courtesy Daniel Stulberg, MD

Nitrous Oxide Cartridges

Tips:

Blue	1-3 mm Spray
White	3-8 mm Spray
Green	6-12 mm Spray

Courtesy Daniel Stulberg, MD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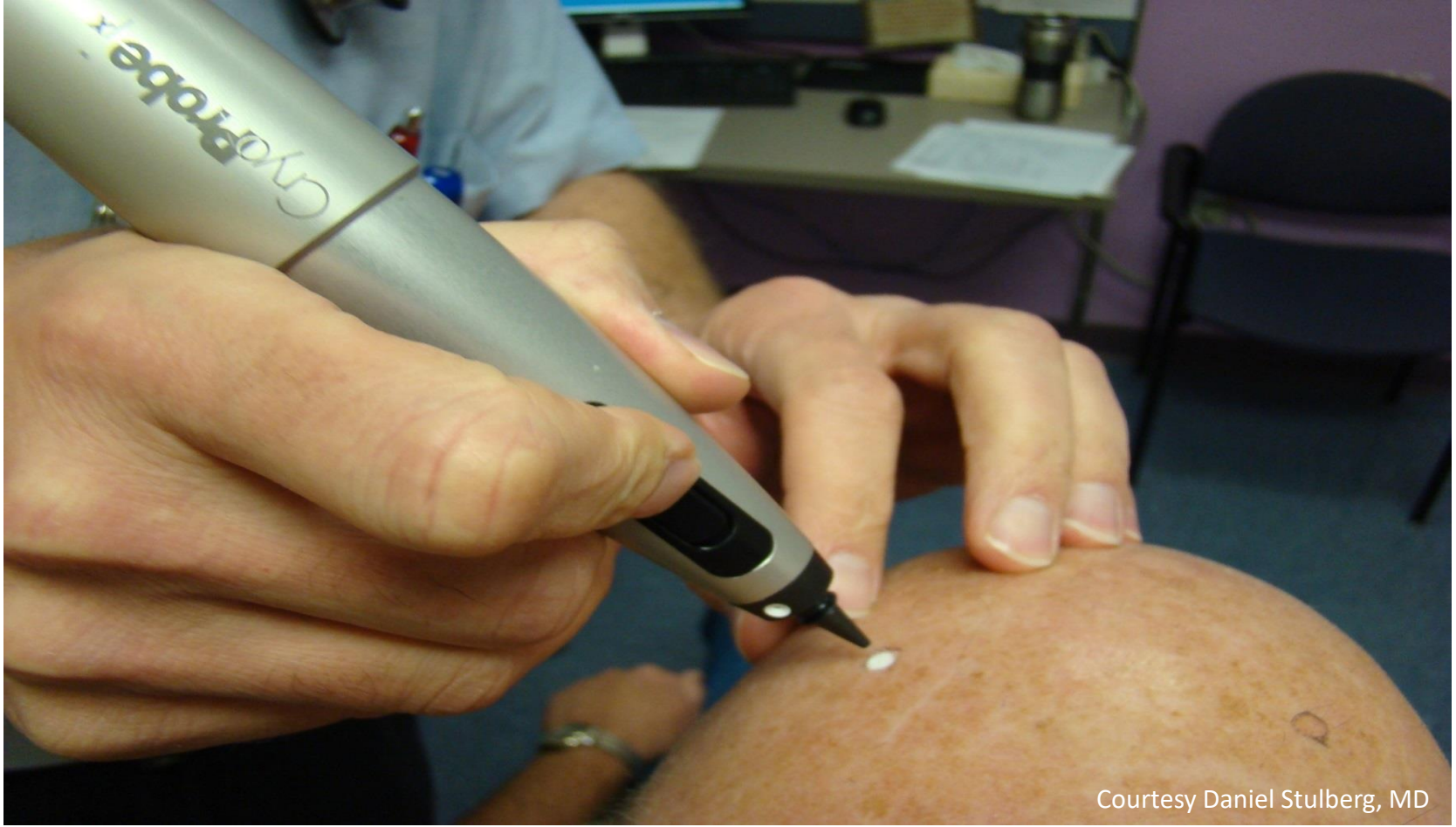

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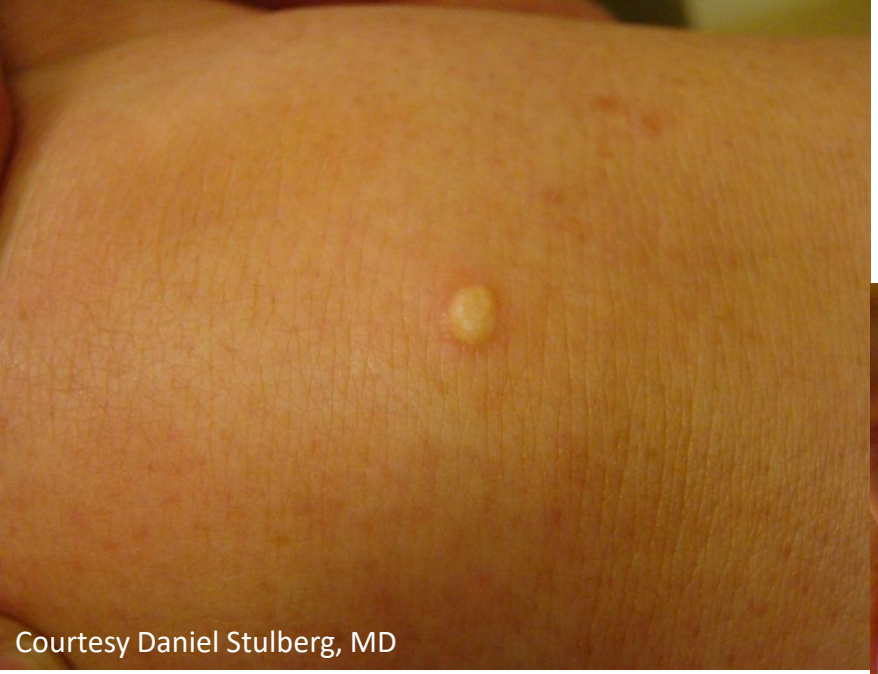

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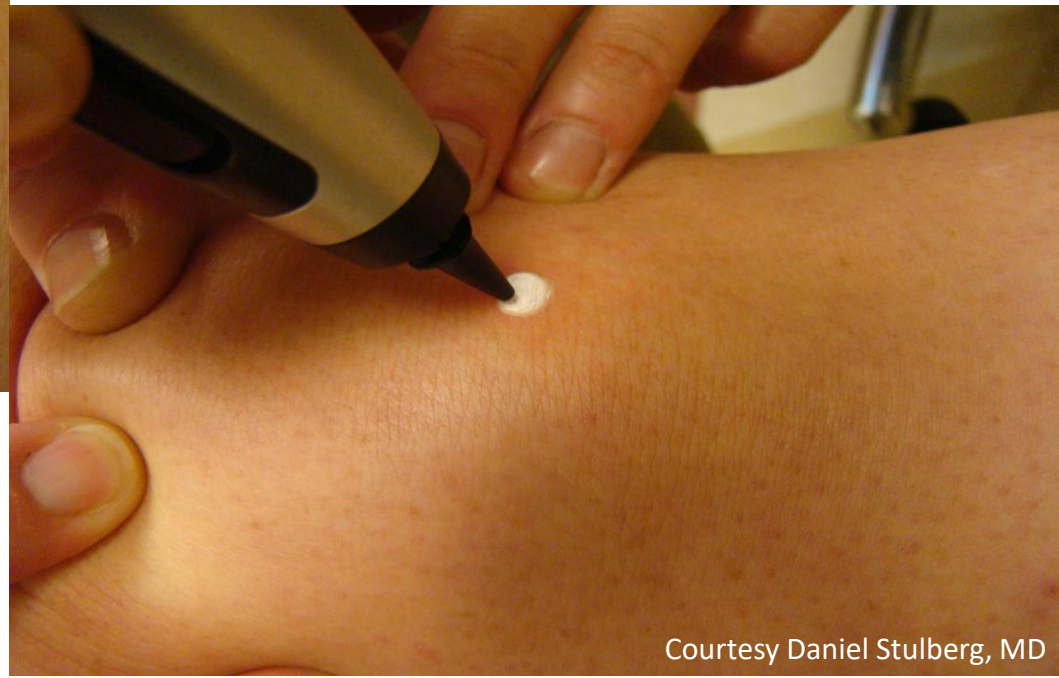


Courtesy Daniel Stulberg, MD

CryoProbe - Tips for Usage

- Hold vertically
- Start high then lower to focus
- Freeze only to margin of lesion
- Freeze sides of tags

CryoProbe - Tips for Usage (Cont.)

• AKs	10 sec	x2
• Seb. Hyperplasia	10 sec	x2
• Cherry angiomas	10 sec	x1
• Lentigos	6 sec	x1
• Tags	by size	x1
• Warts	5 sec/mm of depth	

Disposable nitrous oxide spray

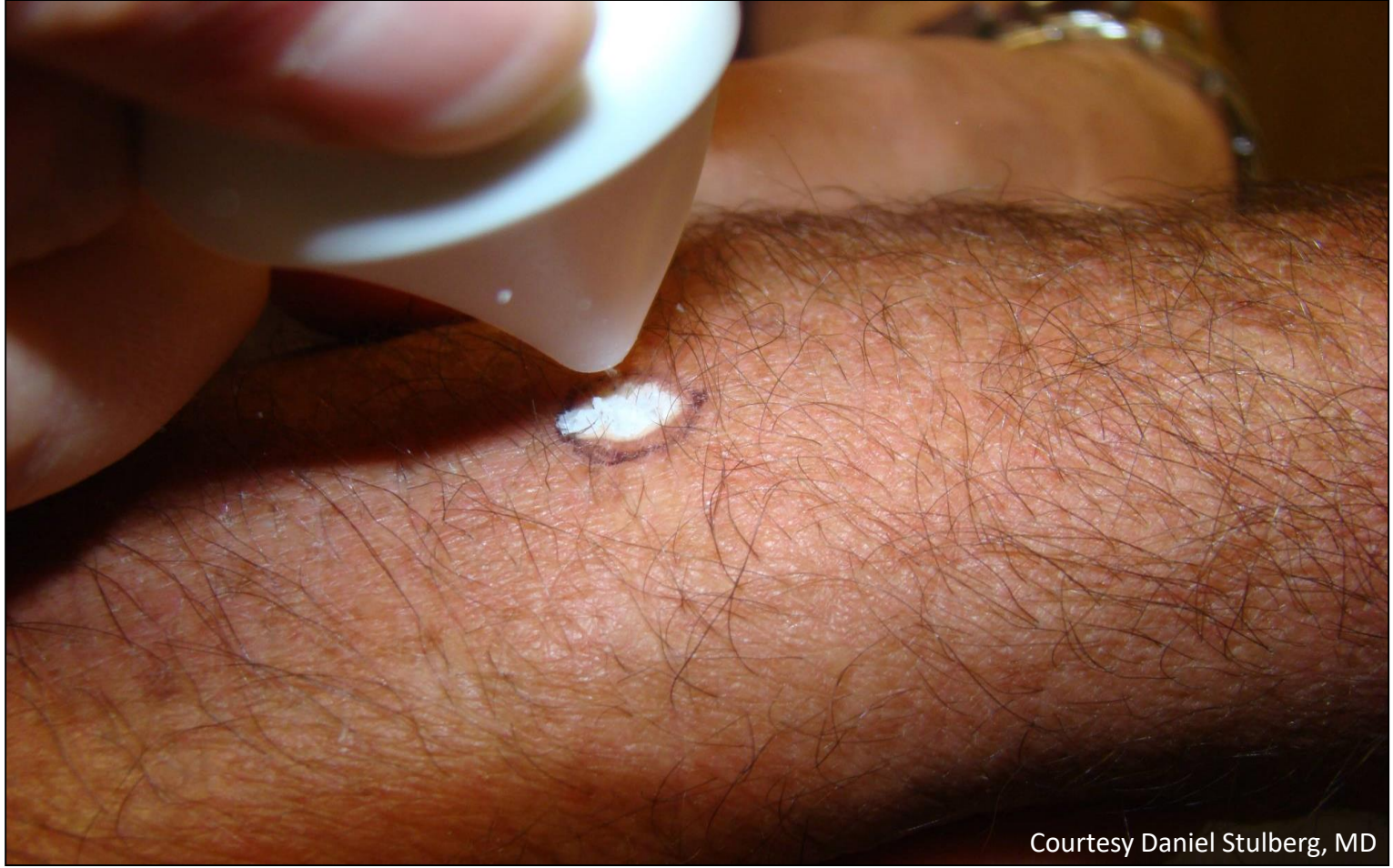
- CryOmega
- Freezpoint
- 95 degrees C
- 30-45 sprays of 5 seconds
- $340 Delasco.com

Freezpoint

ourtesy Daniel Stulberg, MD

Cryomega

Courtesy Daniel Stulberg, MD

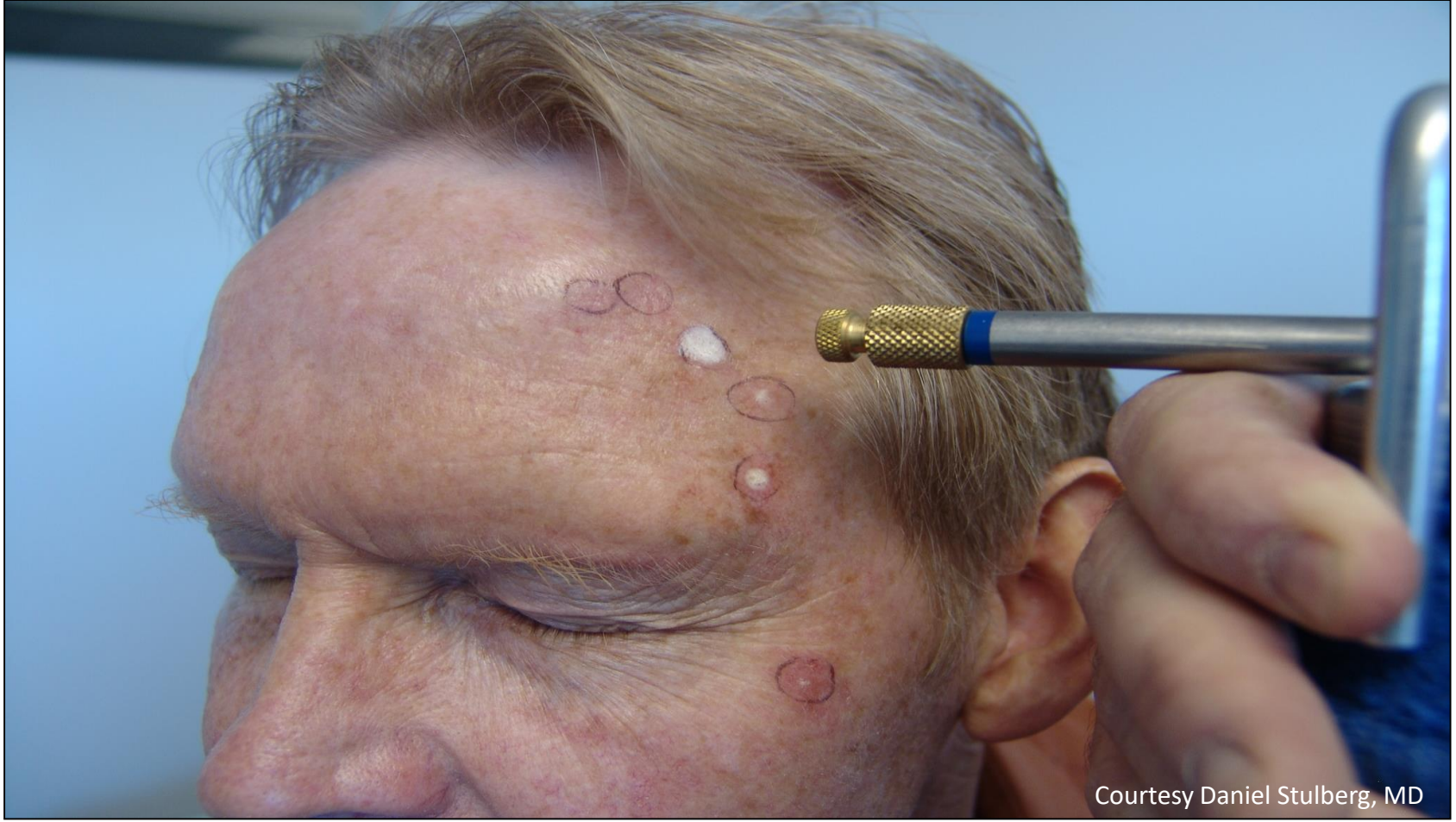

Courtesy Daniel Stulberg, MD

When to Use Cryosurgery

AKs

- Destruction of Actinic Keratoses is the most commonly performed dermatologic procedure

- AHRQ Systematic review of the literature - “analysis of data from the National Ambulatory Medical Care Survey”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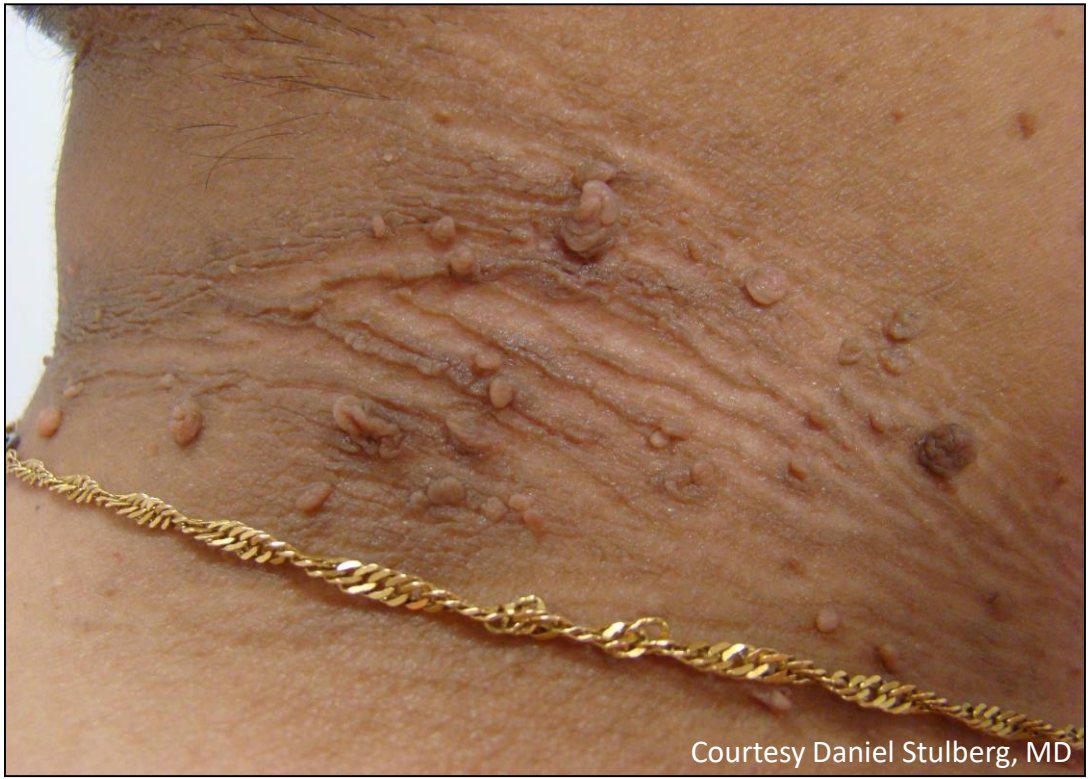
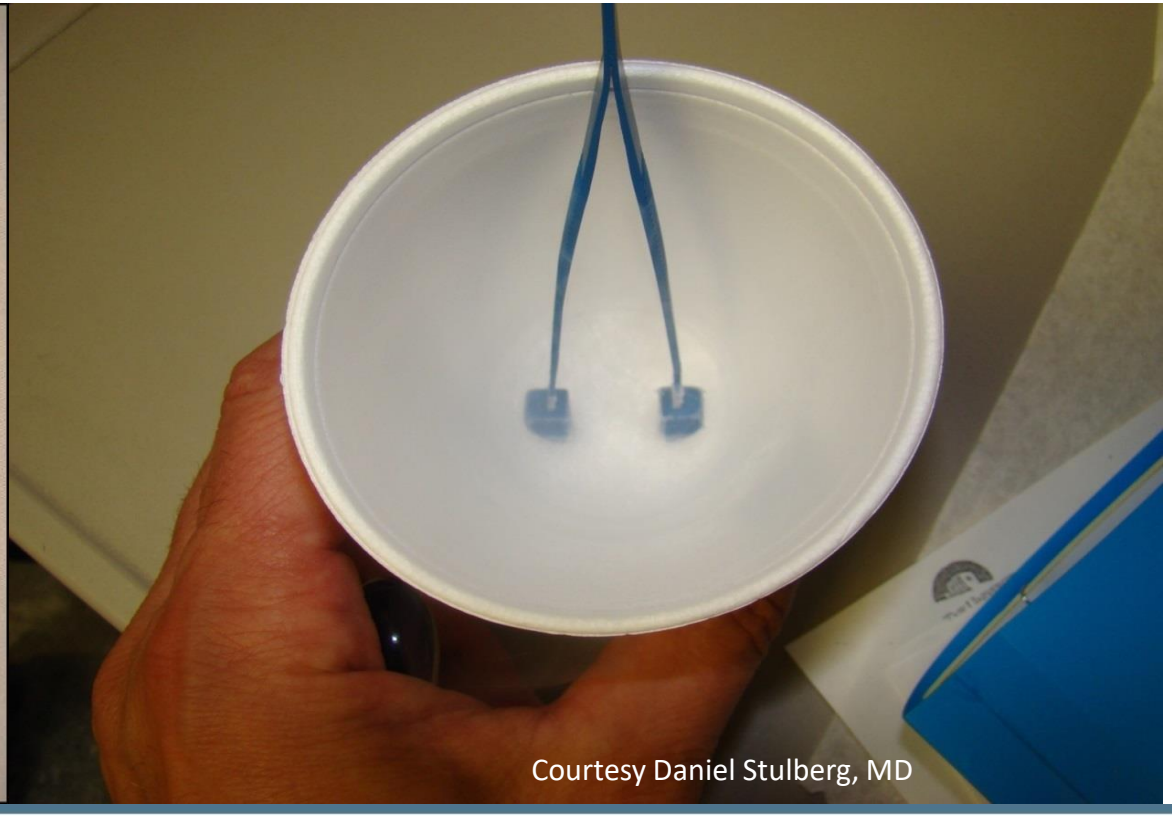
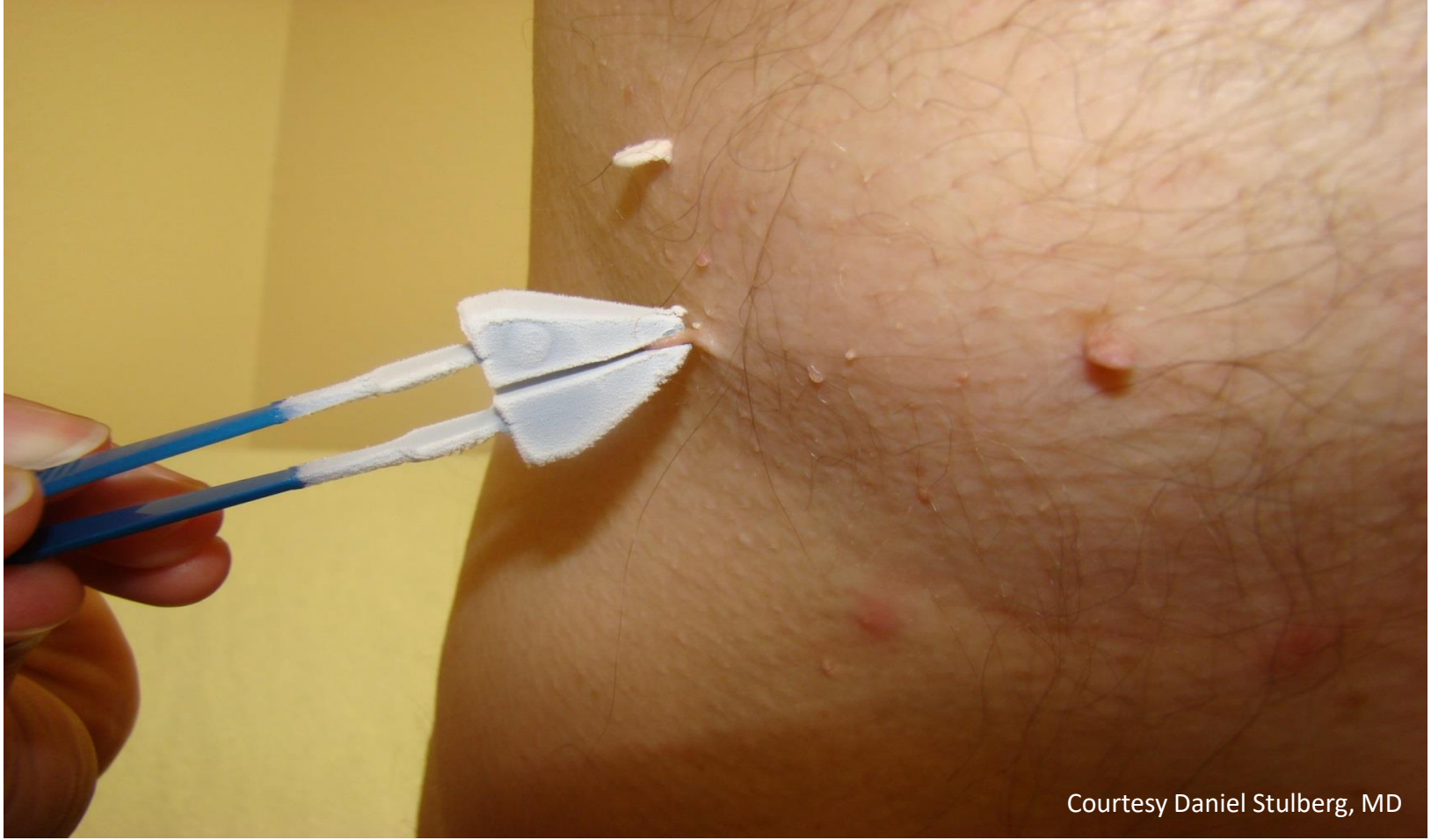
Acrochordons



Cryotweezers $159

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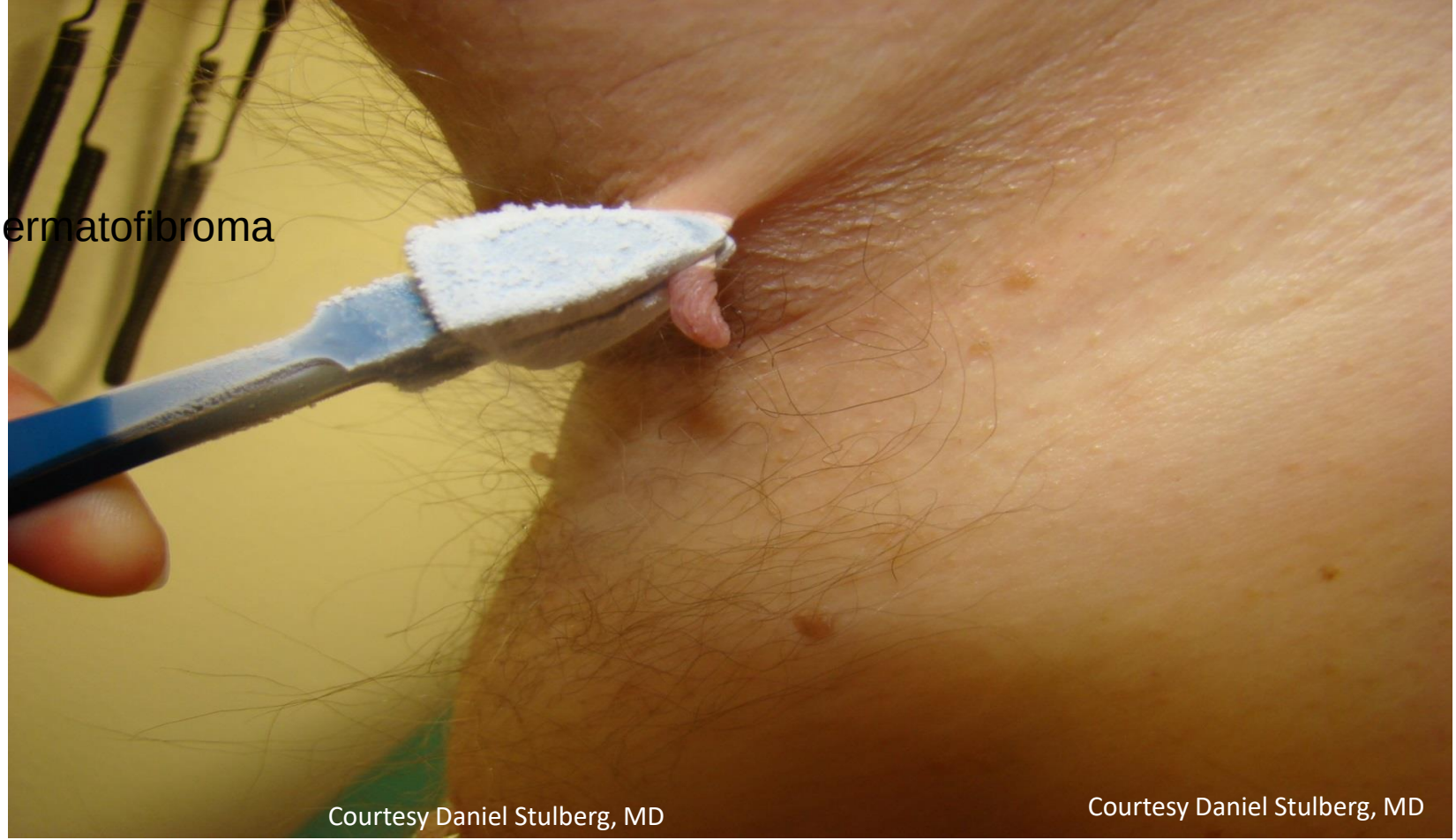
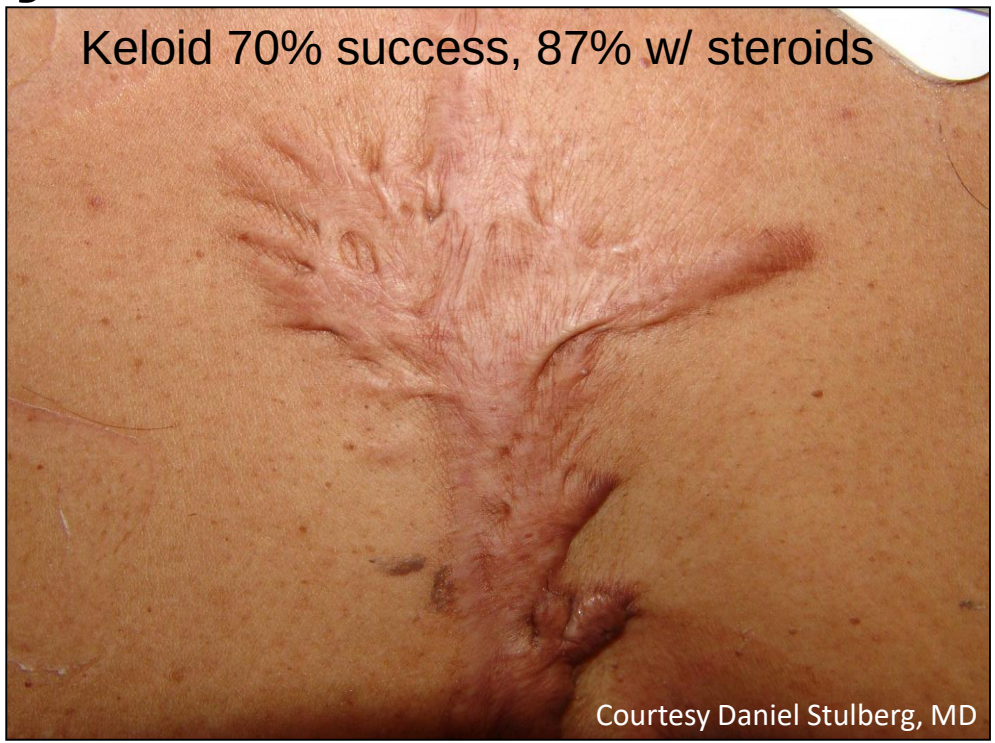
Dermatofibroma

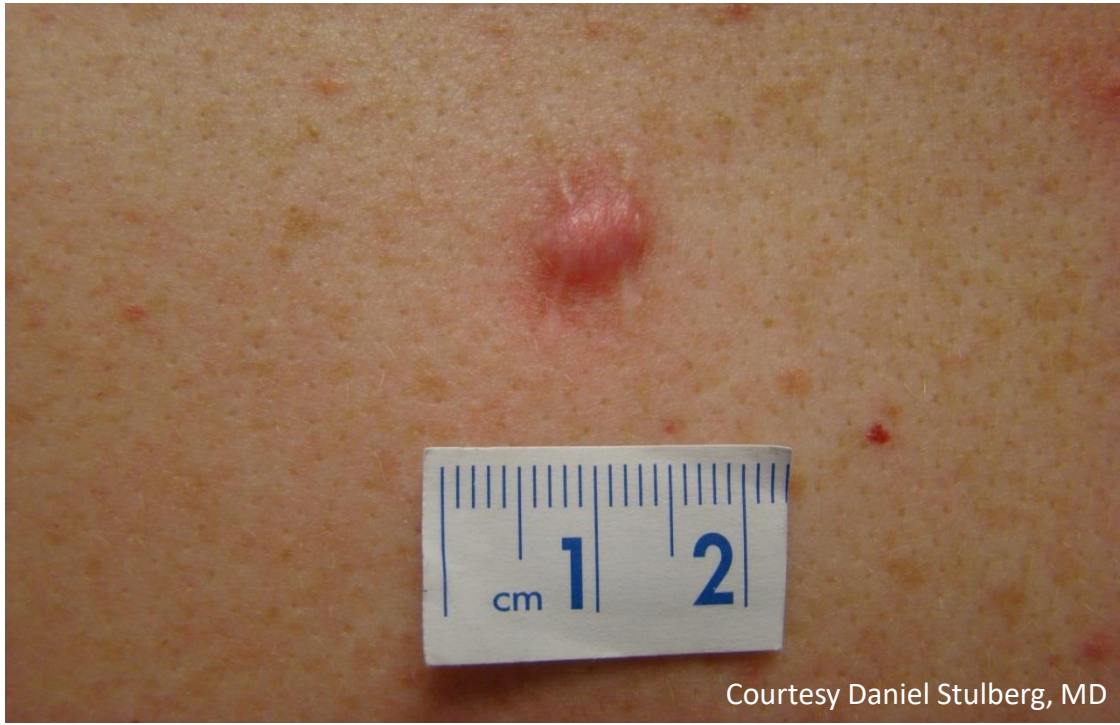


Adjunct and Treatment

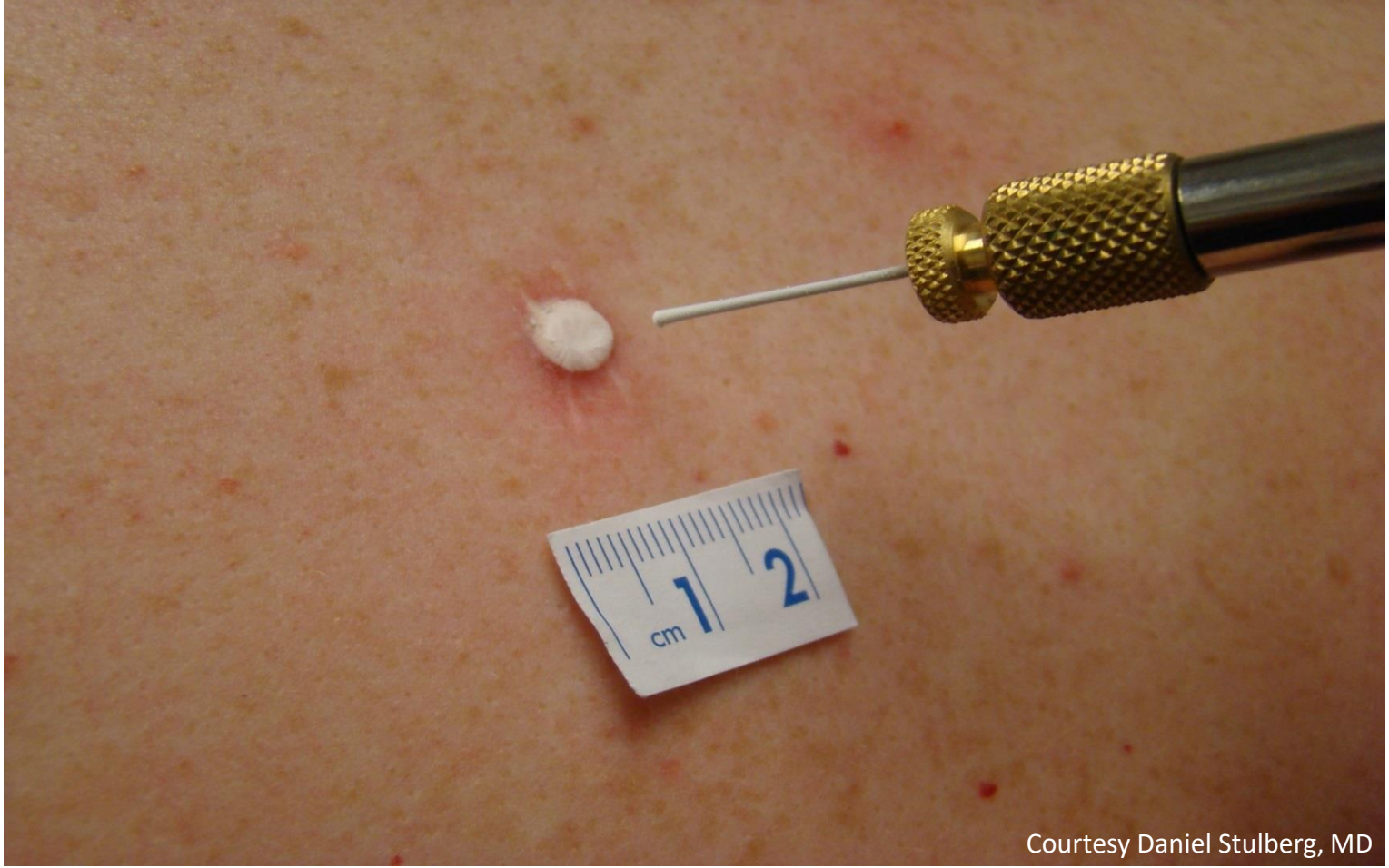


Keloid

- Use the edema post freeze to soften scar to allow injection of steroid
- Freeze 5-20 sec.
- Wait 10-15 min for tissue swelling
- 27 gauge needle inject TAC 10-40 mg/ml
- Cryo alone 10-30 sec. Q 4 wks Freeze to margin

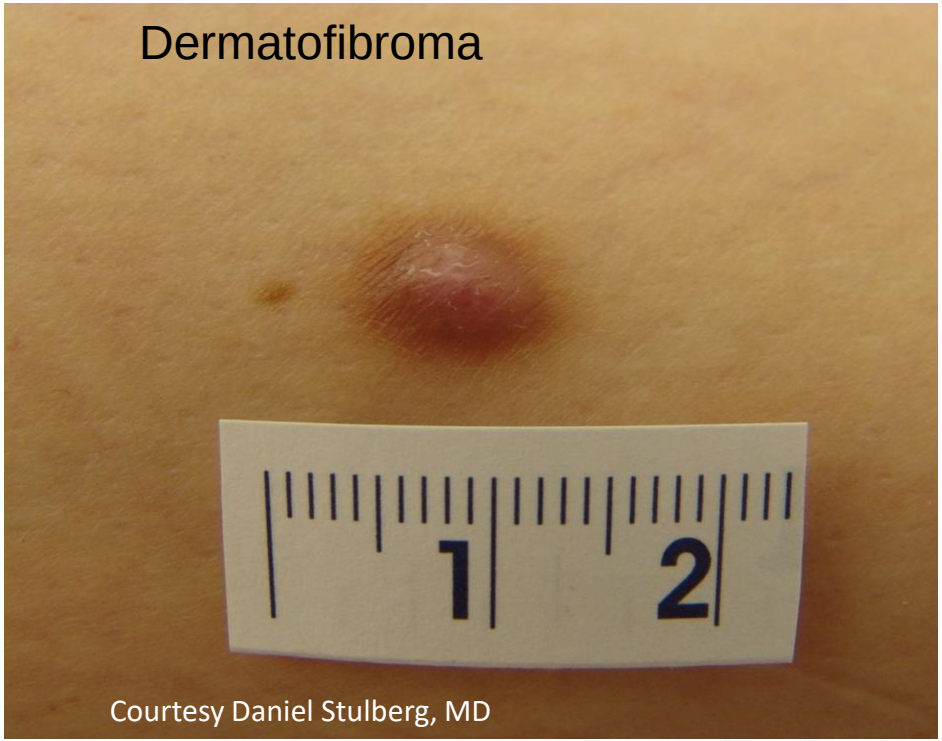


Courtesy Daniel Stulberg, MD



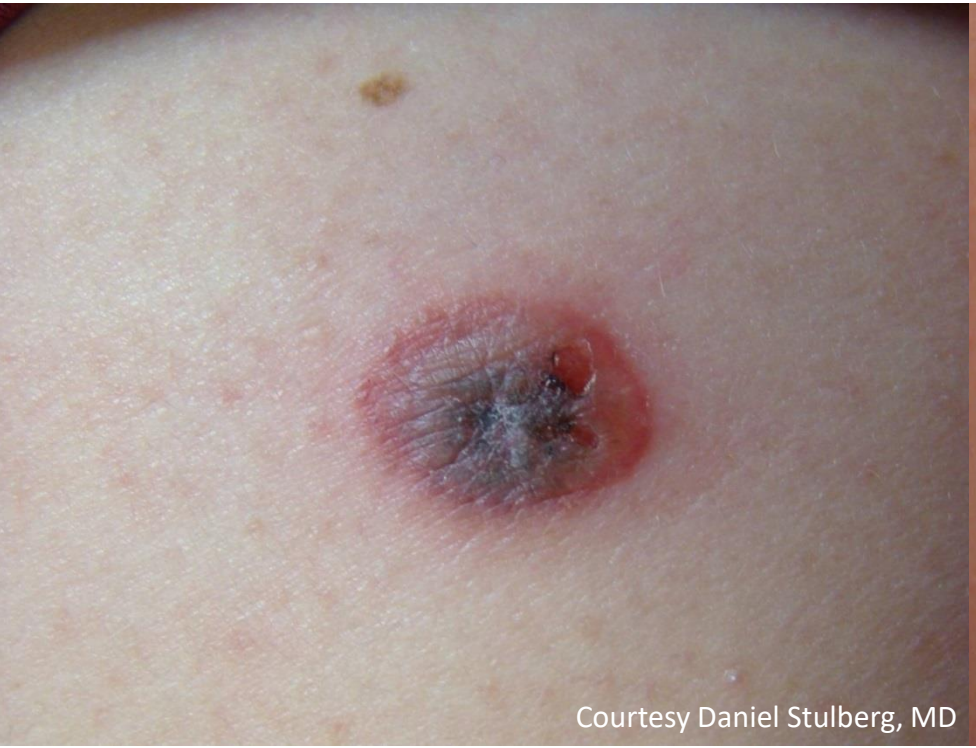
Courtesy Daniel Stulberg, MD

Adjunct and Treatment

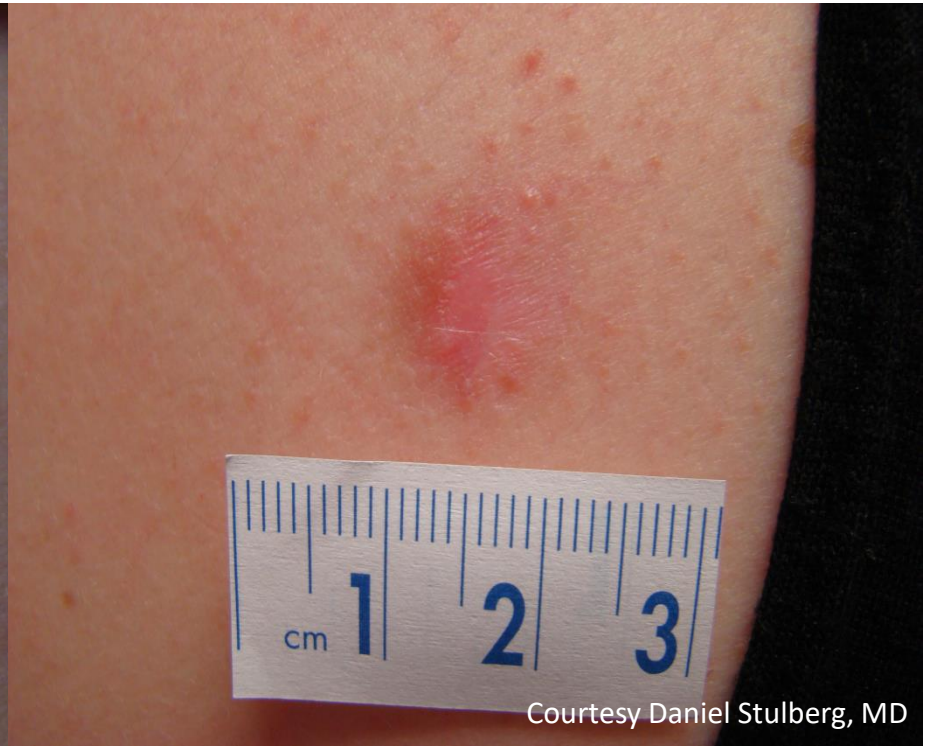


Dermatofibroma after Cryo

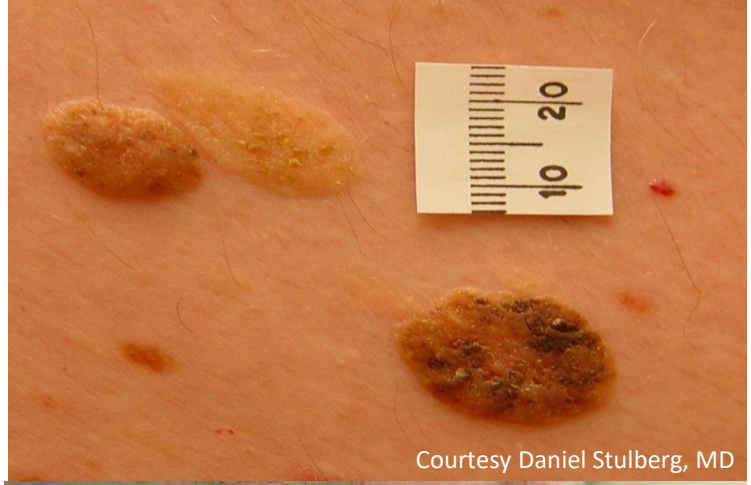
2 days



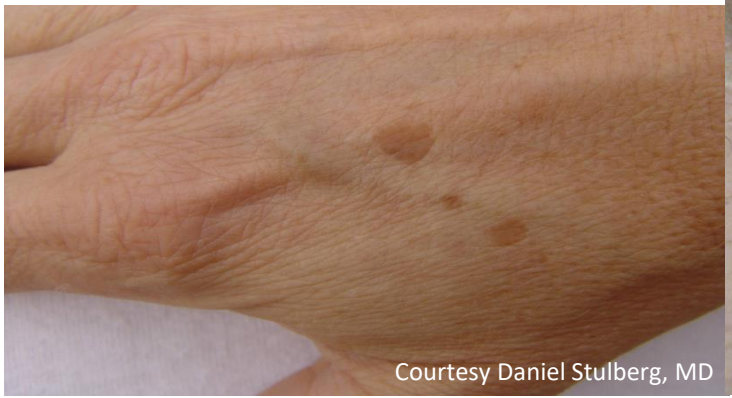
1 year

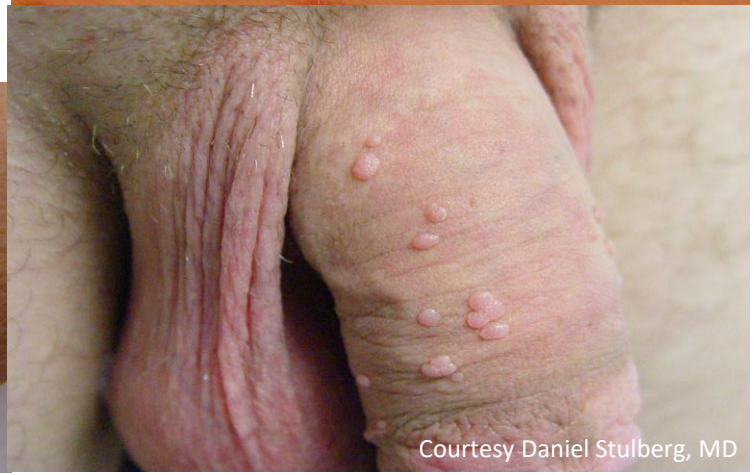


- Seborrheic keratosis
- Warts
- Condyloma acuminata
- Lentigo & Freckles
- Molluscum



Courtesy Daniel Stulberg, MD

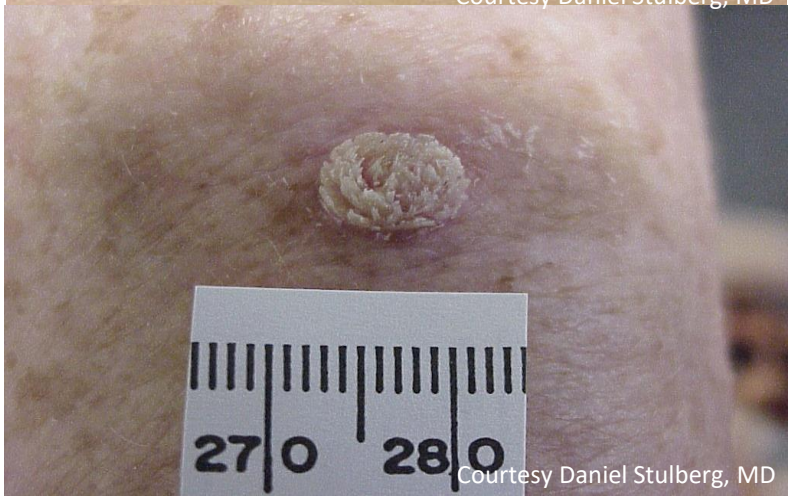

Courtesy Daniel Stulberg, MD


Courtesy Daniel Stulberg, MD

Warts

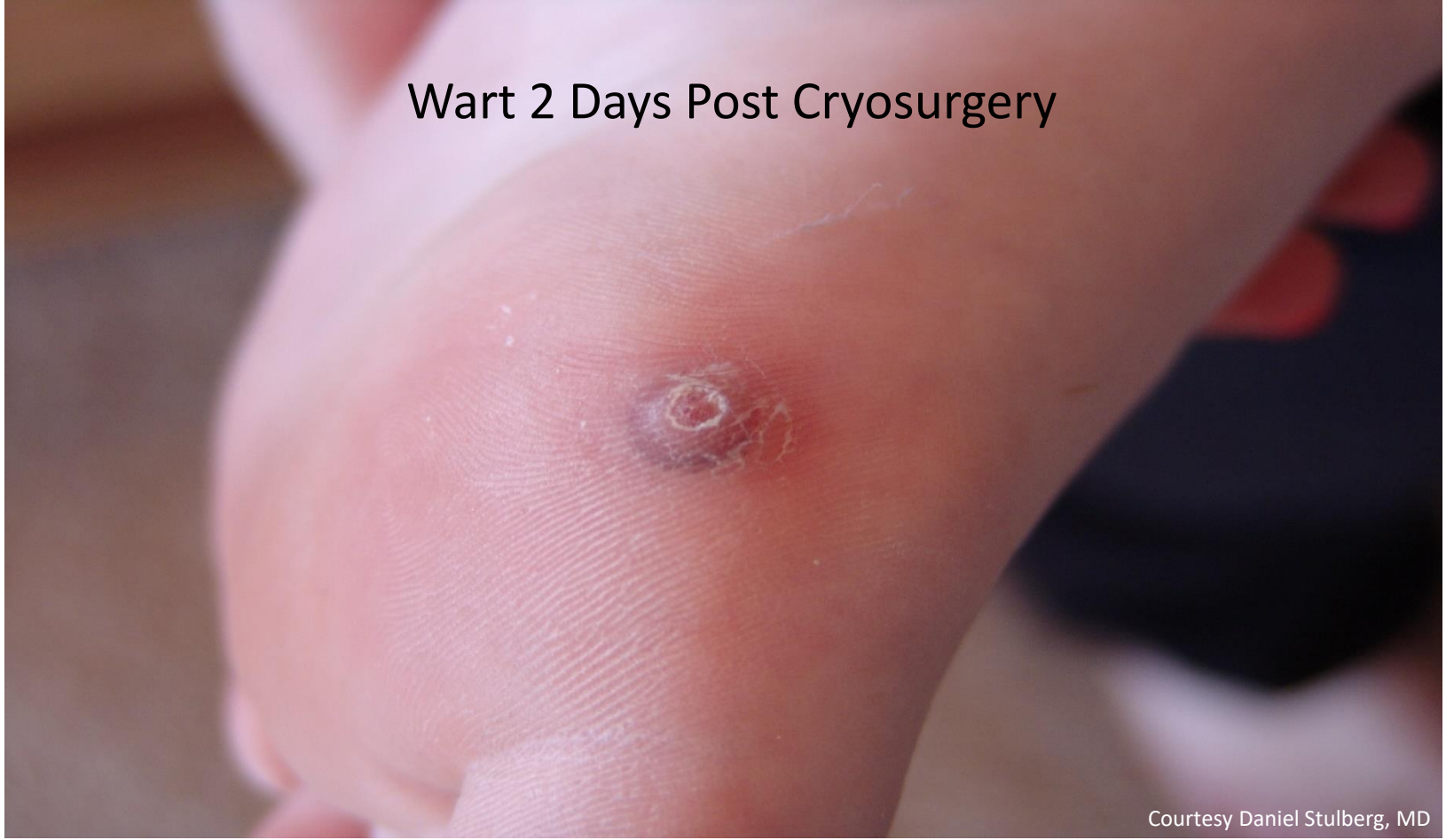
- Verruca:
  - Warts on hands
  - Plantar warts
  - Flat warts


Courtesy Daniel Stulberg, MD



Courtesy Daniel Stulberg, MD

Wart 2 Days Post Cryosurgery

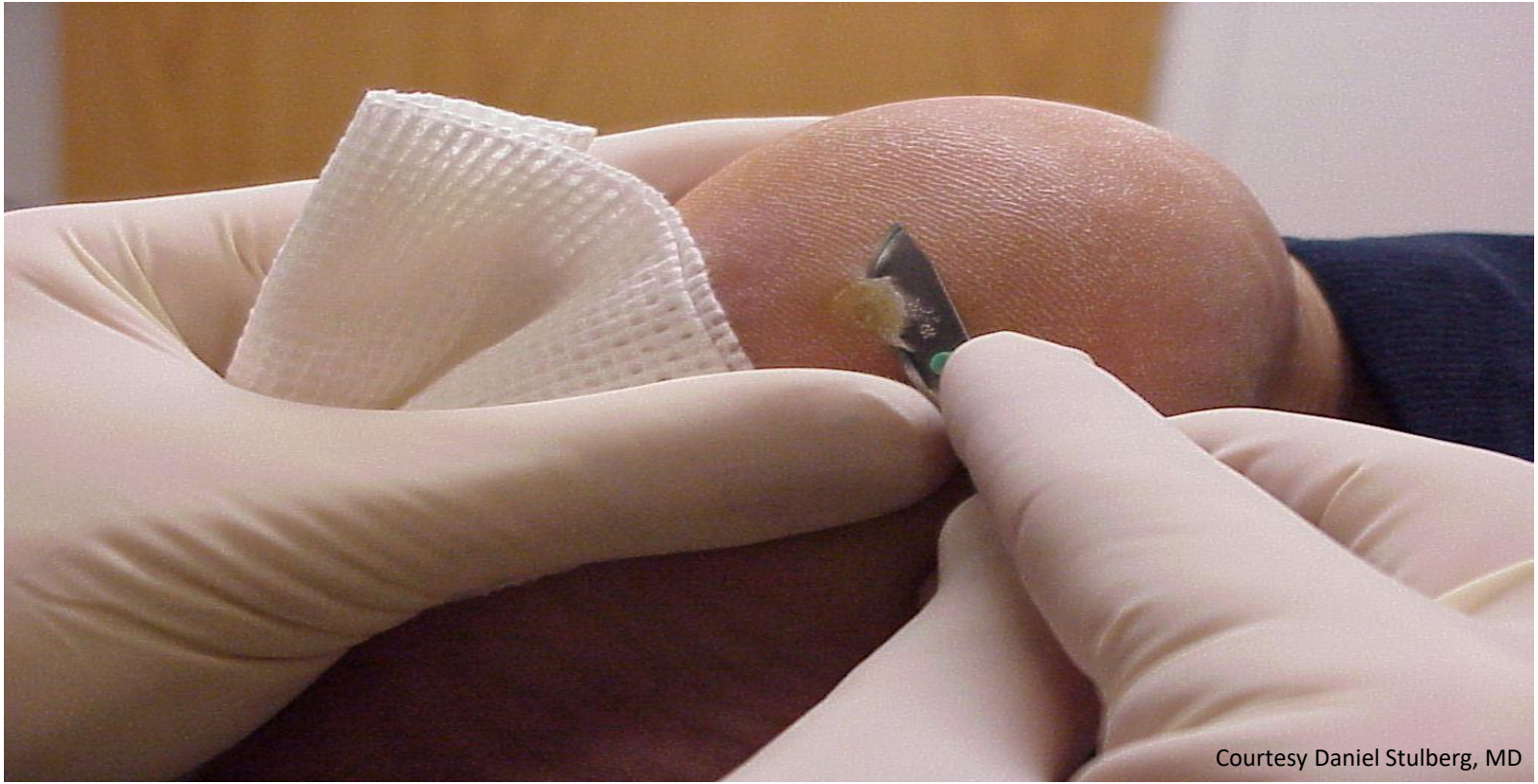


Courtesy Daniel Stulberg, MD

Wart 14 Days Post Cryosurgery

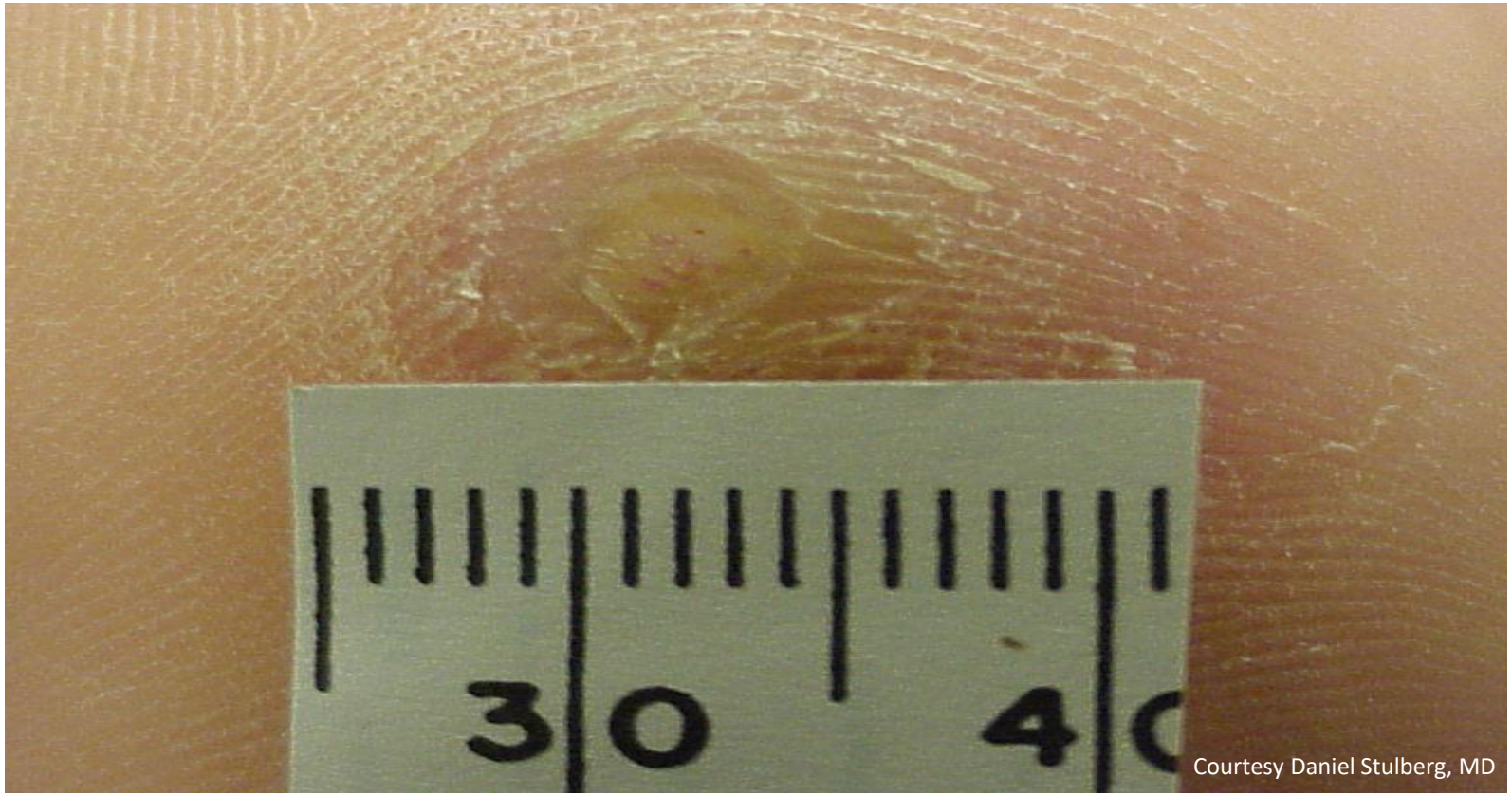
Courtesy Daniel Stulberg, MD

Paring the Wart Before Cryo



Courtesy Daniel Stulberg, MD

Plantar Wart with Thrombosed Capillaries



Courtesy Daniel Stulberg, MD

Warts

- Topical salicylic acid is the most efficacious treatment for warts at 75%, with no evidence for cryotherapy being more effective.

- Reference - Dynamed systematic review of the literature

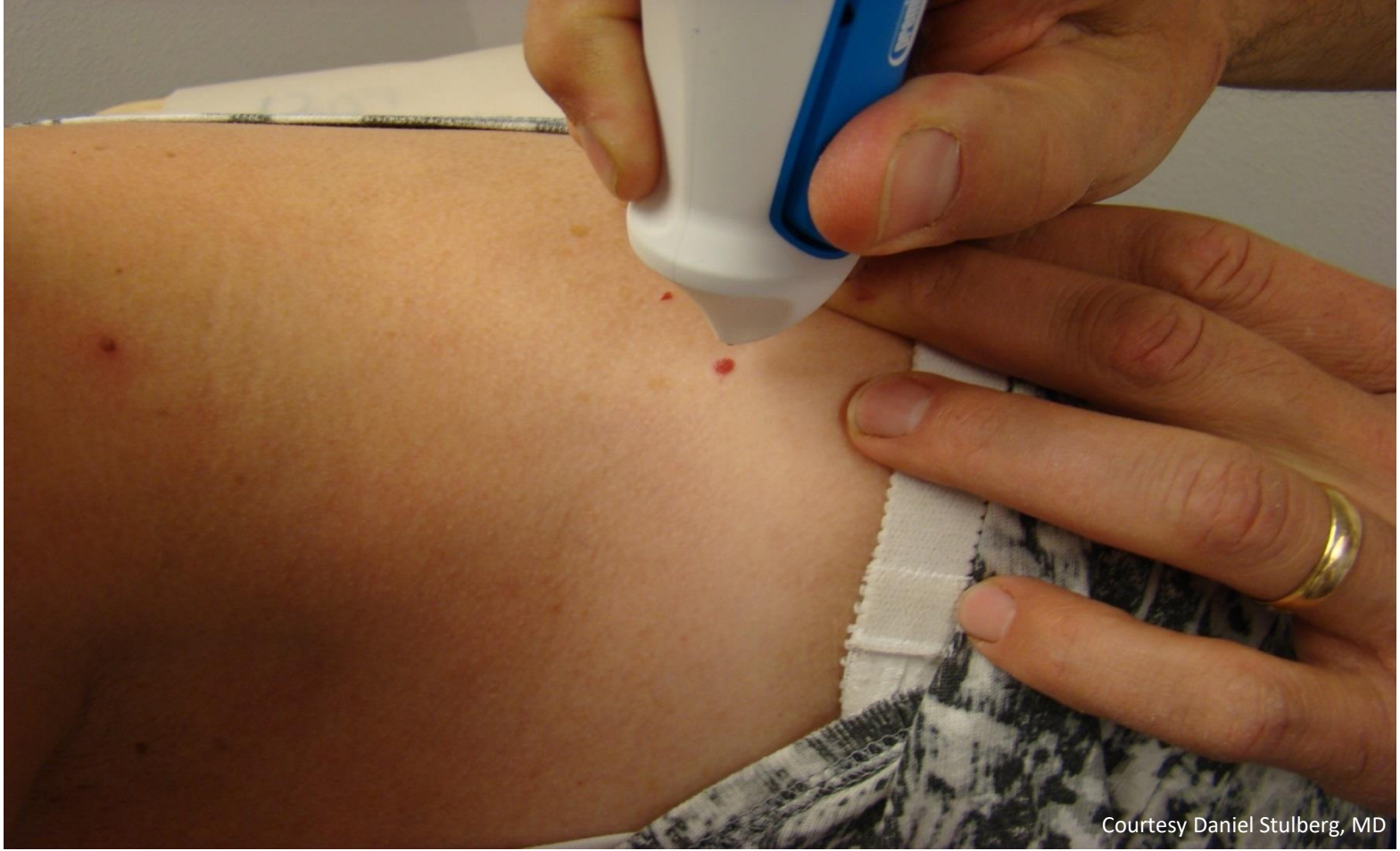
Condyloma

- Cryosurgery and Electrosurgery are both effective treatments for condyloma acuminata, with success rates of 63-88% and 61-94% respectively

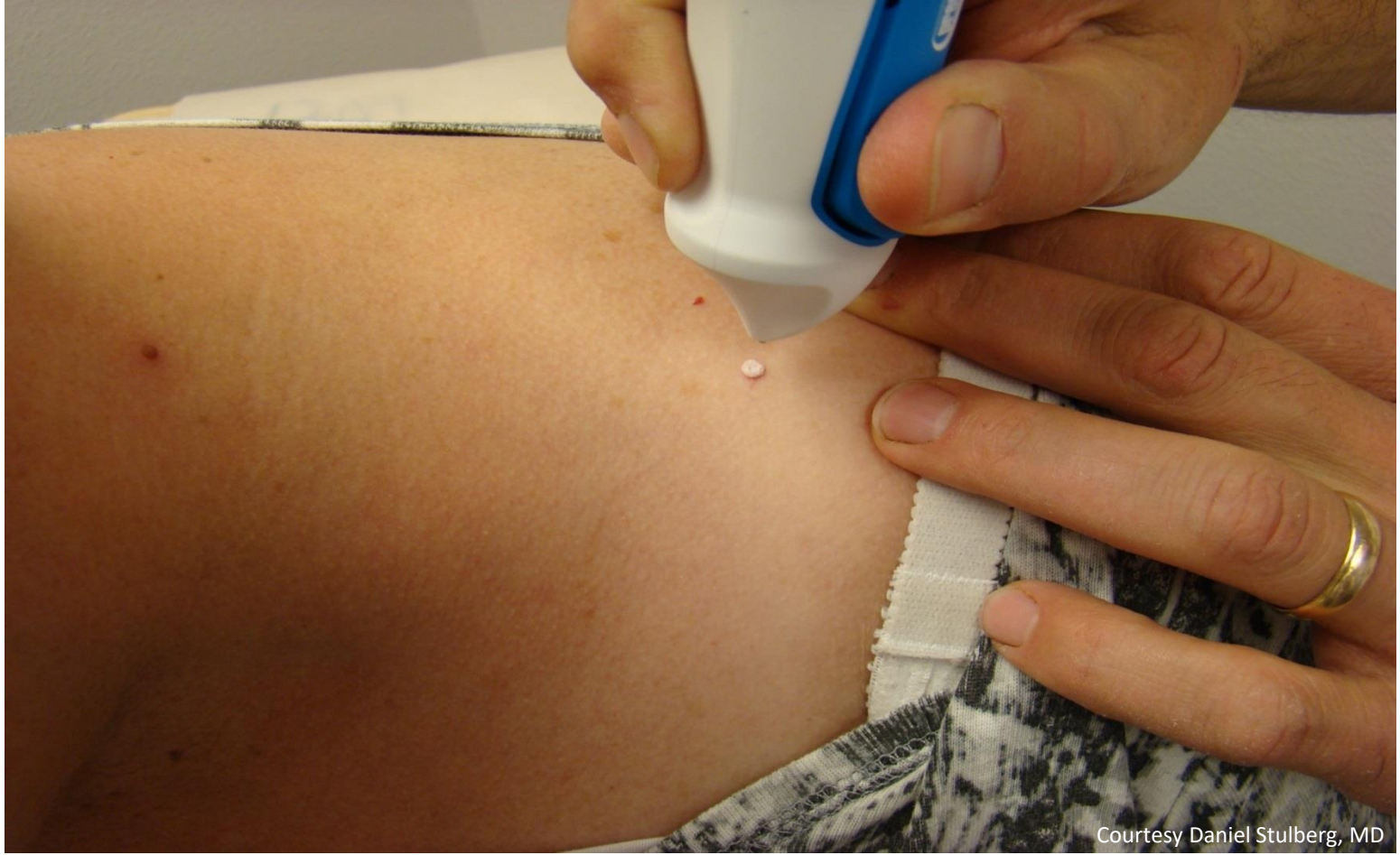
- Reference - Dynamed systematic review of the literature

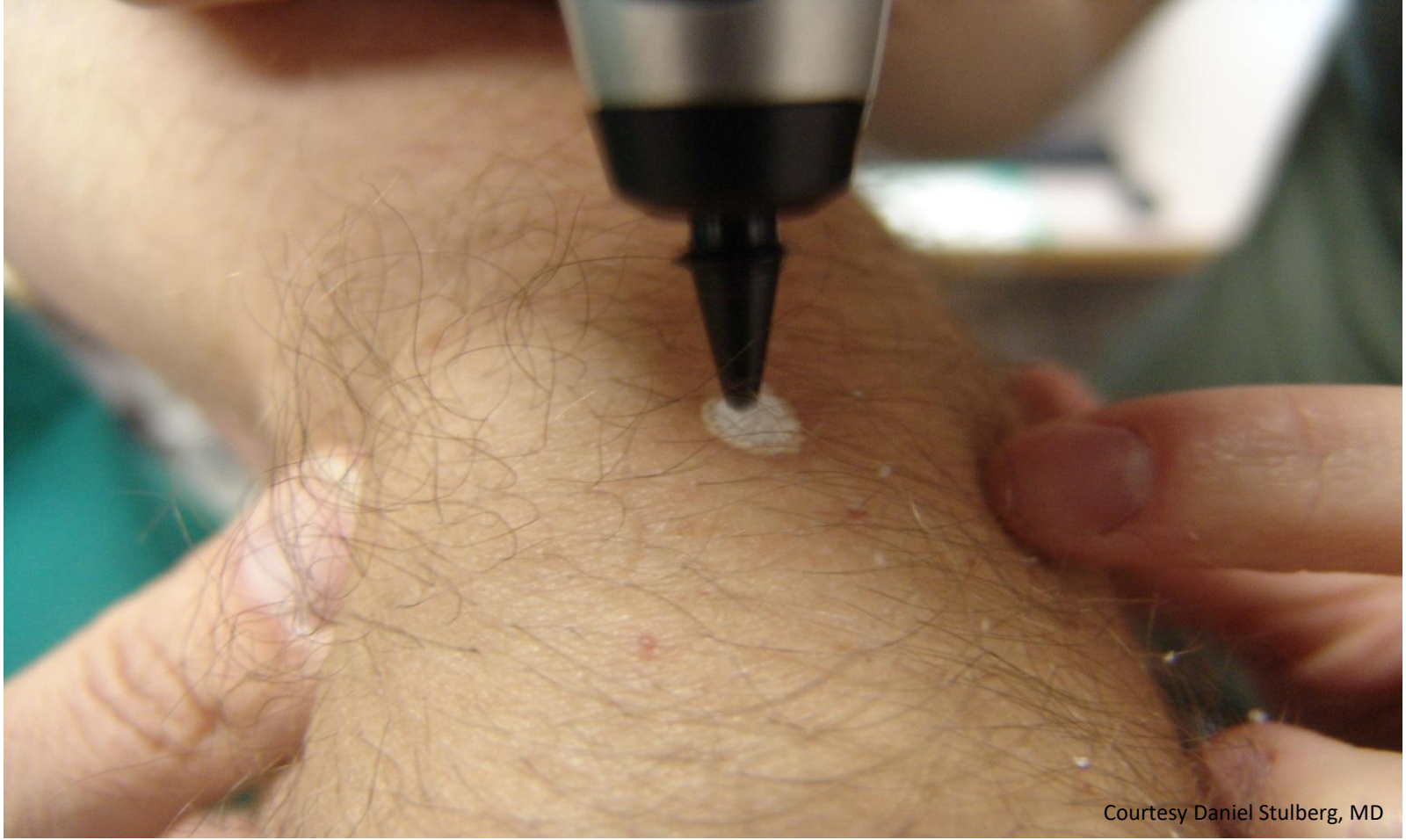
Cherry Angiomas – Senile Angiomas

- Light freeze
- 5-10 seconds
- 0-1 mm freeze margin

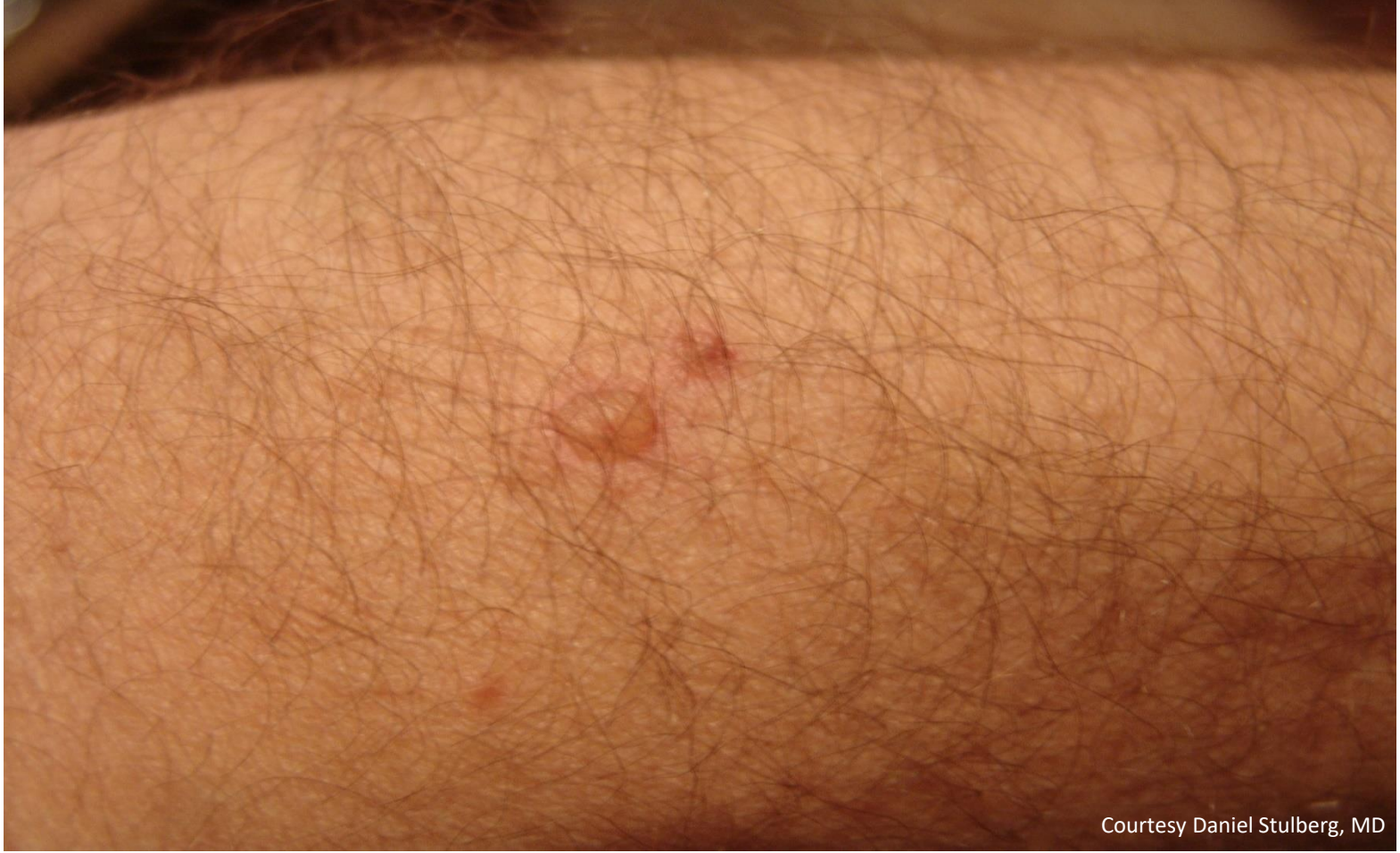


Courtesy Daniel Stulberg, MD

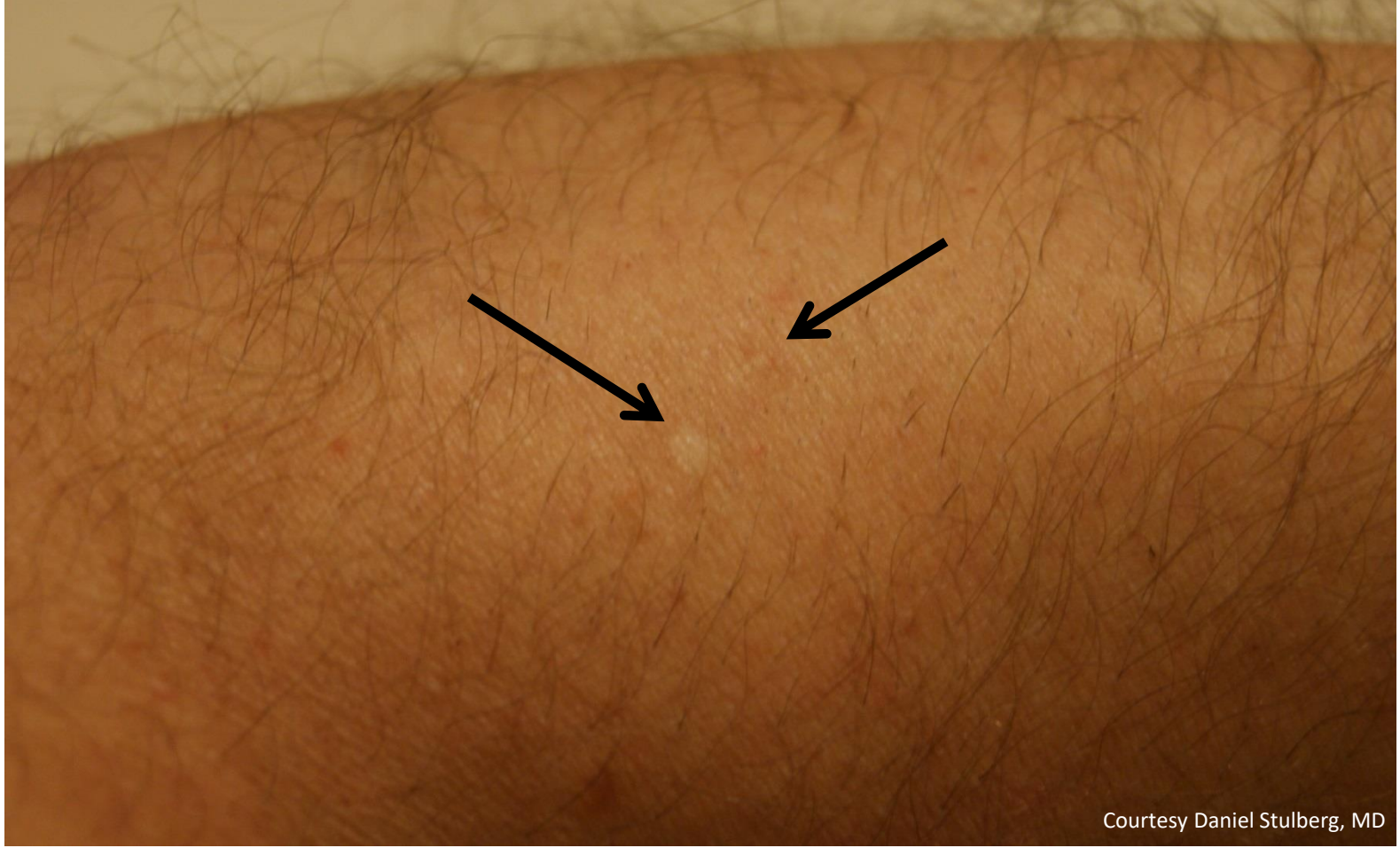

Courtesy Daniel Stulberg, MD

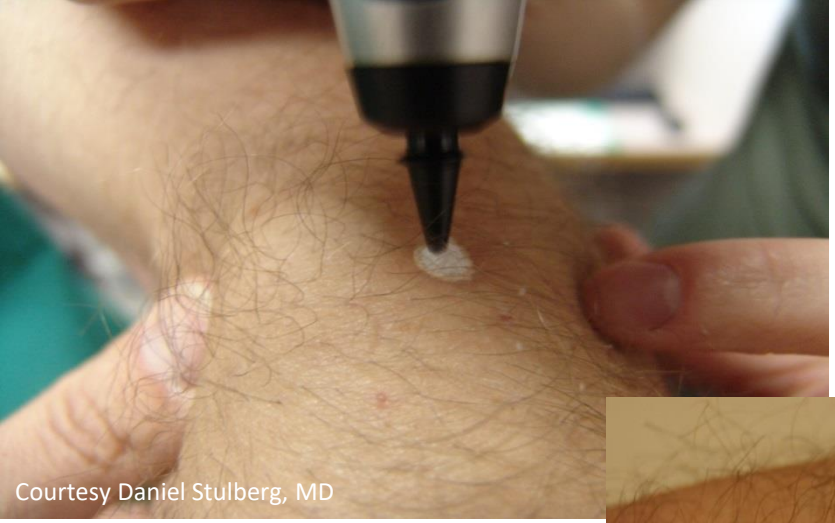


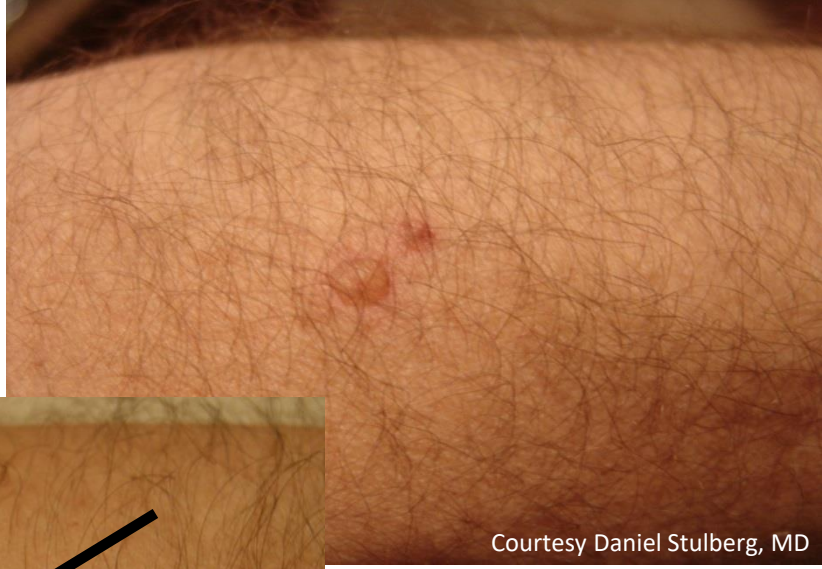
Courtesy Daniel Stulberg, MD

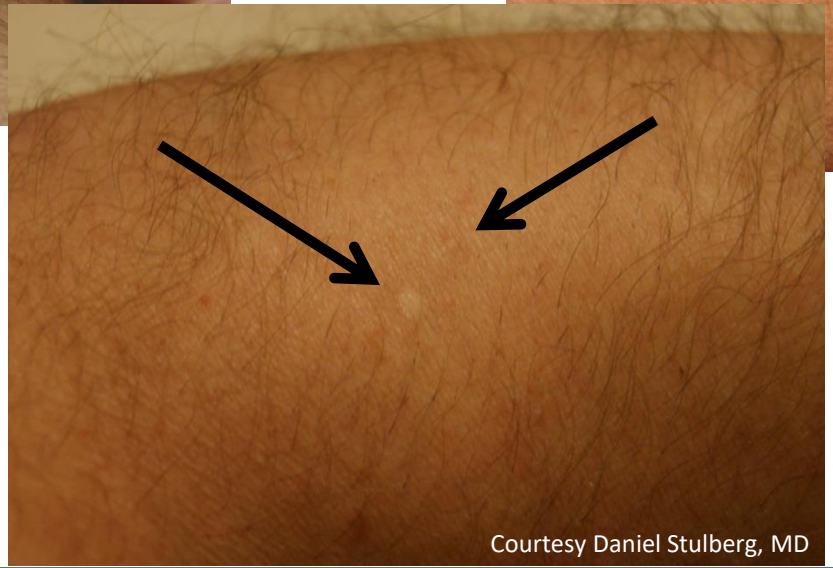


Courtesy Daniel Stulberg, MD

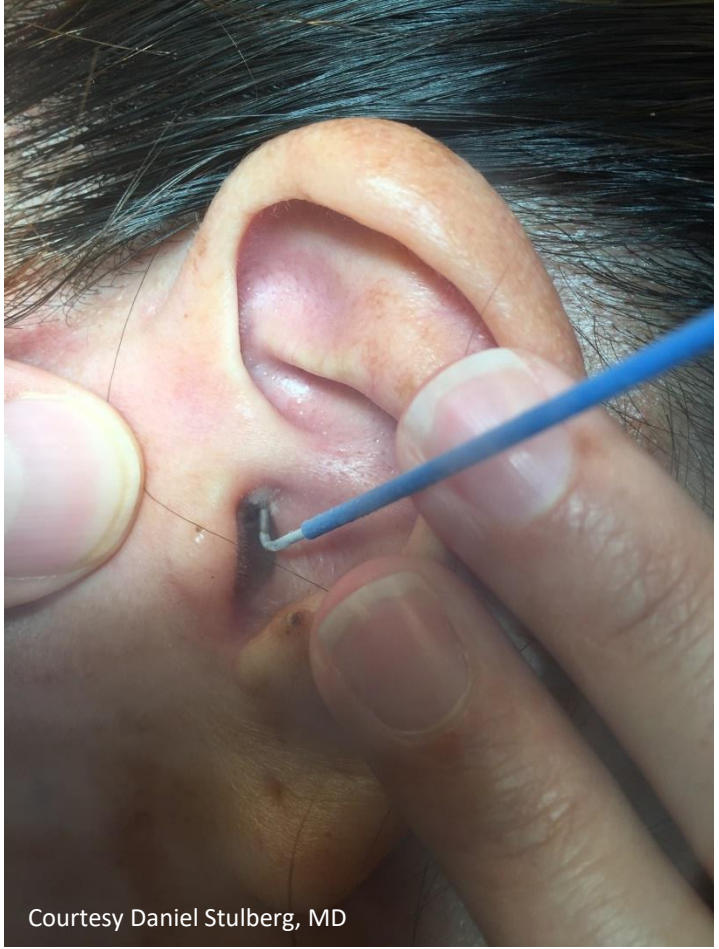

Courtesy Daniel Stulberg, MD


Courtesy Daniel Stulberg, MD

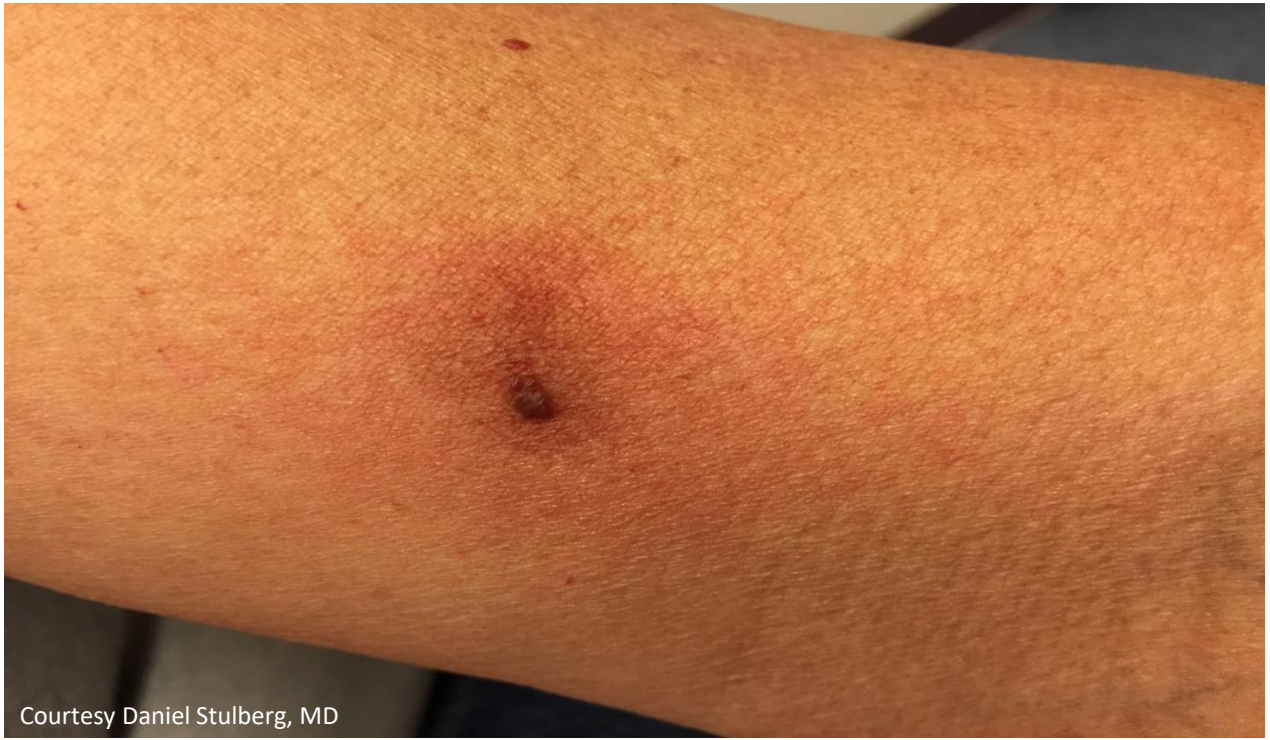

Courtesy Daniel Stulberg, MD


Courtesy Daniel Stulberg, MD

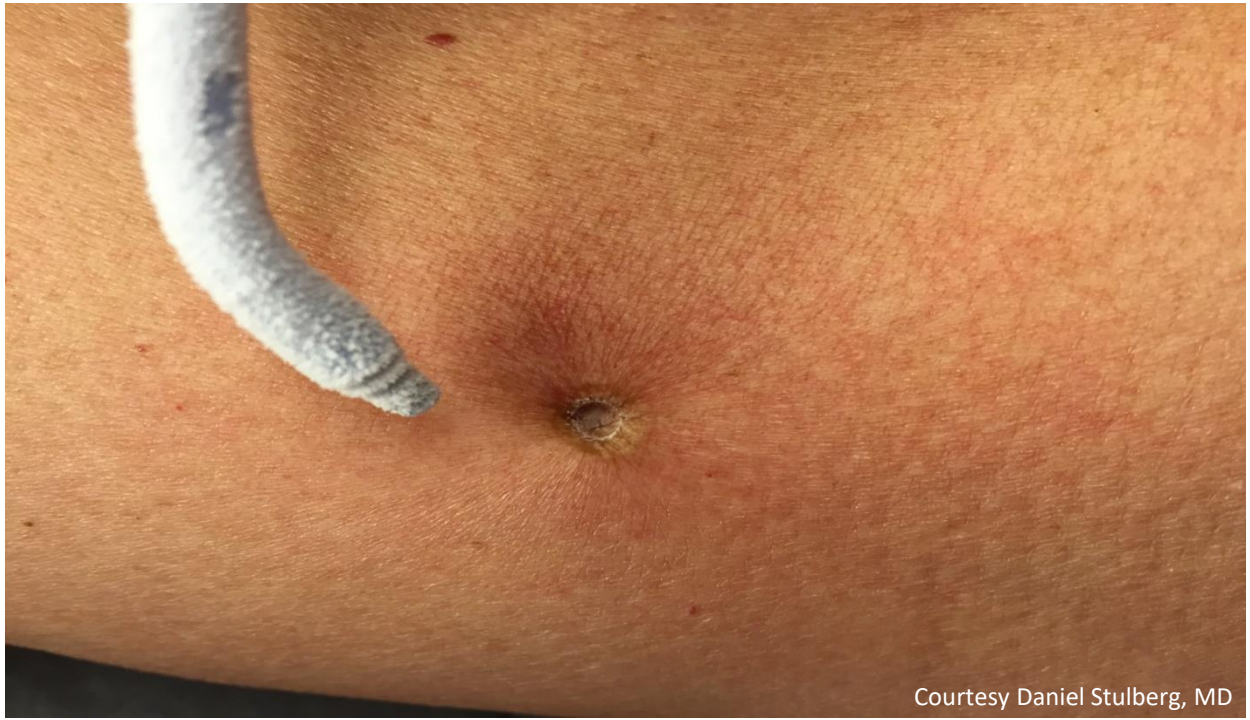
Directional Tip



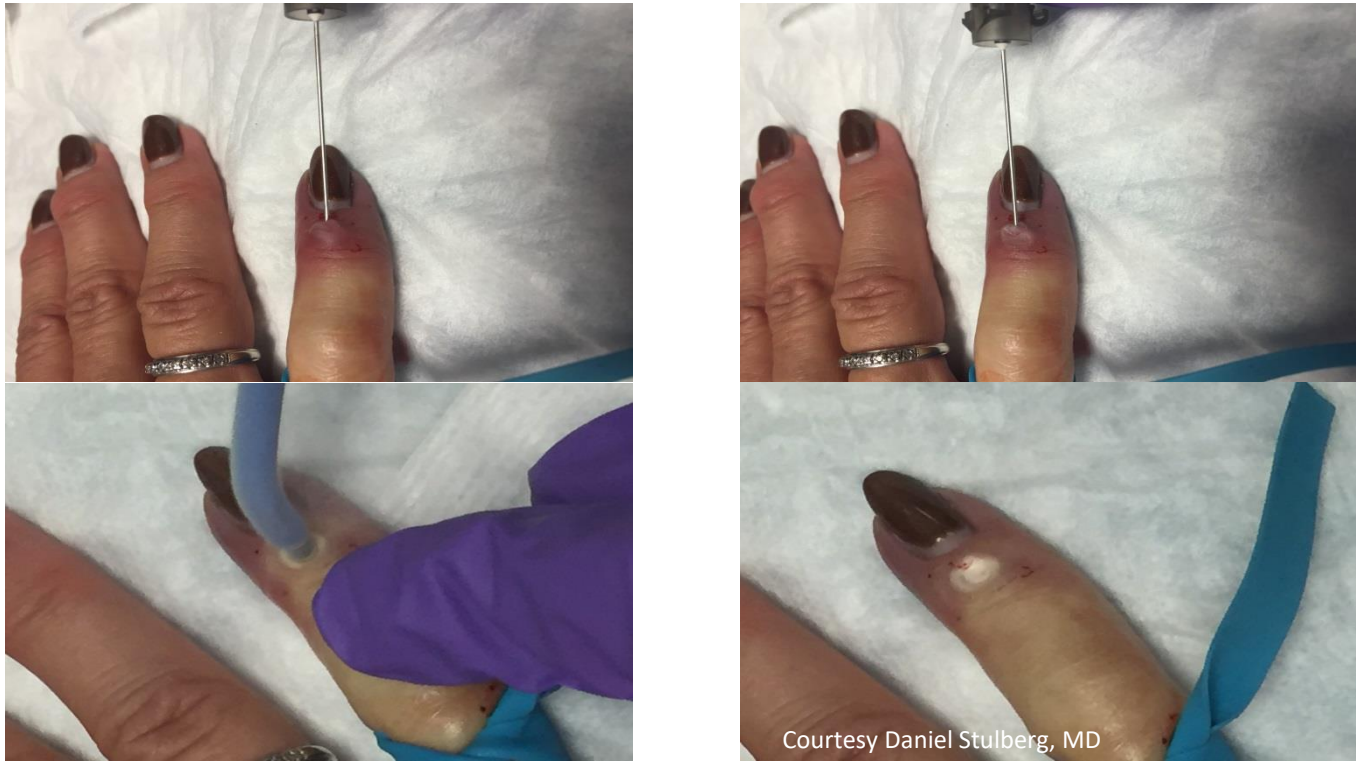
Cherry Angioma



Adherent/Compressive Probe

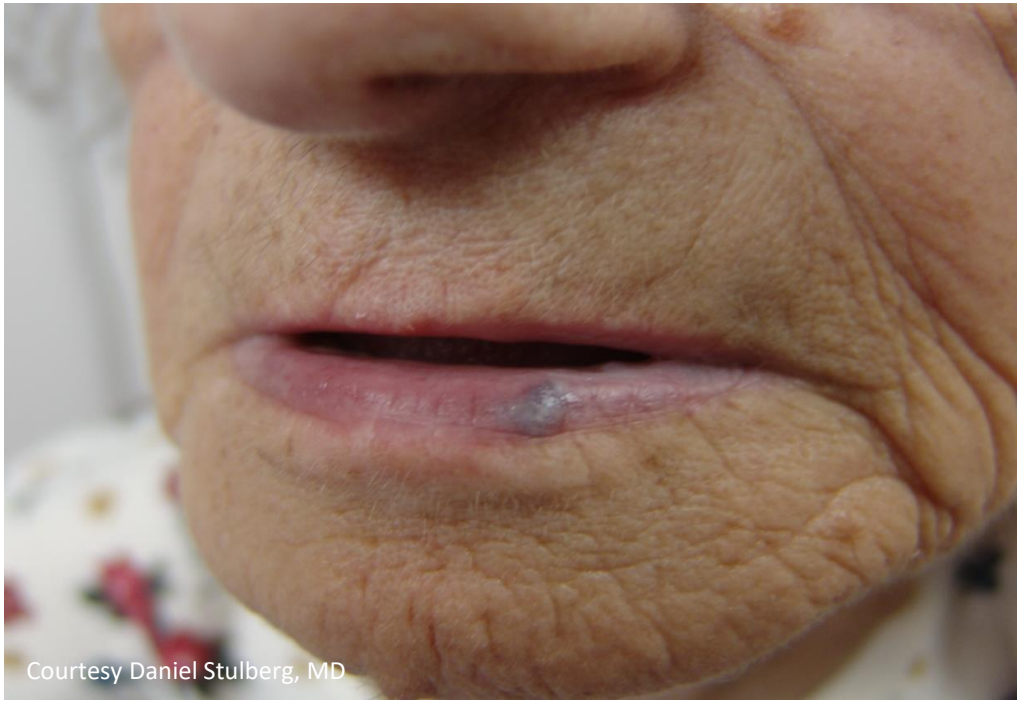


Digital Mucus Cyst



Venous Lake

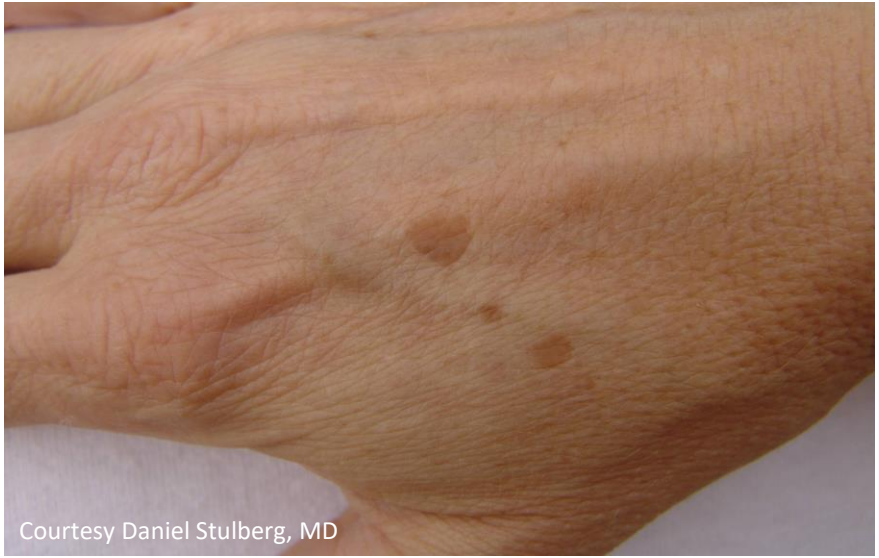
- Compress the lake with the adherent probe 5-15 seconds x 1



Venous Lake

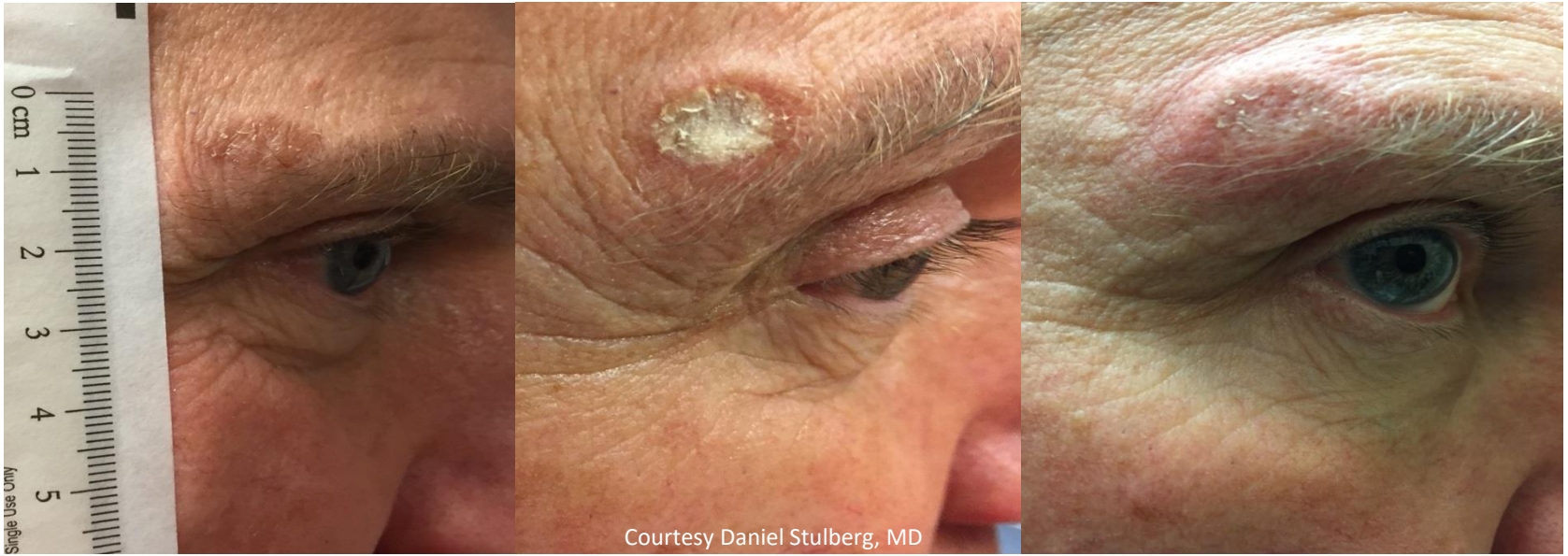
Cryosurgery: Freeze Time

- Freckles/Lentigos: 3-5 seconds

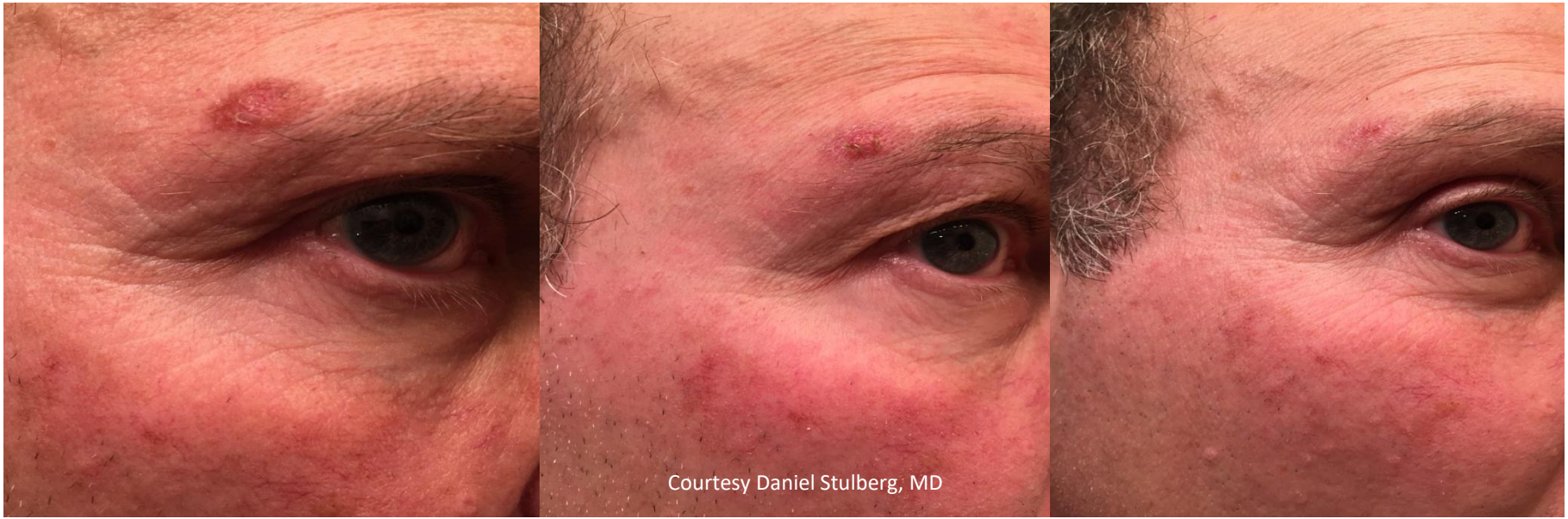


Lentigo - 5 Seconds x 2

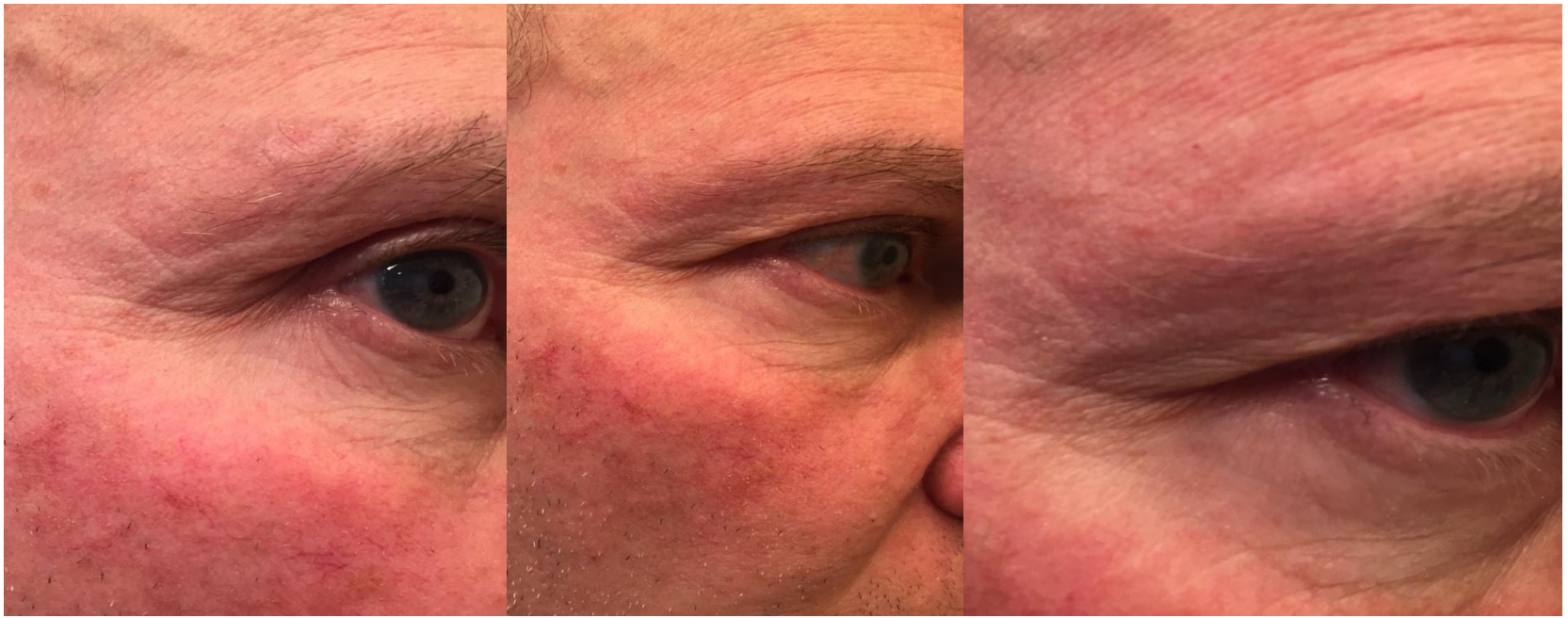
Pre Cryo 30 min



Day 4 7 10

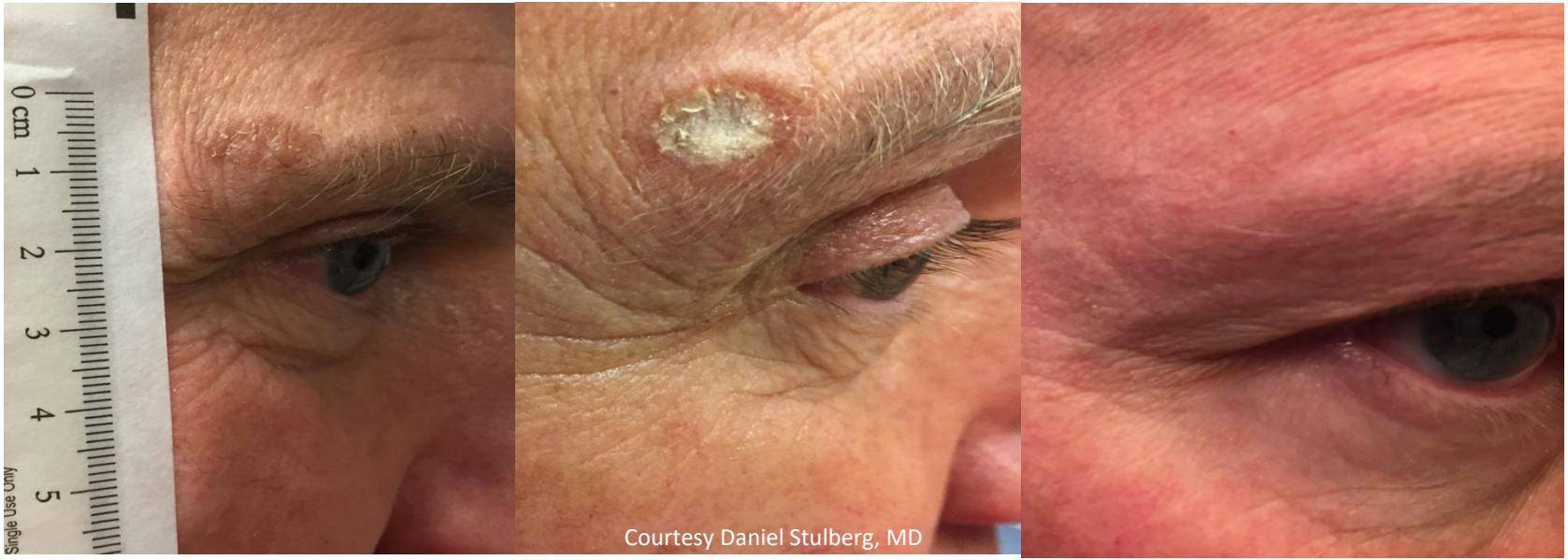


Day 11 17 3 months



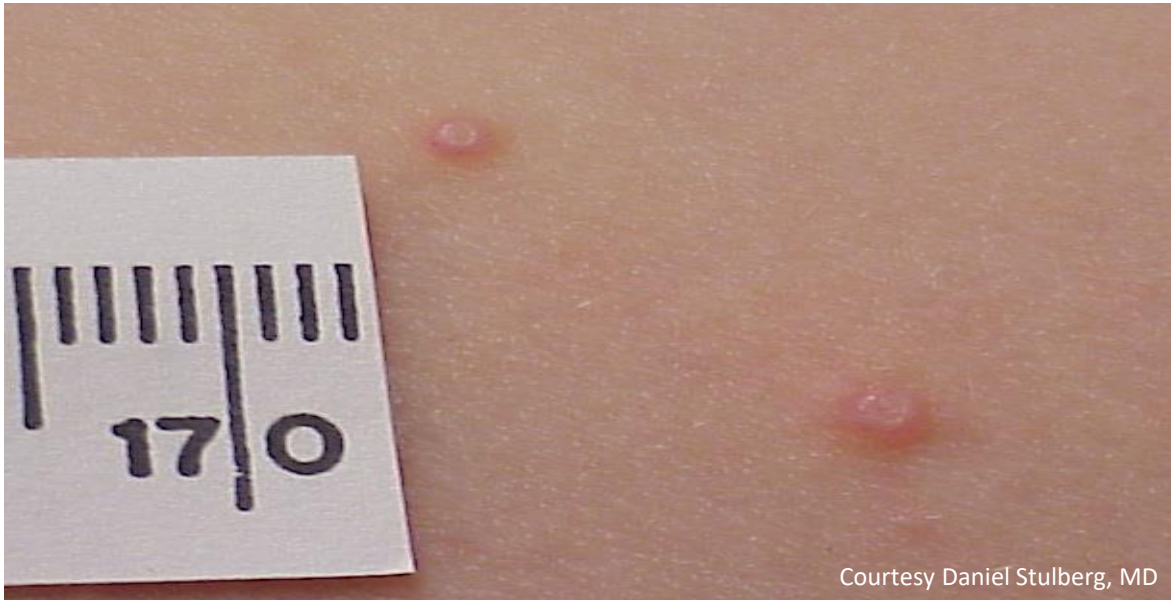
Lentigo - 5 Seconds x 2

Pre Cryo 3 months



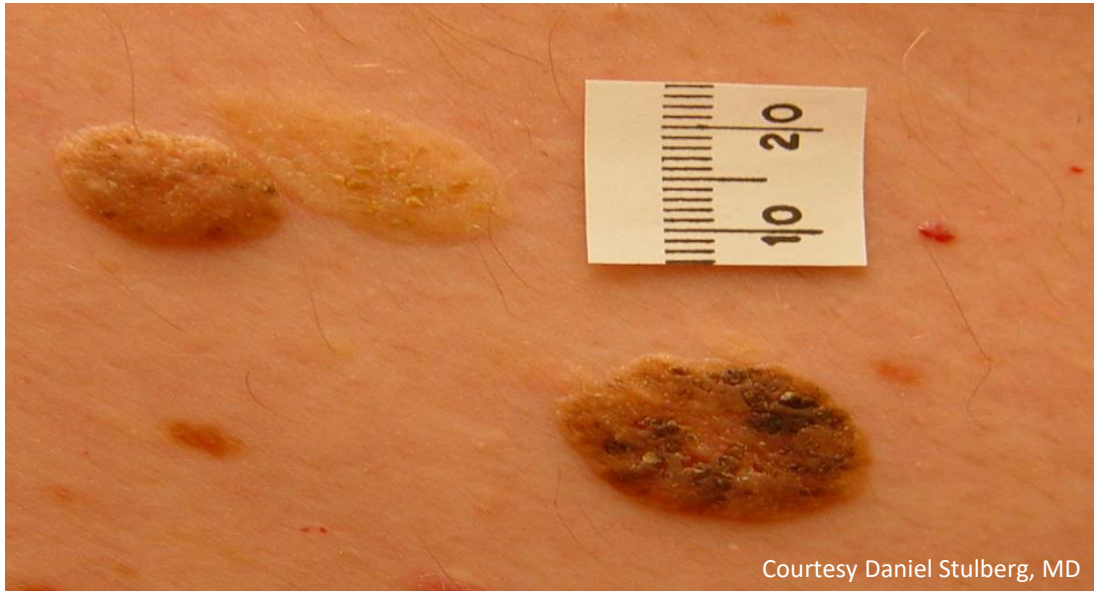
Cryosurgery: Freeze Time

Molluscum 5-10 seconds



Cryosurgery: Freeze Time

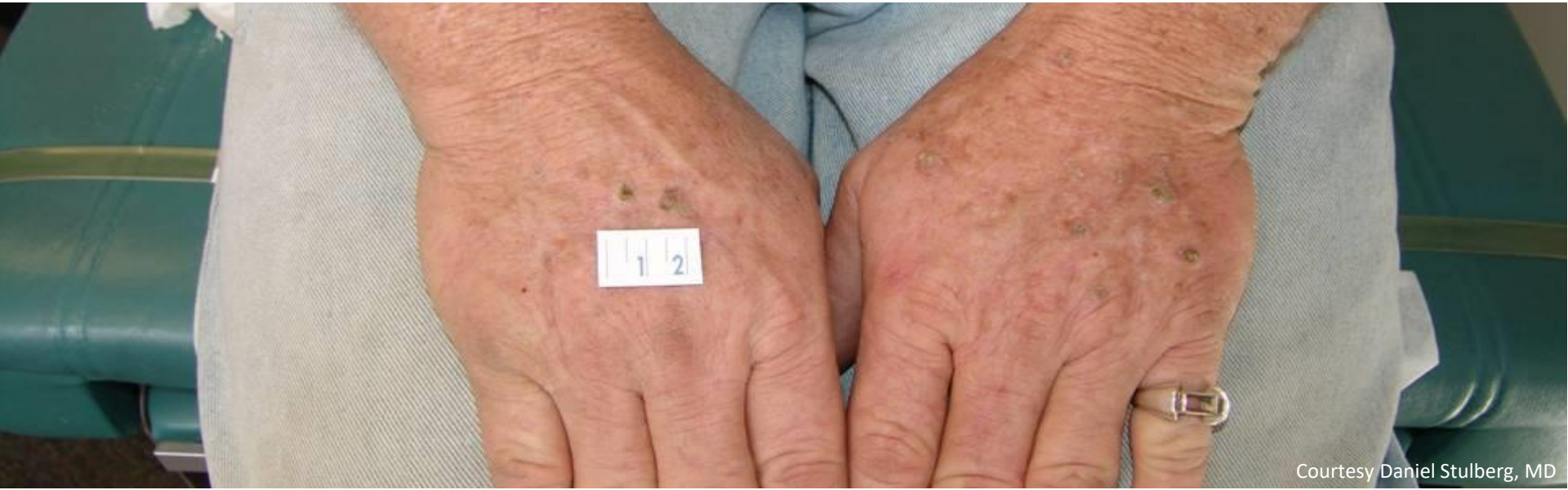
Seborrheic Keratoses: 5-20 seconds x 1-2



Courtesy Daniel Stulberg, MD

Cryosurgery: Freeze Time

Actinic Keratoses: 5-10 seconds x 1-2



Courtesy Daniel Stulberg, MD

Cryosurgery: Freeze ball/margin

- 1 mm — freckles/lentigos
- 1-2 mm — most benign skin lesions
- 1-2 mm — most actinic keratoses
- 2-3 mm — most warts

Cryosurgery

- Superficial BCC
- Establish pathological diagnosis first with shave biopsy
- Success rates > 95%
- 99% success but 6 deaths in 100 pts
- Prospective trial of curettage and cryosurgery in the management of non-facial, superficial, and minimally invasive basal and squamous cell carcinoma

- Peikert JM - *Int J Dermatol* - 01-SEP-2011; 50(9): 1135-8

Avoid Cryosurgery

- Melanoma or suspected melanoma
- Recurrent BCC
- BCC in nasolabial fold
- Sclerosing BCC

Pitfalls

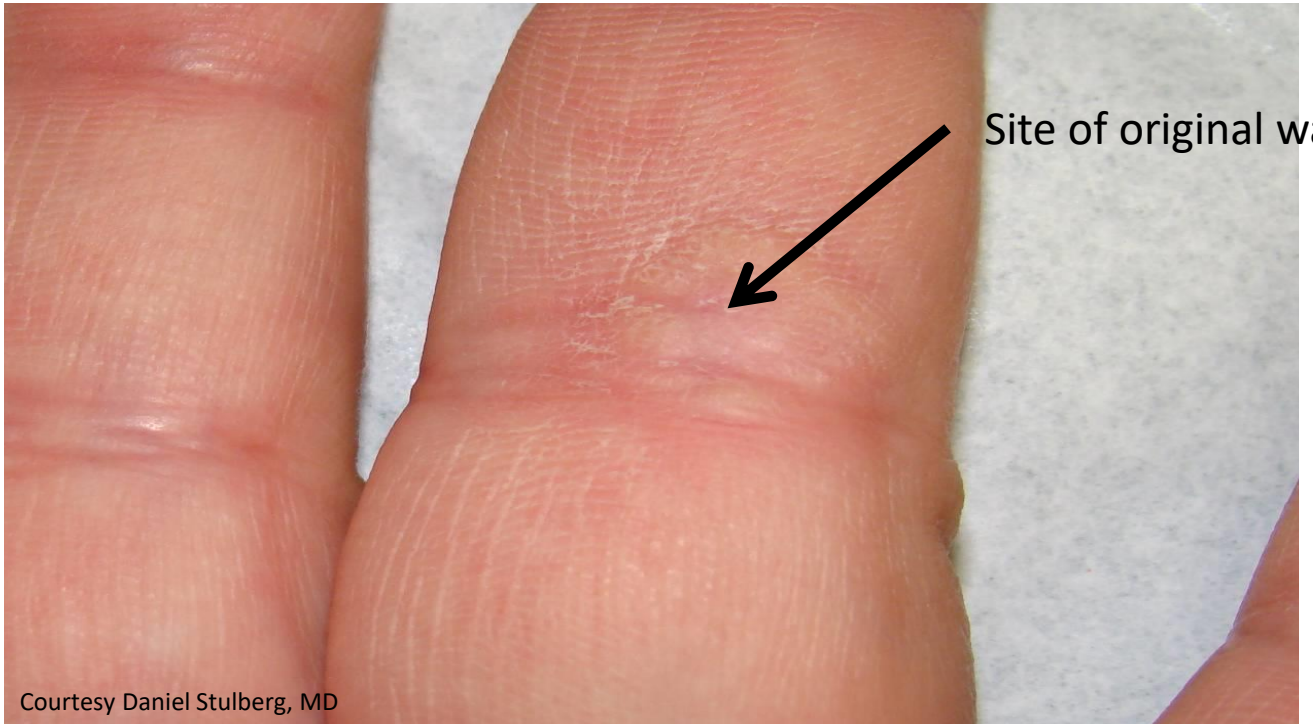
- Tilting the spray guns too far
- Hypopigmentation
- Geometric patterns
- Underlying structures
- Poor technique
- DON’T FREEZE WHAT YOU DON’T KNOW

Cotton Tipped Swabs

- Don’t deliver liquid nitrogen as cold as the spray

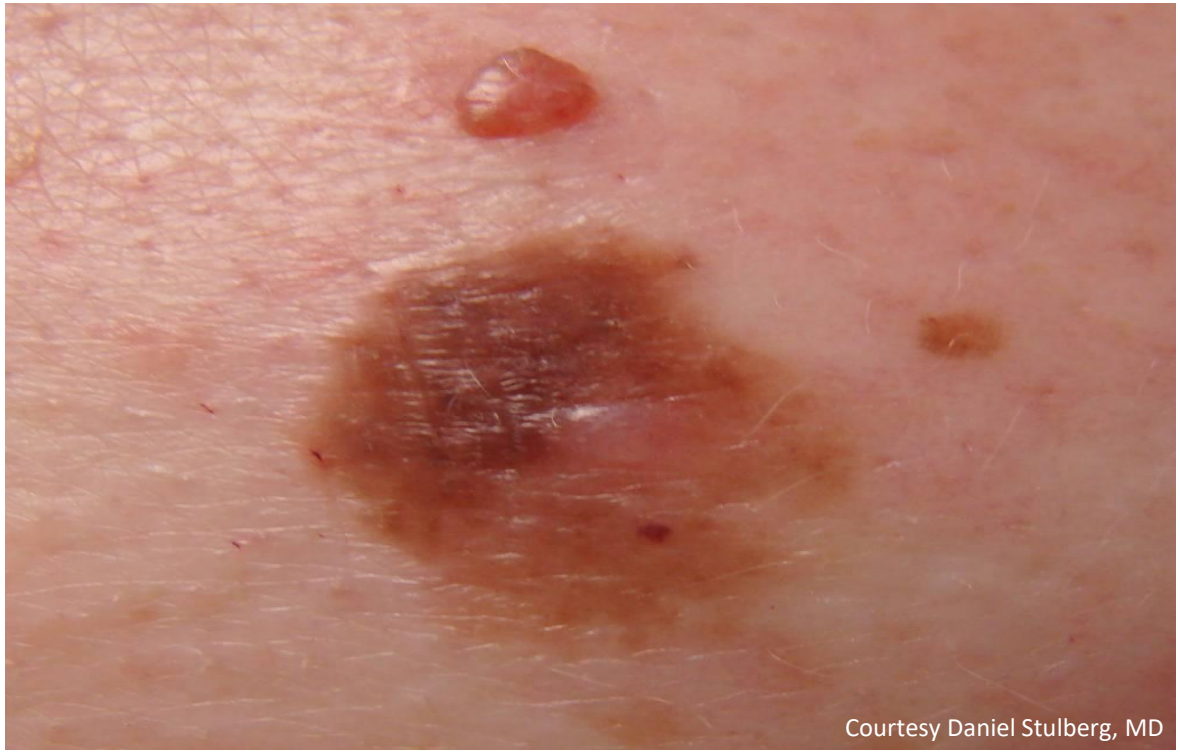
Courtesy Daniel Stulberg, MD

Ring Wart



Courtesy Daniel Stulberg, MD

Don’t Freeze Suspicious Lesions



Electrosurgery vs. Cryosurgery

Electrosurgery

1. Less hypopigmentation
2. Less swelling
3. Treatment results seen immediately
4. Tissue available for pathologic examination
5. Can combine with conventional suturing

Cryosurgery

1. Less scarring
2. Less likelihood of blood loss
3. No local anesthesia needed
4. No need for smoke evacuator or viral particle filter masks

CPT Coding

Pre-Malignant Destruction Lesion

- 17000 Single Lesion $68
- +17003* Lesions 2-14 $5.74 each
- 17004 15 or More $153

- *17003 use with 17000 as an add-on code
- 17004 is used alone
- Genital, Anal, Eyelid, Ear, and Nose have their own site-specific codes

*Medicare Fee Schedule and RVU data as of October 2017 – The Geographic Practice Cost Index (GPCI) will affect local Medicare allowable fees

Destruction Warts or Benign Lesions

- 17110 1-14 lesions $113
- 17111 15 or more lesions $134

- These are standalone codes

- *Medicare Fee Schedule and RVU data as of October 2017 – The Geographic Practice Cost Index (GPCI) will affect local Medicare allowable fees

Destruction/Removal Skin Tags

- 11200 1-15 lesions $90
- 11201 Add for each additional 10 lesions $19
- 11201 Not used alone

- *Medicare Fee Schedule and RVU data as of October 2017 – The Geographic Practice Cost Index (GPCI) will affect local Medicare allowable fees

Reference Times - Cutaneous Cryosurgery by Usatine, Stulberg & Colver (CRC Press 2014)

Name of skin lesion	Freeze time total (secs)	Freeze- thaw cycles	Halo diameter (mm)	Open Spray (OS) Probe (P) Forceps (F) Cotton-tipped applicator (CTA) Intralesional steroid (IS)
Acne cysts	5-10	1	0	OS
Acrochordon – Skin tags	5 -10	1-2	0	OS or F
Angiomas (cherry and spider angiomas)	5 – 10	1	0	P or OS
Chondrodermatitis nodularis	10 – 20	1	1-2	OS
Dermatofibromas	30	1	2 mm	OS
Digital mucous cyst	10-20	1	0	OS After needling
Granulation tissue	20 -30	1	0	OS
Granuloma annulare	5 – 10	1	0	OS
Hemangiomas (strawberry)	10-20	1-2	2	P
Keloids and hypertrophic scars	20 – 30	1	1	OS (with IS)
Molluscum	5	1	0	OS
Mucocele	10 -20	1	0	P
Prurigo nodularis	10-30	1	1	OS (consider IS)
Pyogenic granuloma	20-30	1	1	P or T
Sebaceous hyperplasia	5 – 10	1	0	OS or P
Seborrheic keratoses:	5 – 20	1 or 2	2	OS
dermatosis papulosa nigra	5-10	1	0-1	OS
Solar lentigo	3- 5	1	0	OS or CTA
Syringoma	5 – 10	1	0	P or OS
Venous lake	5-15	1	1-1.5	P
Viral warts (common, flat, plantar)	5 – 30	1-2	2	OS
Filiform wart	5	1-2	1	F or OS
Anogenital wart	5	2	1	OS
Xanthelasma	15	1	0	P


Courtesy Daniel Stulberg, MD

Best Practice Recommendations

- Rotate to try the diff. equipment
- Different tips for control
- Consider your costs/budget/time to choose tools
- Consider Hypopigmentation

Cryosurgery Equipment Lending Library

- Courtesy NMAFP
- 2 months
- Try out in your practice
- See if you want to expand
- Free except responsible for shipping/returning equipment
- Sign up at end of workshop

Courtesy Daniel Stulberg, MD

Courtesy Daniel Stulberg, MD

References/Acknowledgements

1. Usatine RP, Pfenninger JL. Cryosurgical Techniques, Chapter 15, Dermatologic and Cosmetic Procedures in Office Practice 2011
2. Usatine R, Stulberg S, Colver G. Cutaneous Cryosurgery. 4th Edition. Taylor and Francis, London, 2014

Cryosurgery equipment lending library

- The NMAFP is starting a cryosurgery equipment lending library for its members to be able to try out cryosurgery as part of their practices
- Liquid nitrogen storage container
- Cryosurgery gun & tips
- Cryo tweezers
- 1 month
- Must ship back to NMAFP or next user

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