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ASHEVILLE, NC
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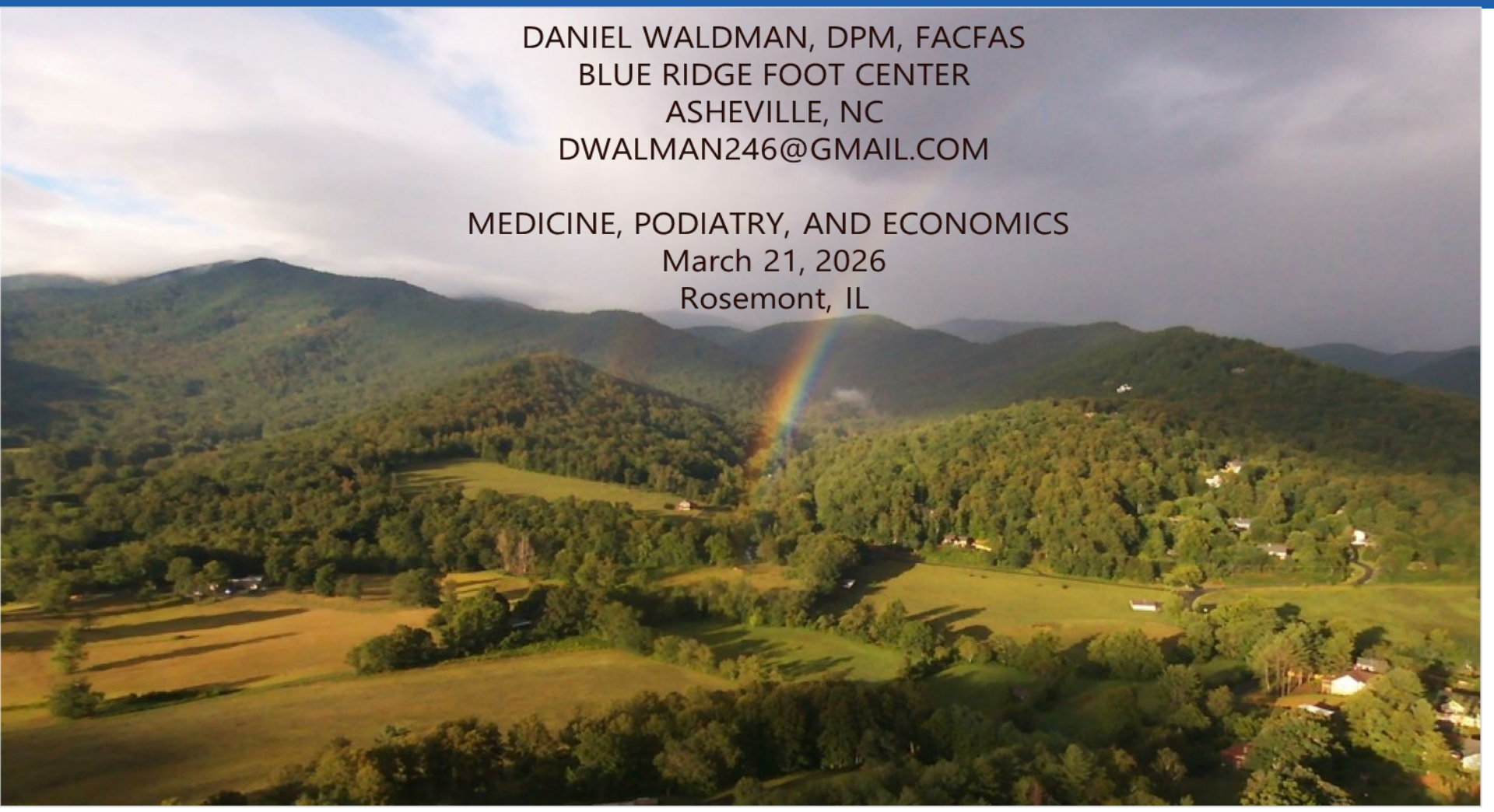
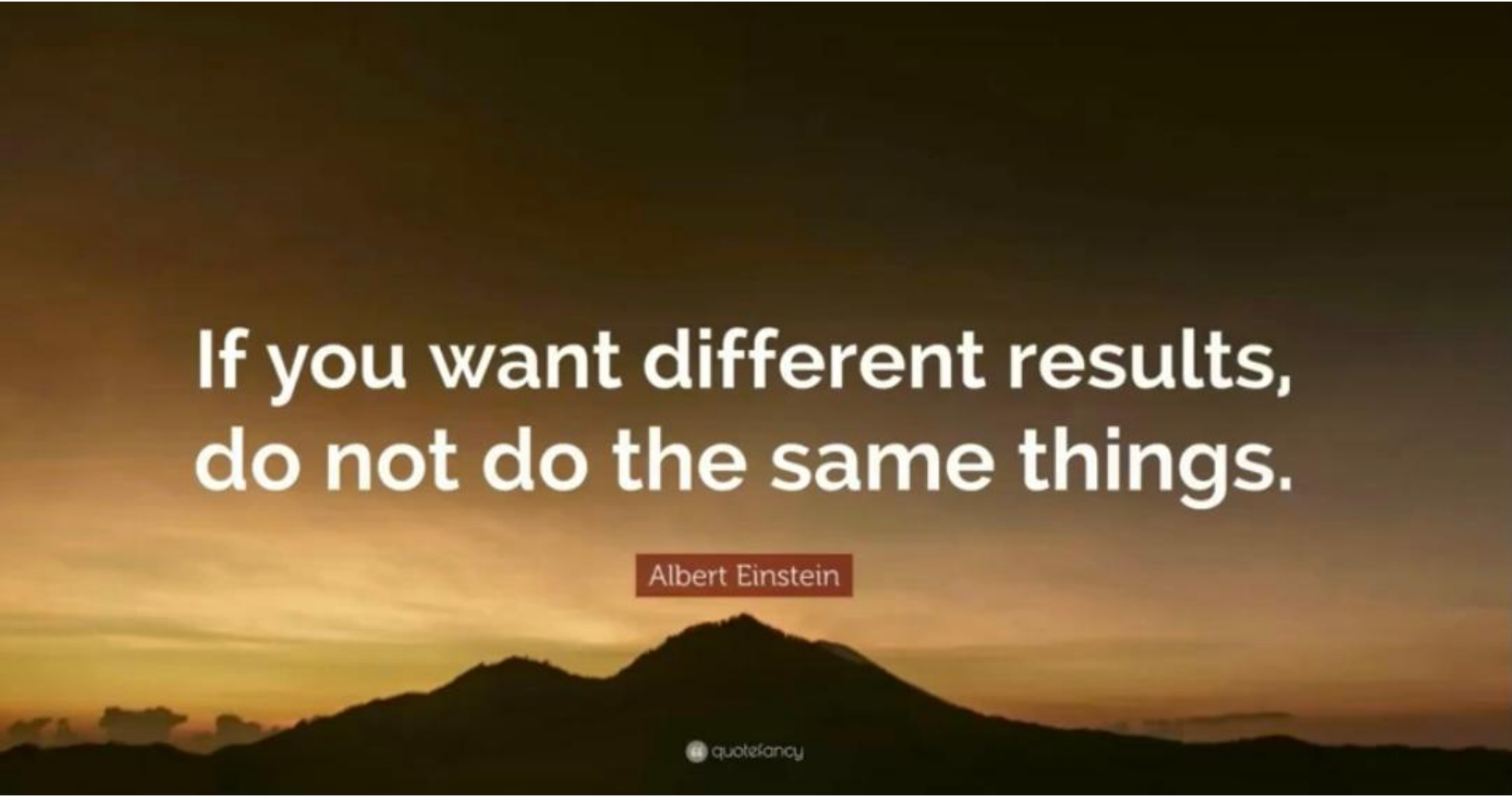
MEDICINE, PODIATRY, AND ECONOMICS

March 21, 2026
Rosemont, IL




WARTS!
NO GOOD, ALL BAD, JUST UGLY.
TOWN OF SAD HILL


If you want different results,
do not do the same things.
Albert Einstein
quotefancy

Disclosures

Clinical Consultant and Speaker:
Bako Diagnostics - BakoDx.com
Consultant&Speaker: Emblation
Consultant&Speaker: Cutting Edge MLS
Editorial Board: Codingline
Consultant&Speaker: Cynosure Lasers
Consultant&Speaker: NuVolase Lasers

Objectives

1. Explore skin immunity and the condition profile for warts

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2. Understand the current treatment landscape

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4. Review practice management implications and impact

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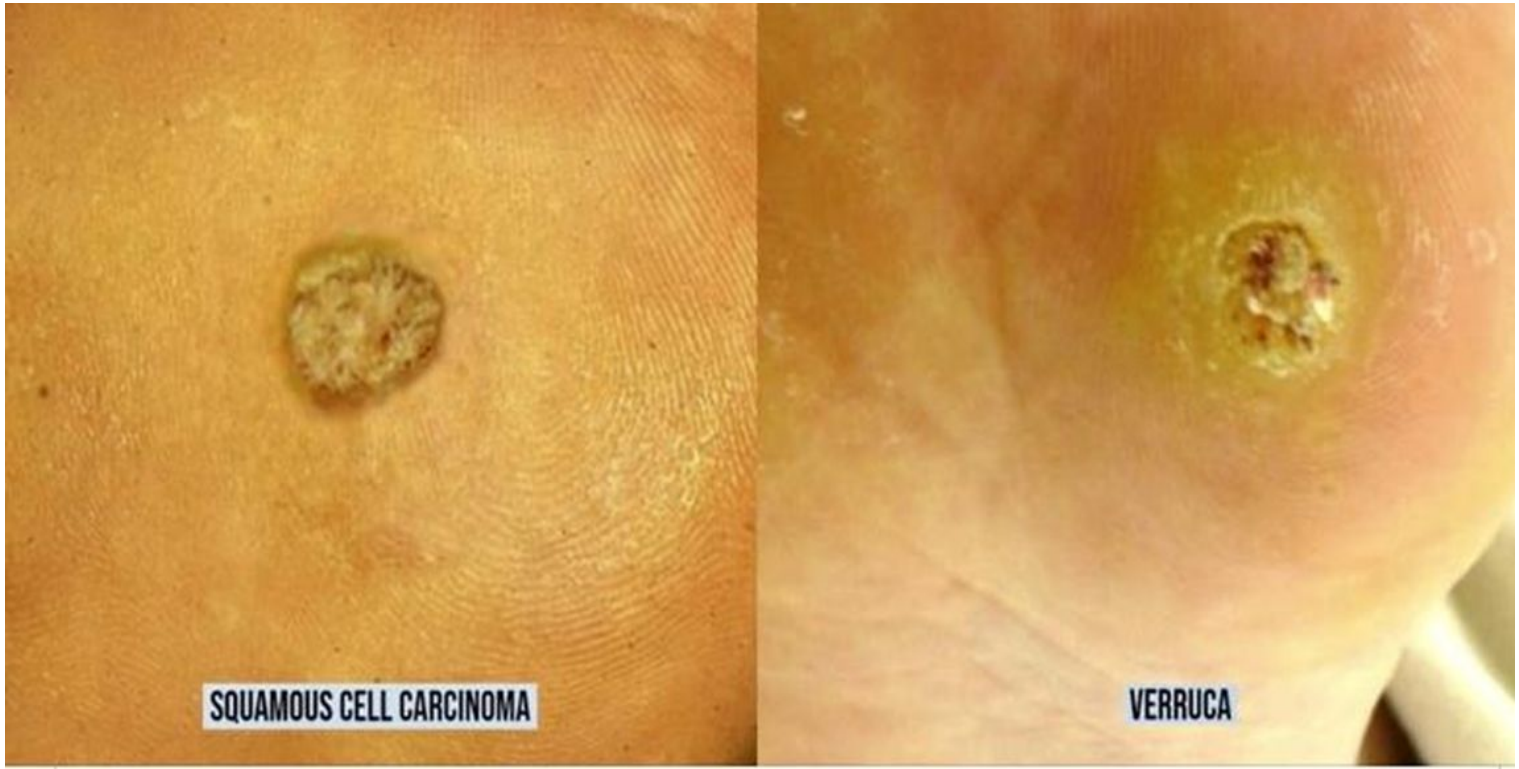
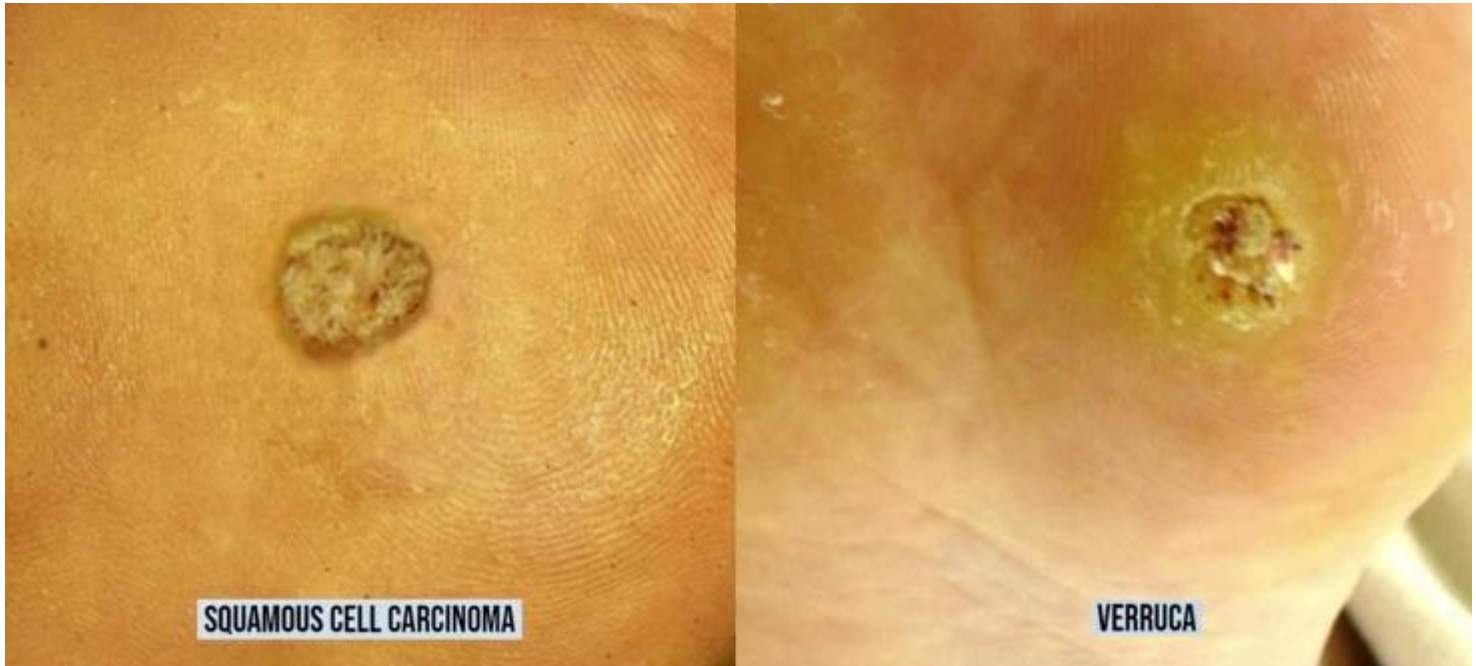
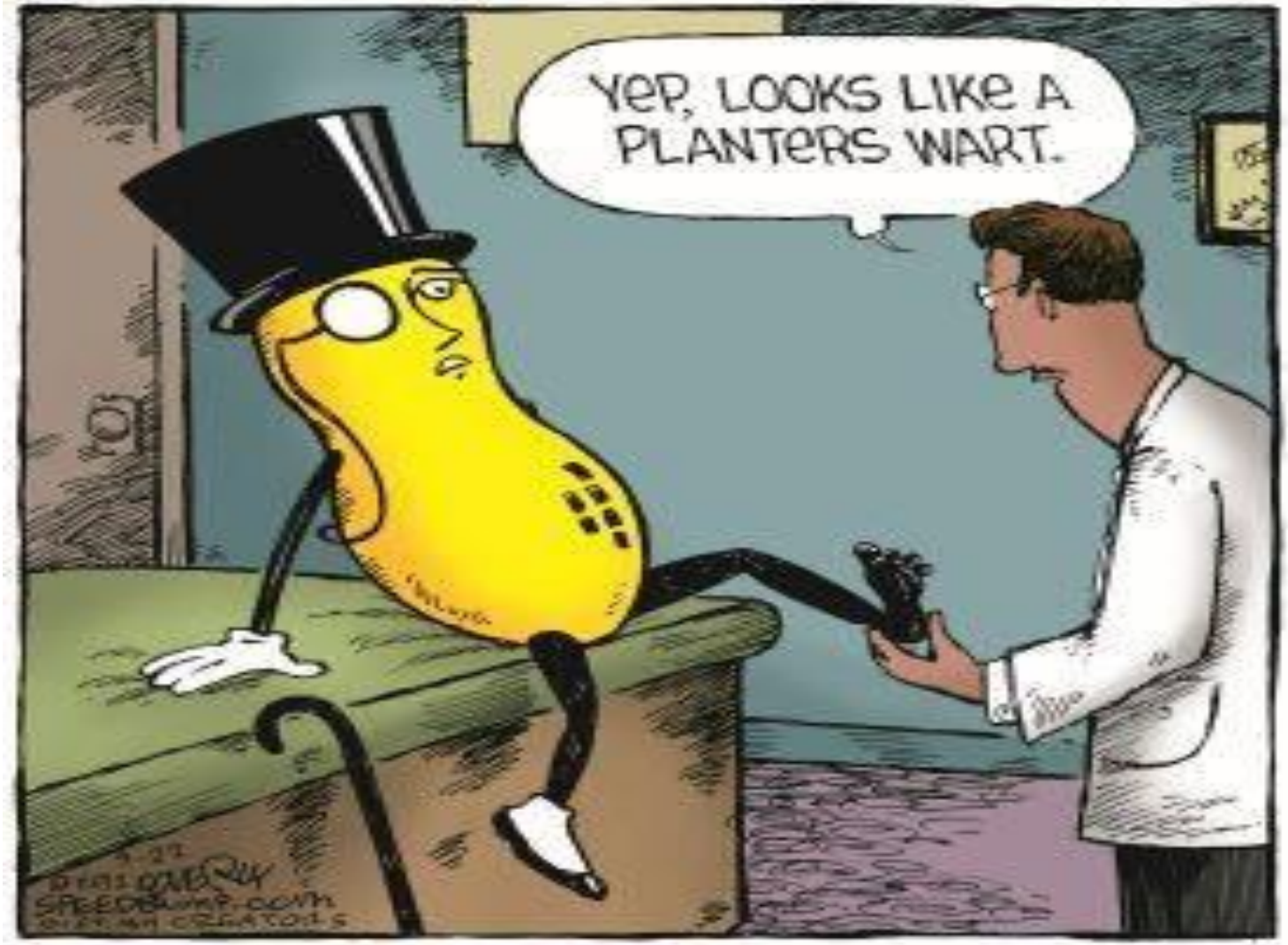
LETS DIVE IN!


SQUAMOUS CELL CARCINOMA
VERRUCA

BIOPSY FIRST...GET DIAGNOSIS!
KNOW WHAT YOU ARE TREATING




YEP, LOOKS LIKE A PLANTERS WART.

HPV

- Virology

Over 200 subtypes

Low risk = warts anywhere on the body

High risk = predominant in ano-genital

- HPV enters through micro abrasion
- Favours cell type junctions
- Evades immune system through multiple mechanisms
- Infection spreads over many years in epithelial tissues

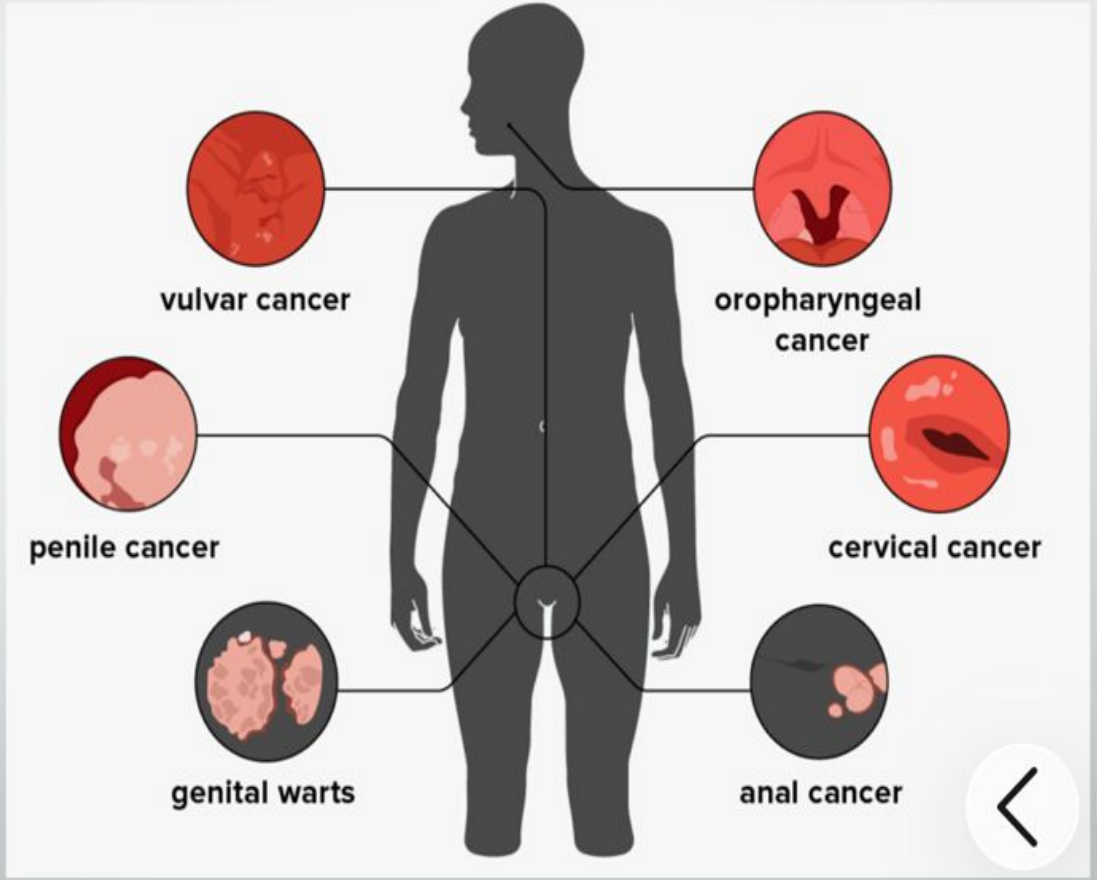
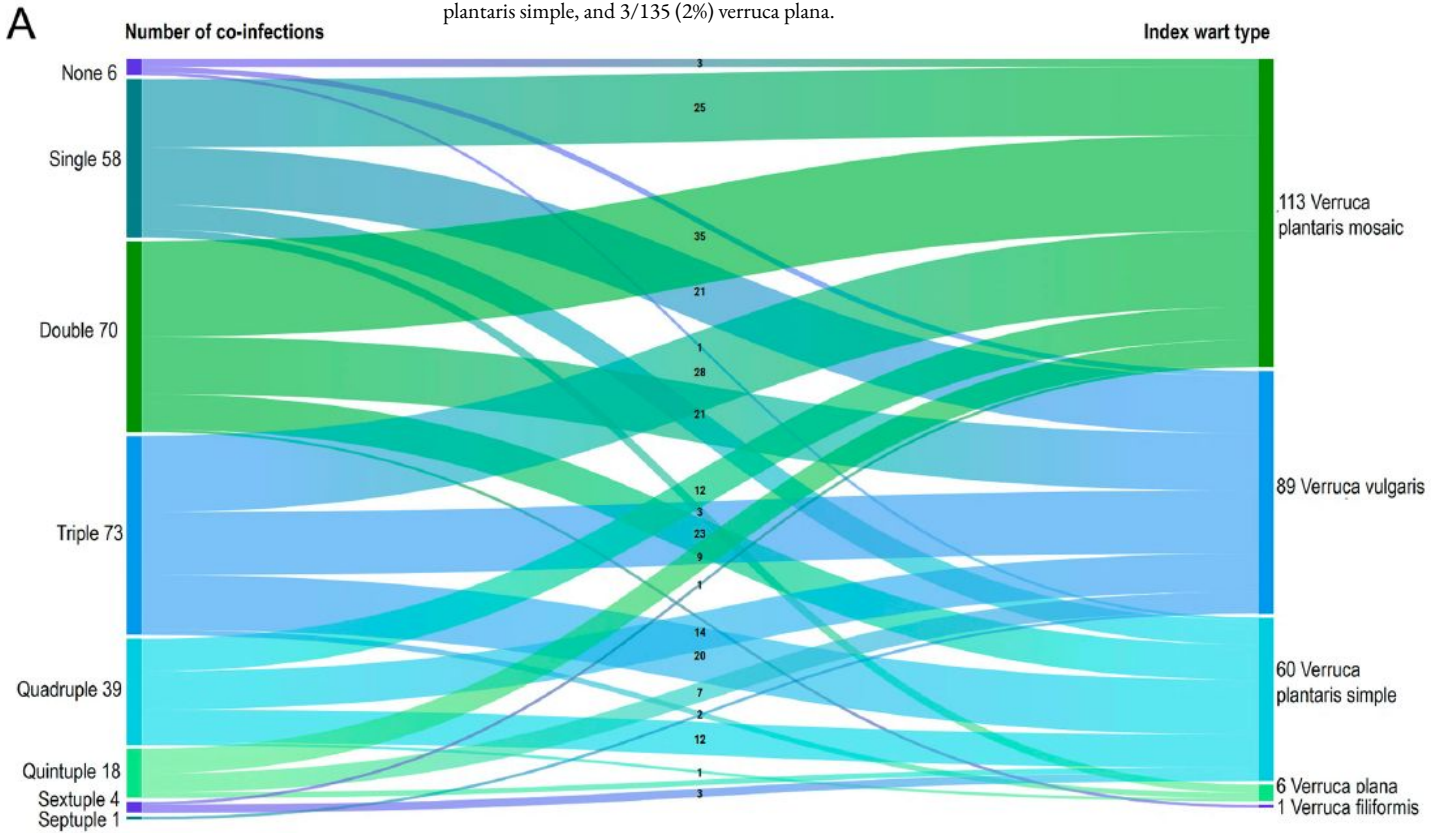


Table 3. HPV type-specific prevalence according to wart type. A summary of HPV type-specific prevalence in different wart types is provided with a distinction being made between cutaneous and mucosal HPV types.

Wart type	HPV type
Common warts	The most commonly found types in common warts are cutaneous types HPV2 and 7, and less frequently HPV1, 2, 4, 7, 27, 28, 29, 57, 60, 65, 77, 91, 94, 95 as well as mucosal types HPV16, 18, 26, 31, 35.
Plantar warts	Simple plantar warts are commonly caused by HPV1, while mosaic warts are usually caused by HPV2 and 57. Other less frequently found cutaneous types are HPV4, 60, 63, 65, and mucosal types 16 and 66.
Flat warts	HPV types most frequently detected in flat warts are HPV3, 10, 28, and 29. Less frequently found types are HPV2, 16, 26, 27 and 41.
Filiform warts	Common HPV types found in filiform warts are HPV1, 2, 4, 7, 27, and 57.

https://repository.uantwerpen.be/docstore/d:irua:22142

Figure 3. (**A**) Distribution of subjects based on their multiple infection status per specific index wart type.
In summary, 25/58 (43%) of warts infected with a single HPV type were verruca plantaris mosaic, 21/58 (36%) verruca vulgaris, 9/58 (16%) verruca plantaris simple, 3/58 (5%) verruca plana.
35/70 (50%) of warts with double infections were verruca plantaris mosaic, 21/70 (30%) verruca vulgaris, 13/70 (19%) verruca plantaris simple, and 1/70 (1%) verruca filiformis.
As regards to warts containing more than two distinct HPV types 50/135 (37%) were verruca plantaris mosaic, 45/135 (33%) verruca vulgaris, 37/135 (27%) verruca plantaris simple, and 3/135 (2%) verruca plana.



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PLANTAR HPV DOES NOT CAUSE CANCER

- **HPV SUBTYPES AFFECT SPECIFIC TYPES OF TISSUE**

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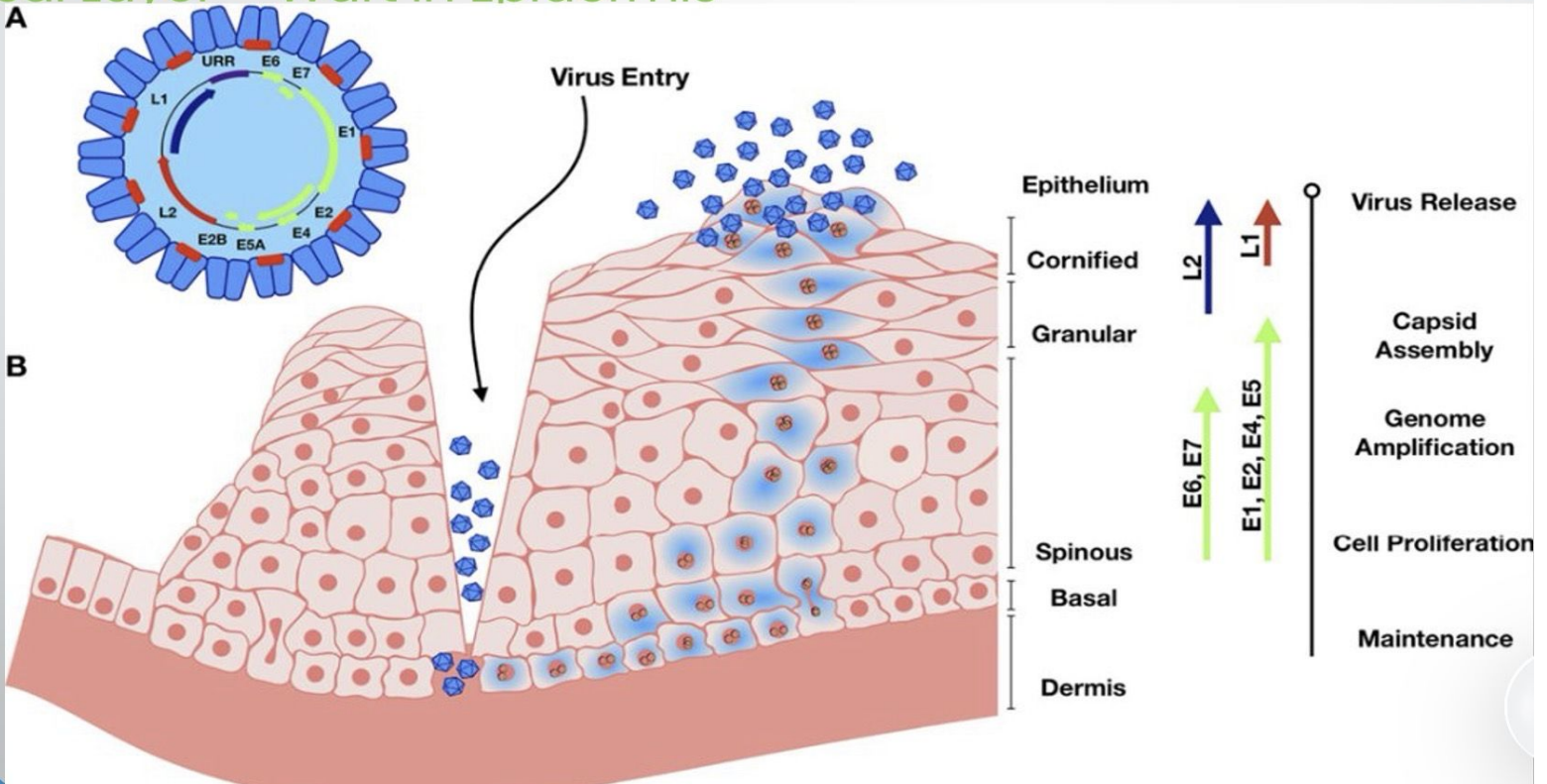
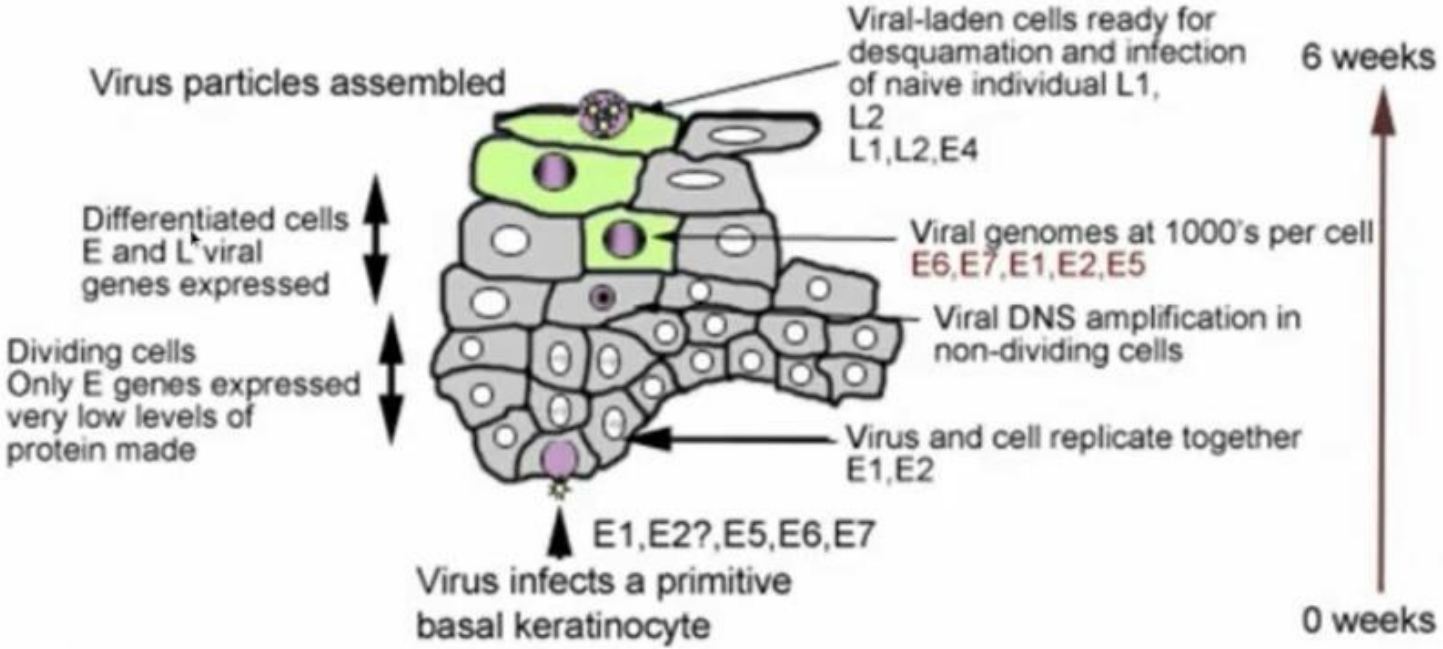
- KERETINAZATION INHIBITS ACIDS/TOPICALS/CRYOTHERAPY

HPV

- HPV in Basal Layer – Wart in Epidermis





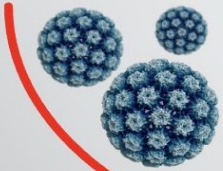
Exclusively intraepithelial infectious cycle no cytolysis or death, no viraemia, long infectious cycle

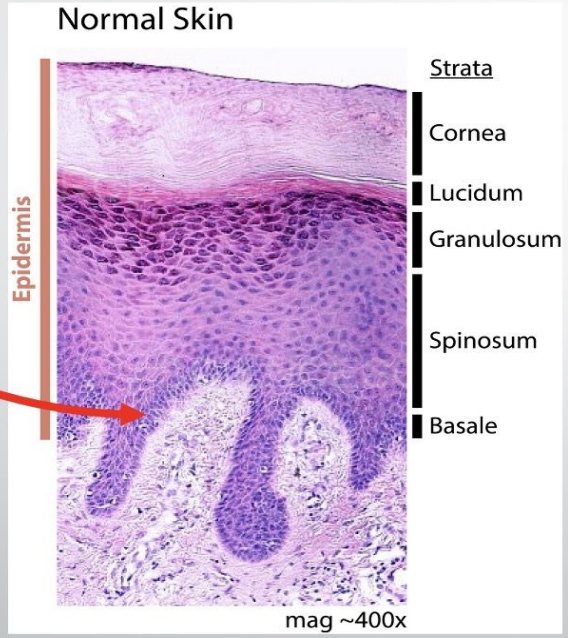
http://emedicine.medscape.com/article/219110-overview#aw2aab6b2b3

HPV

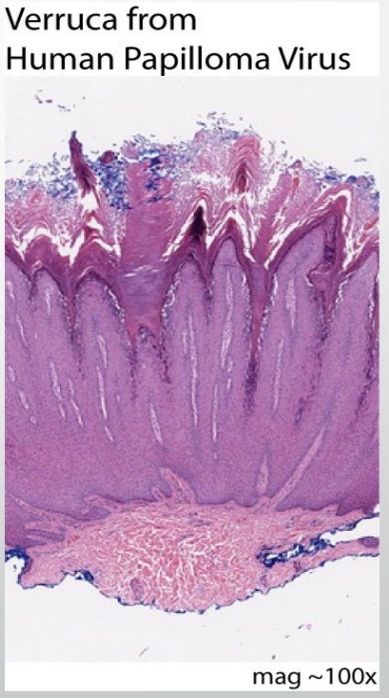
- Histopathology

Infection of basal cells with HPV





Causes proliferation of basal and spinous cells



Ideal Skin Immunity Process

SEARCH

- Microbes and Viruses produce antigens: **detected** by Langerhans cells to stimulate an immune response

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- Langerhans cells “Latch” on particles - **migrate** to lymph nodes and present to CD8+ lymphocytes

Ideal Skin Immunity Process

SEARCH-IDENTIFY-DESTROY

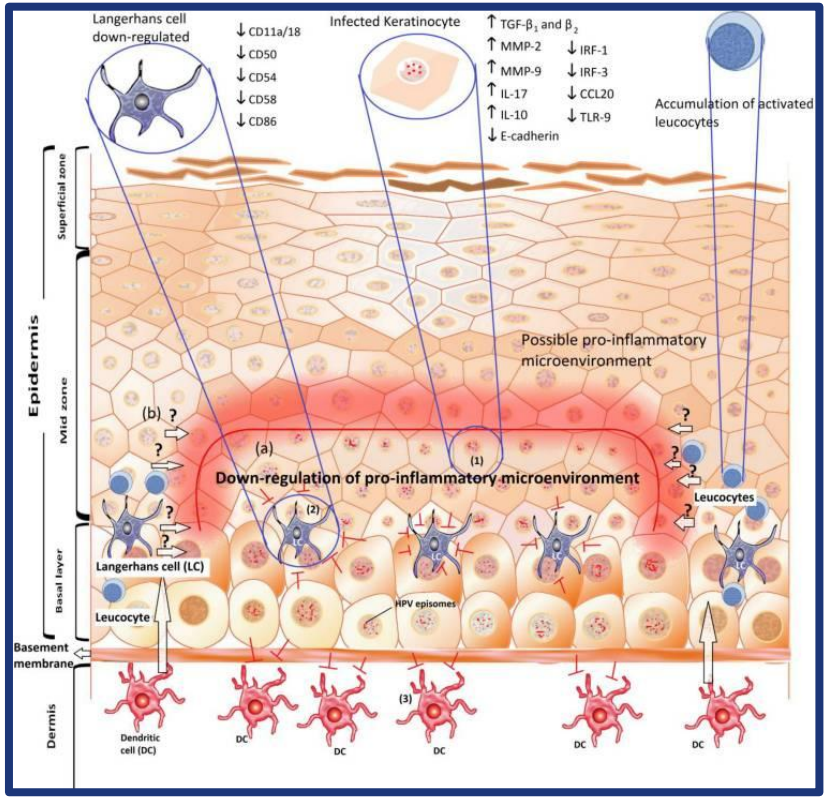
- Microbes and Viruses produce antigens: **detected** by Langerhans cells to stimulate an immune response
- Langerhans cells “Latch” on particles - **migrate** to lymph nodes and present to CD8+ lymphocytes
- **T-Cells** are triggered, cloned and migrate to the infection site to eliminate the infection

Langerhans Cells = Critical to Immunity

Warts and the HPV Persistence Challenge

- Remote location in epidermis
- **No surface markers to alert Langerhans cells: Viral cells go undetected**
- Wart protein production can suppress antigen presentation
- High Levels of Recalcitrance

High Lifetime Probability of Infection



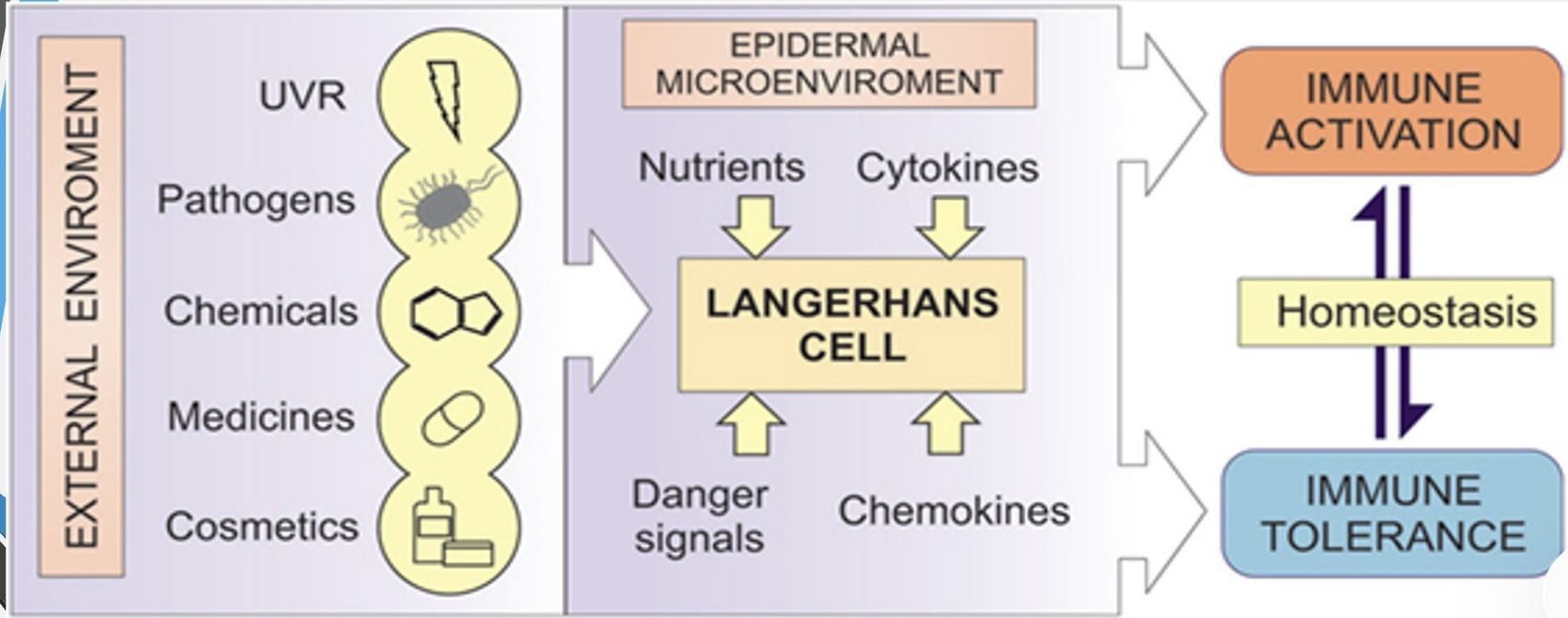
Skin Immune System

- 2 Arms

Innate	Adaptive
Non-specific	Specific
Immediate = 1st responders	Slower (days)
No Memory	Memory
Macrophages Neutrophils	T cells B cells Antibodies

Skin Immune System

- Langerhans



Traditional Wart Treatment Options Destroy Tissue But Do Not Help The Immune System

Common Modalities

- Cryotherapy so cold it “burns” tissue
- Salicylic Acid low pH “burns” tissue
- Cantharadin low pH “burns” tissue
- Laser so hot it “burns” tissue
- Electrocautery so hot it “burns” tissue
- Surgical Excision so sharp it “cuts” tissue

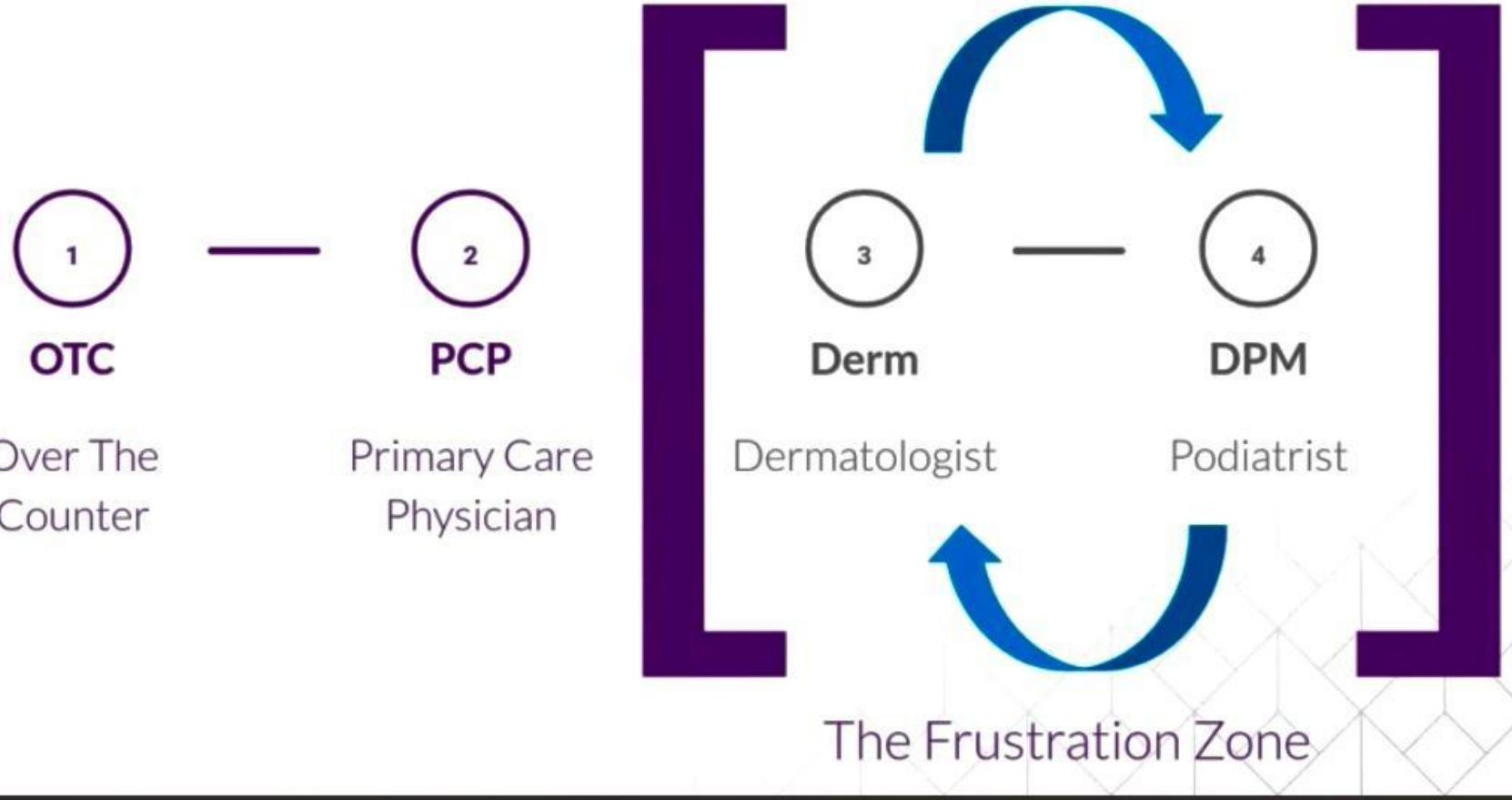
IMMUNE STIMULATION VIA AUTOLOGOUS INTRADERMAL WART INOCULATION

- Small piece of pt's own wart harvested then implanted intradermally or subcutaneously
- Provokes **systemic** cell mediated immune response CD4+ & CD8+ T cells and cytokine response
- 4-8 weeks 60-85% success

OTHER IMMUNOTHERAPIES

- **Candida antigen injections** – supplier issues
- **Topical imiquimod** - poor response plantar wart
- **Topical 5-FU** - poor response plantar wart
- **Diluted bleomycin intralesional injection** directly cytotoxic to HPV infected keratinocytes. Antineoplastic antibiotic denatures the DNA strand causing apoptosis/**necrosis of infected tissue**. Microdose is local not systemic. Enhances exposure to HPV antigens

Understanding the Patient Journey




"You shouldn't do things
differently just because
they're different.
They need to be... better."
Elon Musk

WHAT WOULD THE IDEAL TREATMENT BE?

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- EFFECTIVE

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THE HP VIRUS IS INVISIBLE TO THE IMMUNE SYSTEM

SO……

DO WE DESTROY HEALTHY TISSUE OR WAKE UP THE IMMUNE SYSTEM?

Microwave Power Comparison

Mobile Phone
GSM 0.8 – 1.9GHz Power: **2 W**
WiFi & Bluetooth 2.45 – 5.0 GHz
Power: 100 mW

Microwave Generator
8 GHz Power: **10W**

Microwave Oven
2.45 GHz Power: **1000W**

The world's smallest Medical Microwave Generator

Non-Destructive energy used to stimulate an immune response

Primary clinical application to date: Viral Warts (Significant Unmet Need)

500,000+ treatments procedures since 2016 with real world efficacy of 85%+

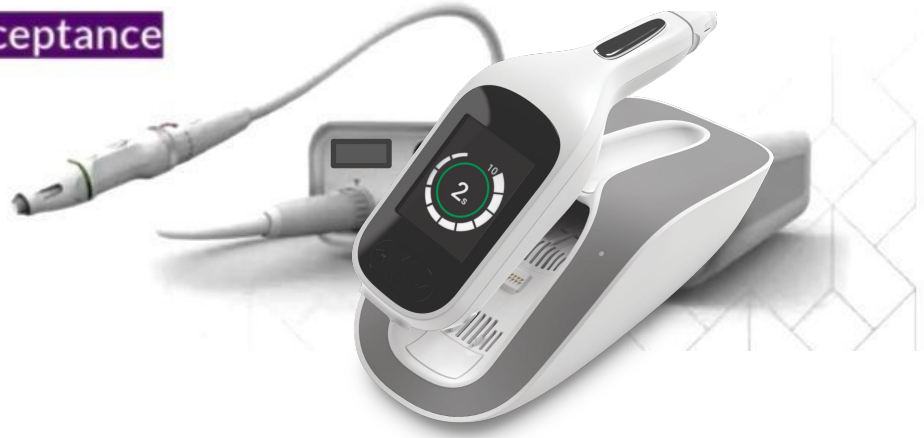
FDA 510K clearance in November 2018

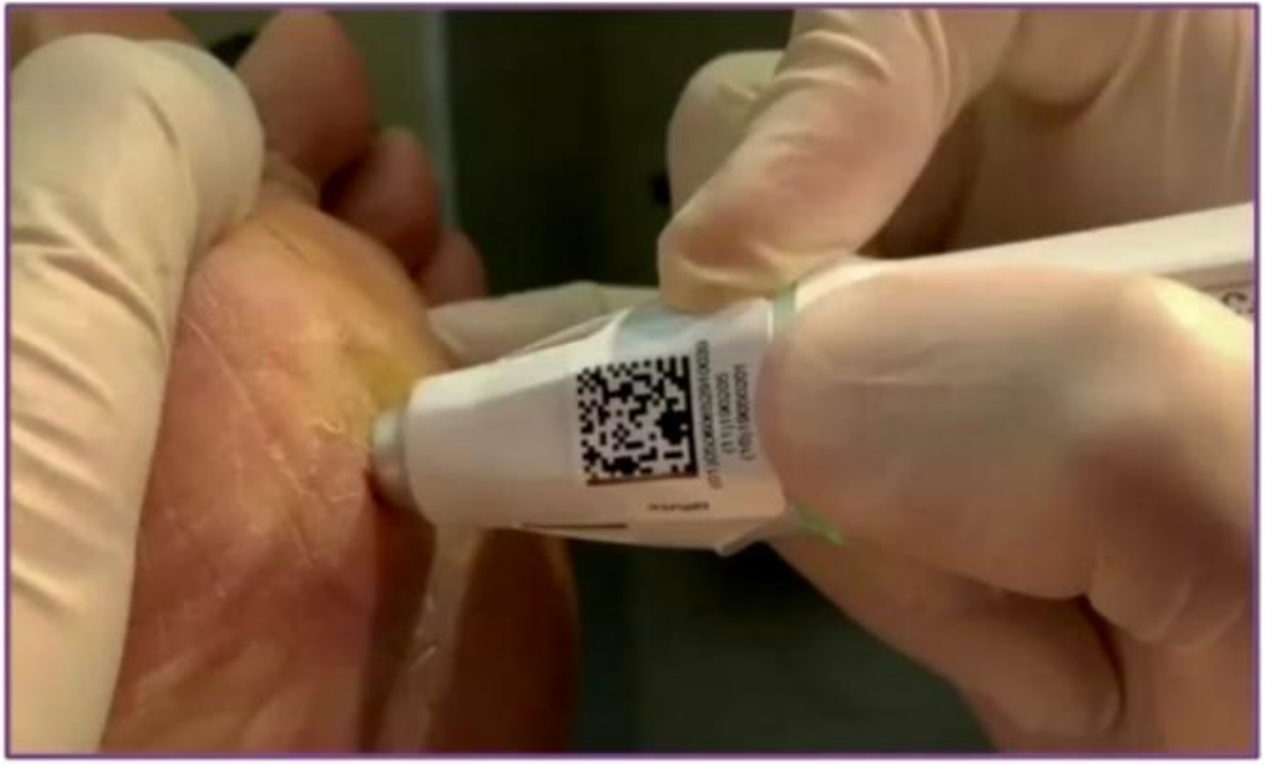
Less than 1% recurrence

Cash Pay Treatment seeing 70%+ acceptance

2025: Updated 510(k) in addition to general use.

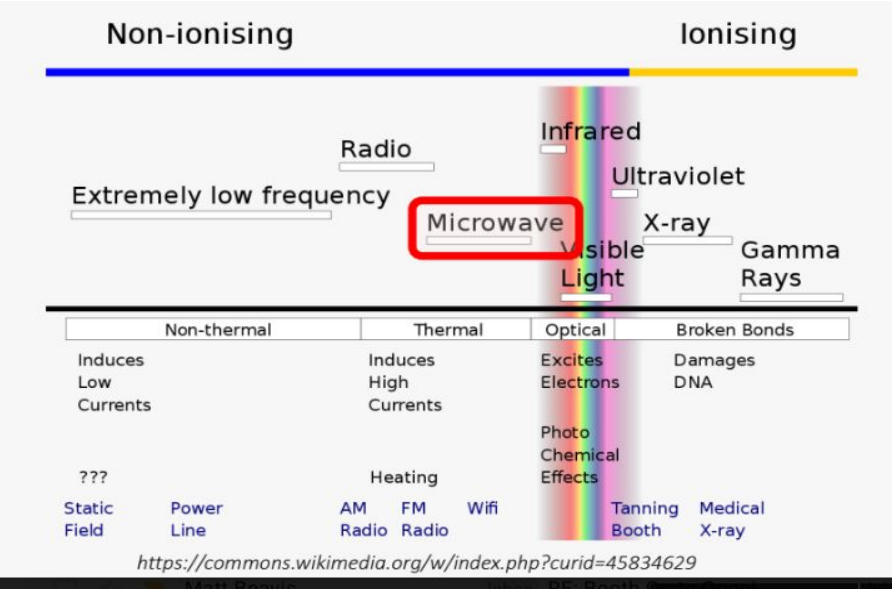
" Specific Indication: Treatment of Common and Plantar Warts. "

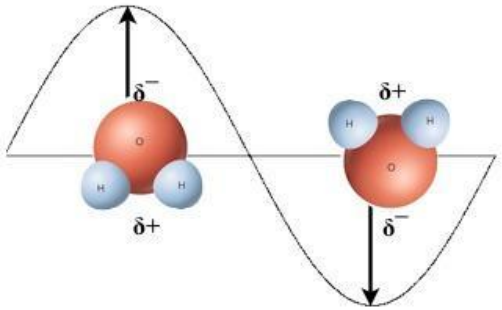




Non Invasive - No Wound - No Smoke - No Dressings - No At Home Care

Microwave Energy: Rapid Heat Production



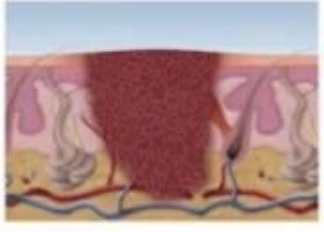


Water molecules align to the microwave field

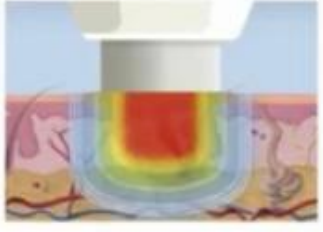
Collisions create friction = Rapid Heat

How It Works

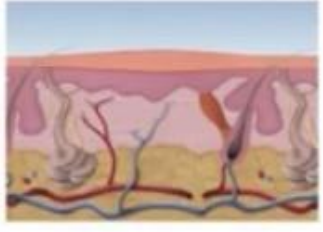
Microwave energy rapidly elevates tissue temperature, triggering a natural immune response.



Infected tissue can exist several milimetres below the surface and can often be difficult to treat using traditional methods, resulting in either untreated tissue or significant damage.



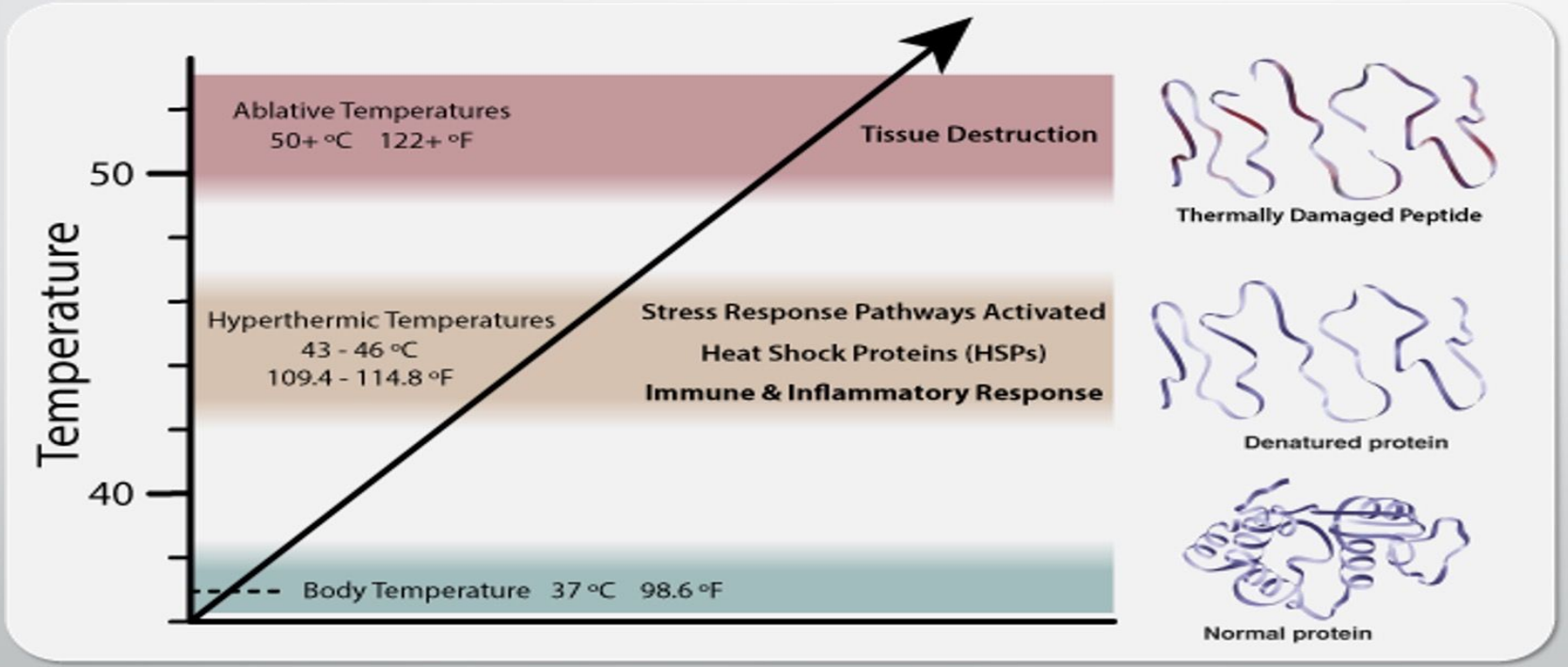
[redacted] deliver[redacted]ecise, highly controlled energy dose. As microwaves travel into the tissue, water molecules begin colliding and creating localised heat energy, between 43-46 degrees celcius.



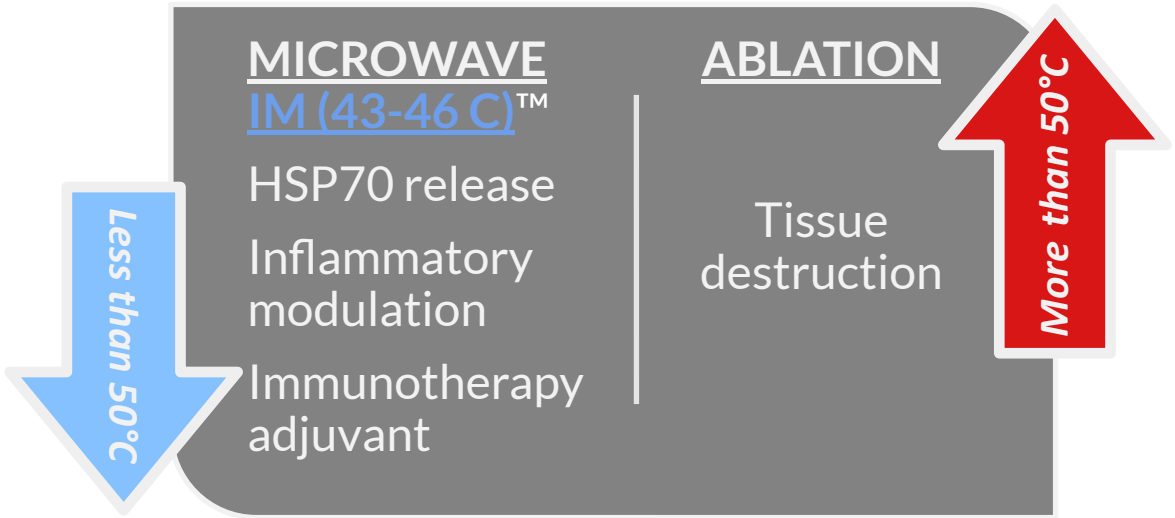
In just seconds the treatment complete and the immune res begins immediately. Heat sho proteins within HPV infected are released, alerting the bod the presence of the virus.


HPV
The Skin's Cloak of Invisibility

Temperature Zones



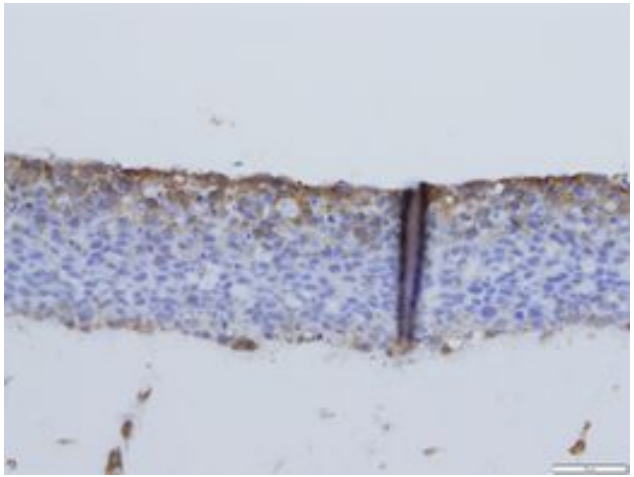
MOA: Non-ablative Immune Modulation (IM)



Microwave treatment upregulates a stress respons

Response to heat stress

Untreated, 16 hours



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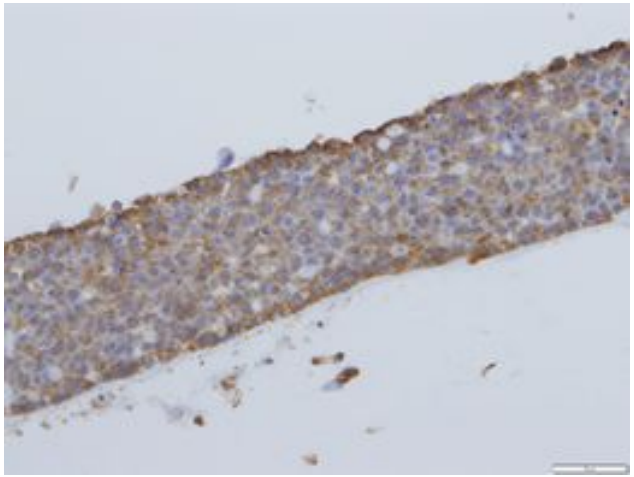
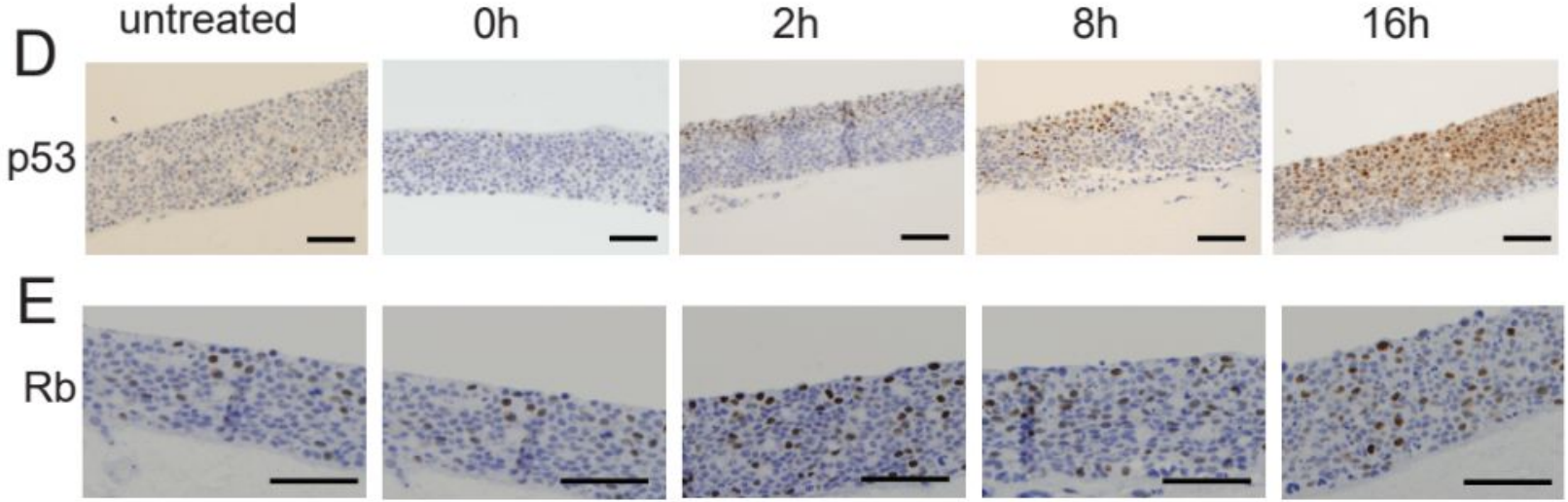


HSP70 is upregulated 16 hours post treatment

https://doi.org/10.1016/j.ebiom.2023.104577

The loss of E6 and E7 expression following microwave treatment correlates with an upregulation of p53 and Rb

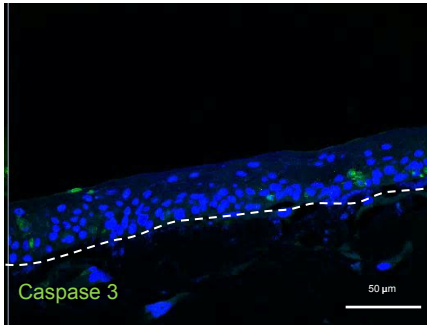


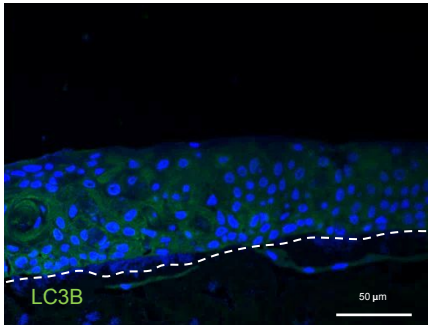
https://doi.org/10.1016/j.ebiom.2023.104577

Microwave treatment results in an upregulation of apoptosis and autophagy markers

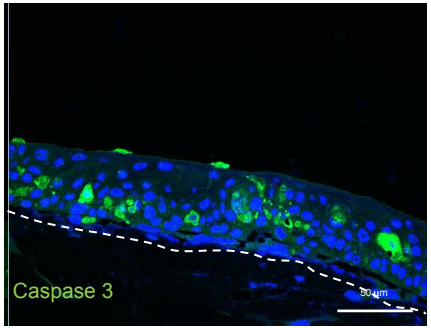
16 hours

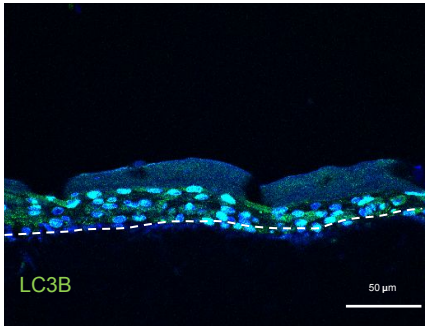
Untreated tissue

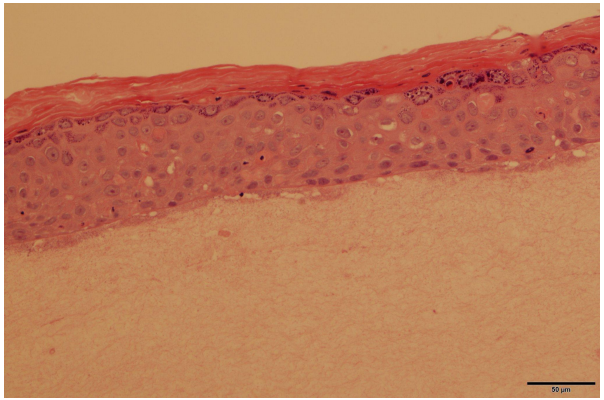




Treated tissue







Apoptosis	Caspase 3
Autophagy	LC3B

Medical Research Council

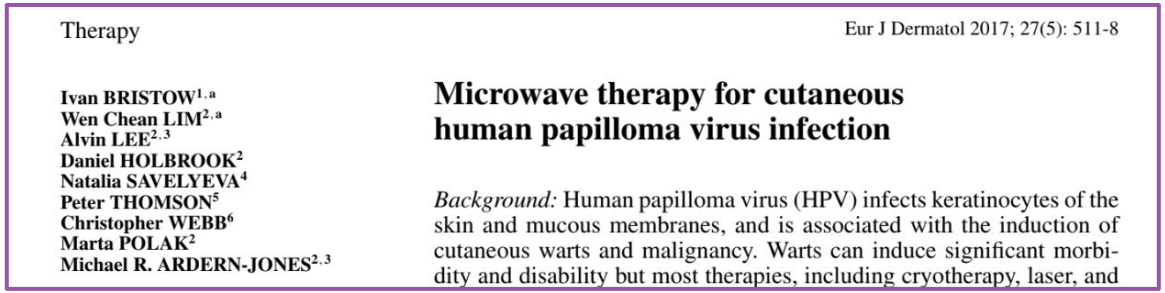
University of Glasgow

CVR Centre for Virus Research

Independent Study: Recalcitrant Plantar Warts

Study Parameters
Average Lesion Age: 5.3 Years
Multiple Failed Treatments
Youth Excluded

Outcome
75.9% Clearance



Therapy

Eur J Dermatol 2017; 27(5): 511-8

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Michael R. ARDERN-JONES[2,3]

Microwave therapy for cutaneous human papilloma virus infection

Background: Human papilloma virus (HPV) infects keratinocytes of the skin and mucous membranes, and is associated with the induction of cutaneous warts and malignancy. Warts can induce significant morbidity and disability but most therapies, including cryotherapy, laser, and

this process. *Conclusion:* Keratinocyte-skin dendritic cell cross-talk is integral to host defence against HPV infections, and this pilot study supports the concept of microwave induction of anti-HPV immunity which offers a promising approach for treatment of HPV-induced viral warts and potentially HPV-related cancers.

Demonstrated Immune Response

Treatment Protocol

85+%

PW specific resolution rate

<1%

Recurrence

2-3 treatments

4 weeks apart

Follow up 12 weeks
after final treament

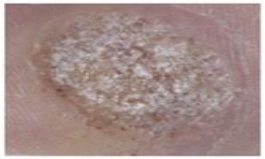
8-10 watts / 2 seconds
5 applications

Energy dosing varies based on (a) lesion type and (b) skin thickness

Plantar Warts

Signs of response and clearance

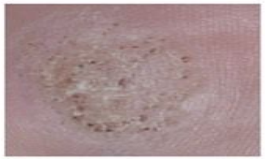
Clearance



Warts become larger, more pronounced.

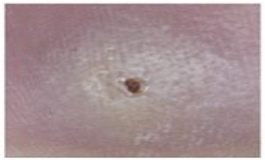
Small satellite warts may appear.

Warts become firmer / more keratotic.



Wart is no longer painful from pressure or palpation.

Warts get thinner and/or reduce in diameter.



Loss of flecks in wart.

Dermatoglyphic features return.

Full Resolution.

Deliver all doses at one site before moving on

Treat the largest lesions first, smallest may be skipped

For Periungual and Subungual

Power
10

Pulse
2s

Rest
5s

Repeat
5x

Treatment sessions

3 sessions
4 weeks apart
12 week follow up

Comfort control

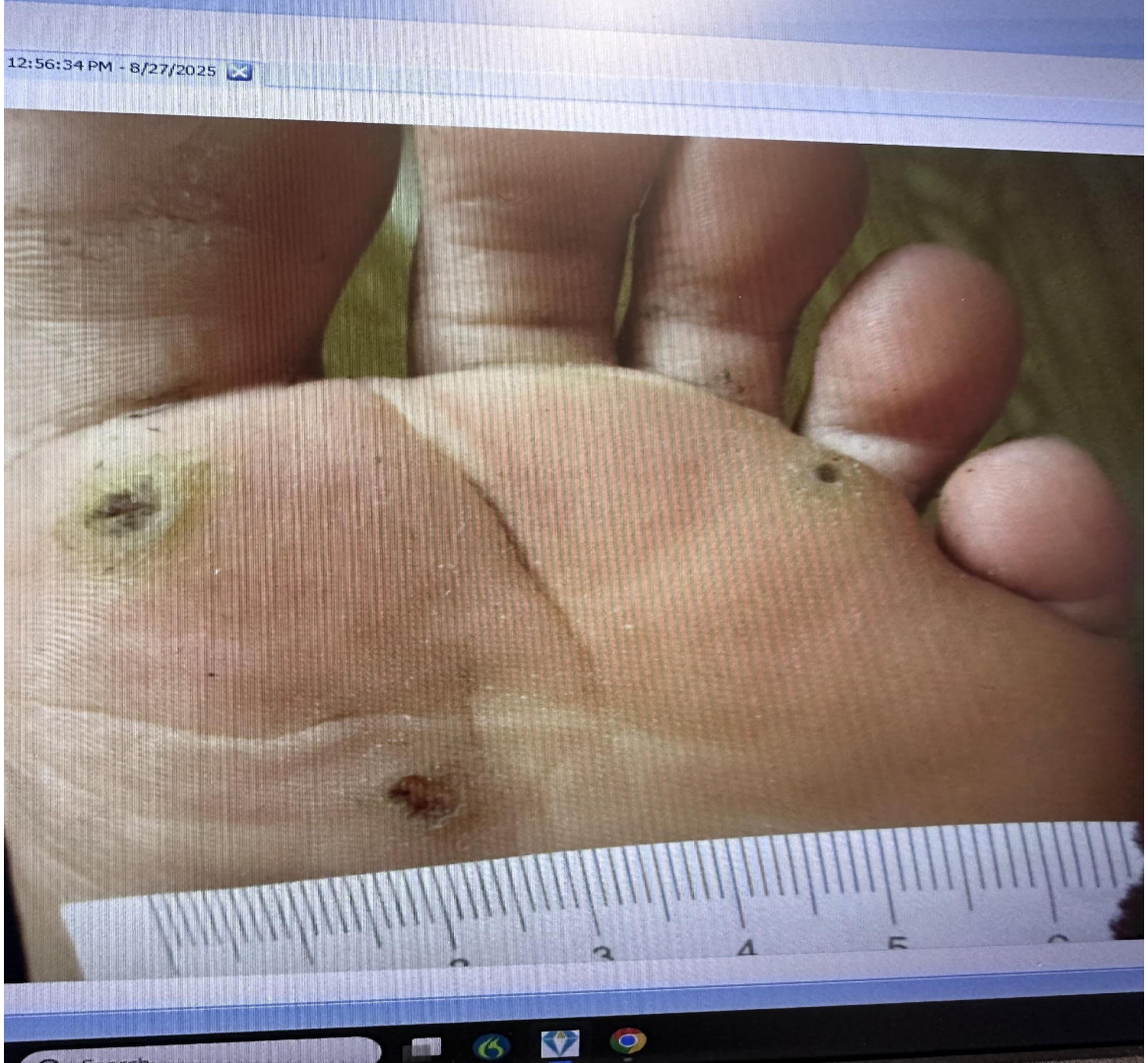
Use these approaches for:
- Children
- Thinner skin
- Superficial lesions
- Other areas of the foot

Option 1

Set power to **10**,
Decrease pulse length to **1 second**,
Increase repeats to **10x.**

Option 2

Reduce the power to **9** or **8**, maintain **2s** pulse.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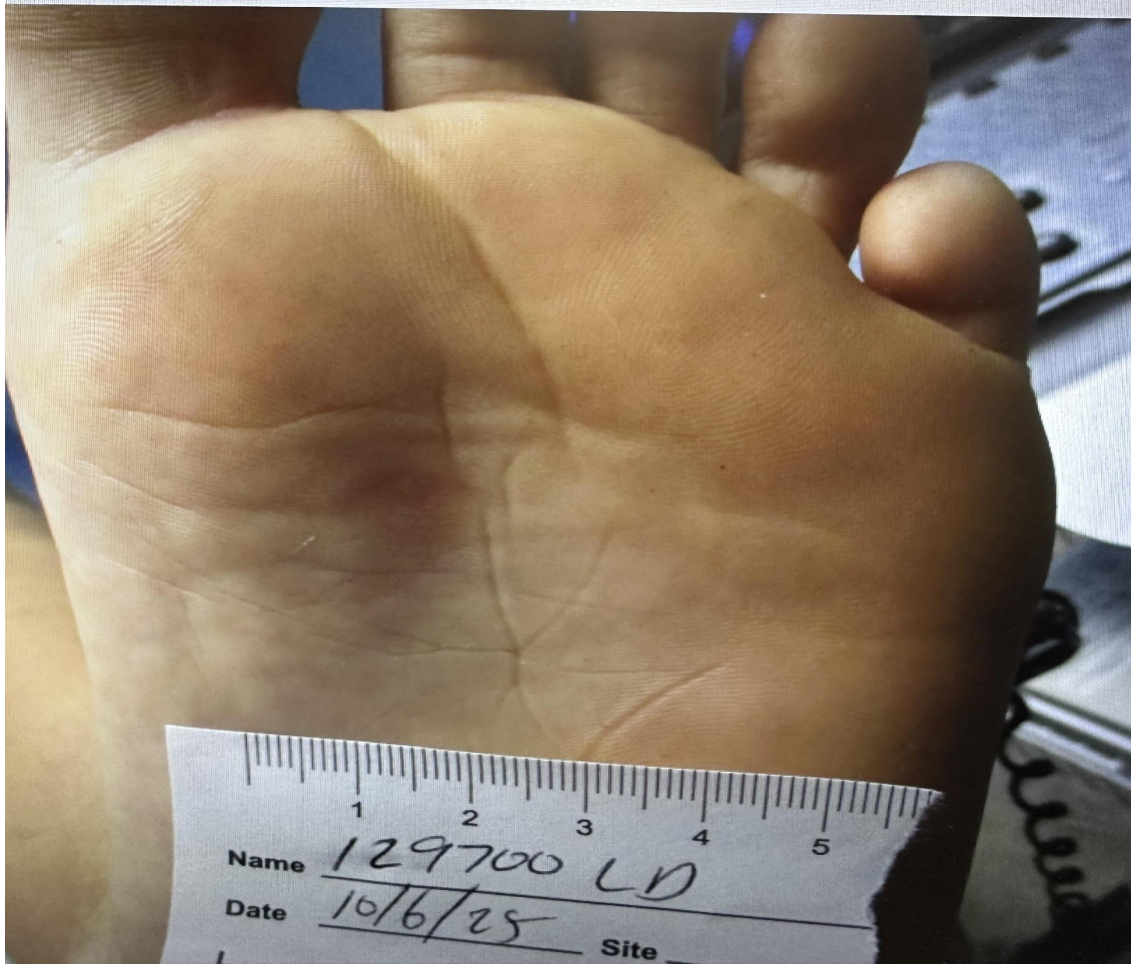
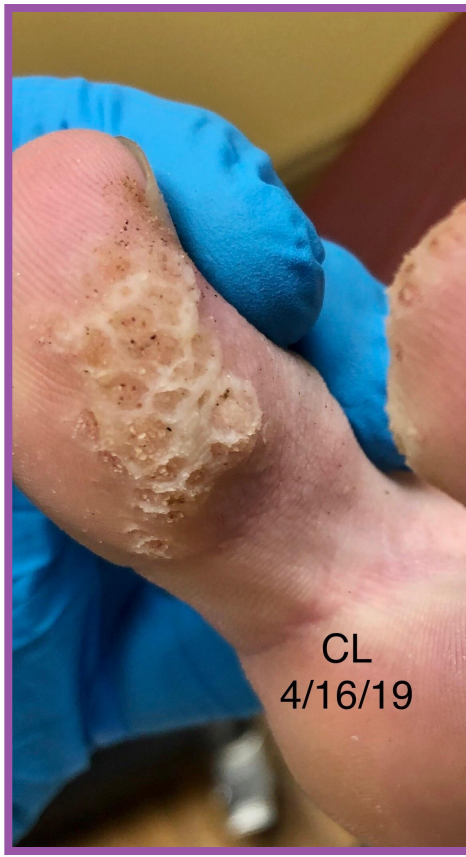

1
2
3
4
5
Name 129700 LD
Date 10/6/25
Site

Case Study 1

- 14 yo male
- 3 year history of mosaic lesions to both feet
- Active unsuccessful treatment for 1 year
  - *Salicylic acid (SA)*
  - *Cryotherapy*
  - *Imiquimod*
- Seen every 2/3 weeks
- Pain level (0-10)= 1



Images Courtesy Dr. Rob Conenello

Case Study 1

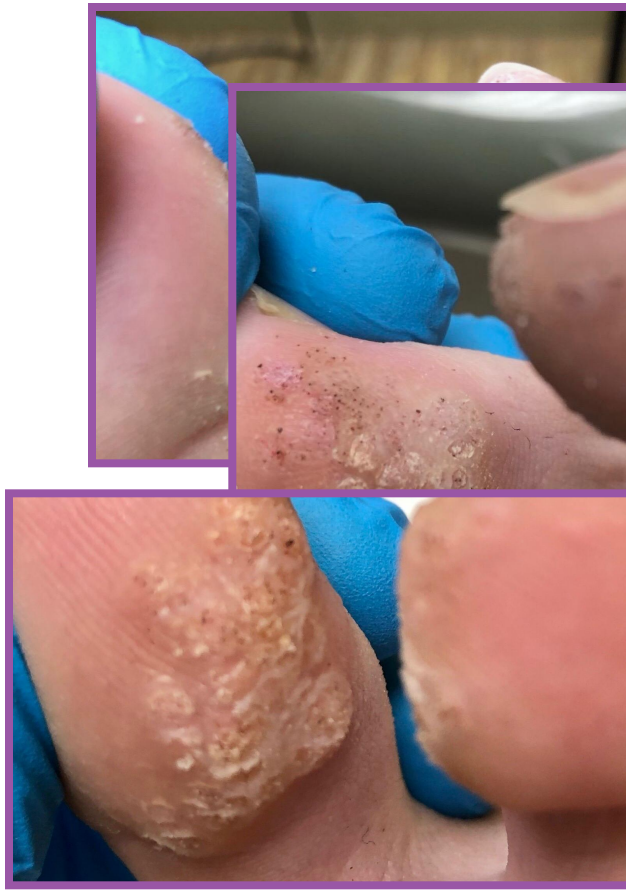
Microwave Dose:

- 8 watts for 2 seconds x 5 applications per site

Treatment Protocol:

- 3 treatments
- 4 weeks apart

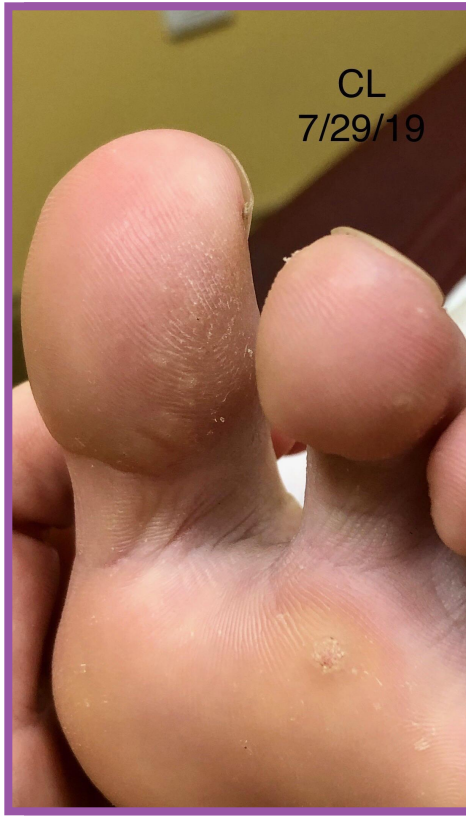
Images Courtesy Dr. Rob Conenello



Case Study 1

12 Week Review: Resolution

Total Microwave Treatments: 2

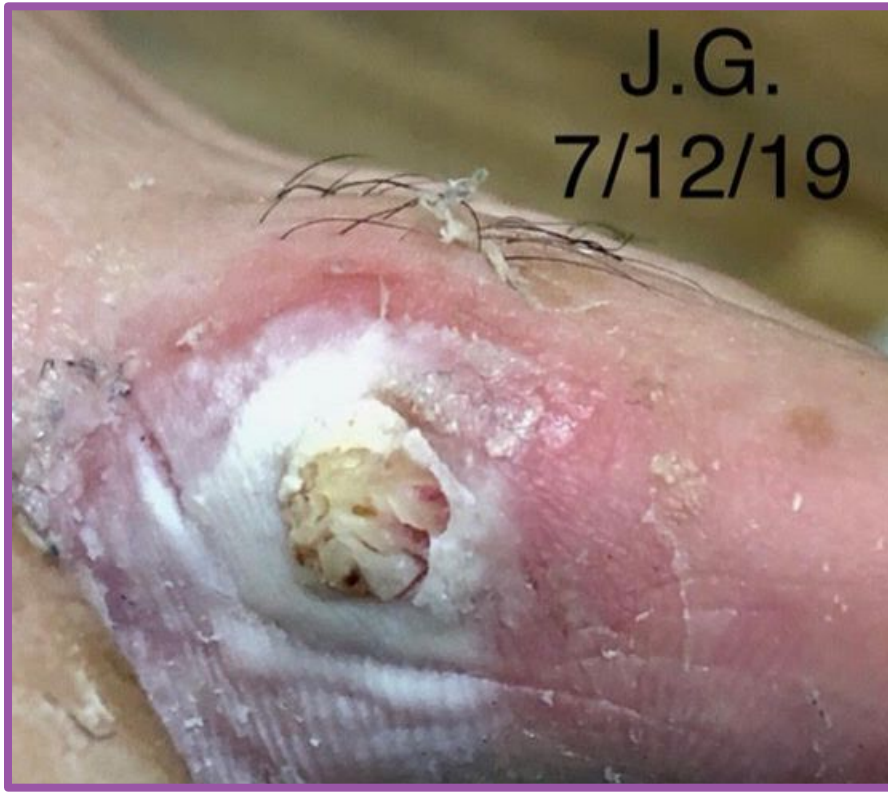


Images Courtesy Dr. Rob Conenello

Case Study 2

- 46 yo male
- 4 week history of lesion to left second digit
- Avid runner
- Physical Therapist
- General health good
- Pain level (0-10) = 5
- Previous treatment SA and home cryo

Images Courtesy Dr. Rob Conenello



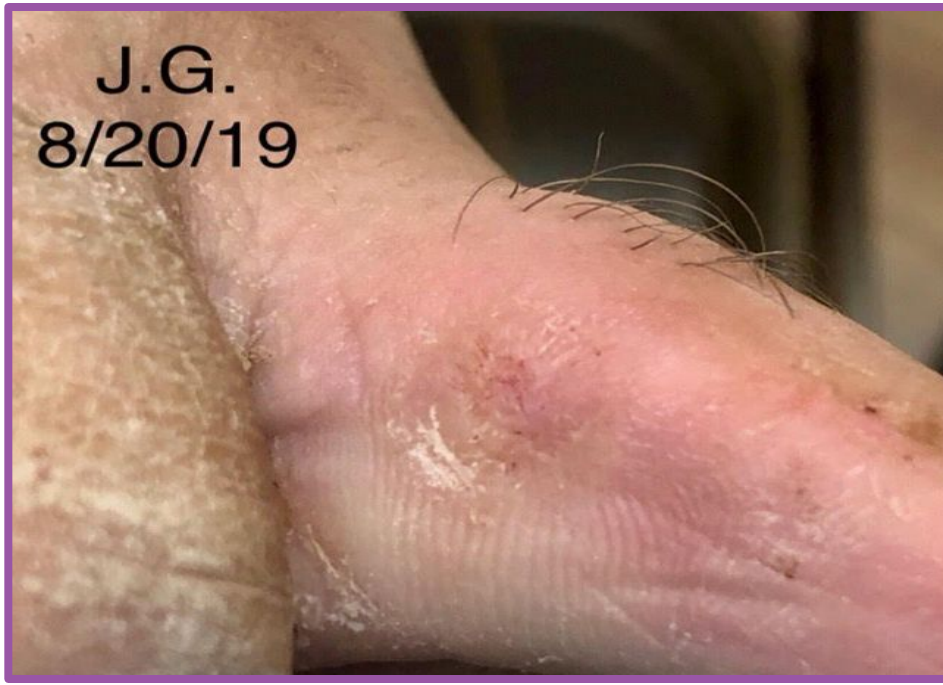
Microwave Dose: 6 watts for 2 seconds x 5

Case Study 2

4 Week Review:
Complete Resolution

Total Microwave Treatments: 1

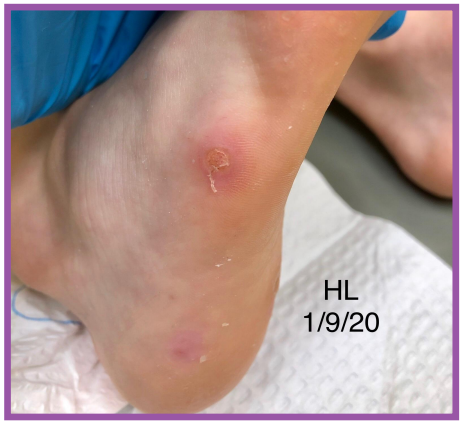
**No Pain 1 Week after Treatment*

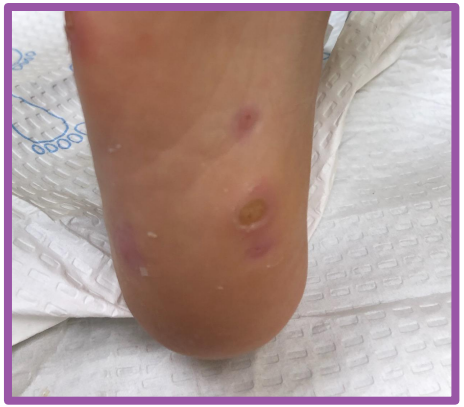


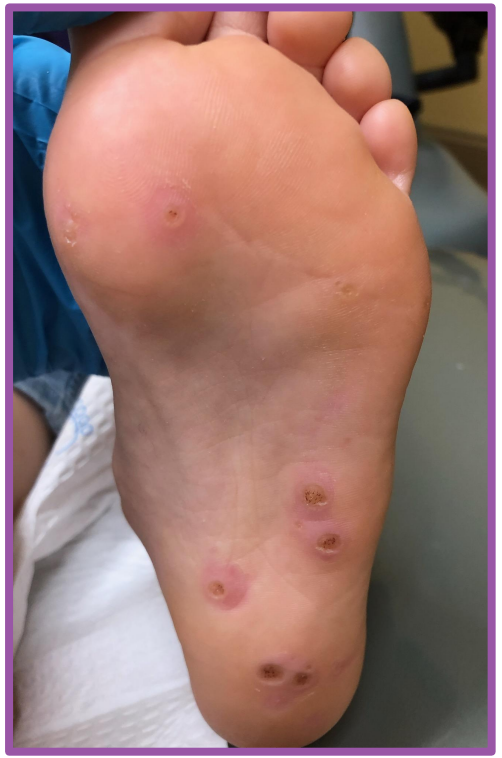
Images Courtesy Dr. Rob Conenello

Case Study 3

- 8 yo healthy female
- Level 5 gymnast
- 3 month history
- 15 lesions-8 left 7 right
- Painful 6/10 while on beam and tumbling
- Previous treatment: 18% OTC SA







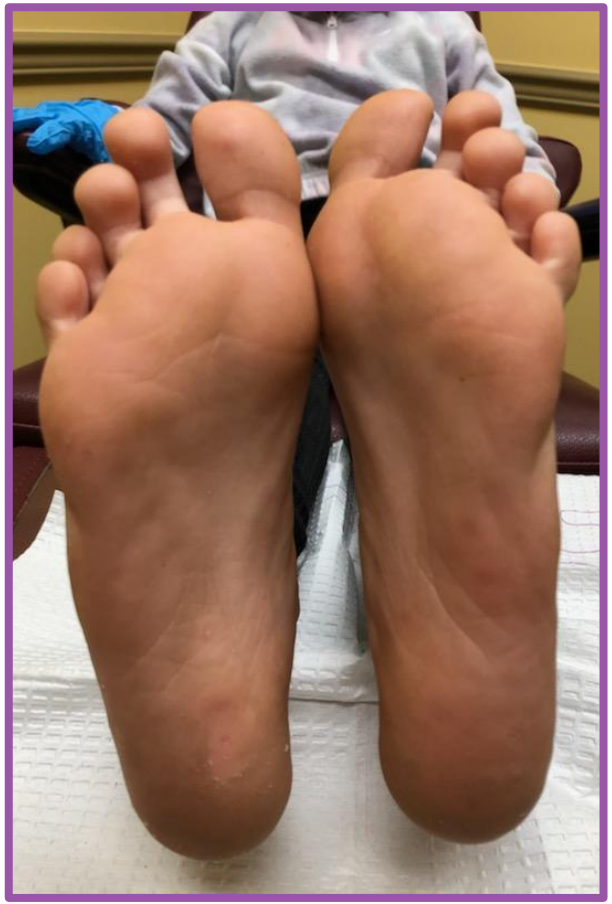
Images Courtesy Dr. Rob Conenello

Microwave Dose: 8 watts at 2 seconds x 5

Case Study 3

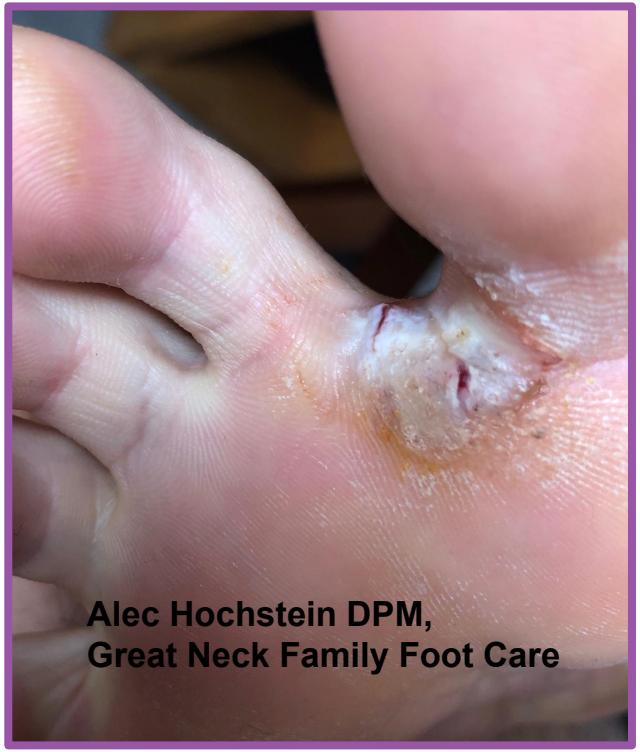
8 Week Review:

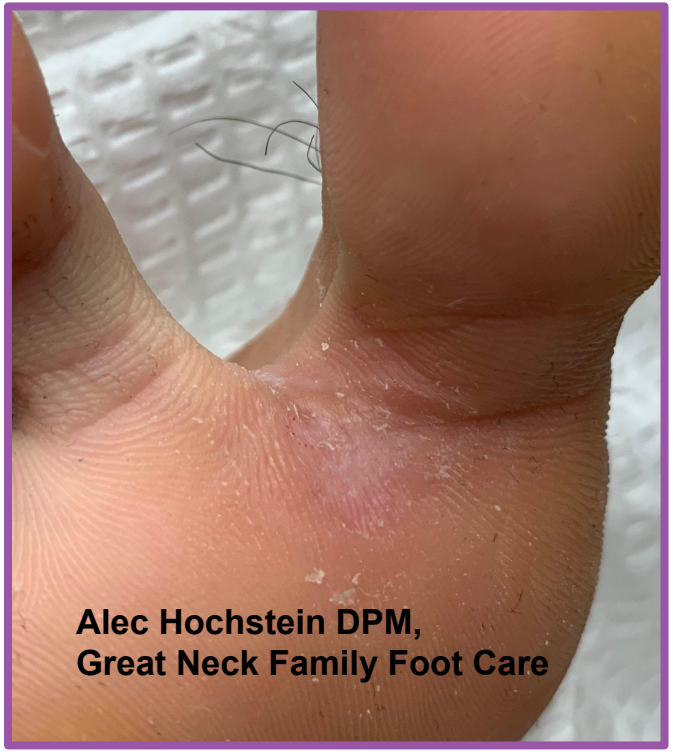
Complete Resolution



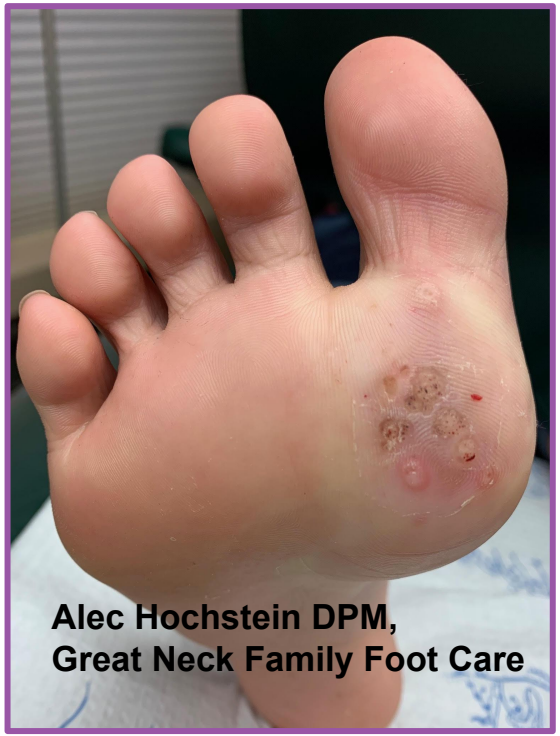
Images Courtesy Dr. Rob Conenello

Case Study 4


Alec Hochstein DPM,
Great Neck Family Foot Care


Alec Hochstein DPM,
Great Neck Family Foot Care

Case Study 5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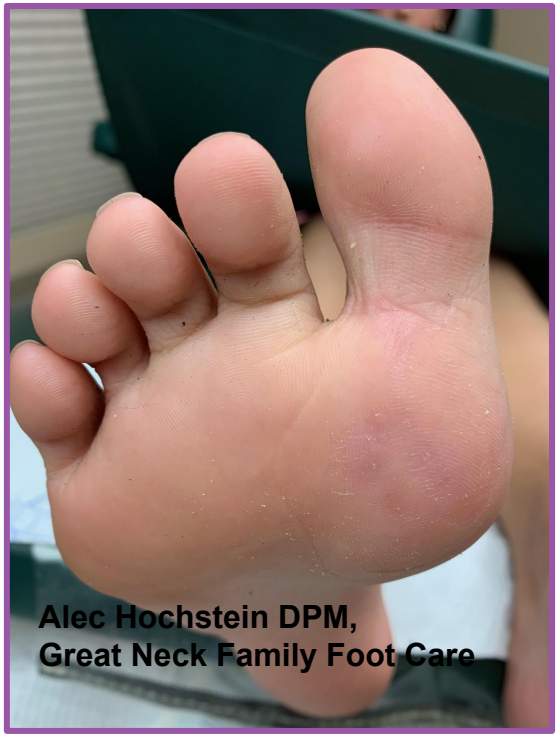
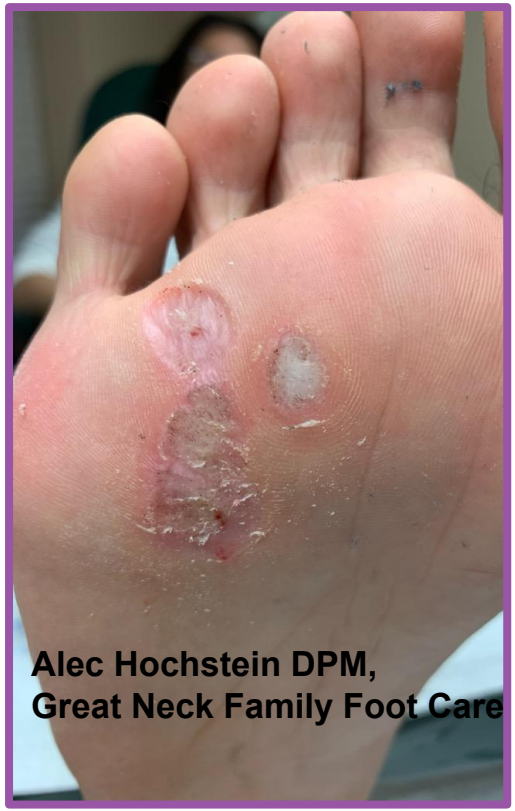
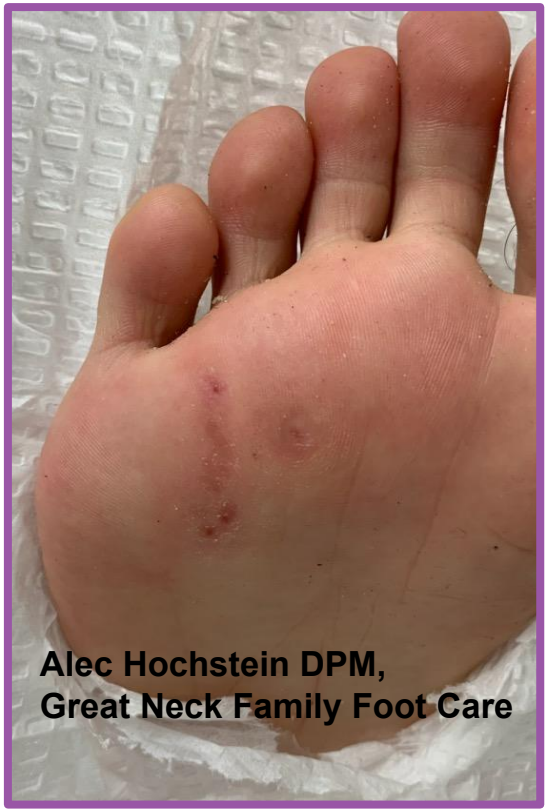
Great Neck Family Foot Care

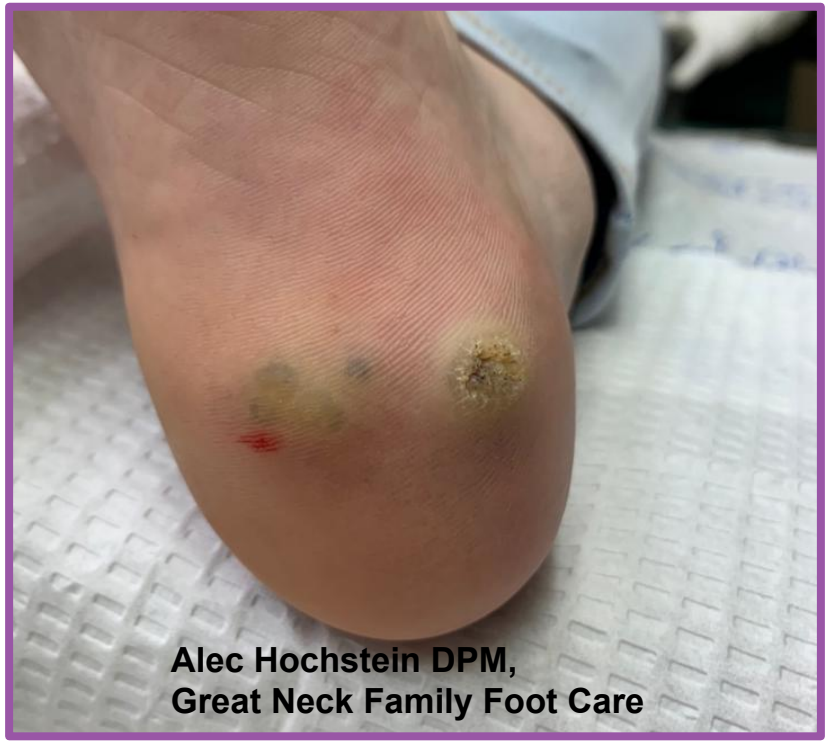

Alec Hochstein DPM,
Great Neck Family Foot Care

Case Study 6


Alec Hochstein DPM,
Great Neck Family Foot Care


Alec Hochstein DPM,
Great Neck Family Foot Care

Case Study 7


Alec Hochstein DPM,
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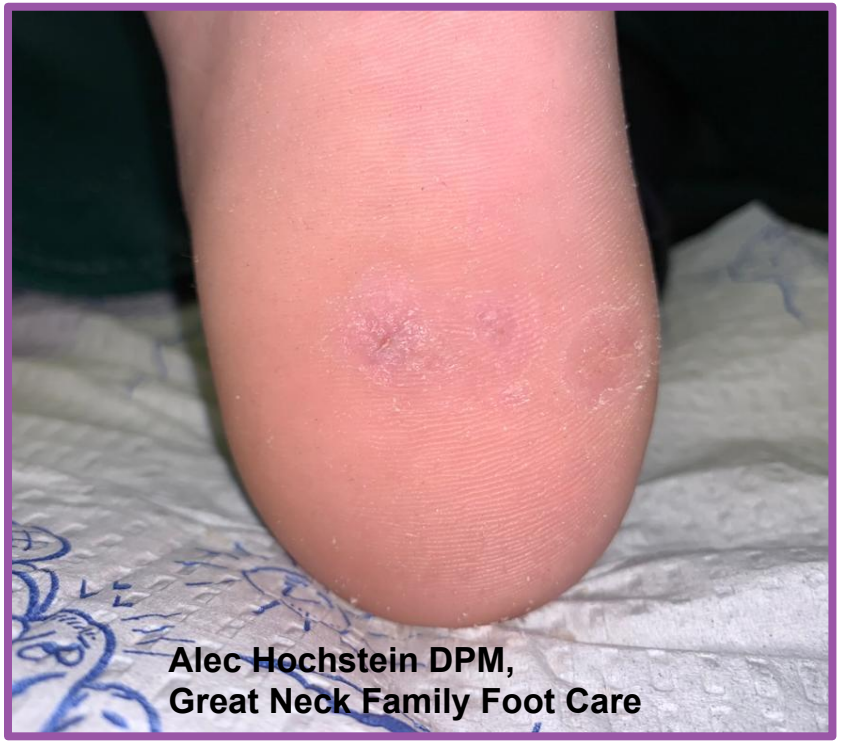
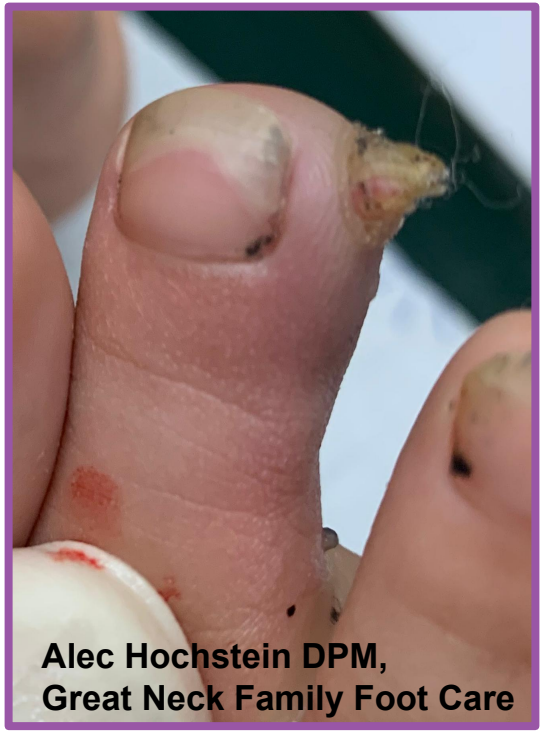
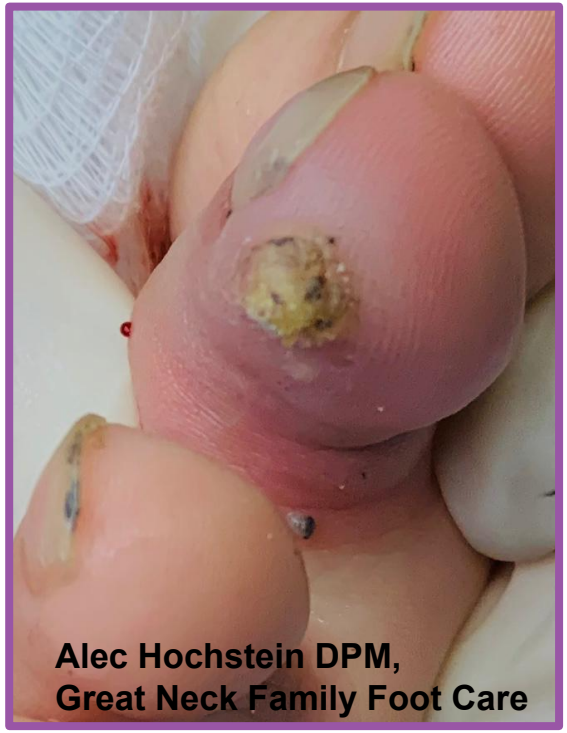
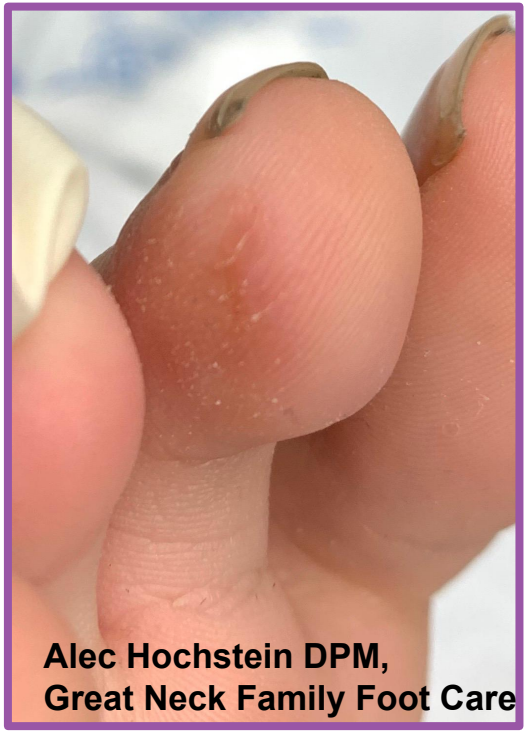

Alec Hochstein DPM,
Great Neck Family Foot Care

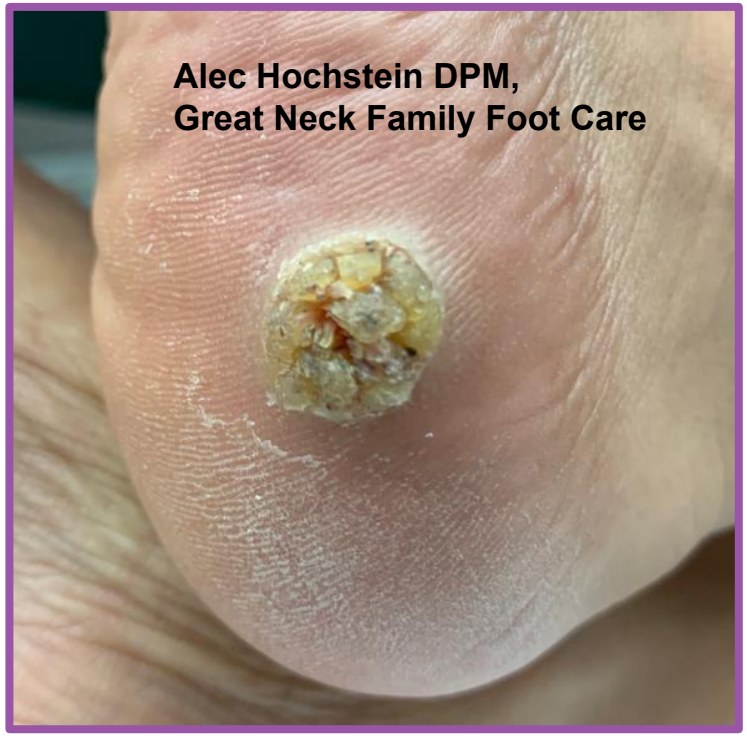
Case Study 8: THIS IS A 4 YEAR OLD PT







Case Study 9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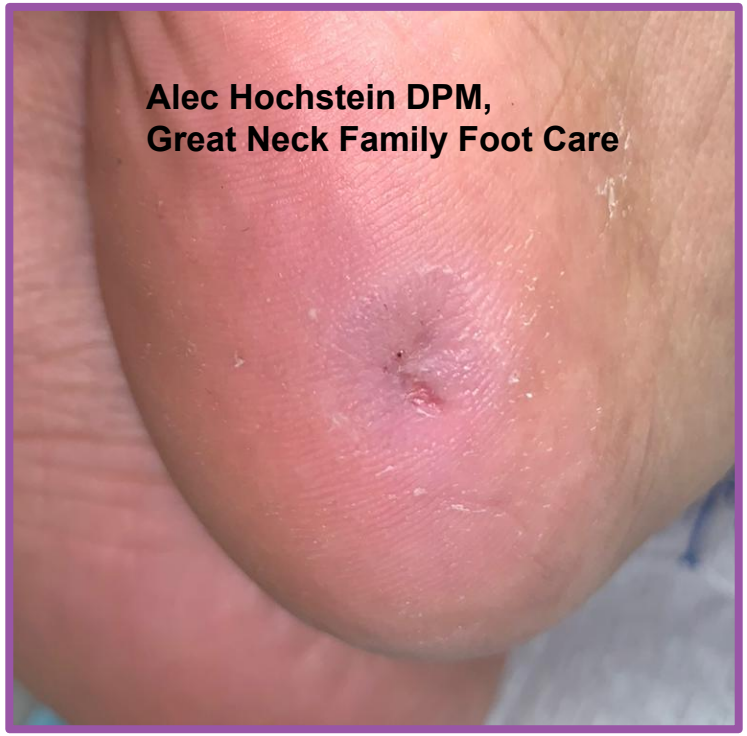
Great Neck Family Foot Care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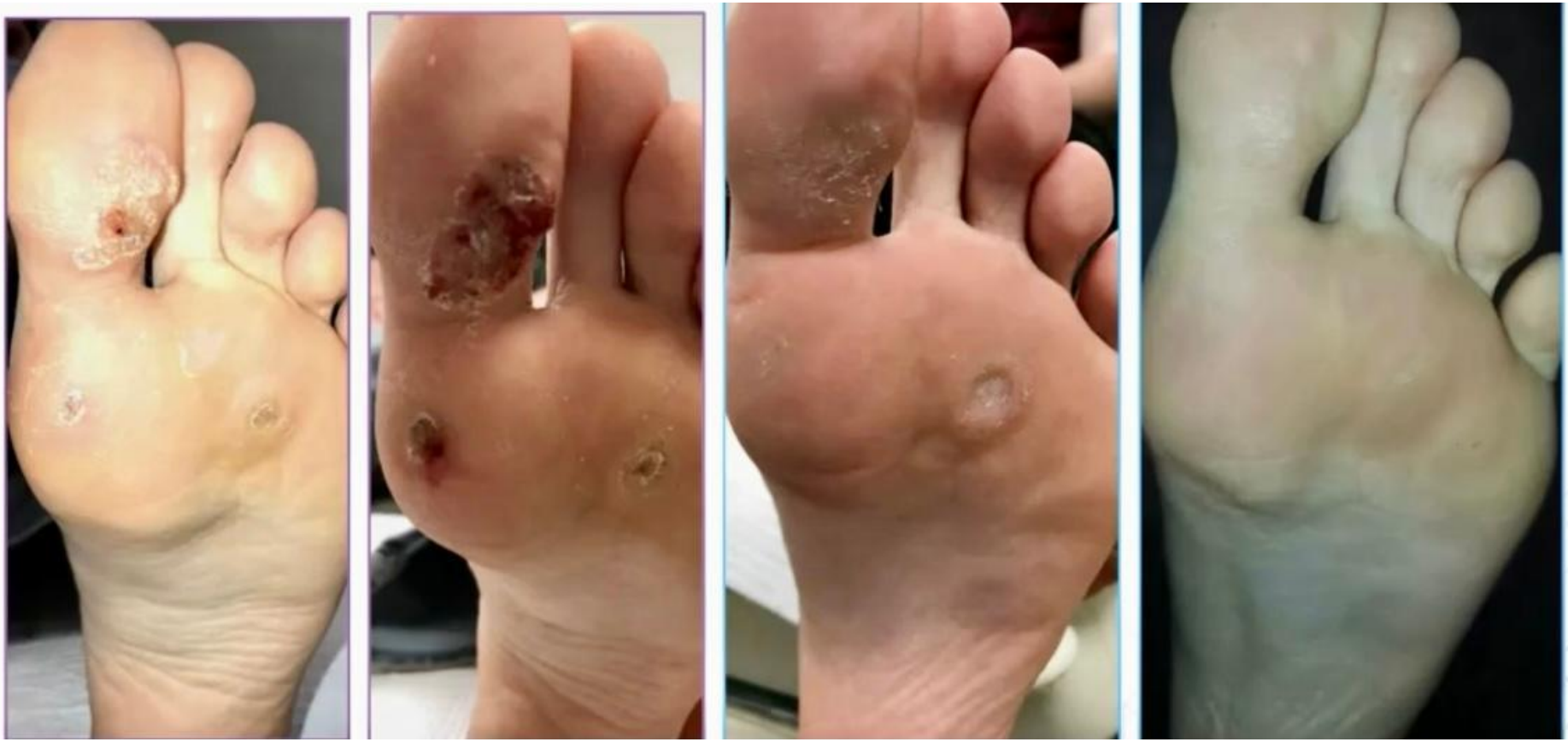

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LISBON SUNSET APRIL 2023

UK Case Studies and Denervation Theory

Case Reports in Dermatology

Case Rep Dermatol 2020;12:213–218

DOI: 10.1159/000509791
Published online: November 5, 2020

Case Report

Successful Treatment of Hard Corns in Two Patients Using Microwave Energy

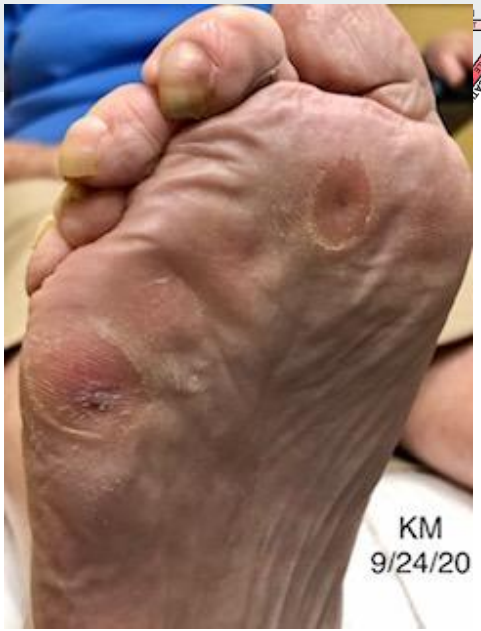
Ivan R. Bristow[a] Christopher J. Webb[b]

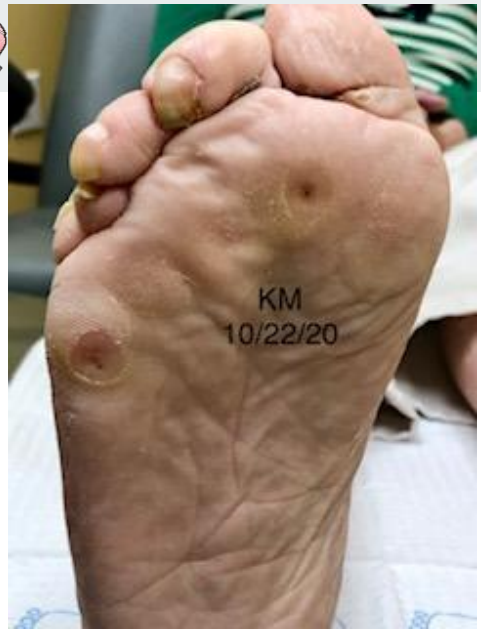
[a]The Chiropody Surgery, Lymington, UK; [b]The Podiatry Centre, Cosham, Portsmouth, UK

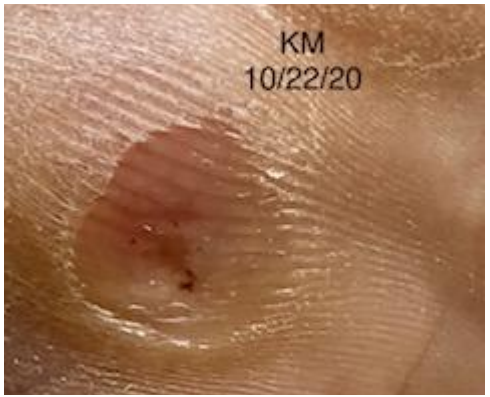
served in these patients [7]. Despite the reduction in pain, both our patients remained with pain-free corns, suggesting that the effect was likely based on alteration of the local pain mechanisms rather than on pain relief through eradication of the lesions. Even though the exact mechanism is unknown, there are several theories which may help explain the observed effect.

IPK Patient Case Study 1

- 86 yo Female - seen every 4-6 weeks since 7/20/12.
- She is active and complains that her IPK's are affecting her ADL's.
- Started treatment 8/27/20 (no pic)
- Pain was 9/10 on VAS
- Pain has decreased to 6 after first treatment and to 4 after second.





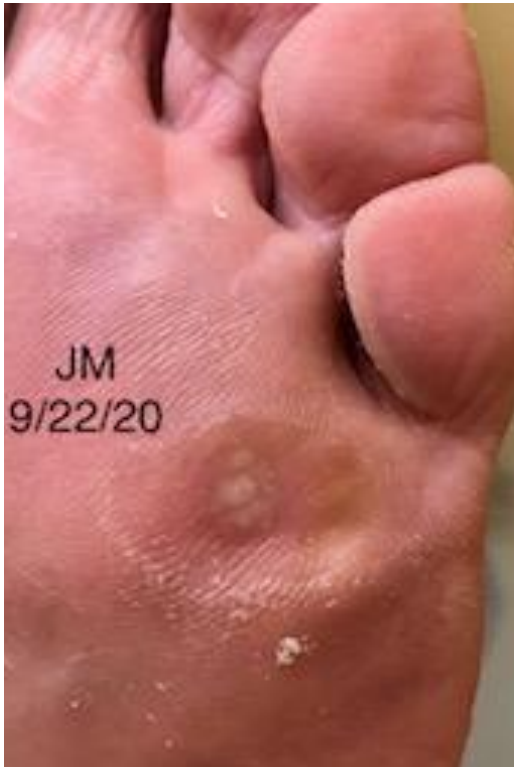


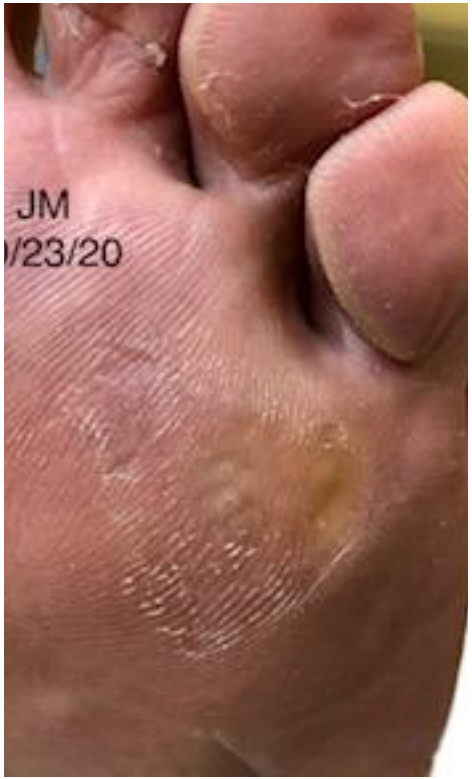
Microwave Dose: 6 watts at 2 seconds x 5

Images Courtesy Dr. Rob Conenello

IPK Case Study 2

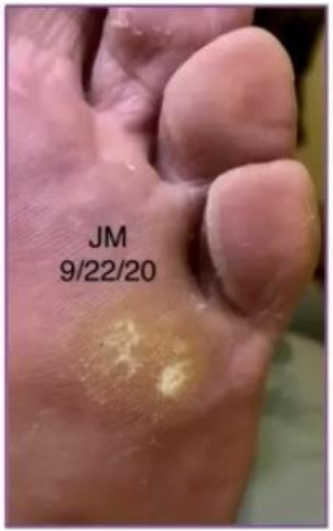
- Patient since 7/15/16 with painful corns and callus'.
- Lesions looked like IPK's with no pinpoint bleeding.
- 6/18/2: Lesions almost looked wart like but still no bleeding on debridement
- Started treatment 9/22/20 and repeated 10/23/20
- He states before treatment he was a 8/10 and now he is a 2/10

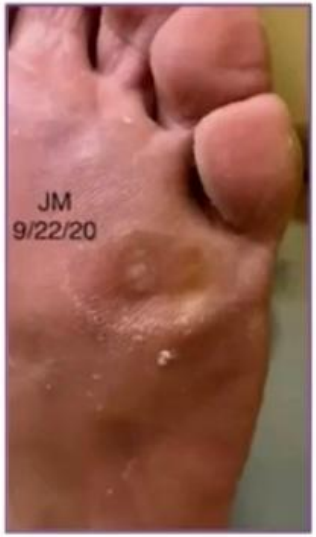


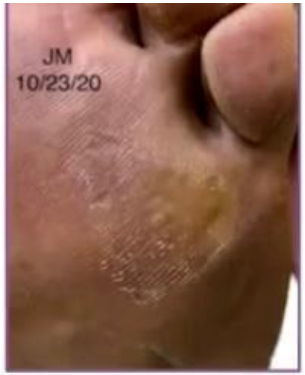


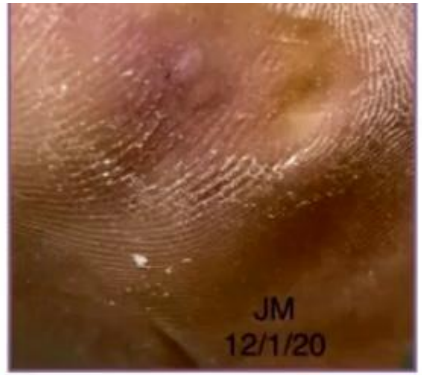
Microwave Dose: 6 watts at 2 seconds x 5

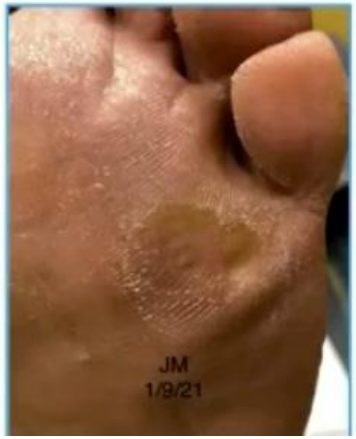
Images Courtesy Dr. Rob Conenello

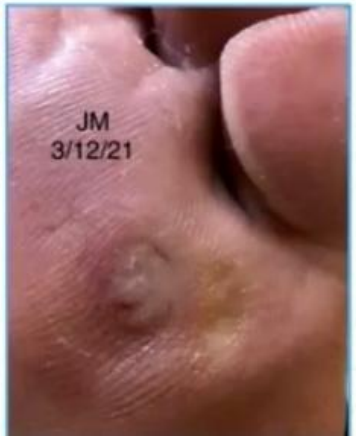


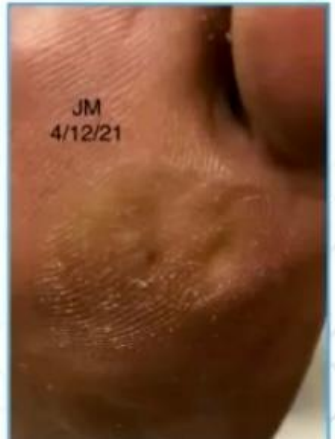












Microwave Dosing:

6 watts at 2 seconds x 5

Onychomycosis

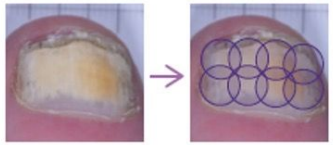
Distal subungual onychomycosis (DSO)

Debridement and preparation

1. Trim nails not attached to nailbed.
2. Hydrate nails for 10+ minutes by wrapping individual toes with water-soaked gauze.
3. One at a time, remove gauze and immediately treat affected nail regions. Start with smallest nails and work to largest / thickest.

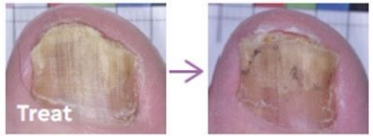
Guidance for successful treatment

Treat affected areas in full, overlapping treatment sites.



Signs of response and clearance

More translucent nails.



Keep Fungus out

Start complimentary anti-fungal topical treatments and lifestyle changes the same day as first Swift treatment.

Power
7

Pulse
3s

Rest
5s

Repeat
5x

Treatment sessions

3 sessions
2 weeks apart
(i.e. weeks 0, 2, 4)

Comfort control

Increase rest time to **10s** between pulses to limit discomfort.

Practice Management Implications

- Specialized Treatment drives new patient flow
- 5 Minute treatment times deliver efficiency
- Cash based billing limits AR frustration and overhead
- Higher per treatment and per patient profit
- Referral opportunities with local pediatricians and dermatologists

Condition	Study Status	Targeted Publication	Institution	Update
Actinic Keratosis	Complete	British Journal of Dermatology 2020	U. of Dundee	AK granted in Canada, UK and Australia
IPKs	Complete	JAPMA 2024	Private Clinics	IPK2 completed (Longevity of pain relief)
Onychomycosis	Underway	TBD	Private Clinics + AK Gupta	
Pre-Cervical Cancers	Lab Testing	The Lancet 2023	U. of Glasgow + U. of Cambridge	
~~Common and Plantar Warts~~	~~In Design~~	~~TBD~~	~~Ruhr-Universität Bochum (RUB)~~	
Multiple	Case Series	Journal of Dermatological Treatment 2025	Multiple	

Lesion category	Indication	Age	Sex	# of lesions	Age of lesion	Total # of txs	Tx interval	Avg Tx settings: Power	Avg Tx settings: Duration	Avg Tx settings: # of reps	Location of lesions	Outcome	FU interval	Adverse events
Viral skin infection	Plantar Wart	50	M	15+	Weeks	3	4wks	8–9 W	2s	6	Plantar left Forefoot	Clinically Resolved	1mo postTx	None Reported
	Common Wart	10	F	6	1 Year	3	6wks	8 or 10W	1s	10	Left Fingers	Clinically Resolved	8wk postTx	None Reported
	Anogenital Wart	22	M	4	5 Months	2	3wks	3 or 5W	3s + EMLA cream	5	Body of the penis	Clinically Resolved	4wks posttx	None Reported
	Molluscum Contagiosum	20	F	50+	NA	2	4wks	10W	1s	10	Dorsum left Hand	Clinically Resolved	NA	None Reported
Fungal infection	Fungal Nail	33	F	1	NA	3	2–4wks	7–9W + debridement before tx	3s	5	Right Hallux	Clinically resolved	11wks posttx	None Reported
Pre-cancer	Actinic Keratosis	57	F	3	2 Months	2	4wks	3W	3s	5	Right Dorsal Forearm Left Lower Back	Clinically Resolved	NA	None Reported
Non-melanoma skin cancer	Basal Cell Carcinoma	71	F	1	NA	7	every 2wks	3 or 5W	5s	5	Right Nostril	Clinically Resolved	4wks posttx	None Reported
Inflammatory skin disorder	Acne Nodular Cystic	32	M	3	5 Months	4	2–4 wks	3 or 4W	2s	5	Face	Clinically Resolved	12wk posttx	None Reported
Non-melanoma skin cancer	Squamous Cell Carcinoma (*in situ*) (26)	Case studies published previously; target dosing 4–5W 3-4s 5reps, 1-month interval, 2 treatments given, after intralesional 1% lidocaine - No scarring or hypopigmentation noted, no other adverse events reported; no wound management needed post-tx.												
Inflammatory skin disorder	Hidradenitis Suppurativa (29)	Case studies published previously; target dosing 4–6W 2s 5reps, variable frequency (weekly/biweekly for most treatments), with 3–5 treatments given - Adverse event reporting: NA												
Hyperkeratosis	Intractable Plantar Keratosis (31)	Case studies published previously; target dosing 7–9W 2s 5reps, every 4–5 weeks; with 2–6 treatments given - No adverse events: 5/7 pts; Pain sensation lasting approximately 2 hr post-tx: 1/7 pts; Heat sensation lasting several hours post-tx: 1/7pts.												

NA: not available; mo: month; wk: week; tx: treatment; W: Watts; s: seconds, duration of treatment wattage application; reps: number of repeated applications during a single treatment session.

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THANK YOU

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