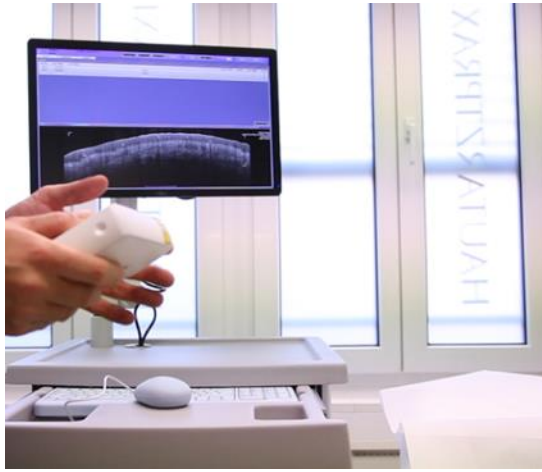
VivoSight



Multi-Beam OCT Dermatological Imaging

Jon Holmes, CEO
Michelson Diagnostics Ltd

See what we can see…

Michelson DIAGNOSTICS

Imaging skin with OCT in real time

VivoSight

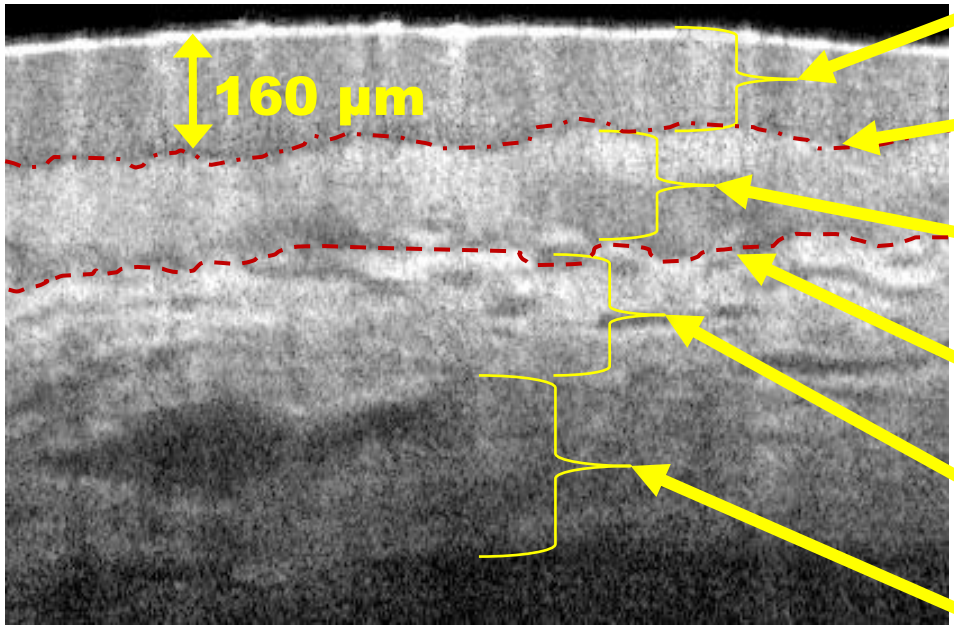
- Imaging depth > 1 mm
- Resolution < 10 µm
- Field of view 6 mm
- Real-time

See what we can see…

Michelson DIAGNOSTICS

Visualize skin structure with OCT

VivoSight



Stratum corneum

Stratum granulosum

Stratum spinosum

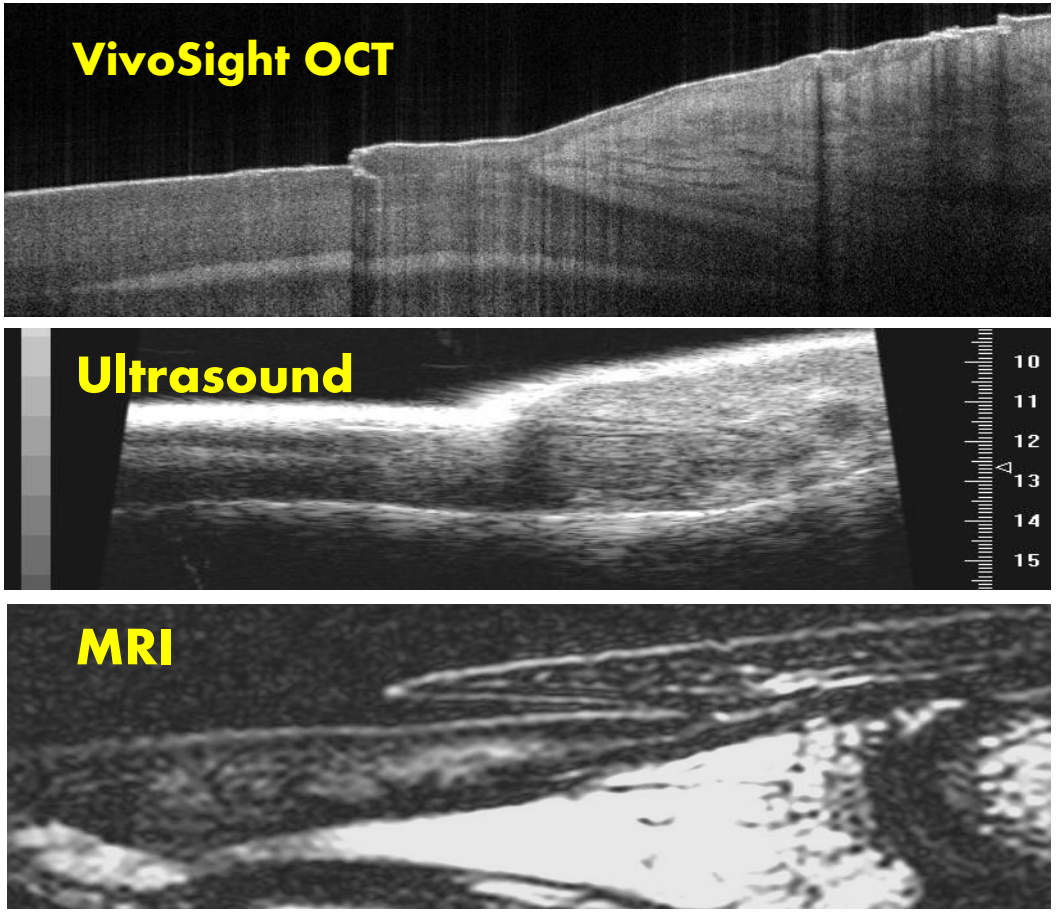
Dermal-epidermal junction

Papillary dermis

Reticular dermis

VivoSight™ OCT resolution vs. other imaging modalities

VivoSight



Resolution

10 µm

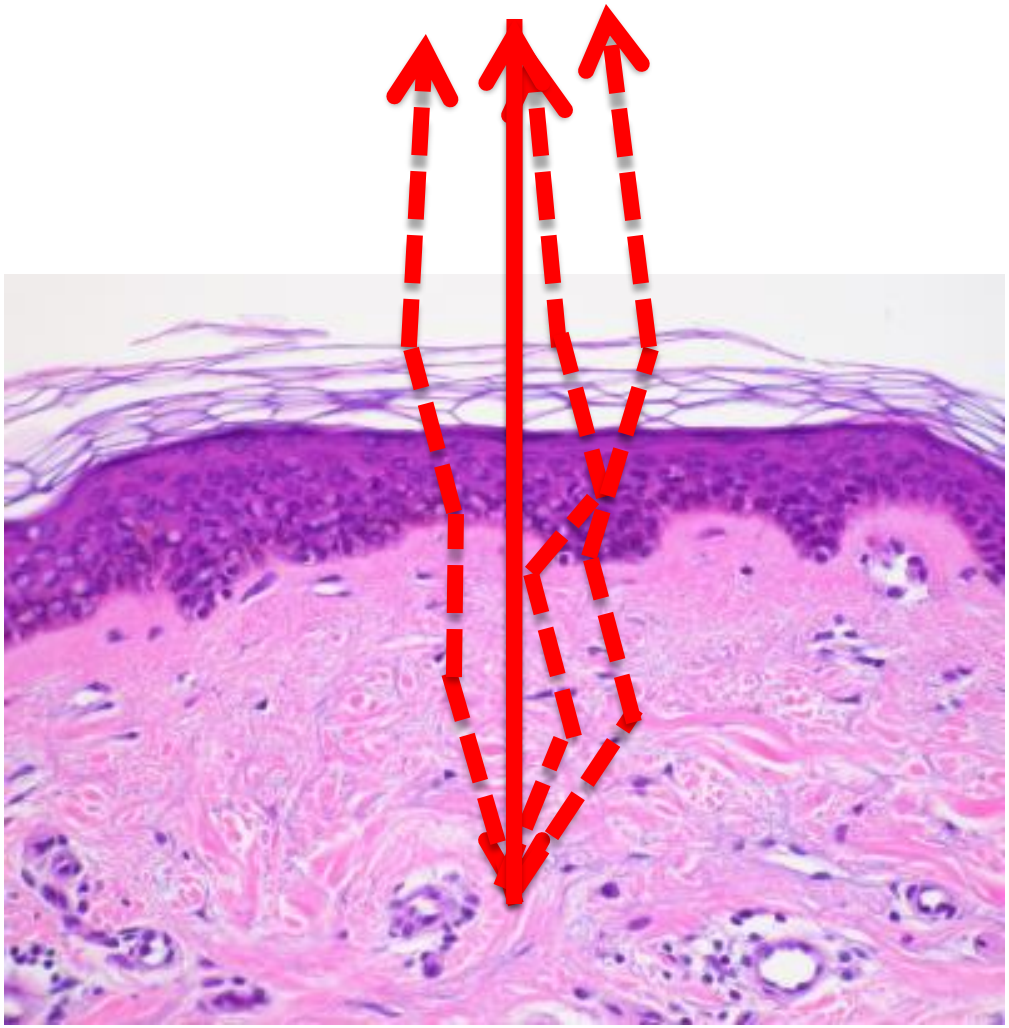
150 µm

1 mm

See what we can see…

Michelson DIAGNOSTICS

What is OCT?



OCT
'filters out'
the masking scattered light
by selecting only coherent,
singly scattered light

Technology Development

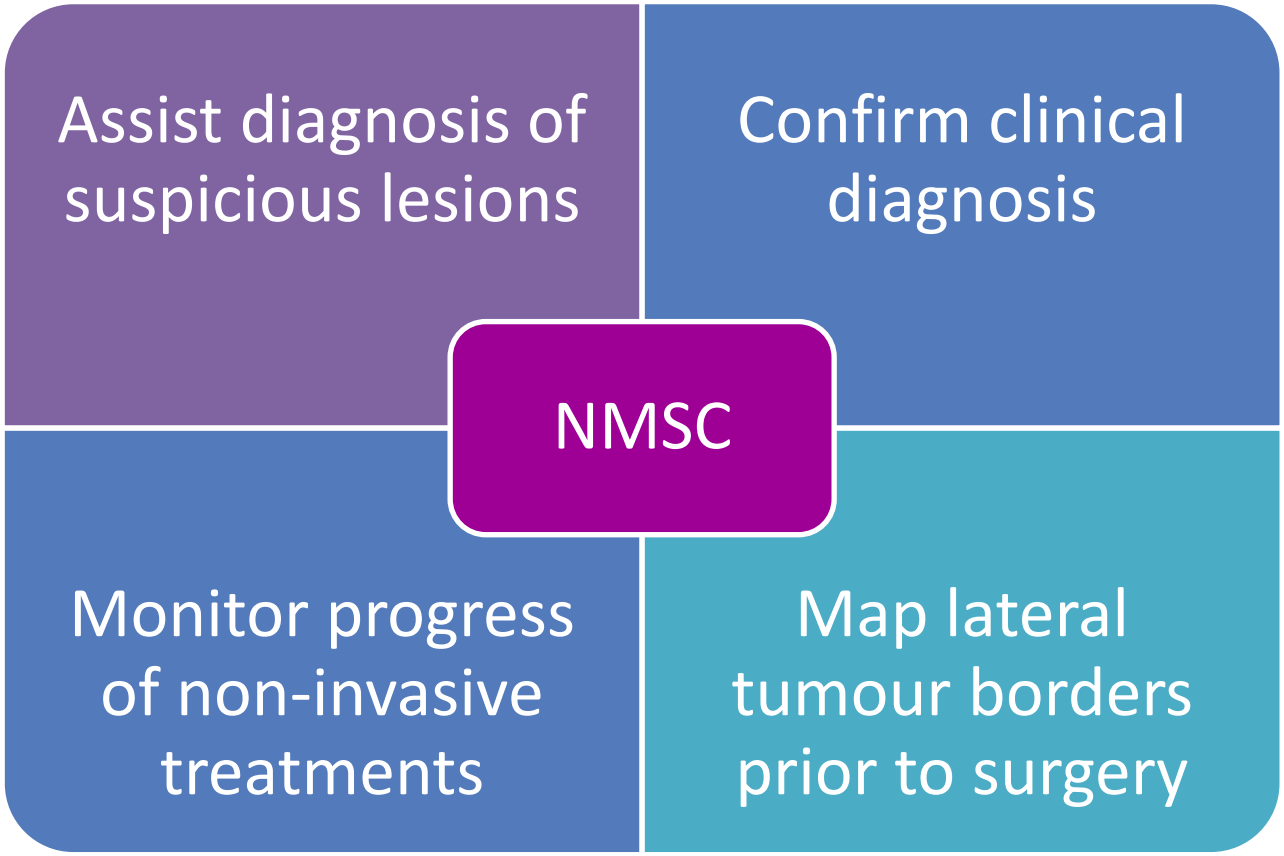
VivoSIght OCT
FDA 2010

VivoSight Dx OCT
FDA 2016

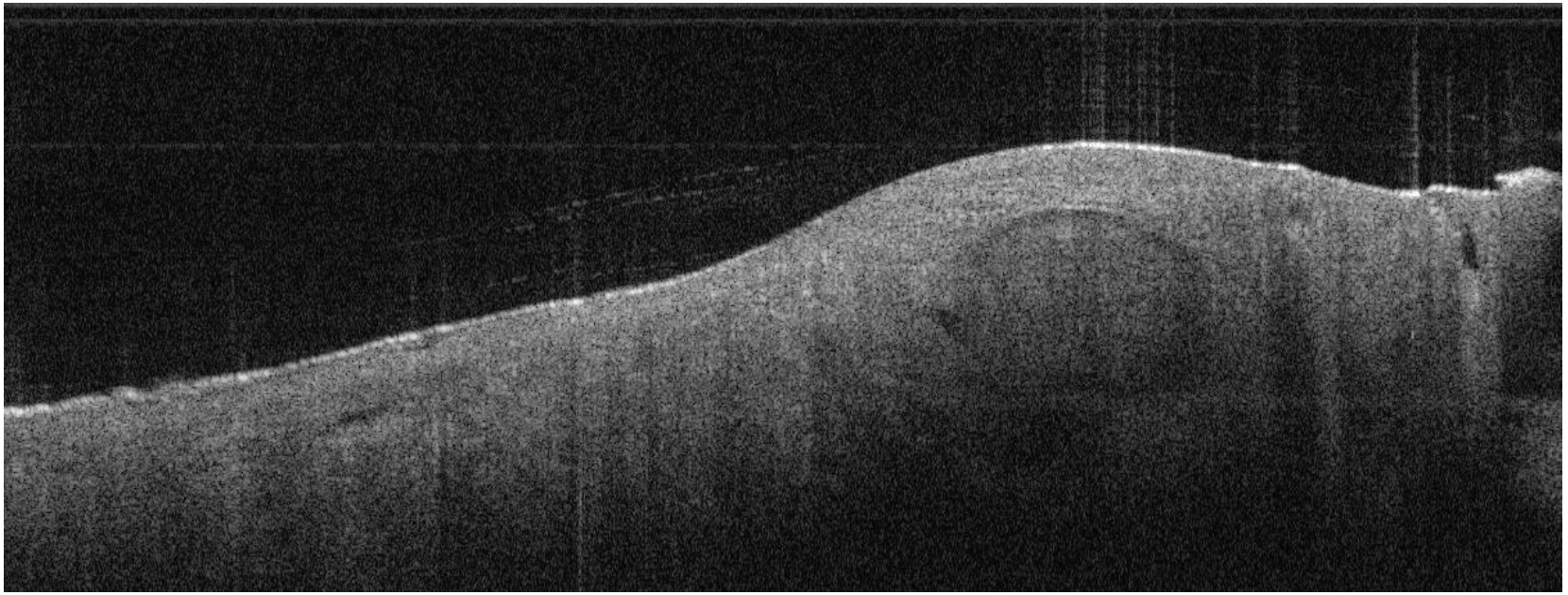
See what we can see…

Clinical Applications Today

VivoSight

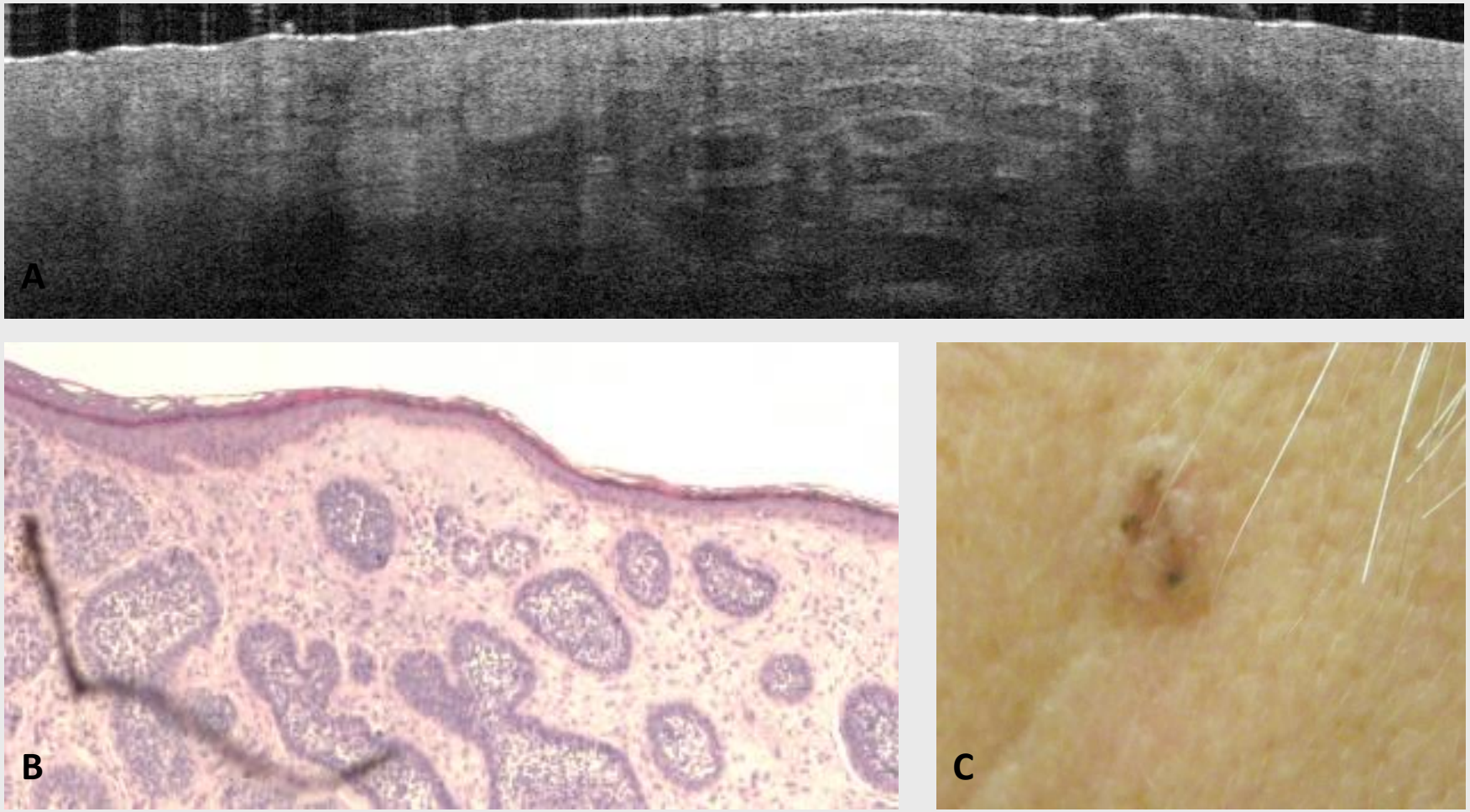


Basal Cell Carcinoma



- Ovoid structure
- Clearly defined dark boundary
- Close to DEJ
- Loss of normal morphology

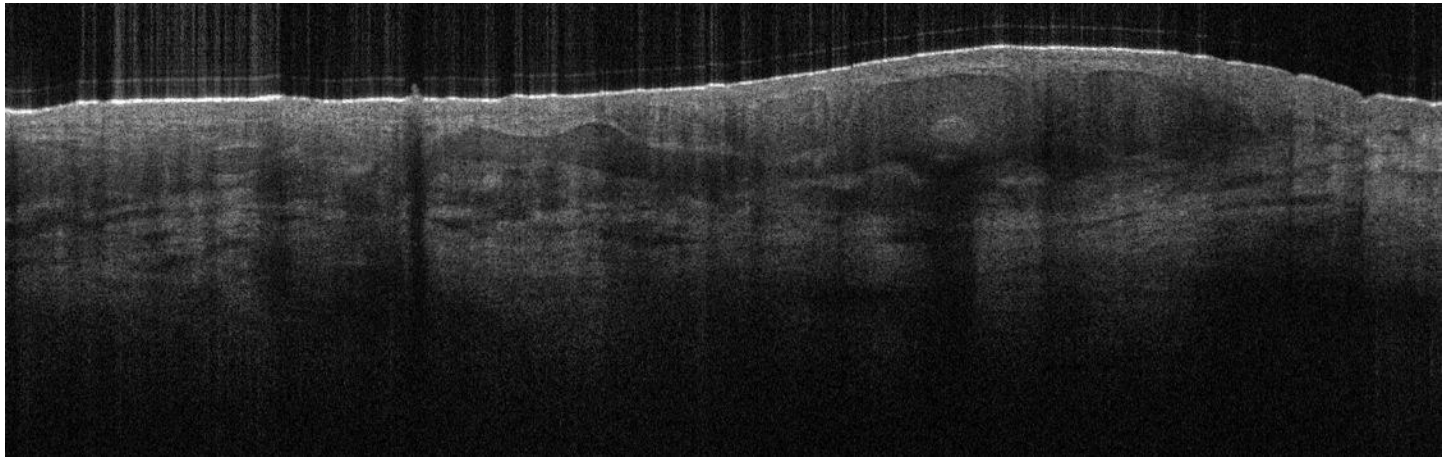
Basal Cell Carcinoma



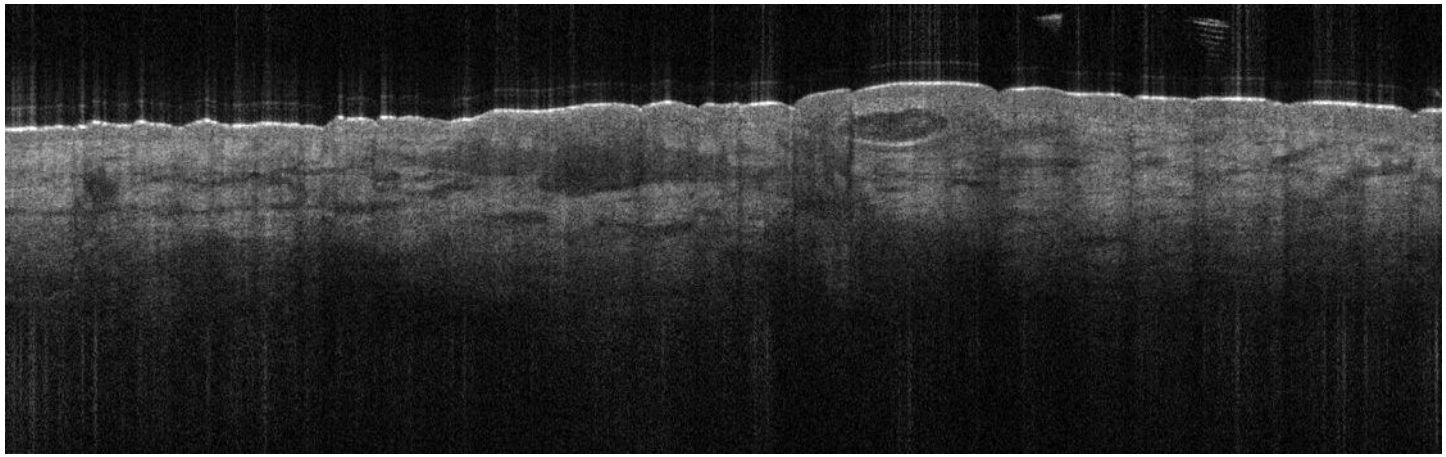
picture 6: A: OCT shows a micronodular BCC. From the top to the bottom. B: Histology. C: Clinical picture.

OCT to monitor imiquimod therapy

VivoSight



BCC clearly visible prior to treatment



After 6 weeks treatment

Images courtesy of Prof Julia Welzel, Augsburg, Germany

See what we can see…

Michelson DIAGNOSTICS

Trial Results – BCC diagnosis

VivoSight

N=234	Sensitivity %	Specificity %	PPV %	NPV %	Diagnostic Accuracy %
Clinical	90	29	66	65	66
Dermoscopy	91	54	75	79	76
OCT	**96**	**75**	**85**	**92**	**87**

- OCT diagnosis is significantly better than clinical or dermoscopic diagnosis
- Results from 3 independent trials agree (Germany, USA, Australia)
- Clinicians estimate 40% of biopsies can be avoided using OCT to rule-in BCC
- Enables non-surgical treatment of BCC

- **AMA has awarded a Category III CPT code for this procedure. To be announced Jan 17 and 'goes live' July 17**

VivoSight user comments

"For diagnostic reasons, we almost need no biopsies at all"

"VivoSight allows for diagnosis of multiple lesions within a short time. It offers a non-invasive way for monitoring progress in PDT"

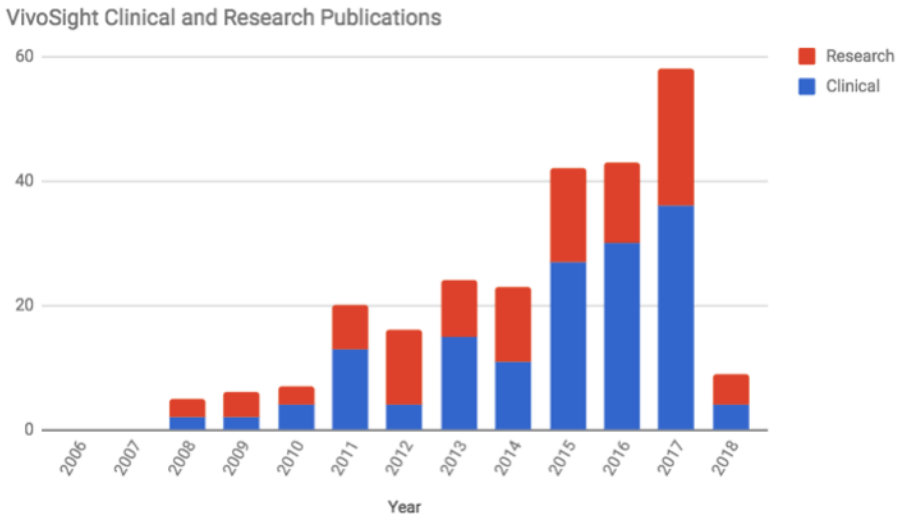
"That is the tremendous difference compared with biopsy. No pain, no bleeding, no effect on everyday life for the patient."

"For patients the time saving is very positive and is appreciated"

*All comments provided to University of Bayreuth Dept. of Health-Economics, April-June 2014

Publications

- 250 Peer-reviewed publications to date (2008-2017)
- Research covering 20 individual clinical applications



Actinic Keratosis, Atopic Dermatitis, Blistering Diseases, Hemangiomas, Port wine stains, Rosacea, melanoma, non-melanoma diagnosis/mapping/monitoring, onychomycosis, oral cancer, parasitic infestations, Psorasis, Psoriatic Arthritis, Scleroderma, wound healing, scar treatment…..and more…

VivoSight OCT in aesthetic medicine

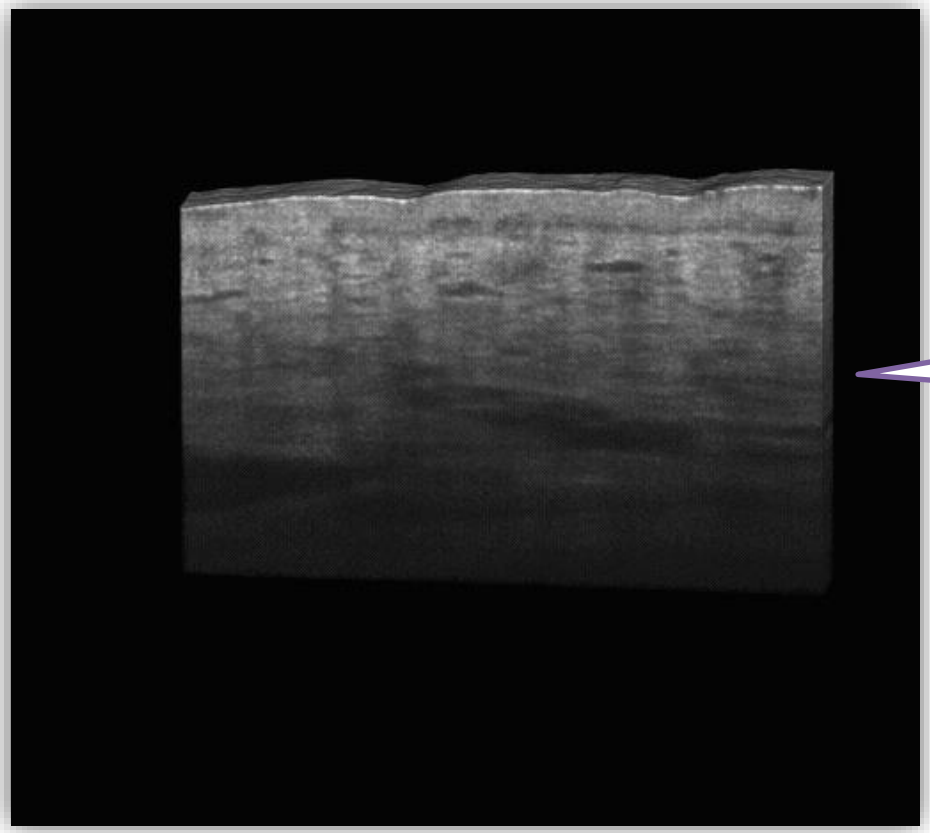
- OCT images are based on high-precision measurements of optical properties of skin

- → We can process the OCT data to extract numerous useful skin physiology parameters

- Many of these parameters are potentially of great value for optimizing aesthetic treatment efficacy

VivoSight

Data-rich OCT scan captured in 30 s



Detect skin surface from 3D stack

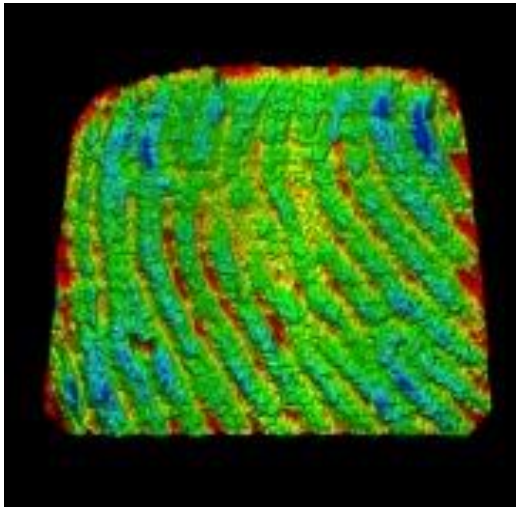
Extract skin parameters vs. depth below surface

Measure surface roughness R_a and wrinkle depth R_z

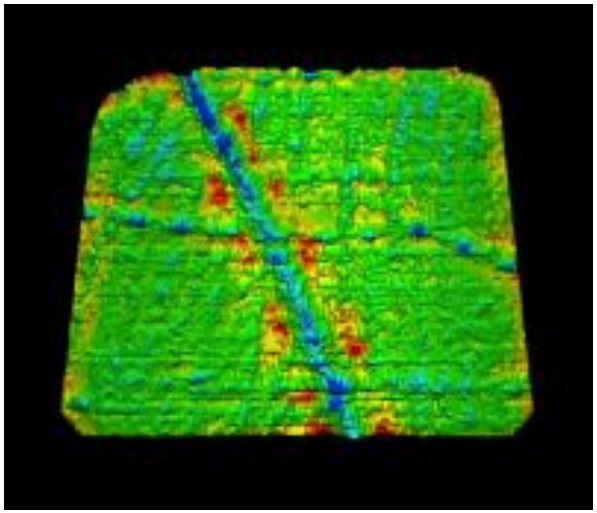
VivoSight

Ra: Mean deviation

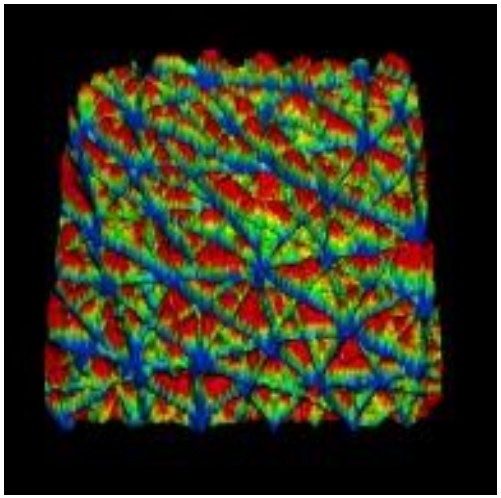
Rz: Average Highest Peak to Deepest Valley



Fingertip R_a = 6 µm



Palm R_a = 4.4 µm



Wrist R_a = 15.6 µm

Multiple Measurements from ONE scan

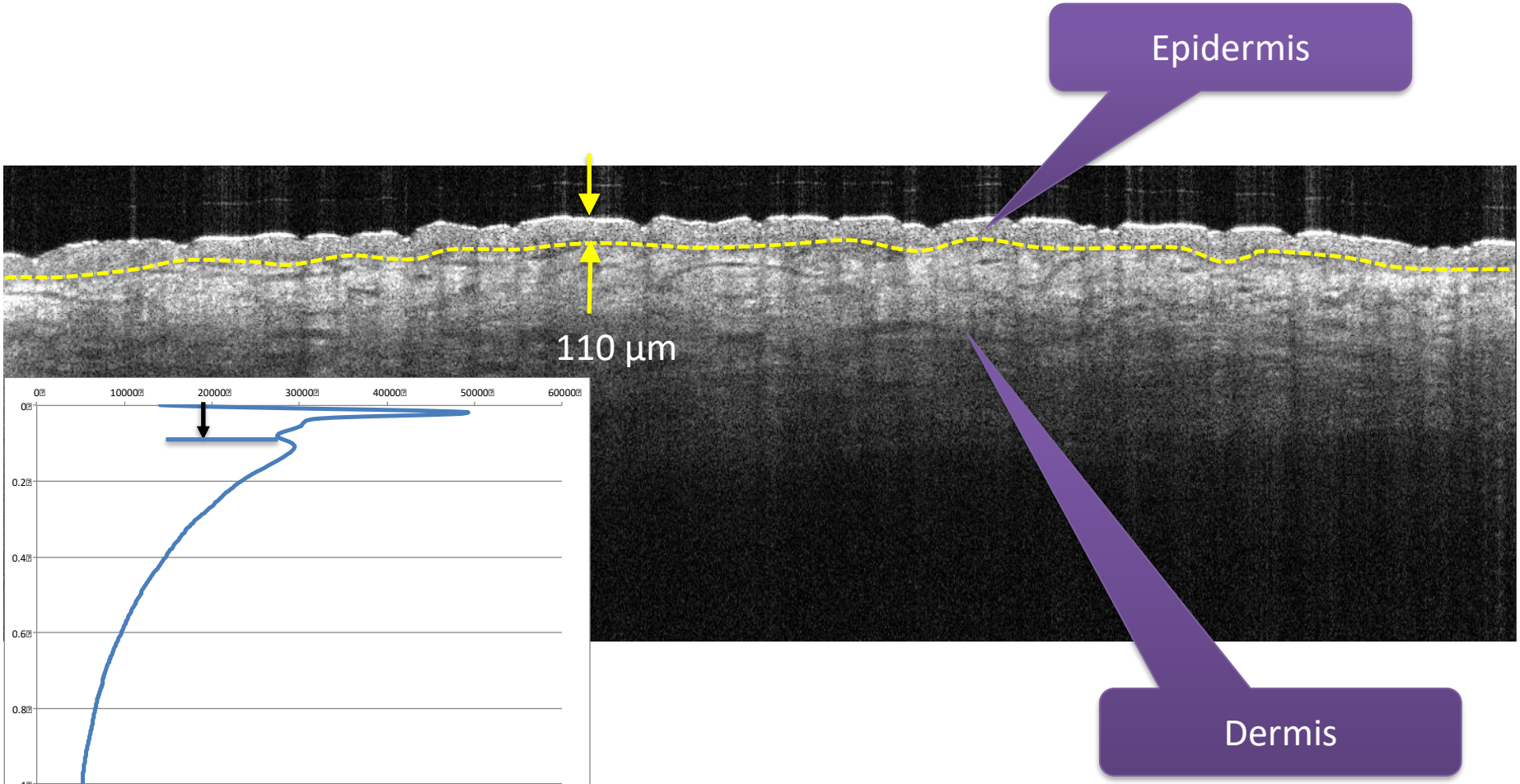
VivoSight

- Epidermal Thickness
- Surface Roughness
- Blood vessel density
- Vessel plexus depth
- Collagen density
- Pore & hair density

See what we can see…

Michelson DIAGNOSTICS

Measure epidermal thickness



See what we can see…

November 2016 1375 Volume 15 • Issue 11
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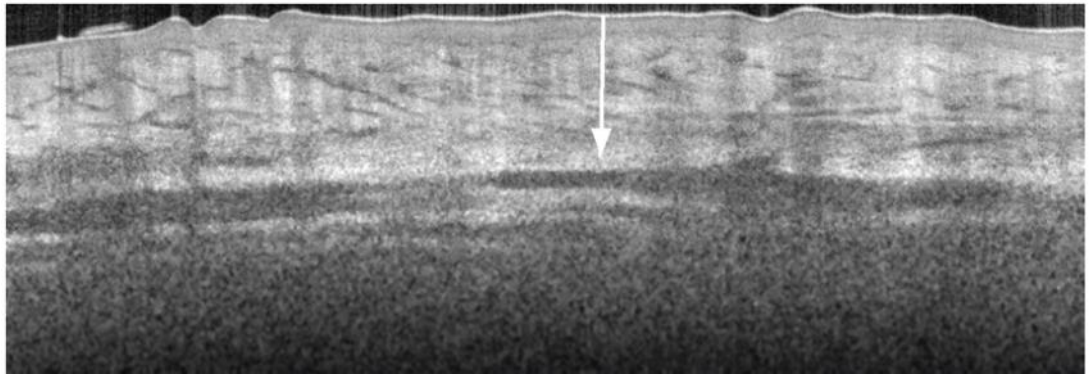
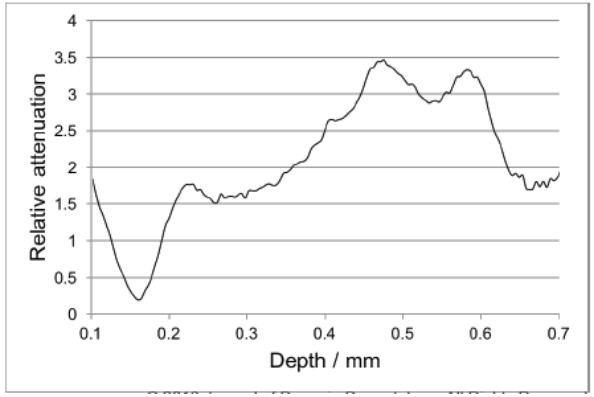
The Diagnostic Role of Optical Coherence Tomography (OCT) in Measuring the Depth of Burn and Traumatic Scars for More Accurate Laser Dosimetry: Pilot Study

Jill S. Waibel MD,[a] Ashley C. Rudnick,[a] Adam J. Wulkan MD,[b] and Jon D. Holmes[c]

[a]Miami Dermatology and Laser Institute, Miami, FL
[b]University of Miami, Department of Dermatology & Cutaneous Surgery, Miami, FL
[c]Michelson Diagnostics Ltd., Maidstone, United Kingdom

FIGURE 5. Example of deep scar tissue. Note thickened epidermis, fibrous appearance of bright dermis extending to 0.7 mm or more.





"We predict that OCT will be the greatest addition to the laser clinician's armamentarium against scars since fractional ablative laser"

See what we can see…

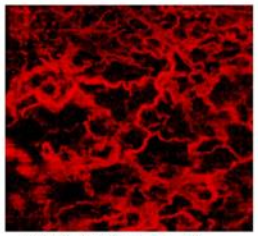
Michelson DIAGNOSTICS

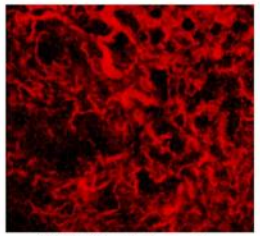
VivoSight


PWB #1 (Subject no. 9)


PWB #2 (Subject no. 7)


PWB #3 (Subject no. 37)


PWB #1 (Subject no. 9)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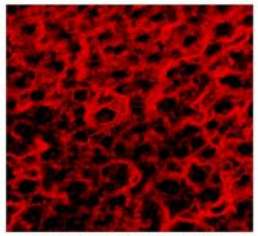
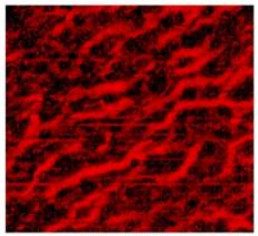

PWB#3 (Subject No. 37)


PWB #4 (Subject no. 75)


PWB #5 (Subject no. 122)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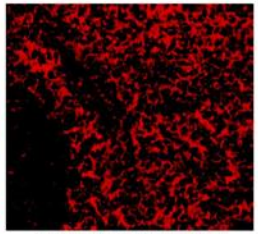
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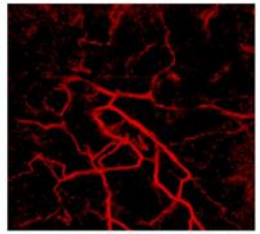
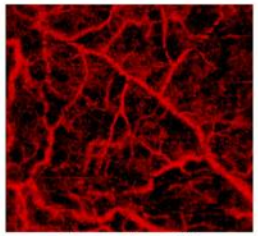
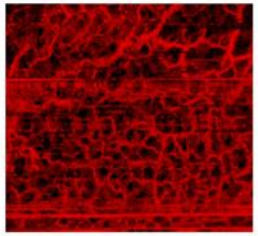

Hemangioma#1 (Subject no. 121)

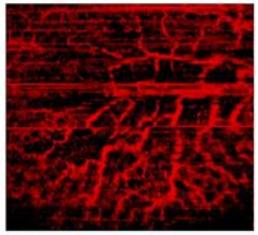

Hemangioma #1
(Subject no. 121)


Hemangioma #2
(Subject no. 100)

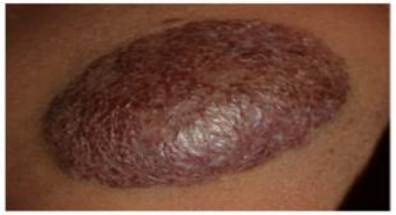

Hemangioma #3
(Subject no. 107)

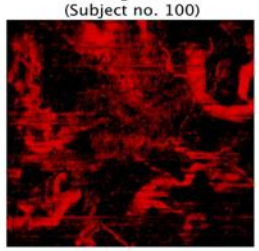

Hemangioma #2
(Subject no. 100)

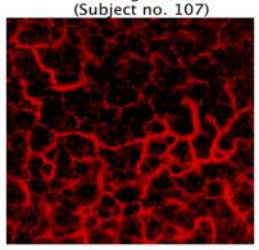

Hemangioma #3
(Subject no. 107)

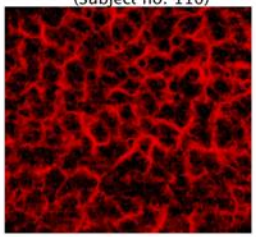

Hemangioma #4
(Subject no. 110)


Hemangioma #4
(Subject no. 110)


Hemangioma #5
(Subject no.109)


Hemangioma #5
(Subject no. 109)


Normal #1


Normal #2

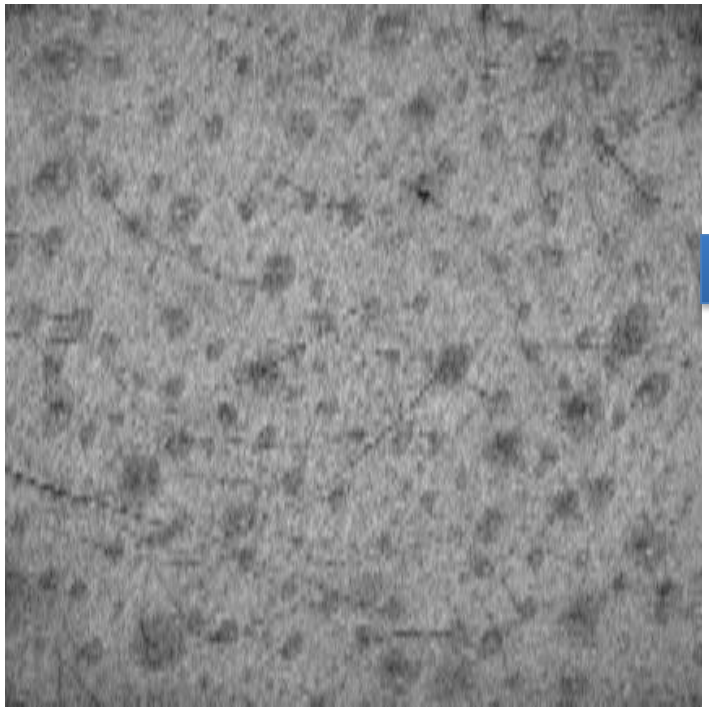
OCT images revealed that the blood vessel patterns in vascular lesions appeared different from that seen in normal skin

Paper accepted for Las. Surg. Med.

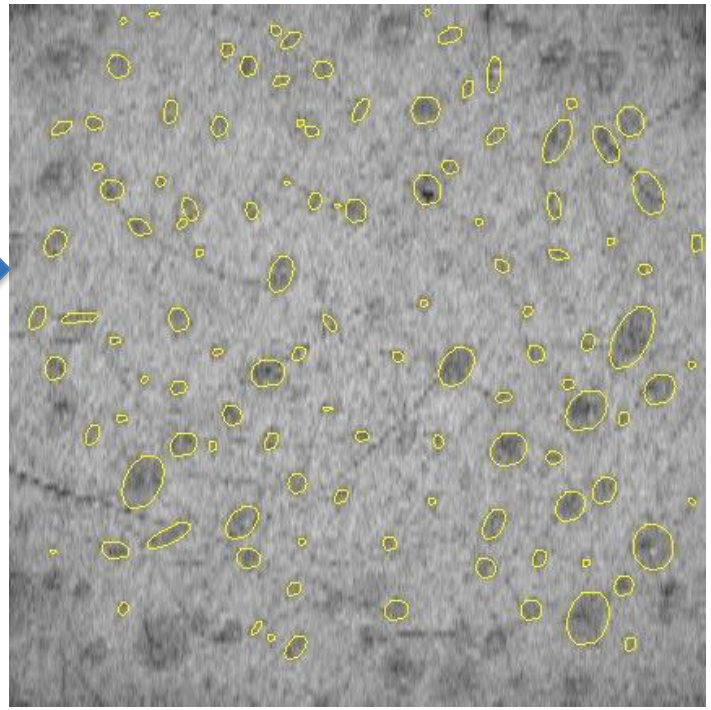
See what we can see…

Michelson DIAGNOSTICS

Pore & hair follicle density



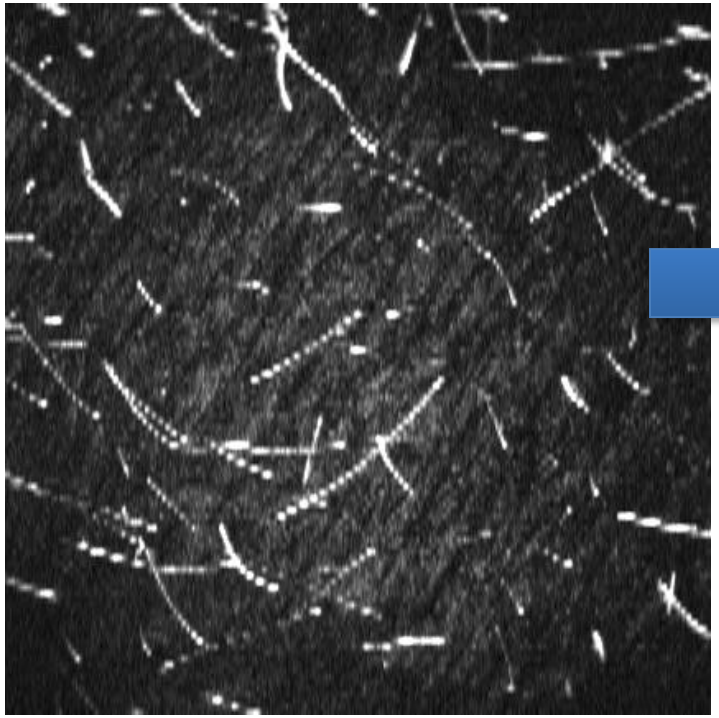
Find pores

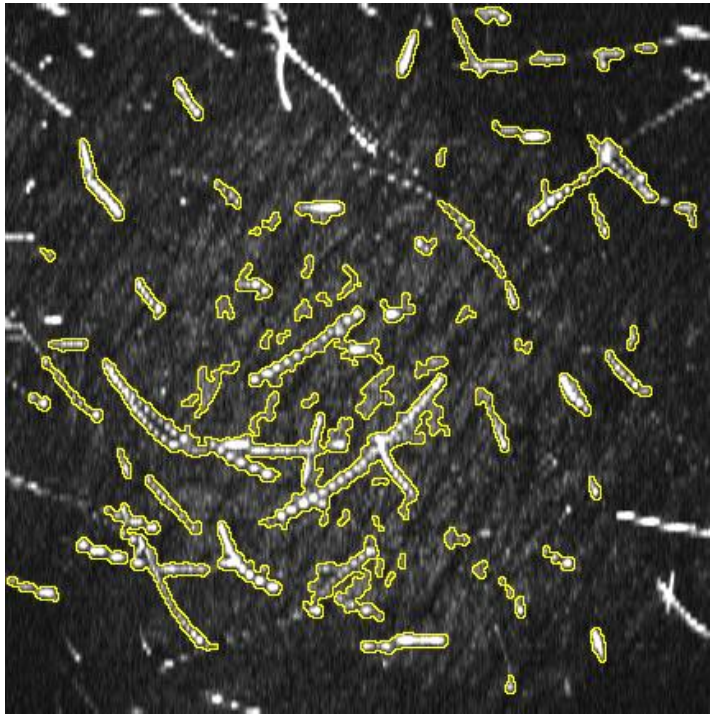


En-face view,
120 µm below skin surface
(Female cheek)

Large blobs → 14 hair follicles
Small blobs → 101 pores

Fine hairs



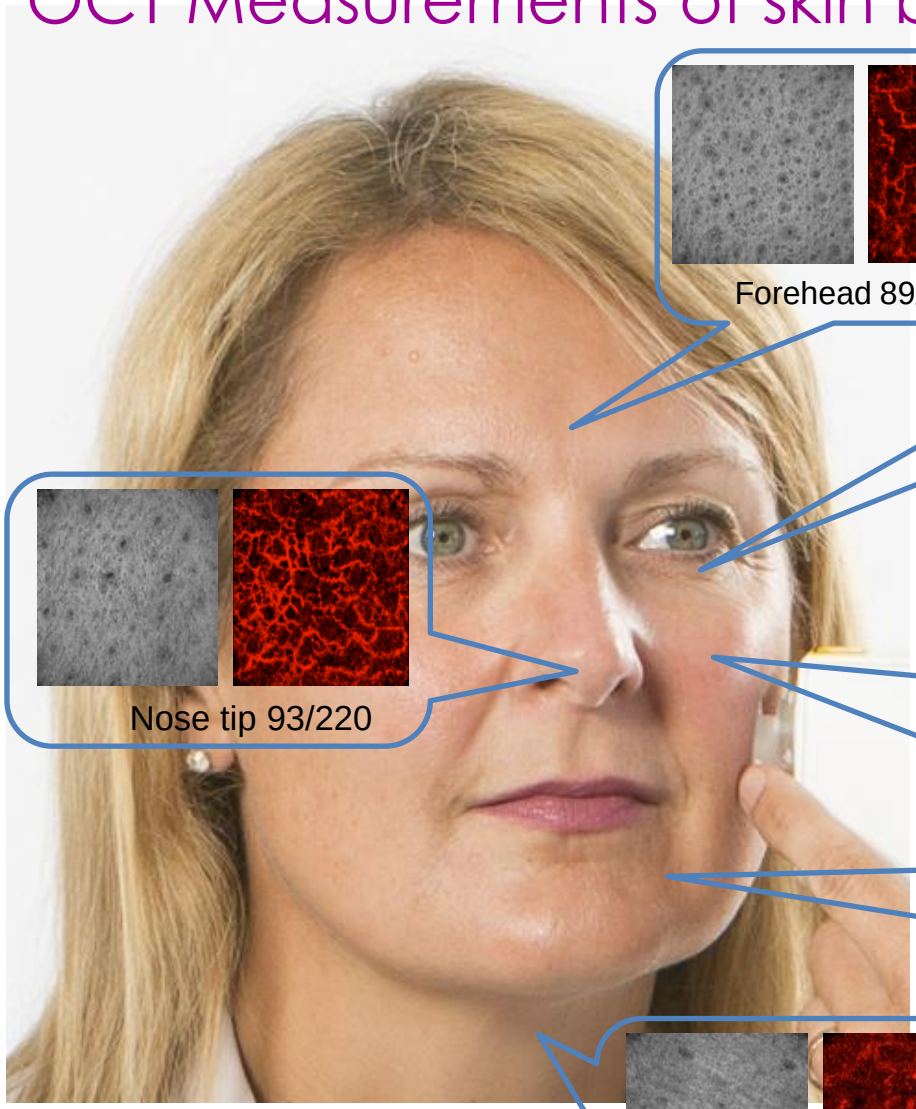


En-face view
100 µm above skin surface
(female cheek)

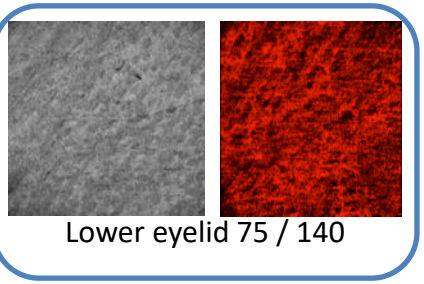
Find & count 69 hairs

OCT Measurements of skin by location

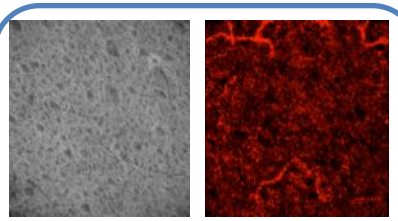
VivoSight

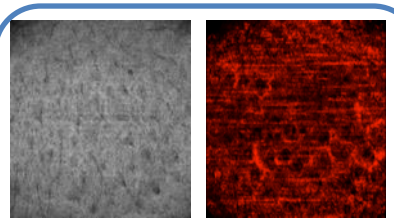


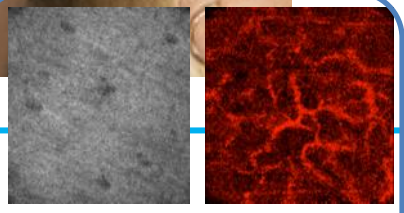
Forehead 89/190


Lower eyelid 75 / 140

Nose tip 93/220


Cheek 75/310


lower lip 93/220


Throat: 89/220

OCT measurements: Epidermal thickness / superficial plexus depth (microns)

See what we can see…

Michelson DIAGNOSTICS