Non-invasive optical skin evaluation device for cancer screening

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Challenge

To create a screening device, that is inexpensive, available in regional clinics and at primary care physician in order to evaluate the suspicious malformations fast, non-invasive and quantitative.
Method

525nm, 405nm (AF), 660nm, 940nm
First device prototype

a) First prototype with the wide end (70mm)
b) 3D designed model with the improved cone tip

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Development of the tip

**Flat walls**
- Sharp tip
- Big diameter (70mm)
- Not centered ROI

**Cone shape**
- Flat walls
- Smooth tip
- Better centered ROI

**Cone shape**
- Flat walls
- Smooth tip – silicone filament
- Better ROI
- Step-type internal walls

**Cone shape**
- Smooth tip – silicone filament
- Better ROI
- Step-type internal walls to improve light polarisation (2nd prototype)

*Step-like* internal structure allows redirecting reflected light that has lost its linear polarization away from the skin.
Second prototype

+ Lighter
+ smaller, more compact in size
+ White LEDs
+ Case: easier assembling for repairs
+ better support for the camera, improved 3D printed case
+ Handle with battery

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Figure 9. Full prototype printout. Uppercase with lens and camera attached (a), back view with opened upper case (b), attached case without LED holder cone (c), assembled case (d).
Conclusions

• With the developed screening device it is possible to evaluate skin malformations by imaging at various wavelengths.

• During the development of 1st and 2nd prototype, a lot of improvement have been achieved, for instance:

  + precise, centered tip with ROI imaging;
  + designed a silicone filament for patient comfort;
  + wireless battery solution;
  + added white LED illumination and one-button switch for each LED light;
  + wireless image transformation to the cloud with 4G modem.

• It is possible to distinguish such malformations: melanoma, basal cell carcinoma (both cancers), hyperkeratoses, melanocytic nevi and hemangioma (benign).
Thank you!

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This study has been approved by Ethics Comitee, the research has been conducted in accordance with the Declaration of Helsinki, as well as with the Oviedo Convention.