Evaluating the aging of the scars after cancer removal by using multispectral diagnostic device

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Introduction

Skin cancer is an evolving problem worldwide. After removing skin cancer it is crucial for the patients to do regular check-ups for any additional lesion and to evaluate the scars for any recurring cancer cell development. In this study we are initiating to evaluate skin cancer post-operative scars with non-invasive, optical imaging methods.

Set-up and methods

As a part of a bigger project of skin malformation evaluation, since 2017 with cooperation of Oncology center of Latvia (LOC) we have started to evaluate scars after various skin cancer removals. The most common skin malformations removed surgically or with a laser are: Basal Cell Carcinoma (BCC), Malignant Melanoma (MM), Squamos Cell Carcinoma (SCC), as well as Sebhorreic Keratosis (benign / suspicious) and others. Research show that 13% of the BCC removals (surgical, laser, criodestruction and radiotheraphy in total) show recurrent cancer in post-operative scars.[1]

We evaluate the scars at RGB and IR illuminations at wavelengths: **525 nm**, **660 nm**, **940 nm** and at **405 nm** to evaluate autofluorescence (AF) with a custom-made diagnostic devise (Figures: 1., 3. and 4.). Normally, the AF curve with the age of the healthy scar should increase with time.[2]

The imaging was done with a custom made optical, non-invasive device for skin malformation evaluation evaluating spectral images. Afterwards, the images of the scars were analyzed, taking the region of interest (ROI) for AF average intensity analysis in the scar (Figure 2).

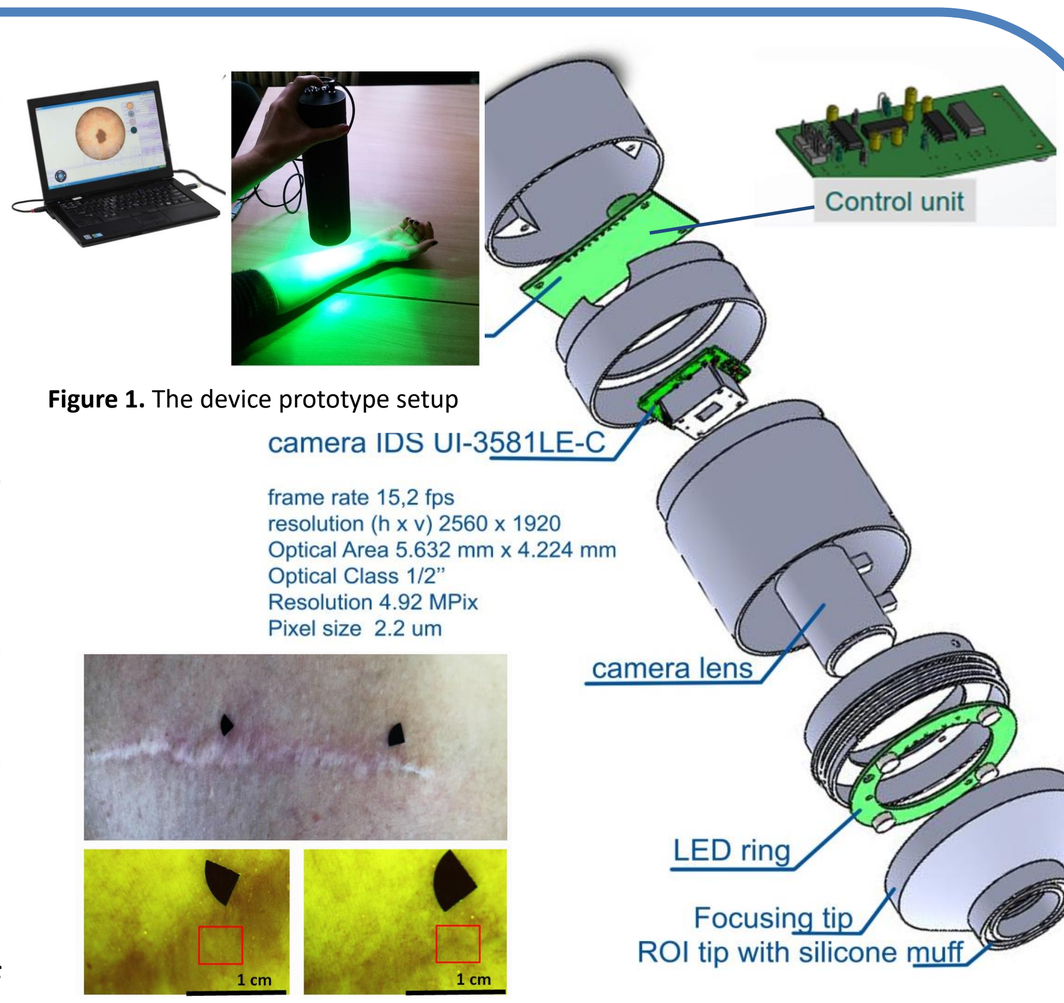


Figure 1. The device prototype setup

Figure 2. Post-op MM surgical scar at white light (upper) and AF (both lower) with selected **ROI**

Figure 3. The assembly of the diagnostic device

Results

In total 66 post-operative scars (after surgical and laser removal) have been evaluated. So far no recurring cancer case has been recorded. Scars after BCC removal (n=49) show a trend of healthy increasing AF, as well as scars after MM removal (n=7) and other scars (n=10) from various causes including benign skin malformation removal.

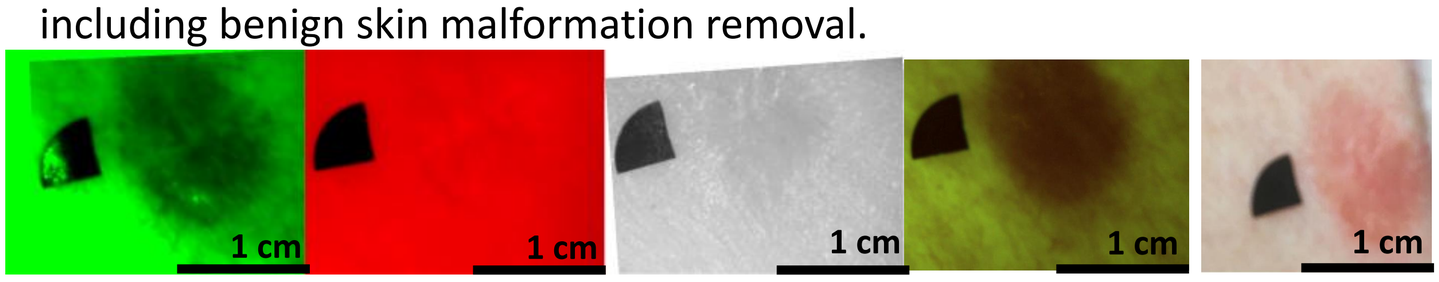
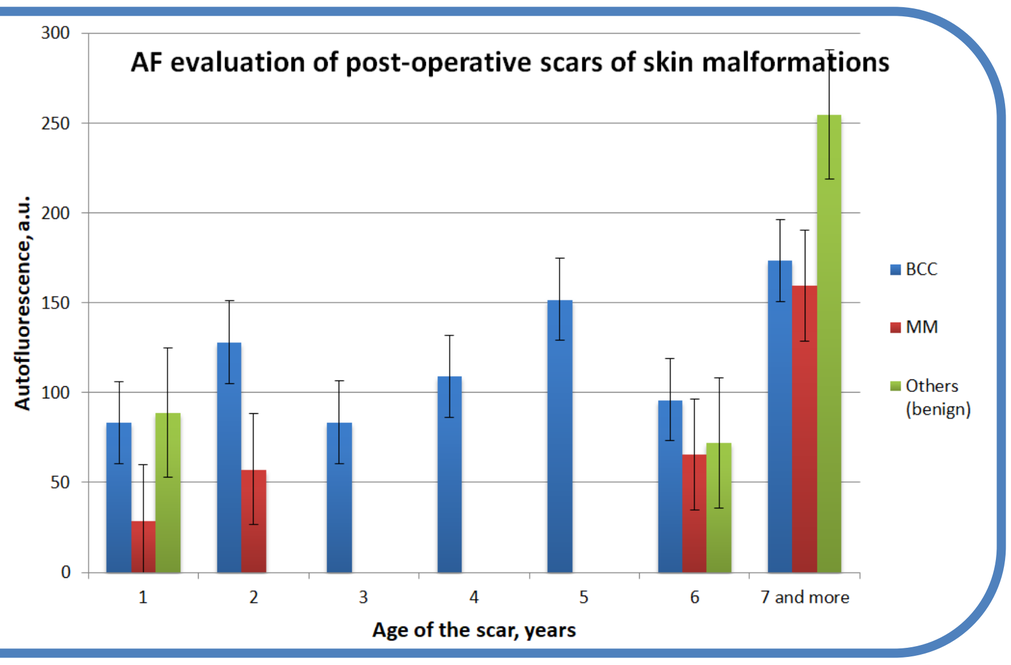


Figure 4. A post-op BCC scar after laser removal at (from the left): green, red, IR, blue (AF) and white light



Conclusions

- The method of AF evaluation of post-operative scars is a good visual and quantitative method to apply when patient visits the oncologist / dermatologist for a regular check-up.
- In case of a recurring cancer we expect the AF values to show irregular characteristics.
- For regular patient screening the visual archive of the scars (an example at Fig.4.) can be a good reference to evaluate the scars (or other skin malformations) in time.
- More statistics of post-operative scars and possibly recurring skin cancer cases evaluated with AF intensity are required for further analysis of the proposed optical and non-invasive method.

References

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Acknowledgments

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