Quantifying levels of endogenous Protoporphyrin-IX (PPIX) in pores of skin

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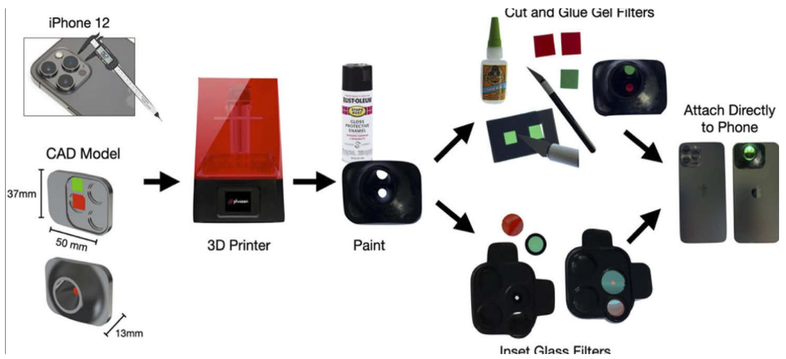
Introduction

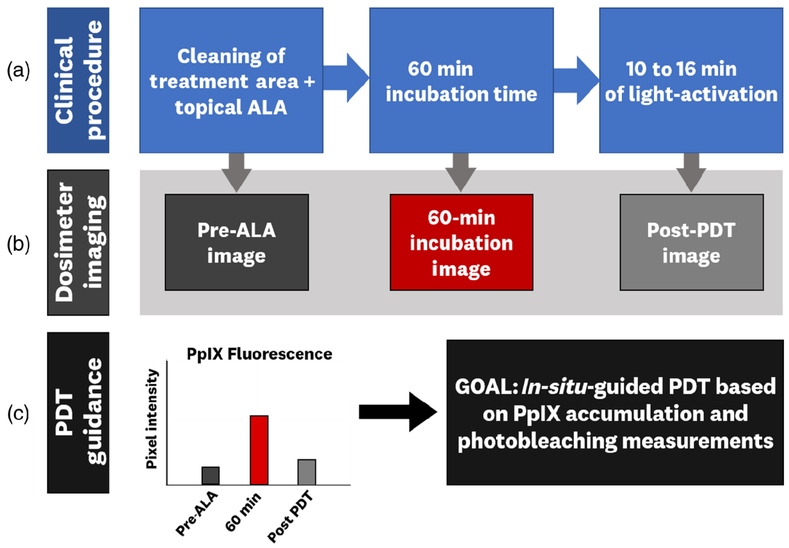
In photodynamic therapy (PDT), we use a special substance called a photosensitizer, PPIX is a common photosensitizer. Protoporphyrin IX is an organic compound, classified as a porphyrin, that plays an important role in living organisms as a precursor to other critical compounds like heme (hemoglobin) and chlorophyll, and we can make more of it by giving a drug called 5-ALA. We're really interested in how PPIX reacts with light because it helps us focus on and treat tumors better. In my research, we are focusing on quantifying PPIX in pores of skin.

Methods

Fig. 1. Fabrication and assembly of ultracompact fluorescence attachment to the smartphone.



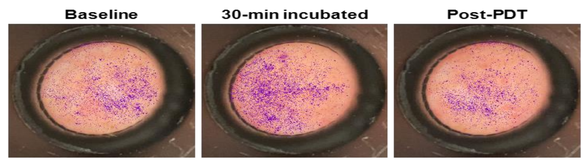
The smartphone's built-in light and camera take pictures of the skin on the forehead, scalp and cheek area to quantify the amount of PPIX in each, before ALA, after ALA and after PDT



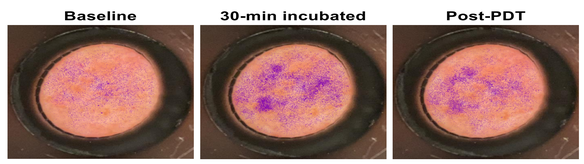
References

1. Brady Hunt, Samuel S. Streeter, Alberto J. Ruiz, M. Shane Chapman, and Brian W. Pogue “Ultracompact fluorescence smartphone attachment using built-in optics for protoporphyrin-IX quantification in skin”
2. Alberto J. Ruiz, Ethan Philip M. LaRochelle, Jason R. Gunn, Sally M. Hull, Tayyaba Hasan, M. Shane Chapman, Brian W. Pogue “Smartphone fluorescence imager for quantitative dosimetry of protoporphyrin-IX-based photodynamic therapy in skin”

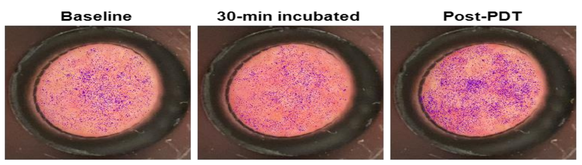
Patient 22 | 635LP | S_s0 | FL overlay



Patient 29 | 635LP | S_s0 | FL overlay



Patient 40 | 635LP | S_s0 | FL overlay



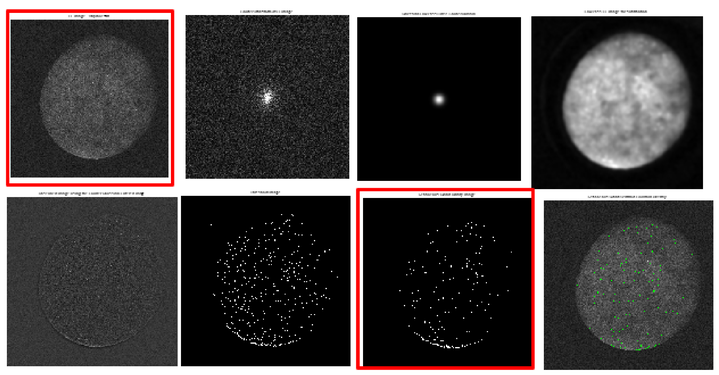


Fig. 3. Unprocessed Image.Fourier Transform.Low Pass Filter, Low Pass for subtraction.Baseline image using Fourier Gausian filter.Threshold Image, Sebaceous Glands.Sebaceous Glands overlay image.

Results

Fig. 4 The number of pores/sebaceous glands in the scalp pre-ALA, post-ALA, post-PDT for 8 scalp patients

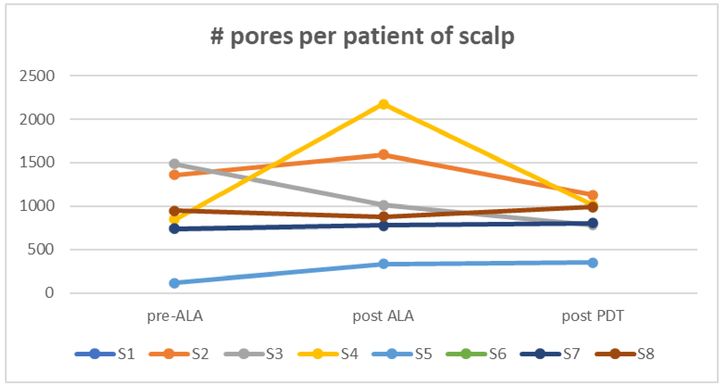
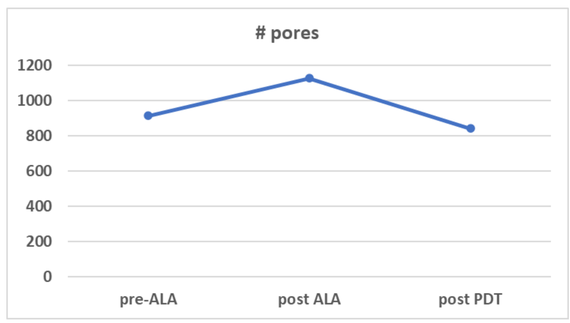


Fig 5.The average number of pores/sebaceous glands in the scalp pre-ALA, post-ALA, post-PDT



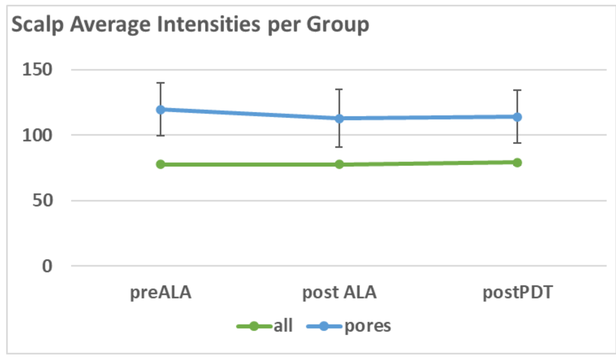


Fig 6. Average Intensities

Conclusions

1. There is a significant difference in the number of pores before ALA and after PDT.
2. The average intensities in the pores have decreased post ALA as compared to the full area being consistent throughout
3. The average intensities in the pores and full are pre and post ALA are mostly the same.

Future Work

1. I am going to be working on the forehead, cheek data to ensure the results are consistent.
2. I am going to be working on finding the difference in PDT vs DPDT data for all three datasets- forehead, scalp, cheek.