Actinic keratosis and surrounding skin exhibit changes in corneocyte surface topography and decreased levels of filaggrin degradation products

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Background

Actinic keratosis (AK) is a frequent premalignant skin lesion mainly caused by chronic sun exposure. AK lesions are often surrounded by invisible, subclinical alterations, called field of cancerization (FoC). Definition of FoC is of importance for therapy management; however, the criteria and non-invasive tools to characterize FoC are lacking. In this study we applied atomic force microscopy (AFM) to investigate AK and surrounding skin obtained by noninvasive collection of the stratum corneum (SC) with adhesive tapes. Furthermore, we determined degradation products of structural protein filaggrin (natural moisturizing factor, NMF), which previously showed association with the changes in corneocyte surface topography.

Methods

Ten patients with multiple AK on the face were recruited from the outpatient clinic. SC samples were collected from the AK lesion, skin sites adjacent to the AK, 5 cm from the AK and retroauricular area (Fig. 1). Corneocyte surface topography was determined by AFM, and NMF by liquid chromatography.

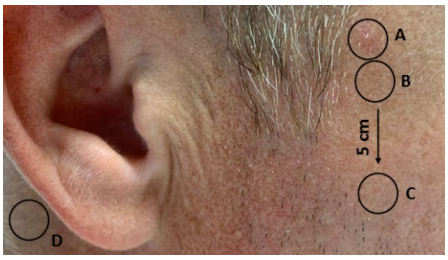

Fig. 1. Sampling locations.
(A) AK lesion
(B) adjacent to AK lesion
(C) at 5 cm distance of AK lesion
(D) retroauricular.

Results

The AK lesion showed alterations of the corneocyte surface topography characterized by an increased number of nanosize protrusions, which gradually decreased with the distance from the lesion. NMF levels show an inverse pattern.

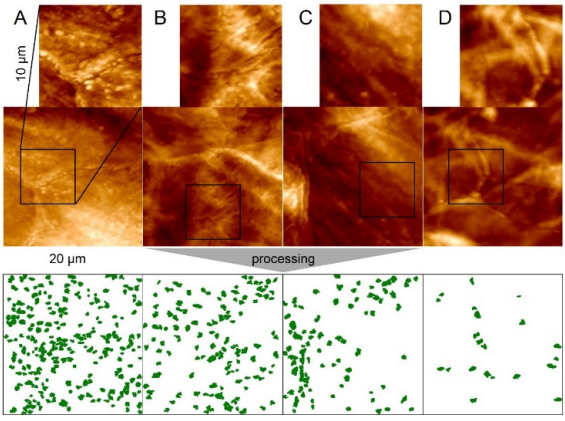

Fig. 2. AFM images of (A) AK lesion, (B) skin site adjacent to AK, (C) skin site at 5 cm from AK and (D) retroauricular skin site.

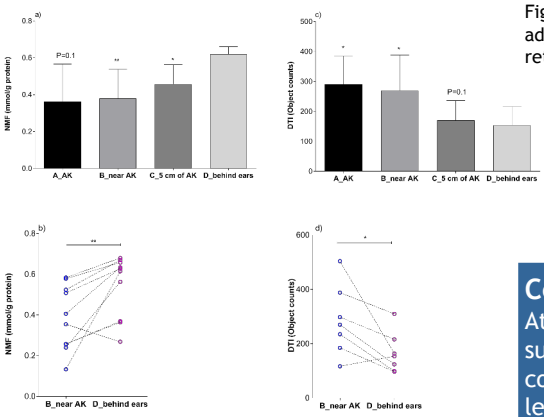

Fig. 3. a) and c), Levels of NMF and DTI at different skin sites, averaged for 10 subjects. b) and d), individual levels of NMF and DTI atskin sites B (adjacent to AK lesion) and D (retroauricular).

Conclusion

Atomic force microscopy showed to be a suitable tool to detect changes in the corneocyte surface topography on the AK lesion and surrounding skin in a non-invasive manner.