

EVALUATION OF THE BIOLOGICAL EFFECT IN DNA DAMAGE REPAIR OF A HIGH BROAD SPECTRUM SUNSCREEN CONTAINING NICOTINAMIDE AND PANTHENOL USING 3D LINE-FIELD OPTICAL COHERENCE TOMOGRAPHY

J. Pérez-Anker¹, B. Alejo¹, P. Iglesias¹, P. Roses-Gibert¹, V. Berot², C. Cano³, E. Cinotti⁴, V. Del Marmol³, M. Fontaine³, M. Miyamoto³, J. Monnier⁵, J.L. Perrot², P. Rubegni⁴, L. Tognetti⁴, M. Suppa^{3,6}, D. Kerob⁷, A. L. Demessant⁷, L. Prieto⁸, J. Malvey¹, S. Puig¹

¹Dermatology Department, Melanoma Unit, Hospital Clínic de Barcelona, Barcelona, Spain, ²Dermatology Department, University Hospital of Saint-Etienne, Saint-Etienne, France, ³Dermatology Department, Hôpital Erasme, Brussels, Belgium, ⁴Dermatology Unit, University of Siena, Siena, Italy, ⁵Dermatology Department, AP-HM, Aix-Marseille University, Marseille, France, ⁶Dermatology Department, Institut Jules Bordet, Brussels, Belgium, ⁷La Roche-Posay Laboratoire Dermatologique, Levallois-Perret, France, ⁸Laboratoire Dermatologique La Roche-Posay, Madrid, Spain

INTRODUCTION

Nicotinamide is the precursor of NAD (nicotinamide adenine dinucleotide), an essential coenzyme in the production of ATP (adenosine triphosphate), the main source of cellular energy. Previous studies in mice showed that oral consumption or topical application of Nicotinamide prevents immunosuppression and reduces the number of tumors induced by UV radiation. In humans, topical application of 5% Nicotinamide prevents immunosuppression caused by solar UV radiation, but not from burns. Furthermore, oral Nicotinamide reduces the diagnosis rate of new non-melanoma skin cancers and actinic keratosis (AK) in high-risk patients. It has been suggested that one of the mechanisms by which Nicotinamide may protect against photodamage is by increasing ATP production which enhances DNA repair. Additionally, Nicotinamide acts as a PARP1 inhibitor. Extensive DNA damage leads to over-activation of PARP1 which can lead to NAD depletion. Thus, cells are unable to enter apoptosis, since the process requires a large amount of energy.

Using a sunscreen with a high broad spectrum UVB-UVA and containing Nicotinamide and Panthenol, may allow to reverse chronic sun damage of the DNA of skin cells and therefore improve the morphological structure of the skin and keratinocyte nuclei.

OBJECTIVE

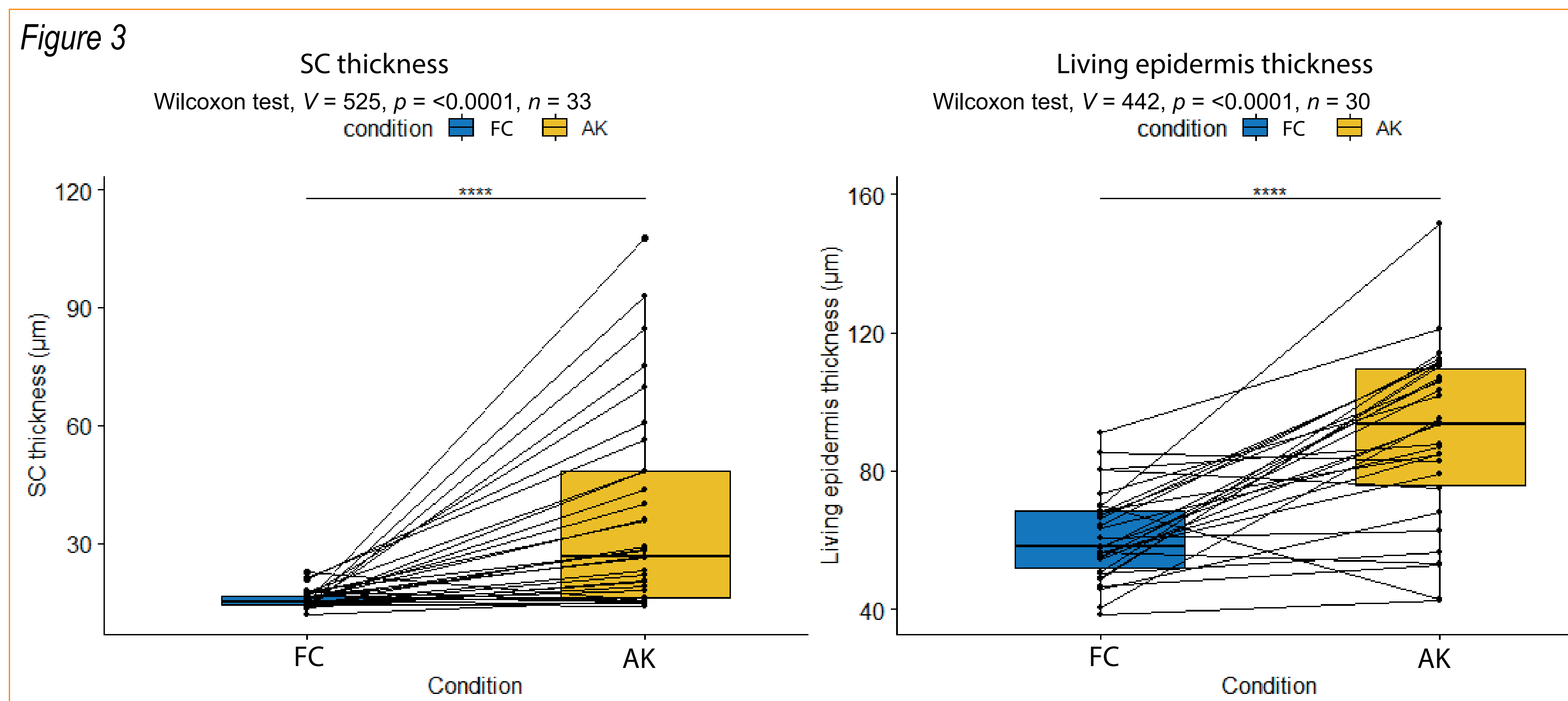
The aim of this study was to determine the biological effect of a high broad spectrum UVB-UVA sunscreen containing Nicotinamide and Panthenol through the in vivo analysis using LC-OCT of treated skin.

RESULTS

The epidermis and the *stratum corneum* were significantly thicker for the AK than for the FC (+51% and +139% respectively,) (Figure 3) and the dermo-epidermal junction (DEJ) was more undulated for the AK than for the FK. Regarding keratinocytes analysis, the average number of layers was higher for the AK than for the FC (+24%) and the atypia score was significantly higher for the AK than for the FC (+36%) (Figure 4). Moreover, the AK keratinocyte nuclei had a larger volume (+9%) with more variability (+19%) and their cytoplasm was larger (+23%).

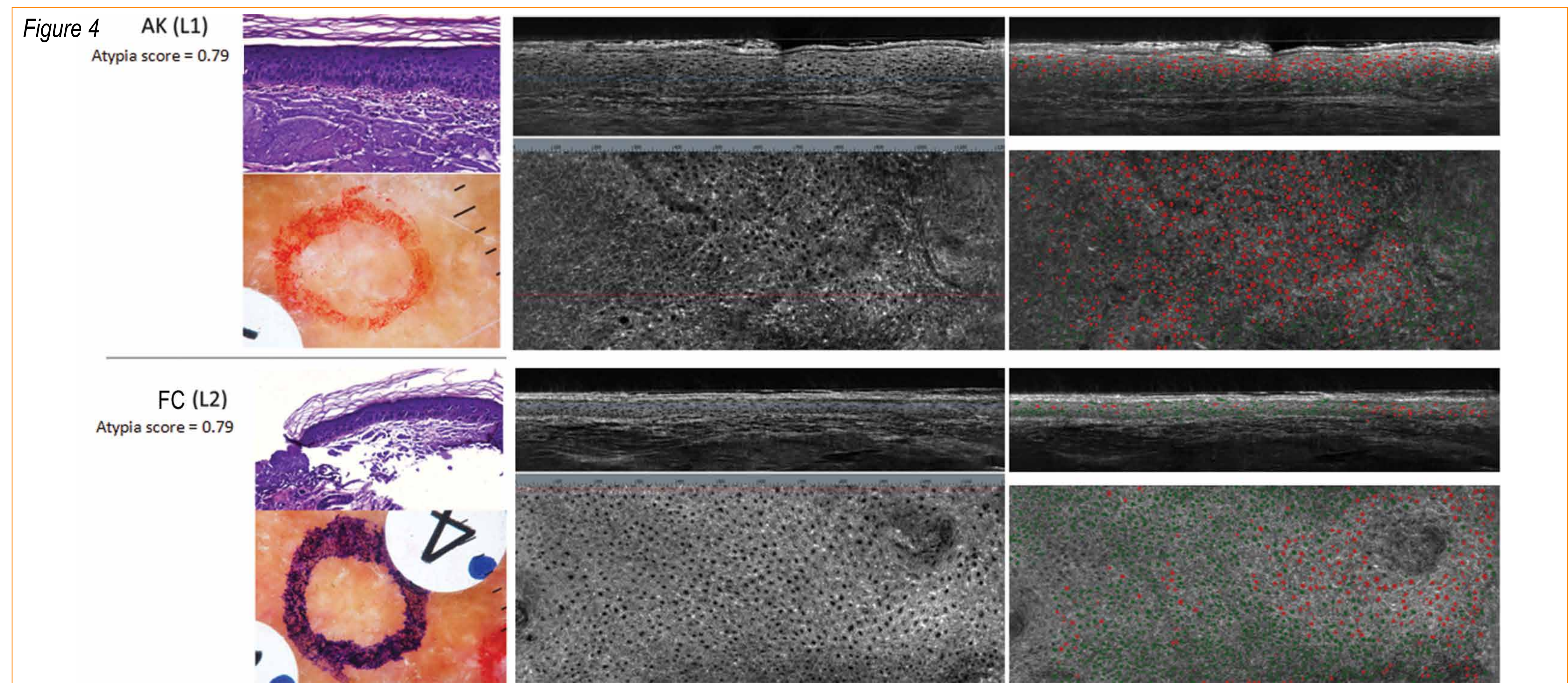
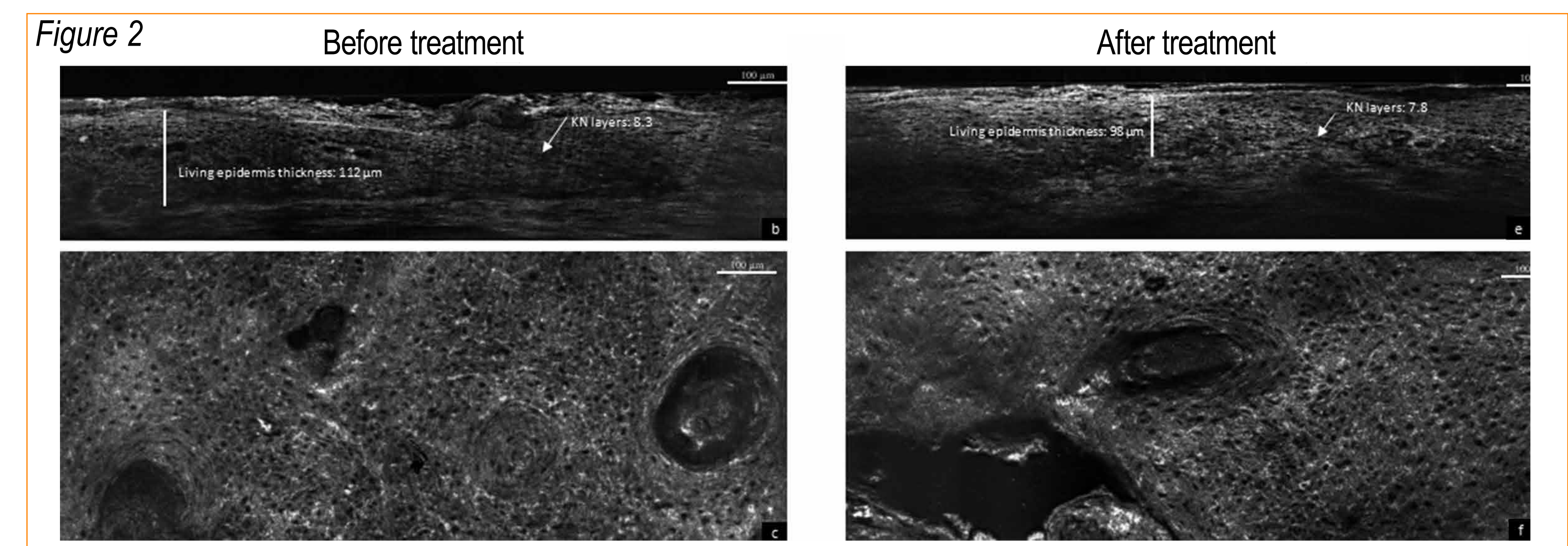
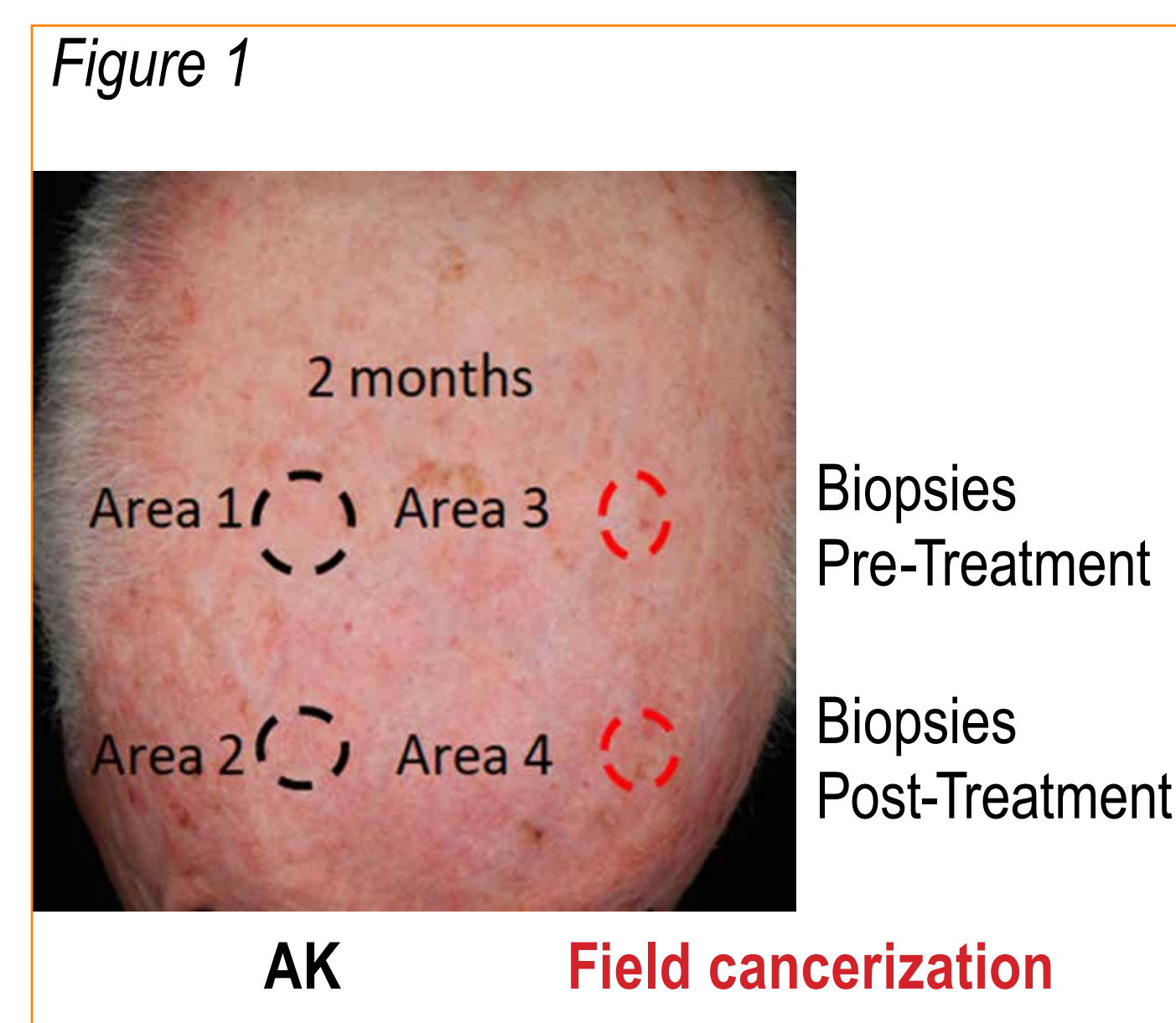
The epidermis was significantly thinner in the AK after treatment than before treatment (-13%).

Regarding the keratinocyte analysis, a small decrease of the mean volume of the FC nuclei and the average number of layers of the FC (-8.8% and -7.2% respectively) was observed.



MATERIALS & METHODS

In a prospective single-centre study, 19 subjects with AK aged between 50 and 70 years were included. Four lesions on the scalp of each subject were selected: 2 AK (area 1 & 2) and 2 field cancerization (FC), (area 3 & 4); (Figure 1). During the screening visit, LC-OCT imaging of the 4 lesions and a biopsy of one AK and one FC were performed. After 8 weeks of applying the high broad spectrum UVB-UVA sunscreen twice a day, LC-OCT imaging technique was repeated for the two remaining lesions and a biopsy was performed (Figure 2). Images of AK vs FC, AK before treatment vs after treatment and FC before and after treatment were compared and a keratinocyte analysis (atypia score and keratinocyte metrics) was done.



CONCLUSION

The tested high broad spectrum UVB-UVA sunscreen containing Nicotinamide and Panthenol may have a positive biological effect on the structure of the epidermis of AK and the keratinocyte nuclei of FC.