**Innovating imaging techniques to understand Atopic Dermatitis skin**

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**Background:** Atopic dermatitis (AD) is a chronic relapsing condition that is commonly observed in primary care. The characteristics of such a condition is itching and redness of the skin, associated with breakdown of the skin barrier. Efforts to estimate the prevalence of AD are complicated due to the presence of few studies in the literature. Optical coherence tomography (OCT) provides a fast and non-invasive method of studying the skin barrier and the effects of treatments on it.

**Objective:** The aim of this study is to understand both morphological and functional characteristics of AD skin and compare it with unaffected volunteers (UA).

**Methods:** The paper is based on comparison of OCT images from four UA (with no history of AD) and AD volunteers with Fitzpatrick skin type varying between I-III. A commercially available Fourier domain OCT system with 20 kHz A-scan rate and 1300nm centre wavelength (Michelson Diagnostics Ltd., UK) was used to investigate six skin sites namely, antebrachium, carpus, elbow, cheek, eye bags and popliteal fossa. B-Scans and angiographic images were gathered successfully to obtain both the morphological and functional (blood vessels) properties from the skin. Morphological parameters such as epidermal thickness and average mean roughness of both the upper-layer and epidermal-dermal junction (EDJ) were calculated using an algorithm acquired from Michelson Diagnostics.

**Results:** The mean thickness of the epidermal layer for AD volunteers (115-170 µm) was higher by 24-70% compared to unaffected volunteers (81-115 µm). This thickening is supported by a lack of superficial microvasculature in the case of eczematous skin. The effect of skin swelling resulted in higher thickness and skin smoothening for AD volunteers. It was also noted, that the non-AD skin sites in AD volunteers had similar morphological parameters to unaffected volunteers.

**Conclusions:** Localised swelling of the skin in AD volunteers resulted in higher epidermal thickness and a reduction in vascular perfusion to the upper layers of skin. Quantification of the differences between the skin in those with and without AD is a prerequisite for studying the effects of therapies on the skin in AD.