Principles and Application of Optical Coherent Tomography in Dermatology

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Key Words

Optical coherent tomography · Epidermal thickness · In vivo imaging, skin tumours

Over the last few years, optical coherent tomography (OCT) has been one of the most innovating developments in medical imaging. The principles of this technique were described at the beginning of the 1990s by Huang et al. [1] and Fercher et al. [2]. The principle is similar to that of ultrasound imaging. It is based on the reflection of light waves instead of ultrasound waves. The emission wavelength must ideally be chosen within the near-infrared optical range, where light penetration into living tissues is deep enough to provide an image of the entire skin structure.

An OCT system has been commercialized for several years for ophthalmic use in the diagnosis of focal lesions of the retina and cornea [3].

As early as 1995, Schmitt et al. [4] presented the first skin images, and recent developments in this imaging technique have been applied to the field of dermatology in particular for ‘real-time’ characterization of some tumours (basal cell carcinoma) or inflammatory diseases of the skin. Comparisons between histological image and OCT image were made to check the precision of the values acquired by OCT [5].

Few studies have been carried out using the OCT technique. It allows a simple, fast and non-invasive in vivo

measurement of the skin especially to monitor epidermal thickness during clinical trials:

- study of the effect of UVA1 and UVB on epidermal thickening [6];
- study of age-related skin changes [7].

It is more suitable than high-frequency ultrasound to explore the epidermis and dermo-epidermal junction.

In this issue of *Dermatology*, Mogensen et al. [8] used an OCT system developed at Risoe National Laboratory, Denmark, to describe the morphology of normal skin and measure skin structures. This hand-held OCT probe used is very interesting because it is easy to handle compared to the first OCT generation. The probe is applied directly to the skin, the scanning lasts few seconds and it is easy to be used on children and at different anatomical sites. The authors present a descriptive study with a small cohort of 20 volunteers (6 months to 59 years old) with interesting results, but unfortunately, reproducibility of the measures has not been discussed.

OCT is a technique that has nearly reached maturity. The recent development of a system using femtosecond lasers with low coherence provides in vivo images that are close to those obtained by classical histological techniques. Such systems are not yet available for daily dermatological use, but several published studies show that the information that they can provide is valuable especially with regard to the epidermis and the dermal-epidermal border.

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