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COMMENTARY

High-resolution ultrasound in the current landscape of dermatology imaging

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We recently read with interest the article 'Seeing beyond skin deep: High-resolution ultrasound in dermatology—A comprehensive review and future prospects' by Zhao Feng Liu et al.[1] Dermatological imaging has made considerable progress in less than 50 years. From visual inspection alone taking into account signs and symptoms, the dermatologist completed his examination with dermatoscopy, a handheld device that magnifies the skin surface making the distribution of skin pigmentation and superficial vessels visible, which has now become standard practice.

In the last 20 years, we saw the development of in vivo microscopic imaging at a cellular level using reflectance confocal microscopy (RCM). Optical coherence tomography (OCT) was also developed for the diagnosis of skin carcinomas and then recently implemented by the integration of RCM technology in the line field confocal OCT (LC-OCT) with a shift from 2D to the 3D images.[2] In a few years, imaging of the first 500 μm of the skin has become familiar to us with an optical definition which tends more and more towards that of histology.

Imaging techniques already make it possible to specifically visualize chemical structures and thus to differentiate between collagen and elastic fibres by multi-photon microscopy and between reduced and oxygenated haemoglobin by photoacoustic microscopy, and to identify various chemical structures by Raman spectrometry. However, all these devices are expensive and reserved for a limited number of teams around the world. At the same time, new imaging devices such as super-high magnification dermoscopy and fluorescence advanced dermoscopy will allow a democratization of this optical microscopic in vivo approach thanks to their lower prices and the possibilities of observing single skin cells.[3]

Optical images provided by RCM, LC-OCT, magnified dermatoscopy or multiphoton microscopy, due to the fineness of their definition and their contrasts, are more attractive than the ultrasound image which can appear out of focus. However, they do not allow us to observe the deeper part of the skin, which is for example relevant to define the thickness of a tumour with the consequent proper management and prognosis (see Breslow index). Operating in one stage with an appropriate margin on malignant tumours, with or without a search for the sentinel lymph node, could save medical and financial resources and improve the patient's quality of life.

The characterization of the deep boundary of the tumour analysed by optical images is most often unknown to us, and this is the field of possibility that high-resolution (HR) ultrasound has opened up to us. Liu et al.[1] reviewed the main indications for HR ultrasound in dermatology and showed the advantage that is offered to modern dermatology thanks to the visualization of the entire skin tissue. For example, basal cell carcinoma can be diagnosed by surface optical microscopic imaging and then correctly managed knowing its deeper extension by HR ultrasound.[4] Monitoring of deep recurrences and tumour mapping before surgery can also be ensured by dermatological ultrasounds.

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However, the race for HR ultrasound should not make us forget that a compromise will always have to be found between improving definition (high frequency) and penetration (low frequency). Finally, new perspectives are possible in this domain such as the analysis of the propagation of mechanical waves in the skin that is opening the way to the objective measurement of tissue viscoelasticity and therefore the possibility of quantifying touch.[5] Multi-scale and multimodal dermatological imaging is likely the future of instrumental dermatology.

CONFLICT OF INTEREST STATEMENT

The authors do not have any conflicts of interest with this manuscript.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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