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The Expanding Role of High Frequency Ultrasound in the Surgical Approach of Skin Cancer

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Editorial

Ultrasonography is widely used in medicine. In recent years ultrasonography and especially High Frequency Ultrasonography (HFUS) has become increasingly popular amongst dermatologists. The introduction of skin ultrasonography in dermatology was a turning point, offering essential information for the diagnosis, therapeutical management and follow-up of tumoral and non-tumoral cutaneous pathology. Modern HFUS equipments allow a highly accurate visualization of skin layers and appendages up to histological details. In dermatology, the diagnosis is based on clinical exam, dermoscopy and histology. Sonography can be considered the physicians' stethoscope, because it allows not only visualization but also listening and palpation. Although histology remains the gold standard of dermatologic diagnosis, HFUS (15 to 18 Mhz) is a real complex, "*in-vivo*" biomicroscope, allowing a multimodal diagnostic approach of skin pathology. Therefore, grey-scale examination, color and spectral Doppler (used for macrovascularisation), elastography and Contrast Enhanced Ultrasonography (CEUS-used microvascularisation and neoformation vessels) offer information related to morphology, echostructure, blood supply and elasticity. HFUS offers information which strongly correlates to the histological findings [1-3].

Skin cancer is the most common type of cancer worldwide and its incidence is on the rise, probably faster than any other form of cancer, due to numerous factors, of which UV exposure plays a crucial role. It can be divided into two groups: malignant melanoma, the most aggressive type, accounting for 4% to 11% of all skin cancers and Non-Melanoma Skin Cancer (NMSC), of which 75% to 80% are Basal Cell Carcinomas (BCC) and up to 25% Squamous Cell carcinomas (SCC) [1,4,5]. Skin lymphomas, angiosarcomas, Kaposi sarcomas, adnexal carcinomas are other types of cancer that can be assessed by HFUS.

Sonographic imaging can be effectively used as a preoperative assessment of skin tumors. HFUS is highly sensitive, but it has a low specificity. However, published literature reports specific sonographic characteristics for benign and malignant tumors. Thus, benign tumors are hypoechoic, homogeneous, oval, well-defined structures, with reduced vascular supply, usually central/mixed circulatory pattern, with moderate rigidity and uneven loading pattern of contrast substance and slow wash-up time on CEUS [1,2]. In contrast, malignant tumors are characterized by irregular contour, hypoechoic, inhomogeneous structure, with hyperechoic surroundings, intense vascularisation, with multiple vascular pedicles, peripheral or mixed circulatory pattern, intense arterial blood supply, fast inhomogeneous uptake pattern of the contrast agent, quick wash-up time on CEUS and increased rigidity. There are particular sonographic features for BCC (intratumoral hyperechoic spots, prominent basal vascular supply), SCC (hypoechoic well-defined lesion with/without hyperechoic spots, frequently invading the deeper structures, with shadows running perpendicularly on the skin structure, induced by superficial scales or crusts, more prominent mixed pattern blood supply) and melanoma (well-defined oval/fusiform homogeneous hypoechoic structure, increased echogenicity of the underlying subcutaneous tissue, intense chaotic vascularisation composed mostly of arterial vessels, some of them displayed in a parallel pattern) [1,2,6]. It is well known that the histological Breslow index is the most important marker for prognosis and surgical margins for melanoma, and it was shown that the sonographic thickness of the tumors correlate to more than 90% with the histological Breslow, making ultrasound a great clinical, non-invasive method for diagnosis, therapeutical approach and prognosis [2-9]. Another domain that has gained a lot of popularity in recent years is cosmetology. HFUS has proven to be a valuable non-invasive method used for examining the local anatomy prior to surgical cosmetic procedures. It is essential for the

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detection and assessment of the wide range of complications that occur with the multitude of aesthetic procedures used nowadays. It has the potential to support pre-procedural mapping, is useful in recognizing anatomical variants and investigating the presence of previous cosmetic deposits that can complicate subsequent cosmetic procedures, thus drastically reducing complication rates and unfavorable results. The injection of cosmetic fillers may also have the potential to become a sonographic guided procedure, making it a lot safer and reducing complications. Sonography finds applications also for chronic inflammatory diseases (psoriasis, scleroderma) and the cutaneous senescence process. HFUS with 20-22-50 MHz transducers allows a highly accurate assessment of topical efficacy of anti-ageing therapies.

In conclusion, in a world that has become reliant on technology, we cannot imagine the future of dermatologic surgery without a preoperative ultrasonographic assessment. Ultrasound is essential for the assessment of cutaneous tumor pathology, offering real-time, "*in-vivo*" details for the diagnosis, clinical management and follow-up of patients. It is a cost-effective, safe, non-invasive, simple to use and easily accepted by patient's method.

Cosmetology is another field that benefits greatly from the use of ultrasound, beginning with pre-procedural anatomical assessment (anatomical variants), echo-guided procedures, early and accurate detection of complications.

Introducing HFUS in the clinical setting provides an economically efficient, quick, and reliable tool for obtaining the best possible aesthetic outcome, reducing the rate of complications and unfavorable results.

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