

Ultra-sound Evaluation of Dermis

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Abstract

The ultra-sound evaluation of dermis, along with other instrumental examinations, medical history and traditional clinical examinations aimed at identifying the patient's request, is part of the aesthetic medical checkup. The ultra-sound measurement of dermis is performed by means of a high-frequency probe (20-100 MHz) and helps evaluate age-related dermal change. The ultra-sound cutaneous examination is intended to provide a qualitative and quantitative evaluation of skin layers and surrounding structures.

The available data suggest that ultra-sound evaluation is a non-invasive diagnostic technique that supports anti-aging treatment monitoring and can be considered as a valid option for the future evaluation of the efficacy of tailored anti-aging injections and topical therapies

This data seems to be confirmed by a clinical experience conducted with a medical device (Class III) to verify the effects on facial skin aging by means of ultra-sound evaluation. In this article, we discuss and analyze the benefits of the introduction of the qualitative and quantitative diagnostic evaluation of hypodermal ultra-sound imaging.

Keywords

Photoaging, cronoaging, SLEB, Ultra-sound evaluation, dermis

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Ultra-sound evaluation with high-frequency probe

The ultra-sound evaluation of dermis, along with other instrumental examinations, medical history and traditional clinical examinations aimed at identifying the patient's request, is included in the aesthetic and medical checkup.

This non-invasive diagnostic technique is considered as a powerful tool in the diagnosis and management of dermatological conditions in the clinical practice, since it provides clinical data that would not be available at naked eye examination^{1,2}.

With regard to this, it is also important to highlight that ultra-sound evaluation with high-frequency probe (20-100 MHz) can play a crucial role in the evaluation of age-related dermal change in the clinical practice. Moreover, the presence and degree of a typical Subepidermal Low-Echogenic Band (SLEB) is strictly related to photoaging degree: the lower is SLEB echogenicity, the greater is photoaging¹.

The high-frequency probe helps evaluate the structural characteristics and dermal thickness. The aim of the cutaneous ultra-sound examination is to provide a qualitative and quantitative evaluation of skin layers and surrounding structures, being an additional and reliable instrument in the diagnostic phase as well as in the evaluation of the activity and severity of cutaneous diseases².

Photoaging initially produces an increase in elastic fibers with consequent dermal hyperechogenicity, which then results in the loss of collagen and elastic fibers and a decrease in dermal thickness and echogenicity³. Several studies support the relationship between cutaneous thickness and skin aging. A study by Gniadecka M et al 1998⁴ showed the thickness and echogenicity of dermal layers by means of ultra-sound technique. The author showed that changes in dermal layers differ according to which body region is evaluated. In fact, in photo-exposed body regions, the most superficial dermal layers are characterized by a progressive reduction in echogenicity, while in the body regions that are not exposed to sun rays the author observed an increase in echogenicity⁴.

The deepest layers of dermis have an increased echogenicity in all body regions.

The author concluded that although photoaging and chrono-aging increase and/or reduce skin thickness depending on the body region studied, no strict correlation was generally observed between skin thickness and age.

In a later study, Gniadecka M 2001 analyzed skin aging-related dermal change observed by means of ultra-sound evaluation with high-frequency probe. The author showed that the presence of SLEB in photo-aging is strictly related firstly to the degeneration of elastic fibers in papillary dermis, secondly to the basophil degradation of collagen and thirdly to the accumulation of glycosaminoglycans (GAGs) and water in papillary dermis^{5,6}.

Based on these considerations, SLEB could be an ultra-sound manifestation of elastosis and edema in papillary dermis. The correlation between age, SLEB thickness and echogenicity makes it possible to use these parameters to evaluate the level of cutaneous photoaging^{7,8}. Based on a number of available scientific data, ultra-sound

evaluation is a non-invasive diagnostic technique that supports anti-aging treatment monitoring and can be considered as a valid option for the future evaluation of the efficacy of tailored anti-aging injections and topical therapies⁸⁻¹¹.

All the above is supported by a clinical study conducted in 28 patients eligible for biostimulation treatment with a medical device (Sunekos 200) in injectable intradermal sterile solution, containing a functional complex of 6 amino acids (glycine, L-proline, L-lysine, L-leucine, L-valine, L-alanine) in association with high-purity hyaluronic acid, of non-animal origin, at a concentration of 10 mg/ml.

It has been documented that the morphological structure of elastin is characterized by a prevalence of L-alanine and L-valine¹²⁻¹⁴ that make this product particularly active on the turnover of the proteins of the ExtraCellular Matrix in case of facial skin laxity¹⁵.

According to the recommendations of the Italian Society of Mesotherapy (Società Italiana di Mesoterapia, SIM), the investigators administered one session for 1 month (4 infiltrations); one session every 15 days for 2 months (4 infiltrations) and one monthly maintenance session. Monitoring by ultra-sound technique was performed just before the first administration, before the fifth administration and one month after the last maintenance administration, in the zygomatic and mandibular region on the right and left hemilates (Figure 1).

In the study group (Figure 1) an improvement was observed in the structure, as well as an increase in the dermal thickness, a hypoechogenicity of dermis and an improvement in SLEB with matrix reorganization, and these factors were maintained until the end of treatment. The most important factor is matrix reorganization.

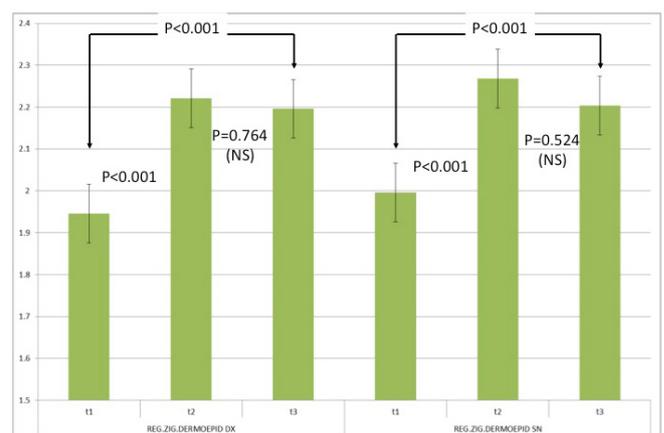


Figure 1 - Ultra sound results of the right and left zygomatic regions.

In conclusion, all subjects showed a reduction in the echogenicity of the dermis, associated with an increase in the thickness after only 4 weekly sessions; one month after the last treatment, an increase in the thickness was observed, as well as a normalization of echogenicity related to patient's age, matrix reorganization and SLEB

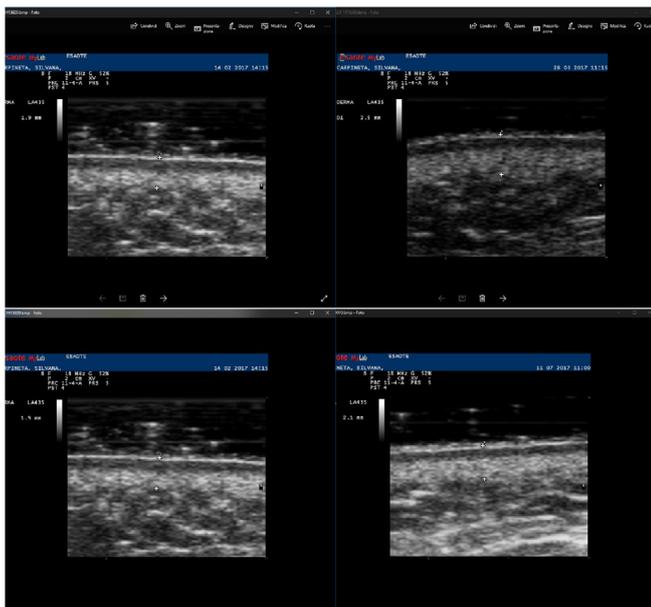


Figure 2 - Ultra-sound evaluation of the right and left zygomatic regions; T1=first administration, T2=after 4 weekly administrations, T3=one month after the last administration.

Conclusions

In summary, the ultra-sound evaluation of dermis, along with other instrumental examinations, medical history and traditional clinical examinations aimed at identifying the patient's request, is part of the aesthetic medical checkup.

This non-invasive diagnostic technique supports anti-aging treatment monitoring and can be considered as a valid option for the future evaluation of the efficacy of tailored anti-aging injections and topical therapies. It is also an additional reliable instrument in the diagnosis and management of dermatological conditions in daily clinical practice. Based on these considerations, in a recent clinical experience 28 patients were treated with a product containing hyaluronic acid and AA and showed a qualitative and quantitative improvement in most patients (*Figure 1*). After 4 weekly administrations, the ultra-sound evaluation showed a reduction in echogenicity that could be related to the deposit of hyaluronic acid and an increase in edema in the acute phase. At the end of treatment, the increase in thickness was maintained and echogenicity restored. The evaluation performed in this undoubtedly positive experience should be further studied in a systematic clinical study, since the results could be extremely relevant.

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