MORPHOLOGICAL AND FUNCTIONAL CHANGES OF THE SKIN AFTER AMINOACID REPLACEMENT THERAPY

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INTRODUCTION

- Aminoacids (AA) are essential substrates for promoting the collagen synthesis. At the same time, this process is efficiently maintained only when AA are continuously available and present in a specific ratio and provided in the precursor form. There are many products, which contain different AA and dedicated to treatment of aging skin.
- Aim of the study: an evaluation of structural and functional characteristics of the skin after aminoacid replacement therapy (AART).

MATERIAL AND METHODS

- 58 females with various degree of aging skin have been included in the study and divided into 2 equal groups: 35-45 years and 46-65 years (hormonal mechanism of skin aging is possible). Females with following conditions were excluded: skin diseases, autoimmune diseases, systemic blood diseases, exacerbation of chronic somatic disorders, pregnancy, intake of supplements or antioxidants additives and other biologically active compounds that could affect the quality of the skin within the last 6 months. All females have signed an informed consent form to participate in the study.
- In order to correct the skin involutional changes 4 procedures once per week were performed. During each procedure 1.5 ml of a solution containing 50 mg lyophilized aminoacids mixture (glycine 25 mg, L-proline 18.8 mg, L-lysine mono hydrochloride 2.7 mg, L-leucine 3.5 mg), sodium hyaluronate 15 mg and water (JALUPRO, Professional Derma SA, Switzerland) has been injected intradermally (0.02-0.05 ml per point, a distance between injections is 1-1.5 cm).
- Participants observation and instrumental diagnostic was conducted at M0 (before the first procedure), M2 (1 month), M5 (4 months) and M7 (6 months after the treatment course completion) *(Tables 1, 2)*. The results were assessed by confocal laser scanning microscopy (CLSM) (MAVIG Vivascope 1500, Germany-USA). This method can visualize the collagen and elastin fibers architecture and the reticular dermis. Microrelief assessment was conducted by visual monitoring method (Visioscan VS 98, Courage + Khazaka electronic GmbH, Germany). Data obtained were processed by SELS software. Epidermis and dermis structural patterns were evaluated by 2D ultrasound scanning (Dermascan C Ver. 3, Cortex Technology, Denmark) with a signal frequency of 20 MHz. Skin biomechanical properties were evaluated using elastometry under negative pressure 450-500 bar (Cutometer MPA 580, Courage + Khazaka electronic, Germany). Data obtained were evaluated by parametric (t-test) and nonparametric (paired Wilcoxon test, Mann-Whitney test) methods. Statistical significance threshold was established at $p \leq 0.05$.

RESULTS

Table 1. Results of instrumental evaluation of the skin before (M0) and after (M2, M5, M7) AART in 35-45 yo group.

METHOD	M0	M2	M5	M7
CLSM	A minimal changes in the structure of fibers; single areas of fibers disorganization *(Figure 1)*.	A quantitative and qualitative improvement of fibers; a reduction or disappearance of a fibers disorganization areas *(Figure 1)*.	Result persists without changes	Result persists without changes
2D US scanning	Areas of uneven distribution of an US signal and epidermis structure *(Figure 2)*.	A thickening of epidermis and dermis; an increasing of US signal intensity; an epidermis structures alignment *(Figure 2)*.	Result persists without changes	
Visual monitoring	Microrelief rugosity volume parameter 51.13±1.34 SER-scabrities 2.3±0.1 to 2.08±0.3 SEW wrinkleness 38.4±0.11 units *(Figure 3-5)*.	Microrelief rugosity volume parameter 48.63±2.1 SER-scabrities 2.08±0.3 SEW-wrinkleness 33.12±0.17*(Figure 3-5)*.	Revealed the decrease of initially increased parameters: scabrities (SER), wrinkleness (SEW), microrelief rugosity (Volume)	
Elasto-metry	Baseline parameters	The total elasticity parameter increase by 1.04% from baseline	The total elasticity parameter increase by 2.09% from baseline	

Table 2. Results of instrumental evaluation of the skin before (M0) and after (M2, M5, M7) AART in 46-65 yo group.

METHOD	M0	M2	M5	M7
CLSM	A large number of fibers disorganization areas; chaotic fibers location; lack of spatial orientation *(Figure 6)*.	A decreasing of amount of fibers disorganization areas; improvement of evenness of fibers distribution; a reticular structure formation *(Figure 6)*.	A significant reduction of areas of low refraction grade	Result persists without changes
2D US scanning	Epidermis and dermis thickness reduction; thinning and irregular structure of the epidermis; areas of uneven distribution of US signal *(Figure 7)*.	An increasing of epidermis and dermis thickness; an even distribution of US signal in the dermis, an intensity of US signal increase by 13.2% *(Figure 7)*.	Result persists without changes	
Visual monitoring	Microrelief rugosity volume parameter from 68.43±3.1 SEr-scabrities 2.64±0.52 SEw-wrinkleness 45.8±0.21 *(Figure 3-5, 8)*.	Microrelief rugosity volume parameter 50.31±0.15 units; SEr-scabrities 2.41±1.1; SEw-wrinkleness 40.17 *(Figure 3-5, 8)*.	Revealed the decrease of initially increased parameters: scabrities (SEr), wrinkleness (SEw), microrelief rugosity (Volume)	
Elasto-metry	Baseline parameters	Total elasticity parameter increase by 4.13% from baseline	Total elasticity parameter increase by 4.29%	

FIGURE 1. Confocal laser scanning microscopy before (M0) and 1 month after AART (M2). Patient N., 36 yo. Collagen fibers in papillary and reticular dermis are marked by arrows.

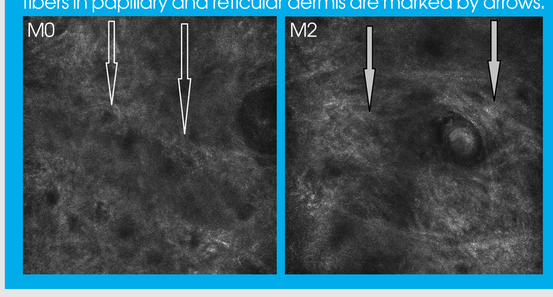


FIGURE 2. 2D ultrasound scanning before (M0) and 1 month after AART (M2). Patient N., 36 yo.

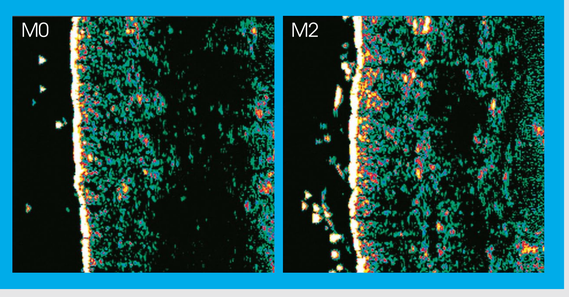


FIGURE 6. Confocal laser scanning microscopy before (M0) and 1 month after AART (M2). Patient A., 57 yo. Collagen fibers in papillary and reticular dermis are marked by arrows.

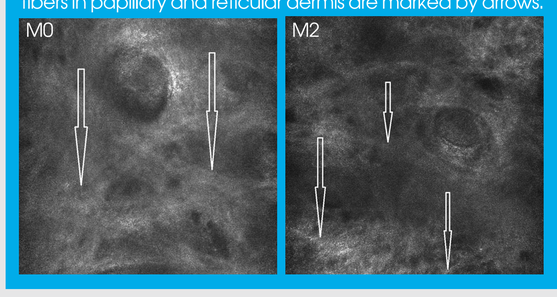


FIGURE 7. 2D ultrasound scanning before (M0) and 1 month after AART (M2). Patient A., 57 yo.

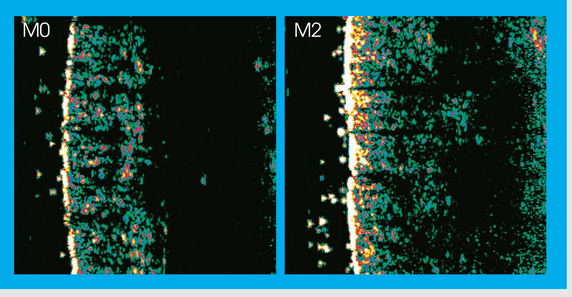


FIGURE 3. Visual monitoring (microrelief rugosity volume parameter) before (M0) and 1 month after AART (M2) in both groups.

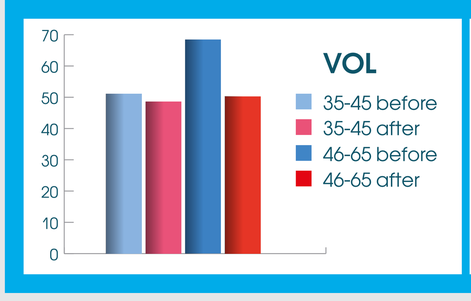


FIGURE 4. Visual monitoring (scabrities parameter) before (M0) and 1 month after AART (M2) in both groups.

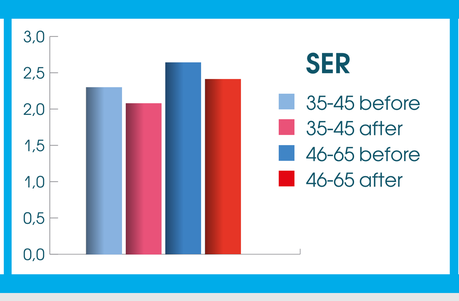


FIGURE 5. Visual monitoring (wrinkleness parameter) before (M0) and 1 month after AART (M2) in both groups.

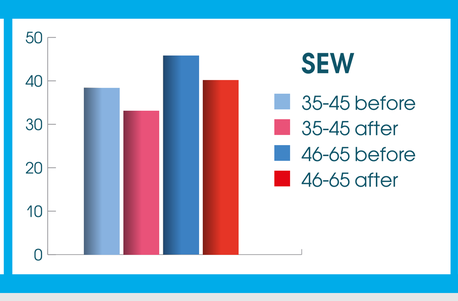


FIGURE 8. 3D Imaging of visual monitoring of a periorbital area before (M0) and 1 month after AART (M2) in both groups. Female A.,57 yo

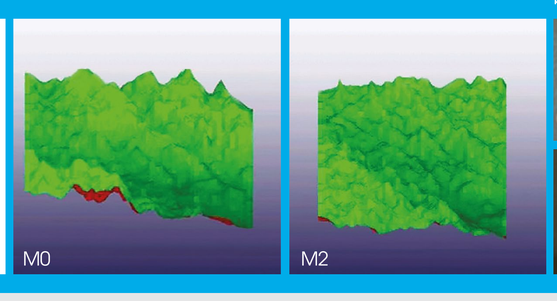
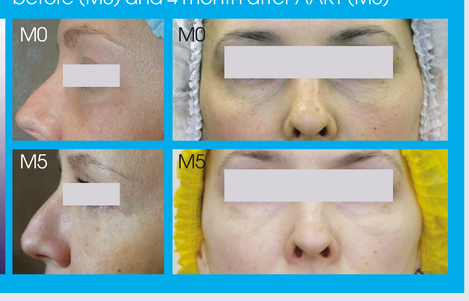


FIGURE 9 *(left)*. **Clinical case.** Patient E., 47 yo before (M0) and 4 month after AART (M5)
FIGURE 10 *(right)*. **Clinical case.** Patient V., 43 yo. before (M0) and 4 month after AART (M5)



CONCLUSION

- Instrumental examination of the skin by modern objective methods show skin structure improvement after AART.
- Results of CLSM revealed dermis structure rejuvenation after AART. The most pronounced results were observed in the group of 46-65 yo women (comparing to the group of 35-45 yo women) *(Figure 9, 10)*. Results of visual monitoring, 2D ultrasound scanning and elastometry confirm the results of CLSM for M2, M5 and M7.
- AART can be recommended to use in clinical practice for prevention and treatment of skin involutional changes, especially in elderly patients. Younger patients could receive this therapy as a prevention of the skin premature aging after photodamage. In addition, we recommend AART to improve and prolong the results of various aesthetic treatments such as chemical peels, laser therapy, fractional photothermolysis, phototherapy (IPL), dermabrasion, radiofrequency, ultrasound lifting, thread lifting, etc.

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