# A NEW METHOD TO EVALUATE THE EFFECTIVENESS OF SEAWEED WRAPPING GEL ON HANDS SKIN

[1]Fedorova V.N., [1]Kozyr L.V., [2]Churinova O.I., [3]Faustova E.E.

*[1]State Educational Institution of High Professional Education "Russian National Research Medical University by N.I. Pirogov", Moscow, e-mail: fedvn46@yandex.ru;*
*[2]NPO Summa Technologiy;*
*[3]Medical Beauty Centre Camelot, Moscow*

This work describes the usage of a new acoustic instrument for express method of evaluation of cosmetic product effectiveness on hands skin based on changes of mechanical properties of the skin. A cosmetic product, seaweed body wrap gel "Gorgeous skin", is manufactured by NPO Summa Technologiy, Russia and is used for SPA treatments. Seaweed wrapping gel is recommended for hands treatment to provide deep hydration and prevent dryness. The mask is homogenized jelly substance from brown seaweed Laminaria Japonica valuable for high concentration of micro and macro elements, vitamins and amino acids. Quickly penetrated the mask intensively moisturizes and deeply nourishes, preventing dry and itchy skin.

**Keywords: acoustic method, speed of propagation of audible frequency surface waves, the effectiveness of seaweed wrapping gel on hands skin**

For the purpose of confirmation of the above characteristics of the cosmetic product – seaweed body wrap gel «Gorgeous skin» – we made experimental investigation of the changes of skin mechanical properties. We developed a scheme for hands acoustic scanning in three areas which differ in their properties and in their exposure to environmental influence. We offered the method of evaluation of skin mechanical properties changes. As an objective criterion we offered the parameter equal to the difference in propagation speed of audible frequency surface waves measured before and after 30 minutes of the product application. The measured results show that the speed decreases after the seaweed mask application in 91 % thus confirming moisturizing effect as the proven fact is that skin hydration causes the decrease in speed. The cosmetic product can be highly recommended to people with dry hand skin.

Nowadays we can see a lot of new technologies, directions, numerous cosmetic products and a number of treatments including SPA procedures for handskin texture improvement. It's difficult to evaluate their efficiency taking information just from advertising and directions for use. Usually the benefits of the products are evaluated subjectively: visual examination, palpation, patient's perception. We do need objective, multiply repeated methods of control. One of such methods can be acoustic scanning.

**Purpose of the work:** to prove high informative possibilities of acoustic medical diagnostic instrument (AMDI) in evaluation of effectiveness of seaweed wrapping gel and to confirm declared product benefits.

## Materials and methods of research

**Objectives:** to develop the method of examination and experimental measurement of acoustic mechanical skin properties during mask application.

**Study object:** hand skin (11 women of different age: from 20 to 60 years old), which seaweed body wrap gel «Gorgeous skin» was applied to, was investigated. The mask was evenly applied to both hands (5 grams to each hand).

Speed (V) measurements were made in specific areas according to written above scheme of scanning in the mutually perpendicular directions.

**Study method:** Study was performed by using anacoustic medical diagnostic instrument (AMDI) [1, 2], widely used for examination of skin and soft tissues [8–9], which is capable to determine the propagation speed of surface wave *V*. The measurement of speed was made in the mentioned areas in mutually perpendicular directions: *Y* axis coincides with natural vertical hand axis; *X* axis is perpendicular to *Y* axis. Such measurement method allows to get more experimental parameters for each area.

The speed measurements were performed during 3–5 seconds (express method). The speed difference was calculated as

$\Delta V = V_{before} - V_{after}$ (30 minutes after mask application).

## Results of research and their discussion

Hands skin acoustic scanning scheme was developed. It included three areas which differ in their properties and in their exposure to environmental influence.

The first area (point 1) – inner part of the hand near the thumb (there are no sebaceous glands).

The second area (point 2) – middle outer part of the hand (always in contact with environment). The third area (point 3) – outer side of the arm (lower part), which is often covered with clothes.

**Table 1**

Speed parameters $V_y$ and $V_x$ before and after application in point 1 – thumb area (Patient 6)

| Right | | | | | | Left | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_y$ | | | $V_x$ | | | $V_y$ | | | $V_x$ | | |
| 11,25 | 11,25 | 12,37 | 10,41 | 10,50 | 10,50 | 12,37 | 12,13 | 12,19 | 11,26 | 11,16 | 11,31 |
| 9,32 | 9,60 | 9,65 | 9,12 | 9,22 | 9,12 | 8,22 | 8,15 | 8,19 | 8,47 | 8,47 | 8,53 |
| 1,93 | 1,65 | 2,72 | 1,29 | 1,28 | 1,38 | 4,15 | 3,98 | 4,00 | 2,79 | 2,69 | 2,78 |

ΔV

| Average parameters | | | |
|---|---|---|---|
| Right | | Left | |
| $V_y$ | $V_x$ | $V_y$ | $V_x$ |
| 11,62 | 10,47 | 12,23 | 11,24 |
| 9,52 | 9,15 | 8,19 | 8,49 |
| 2,10 | 1,32 | 4,04 | 2,75 |

ΔV

**Table 2**

Speed parameters $V_y$ and $V_x$ before and after application in point 2 – outer hand area (Patient 6)

| Right | | | | | | Left | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_y$ | | | $V_x$ | | | $V_y$ | | | $V_x$ | | |
| 8,44 | 8,44 | 8,44 | 8,86 | 9,19 | 8,96 | 8,85 | 8,86 | 8,89 | 8,63 | 8,83 | 8,59 |
| 7,53 | 7,78 | 7,53 | 8,50 | 8,47 | 8,50 | 8,77 | 8,60 | 8,65 | 8,41 | 8,33 | 8,50 |
| 0,91 | 0,66 | 0,91 | 0,36 | 0,72 | 0,46 | 0,08 | 0,26 | 0,24 | 0,22 | 0,50 | 0,09 |

ΔV

| Average parametres | | | |
|---|---|---|---|
| Right | | Left | |
| $V_y$ | $V_x$ | $V_y$ | $V_x$ |
| 8,44 | 9,00 | 8,87 | 8,68 |
| 7,61 | 8,49 | 8,67 | 8,41 |
| 0,83 | 0,51 | 0,19 | 0,27 |

ΔV

**Table 3**

Speed parameters $V_y$ and $V_x$ before and after application in point 3 – lower arm area (Patient 6)

| Right | | | | | | Left | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_y$ | | | $V_x$ | | | $V_y$ | | | $V_x$ | | |
| 8,33 | 8,33 | 8,36 | 8,47 | 8,54 | 8,56 | 8,63 | 8,69 | 8,72 | 8,62 | 8,72 | 8,80 |
| 8,09 | 8,19 | 8,14 | 8,30 | 8,30 | 8,47 | 8,53 | 8,36 | 8,41 | 8,53 | 8,47 | 8,41 |
| 0,24 | 0,14 | 0,22 | 0,17 | 0,24 | 0,09 | 0,10 | 0,33 | 0,31 | 0,09 | 0,25 | 0,39 |

ΔV

| Average parameters | | | |
|---|---|---|---|
| Right | | Left | |
| $V_y$ | $V_x$ | $V_y$ | $V_x$ |
| 8,34 | 8,52 | 8,68 | 8,71 |
| 8,14 | 8,36 | 8,43 | 8,47 |
| 0,20 | 0,17 | 0,25 | 0,24 |

ΔV

All the patients were in a sitting position during measurements, the arm was laying on the table without any tension.

The measurements were made three times in each scanning point before and after 30 minutes of the mask application. Individual parameters (patient 6) of speed $V_y$ and $V_x$ are given in Table 1 – for the thumb area, Table 2 – for the outer part of the hand, Table 3 – for the lower part of the arm.

Graphic illustrations of the Tables for Patient 6 in corresponding points are represented in Fig. 1, 2, 3 (measurements for axis $X$ – blue color, for axis $Y$ – red color).

The summary of the results for all patients in each area is represented in Table 4.

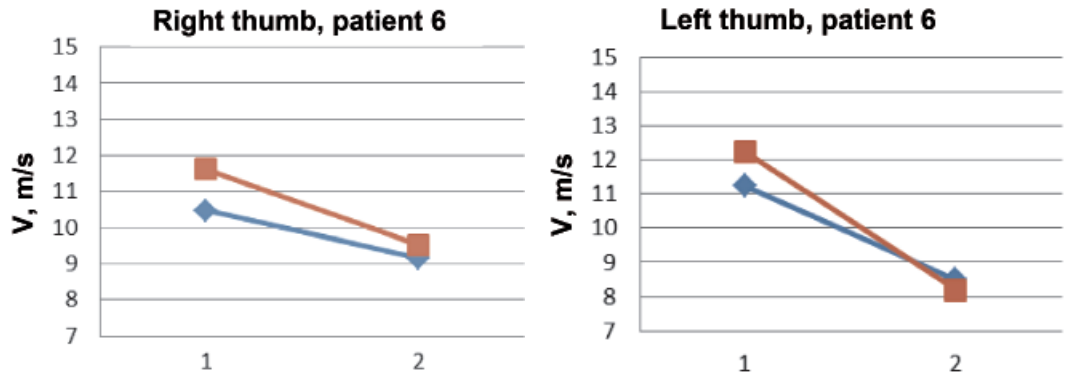


Fig. 1. Speed change after the product application in point 1

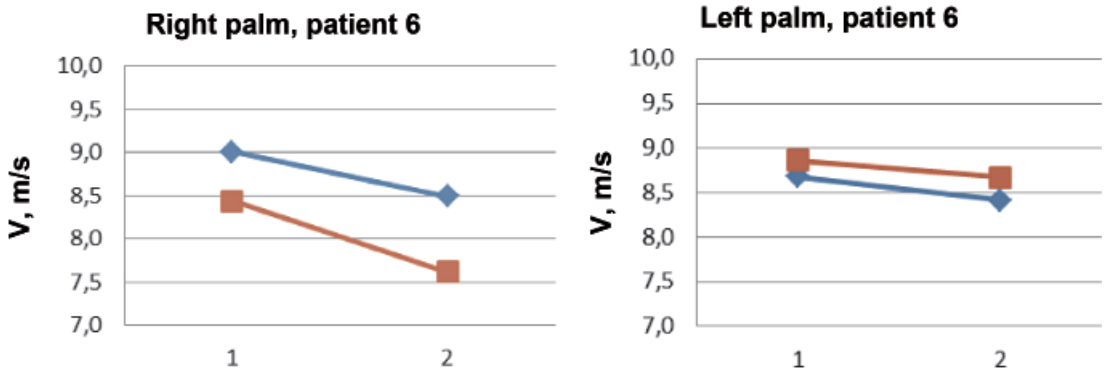


Fig. 2. Speed change after the product application in point 2

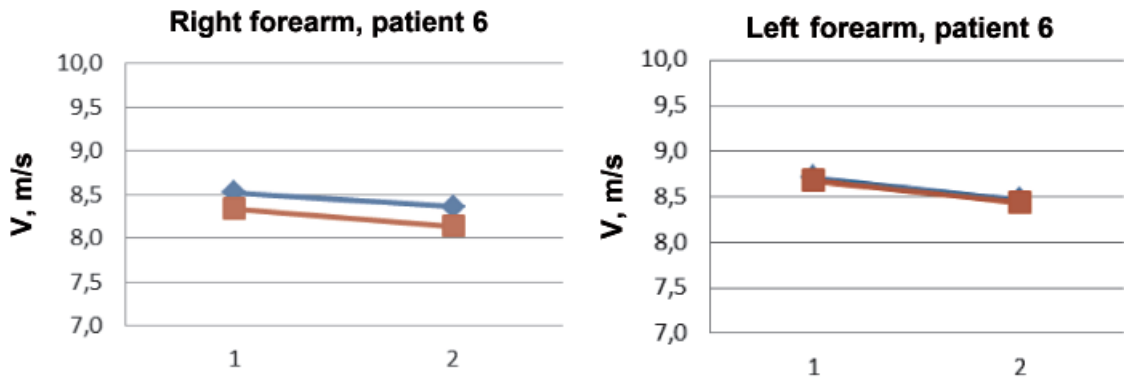


Fig. 3. Speed change after the product application in point 3

**Table 4**

The comparison of speed change $\Delta V_y$ and $\Delta V_x$ after the product application in different areas

| Patient | Thumb area (Point 1) | | | | Outer hand area (Point 2) | | | | Lower arm area (Point 3) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Right | | Left | | Right | | Left | | Right | | Left | |
| | $\Delta V_y$ | $\Delta V_x$ | $\Delta V_y$ | $\Delta V_x$ | $\Delta V_y$ | $\Delta V_x$ | $\Delta V_y$ | $\Delta V_x$ | $\Delta V_y$ | $\Delta V_x$ | $\Delta V_y$ | $\Delta V_x$ |
| 1 | 0,36 | 1,09 | 0,20 | 0,16 | 0,25 | 0,22 | 0,18 | 0,23 | 0,22 | 0,24 | 0,16 | 0,15 |
| **2** | **0,53** | **0,86** | **0,88** | **0,65** | **0,34** | **0,52** | **0,53** | **0,80** | **0,57** | **0,26** | **0,33** | **0,37** |
| 3 | 0,17 | 0,78 | 0,39 | 0,42 | 0,41 | 0,17 | 0,36 | 0,81 | 0,62 | 0,39 | 0,16 | 0,62 |
| 4 | 0,12 | 0,27 | 0,18 | 0,23 | 0,15 | 0,13 | 0,24 | 0,13 | 0,34 | 0,66 | 0,78 | 0,27 |
| 5 | 0,19 | 0,83 | 0,46 | 0,24 | 0,28 | 0,18 | 0,50 | 0,33 | 0,21 | 0,12 | 0,10 | 0,33 |
| **6** | **2,10** | **1,32** | **4,04** | **2,75** | **0,83** | **0,51** | **0,20** | **0,27** | **0,20** | **0,16** | **0,25** | **0,24** |
| **7** | **0,74** | **0,93** | **0,49** | **0,68** | **0,57** | **0,29** | **0,41** | **0,39** | **0,44** | **0,56** | **0,28** | **0,34** |
| 8 | 0,17 | 0,34 | 0,30 | 0,54 | 0,16 | 0,63 | 0,18 | 0,29 | 0,38 | 0,27 | 0,21 | 0,19 |
| **9** | **3,54** | **1,07** | **1,68** | **1,19** | **1,27** | **0,30** | **1,25** | **0,28** | **0,53** | **0,17** | **0,51** | **0,55** |
| 10 | 0,28 | 0,48 | –0,07 | 0,23 | –0,55 | –0,50 | –0,58 | 0,01 | 0,30 | 0,39 | 0,60 | –0,16 |
| 11 | 0,34 | 0,67 | 0,17 | 0,17 | 0,48 | 0,74 | 0,15 | 0,35 | 0,38 | 0,68 | 1,56 | 1,29 |

Based on the results of this work one can conclude the following:

1. Speed parameters after the product application decreased in each area in both directions among 10 patients (91%).

2. Only one patient (10) experienced an increase in surface waves speed as well as a decrease.

3. The most significant speed decrease is measured in thumb area of the inner side of the hand.

4. The product effectiveness was more pronounced in thumb area of the patients with dry skin (Patients 2, 6,7, 9). These women themselves confirmed the greater benefits of the product and are willing to use it more often.

5. Seaweed body wrap gel "Gorgeous skin" demonstrated its high effectiveness, proving its moisturizing properties.

The results of the work confirmed that one can develop a method allowing individual selection of cosmetic products for each person using the changes in mechanical properties of the skin after a single application. The mask can be highly recommended for woman with dry hands.

In conclusion, acoustic method proved to provide objective express evaluation of the effectiveness of seaweed wrapping gel to hand skin.

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