Quantitative Skin Elasticity Improvement Following JVR Technology by EnerJet treatments for Aging Skin Rejuvenation: A Case Report.

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Abstract

Introduction EnerJet, based on JVR Technology to initiate a dermal wound healing process, is a new aesthetic system designed for skin rejuvenation with both immediate and long term effects.

Materials and methods Skin elasticity measurements, using a Cutometer, were performed on the right dorsal hand of a 39 years old male patient to evaluate and quantify the EnerJet long term effect. The left, untreated hand served as control.

Results Significant improvement in skin elasticity was measured on the EnerJet treated hand as compared to control. Overall elasticity (R2) was increased by 82% while net elasticity (R5) increased by 79%. Photographs confirmed the visible change in elasticity. Side effects were minor and transient.

Conclusion JVR Technology by the EnerJet appears to be safe and effective for both immediate as well as long term skin augmentation and collagen remodeling. It provides significant, measureable increase in skin elasticity with no downtime. It may be applied on patients of all skin types desiring rejuvenation of aging skin on all body sites, particularly on the face, neck, chest and hands.

Introduction

EnerJet (PerfAction, Rehovot, Israel) is an innovative system designed for aesthetic skin rejuvenation with both immediate and long term results. EnerJet applies patented JVR Technology to initiate a wound healing process in the dermal layer. This is performed by pneumatically accelerating a carrier fluid jet which contains high mass molecules of hyaluronic acid into the dermis (1,2). The accelerated jet penetrates the epidermis via a very small entry point of 200 microns in diameter. Upon reaching the dermal layer, the jet spreads laterally covering an area of approximately 1 cm^2. The massive HA molecules, driven to

extremely high speeds by the pneumatic pressure, act as "nano-bullets". Their very high momentum disrupts dermal cells encountered on their way. This disruption is aimed to initiate a wound healing process with subsequent long term skin renewal due to collagen remodeling (3). The HA molecules, once evenly dispersed within the dermis, attract and retain water molecules adding hydration and volume to the skin. This results in an immediate skin improvement. EnerJet is designed to provide skin volume restoration and wrinkle reduction. It may be applied on patients of all skin types desiring rejuvenation of aging skin on all body sites, particularly on the face, neck, chest and hands.

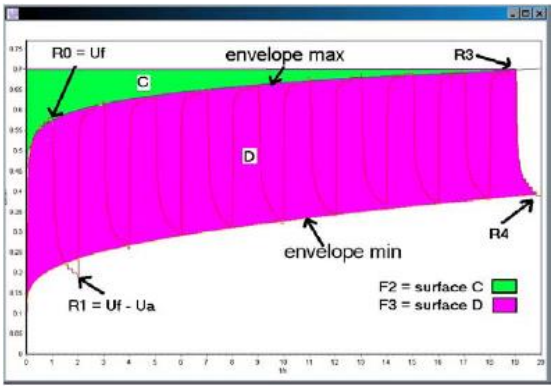

Fig 1a: Typical cutometer output graph

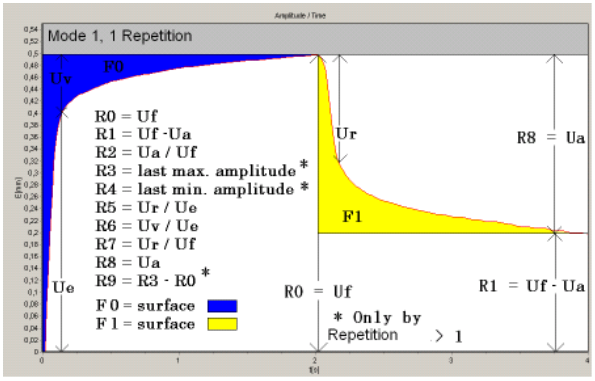

Fig 1b: definition of terms

Materials and Methods

To evaluate and quantify the long term clinical efficacy of the EnerJet system a Cutometer (MPA 580, Courage & Khazaka Electronic GmbH, Cologne, Germany) was used to measure skin elasticity of the dorsal hand of a 39 year old male who underwent three EnerJet treatments spaced 4 weeks apart. The Cutometer is an established technique in clinical dermatology for measuring skin elasticity (4). Its measuring principle is based on the suction method. Negative pressure is created in the device and the skin is drawn into the aperture of the probe. Inside the probe the penetration depth is determined by a non-contact optical measuring system. The resistance of the skin to be sucked up by the negative pressure (firmness) and its ability to return to its original position (elasticity) are recorded by the instrument and are indicative to skin age.

The male patient was first checked for any exclusion criteria which included use of immunosuppressive

medications, active infection of the skin, history of herpes simplex and infection or connective tissue disease. Prior to treatment a mild soap was applied followed by a moisturizing cream which softens the skin. Treatment was comprised of consecutive applications, until the entire treatment area was covered. At the end of treatment a soothing cream was applied to the treated skin area. Treatment regimen consisted of 3 sessions at intervals of 4 weeks. Photographs were taken before treatment, immediately following treatment and at the follow-up visits up to 8 months following last treatment. The Cutometer measurements were taken 5 months following final treatment, on the treated skin site and on the non-treated hand control site. Measurements were taken in Mode 1 with the skin drawn into the aperture of the probe with a constant negative pressure of 450 mbar for 1 second followed by 1 second relaxation for the skin to retract and this cycle repeated ten times. Skin deformation was recorded and analyzed using the Cutometer software. Typical Cutometer outputs and definition of terms are shown in Figs 1A & 1B.

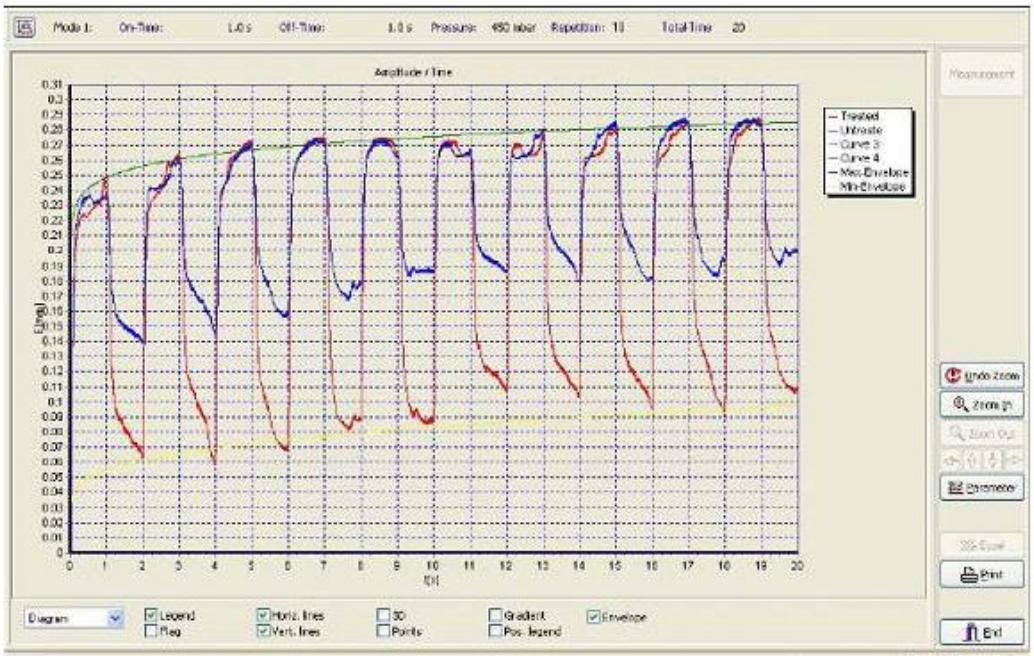

Figure 2: Output graph of the case report patient

Results

Cutometer measurements on the treated and non-treated control skin sites are presented in Fig 4. Overall or gross skin elasticity is defined by R2 which is the ratio of Ua/Uf, where Uf is the total skin deformation and Ua is the total skin retraction. A high R2 value stands for high elasticity and a value of 100% would indicate that the skin completely returns to its original state following release of the negative pressure. Another important parameter is R5 which is the ratio of Ur/Ue where Ur is the immediate retraction and Ue is the immediate deformation. This ratio is termed net elasticity and is considered the variable of choice for quantifying skin aging independently of skin thickness. This ratio is also termed elastic recovery since it eliminates the viscoelastic or plastic component of the skin.

On the EnerJet treated hand an R2 value of 0.741 was measured compared to 0.4076 on the non-treated, control hand. This represents an increase of 82% in gross skin elasticity. R5 measured values were 0.4229 and 0.2366 respectively, representing an increase of 79% in net elasticity. Photographs of the treated and untreated hands are shown in Fig 3.

Side effects encountered were mostly pinpoint bleeding, redness, swelling and tenderness and have all been minor and transient, disappearing within 24 hours. No bruising was encountered.

Discussion

The layer which gives our skin its strength and elasticity, hence its aesthetic appearance, is the dermis. The main structural component of the dermis is collagen fibers which account for 75% of the dry weight of skin. Collagen is responsible for the skin's strength while other protein bundles in the dermis, elastic fibers, give skin its elasticity - the ability to return to its original shape after stretching. Collagen and elastin are produced by fibroblasts which are scattered throughout the dermis. As our skin ages, chronologically and from chronic sun exposure, a reduction and degradation of collagen occur. Elastic fibers decrease in number and diameter resulting in decreased skin elasticity. Fragmentation, progressive cross - linkage and calcification of elastic fibers also occur. Alterations of mucopolysaccharides that normally bind water in the dermal matrix may also affect elasticity as evidenced in skin turgor. Decrease in skin elasticity accompanied by increase in tortuosity of elastic fibers, are important early events

in wrinkle formation. Impairment and degeneration of elastic and collagen networks during aging leads to the skin being less stretchable, less resilient, more lax and prone to wrinkling, particularly on sun-exposed skin areas such as the face, neck, chest and hands (5).

In the quest for younger looking skin, a myriad of energy based skin rejuvenation technologies, such as lasers, radiofrequency and infrared have been introduced which are aimed at triggering collagen remodeling in response to controlled thermal damage of the dermal skin layers (6-9). These technologies require multiple treatments over several months and may lead to long term effects which appear limited in comparison to EnerJet, and lack any immediate effect. To obtain an immediate effect patients resort to injection treatments employing either botulinum toxin to temporarily denervate specific muscles responsible for certain facial rhytids, or various dermal fillers which can augment specific cutaneous defects by volumizing the skin for a limited length of time (10). Both of these injection treatments are limited to small skin areas and specific defects. No treatment technique presently offers effective skin augmentation of large skin areas with both immediate and long term results and no downtime. The EnerJet system based on JVR Technology was designed with the aim of achieving this highly desirable aesthetic treatment goal. The clinical result presented in this case report indicates that this modality is a significant addition to the field of aesthetic medicine. Increase in skin elasticity using the EnerJet system on the dorsal hand was around 80% 5 months following final treatment. Similar elasticity measurements following IPL facial photo rejuvenation (11) found only 15% mean improvement at 6 months following final treatment while 18.2% overall improvement was reported (12) at 6 months following a single pulsed, carbon dioxide laser skin resurfacing of the face. Based on an unpublished study (13) with results of elasticity as a function of age, it appears that the EnerJet treated hand was rejuvenated by at least 20 years.

The photographic images of the EnerJet treated hand compared to the non-treated hand also indicate a significant improvement in skin appearance both immediately as well as 8 months following the final treatment.

The EnerJet technique appears particularly safe compared to alternative modalities since it is an intradermal effect which almost completely bypasses the epidermis.

Conclusions

Based on the results of this clinical case study, the new EnerJet system appears to be safe and effective for both immediate as well as long term skin augmentation and collagen remodeling. It provides volume restoration and wrinkle reduction with significant, measureable increase in skin elasticity with almost no downtime. It may be applied on patients of all skin types desiring rejuvenation of aging skin on all body sites, particularly on the face, neck, chest and hands.

Figure 3: Treated versus untreated hands

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