



The New Cosmetic Jet Hand piece Technology for Jet Facial Rejuvenation Treatments Delivers Clinical Improvement in Hydration and Elasticity: A Preliminary Clinical Study

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Abstract

This preliminary clinical study evaluates the improvement of skin hydration and elasticity of a novel hand piece technology for cosmetic jet. Until now investigations on skin rejuvenation impact of cosmetic jets focused on its peeling effects, but very little on building and maintaining skin hydration over time. A group of 30 volunteers (Aged 20-60) were subjected to 1 month of treatment (3 sessions at 10 days intervals) with the novel BYTJET™ device.

At baseline and after treatment photos were made and biophysical assessments of skin elasticity and skin hydration with IONTO-SCOPE APA 100 device. The results given in percentage to the predefined value for the given age are presented in a high and low bar graphic showing data for each patient and summed up data for all subjects at baseline and after. The overall average increase in hydration for all 55 treatments 30.05% with SD value of 12.73%. Conclusion: The device causes valuable increase in hydration and builds it up after each subsequent treatment. Similar results are achieved for the skin elasticity. Further investigations are needed to explore duration of the boosting hydration effects until the values drops back down to the baseline.

Introduction

Meteroic growth of the consumer interest in healthy looking skin has induced great demand for development of new cosmetic devices. Among the standard distinct aging symptoms such as wrinkles, decreased epidermal thickness, skin roughness and etc. the lack of hydration and loss of elasticity are the main concerns of the consumers [1].

Transdermal Drug Delivery (TDD) is the most effective method for skin care and the treatment of aging symptoms [2]. Most of the cosmetic devices are making usage of the standard TDD technologies like dermabrasion, microneedling, iontophoresis and sonophoresis or in some cases combinations of two or three [3].

However, recently there has been given great attention in using high velocity jet technique with the purpose of aesthetic skin restoration in the medical technology [4].

Regarding cosmetic jet devices there has been a few studies of high velocity jets as effective skin peeling and dermabrasion devices [5]. The Jet Peel™ has also been evaluated regarding its hydroporation and hydration effects [6,7].

Materials and Methods

Study Population

This was a single group, open, pilot investigation study designed to evaluate hydration and elasticity effects of peeling and hydroporation treatment with cosmetic jet. The indications for treatment were: lack of hydration and skin elasticity. 30 volunteers (all women) aged between 20 and 60 were included in the study. All participants demonstrated skin phototype III.

The exclusion criteria included pregnancy, a history of keloid scars, an infection at the investigational treatment site, aesthetic treatments within the past 12 months, including dermabrasion, filler injections including HA, collagen, and polycaprolactone, botulinum toxin injection, or oral medications.

All subjects provided written informed consent to take part in the study and, in the initial enrolment, all participants were explained the procedures used in this study. A total number of 3 people were excluded after the qualification procedure due to medical contraindications: 1 labial herpes and 2 to aesthetic procedures (dermal fillers).

Device description

Cosmetic jets which deliver high velocity gas-liquid mixtures are based on the Venturi effect (special case of Bernoulli principle). Jet handpieces are constructed so that the gas (in this case air which is regarded as 88% oxygen gas) is delivered through extremely thin nozzles, thus creating an enormous pressure difference which results in liquid media getting sucked out from the containers and being expelled together with the gas. Gas and liquid are mixed in front of the nozzles creating microdroplets, an aerosol suspension which is then dispersed to the skin with supersonic velocity (Figure. 1).

This has two different impacts on the skin depending on the angle under which the stream hits the skin. The first impact is causing gentle cosmetic peeling and the second has hydroporation effect *i.e.* hydro-dynamic delivery of the active substance in the skin.

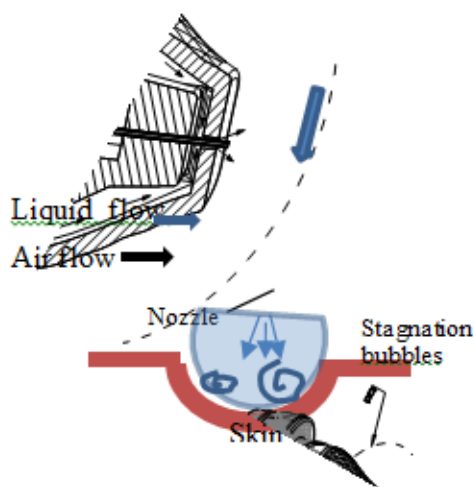


Figure 1: Venturi effect - high velocity gas sucking liquid medium from the nozzle.

BYTJET TM Device

The device used in this study is the BYTJET™ device manufactured by Be You Technology GmbH, (Aachen, Germany). The BYTJET™ device is a standalone hydraulic cosmetic jet machine which produces aerosol *i.e.* a spray of liquid mixed with gas under a predetermined pressure of up to 7.5 bar. The jet spray consists of liquid droplets, 5 micromillimeter-200 micro millimeter in diameter, emitted at a speed of up to 150 m/sec. Since the device is used for cosmetic purposes it is designed to maintain shallow dermal penetration depths (Figure. 2)

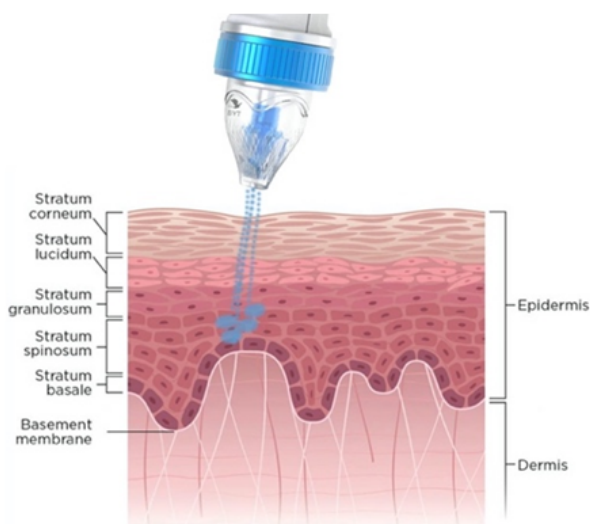


Figure 2: Cosmetic jets penetration depths limitation.

The BYTJET™ device consists of specially designed handpieces, touch screen control unit which allows to choose between the

handpieces, a source of pressurized gas (the gas used is air) and the tubing. The device pressure can be set up to 7.5 bar.

The novelty in regard to the standard cosmetic jets are the BYTJET™ handpieces (Figure.3) which have an integrated liquid flow regulator, and 4 sterile tips which have a variable number of nozzles from 1 to 4, an electrical button to start and stop the device easily during the treatment is also integrated in the hand piece.



Figure 3: Specially designed handpiece with mounted bottle.

Measurement device

IONTO-SCOPE APA 100 device

Dual 5 megapixel camera, 10.16 cm Grass Multi C-Touch Screen touchscreen, wireless wifi +Bluetooth, HDMI 1080p HDMI.

IONTO SCOPE is a 5-megapixel camera used for professional skin analysis before and after facial treatments. It provides the operator with detailed scientific analysis results of the skin. IONTO SCOPE performs hydration and elasticity analysis by a special sensor at the tip of the lens allowing the device to gather an accurate reading on both moisture and skin elasticity which is then calculated in percentage in relationship to the predefined value which is in direct relation to the age group of the participant.

Treatment Procedure

The treatment consisted of two phases: The first was skin peeling using the BYTJET™ basic applicator and the second was the intake of active ingredients using BYTJET™ premium applicator. Skin peeling was performed using a tip with two nozzles at a pressure of 7.5 bar and at an angle of 45°. The procedure lasted 10 minutes and covered the whole face including the periorbital area was treated. Distilled water was used for the peeling procedure. Before the treatment, skin was cleaned with cleansing foam.

The second phase is the intake of a mixture of oxygen and fluid using a nozzle with applicator 1 (or as you call these extensions) at an angle of 90°. An aqueous solution of 3% hyaluronic acid was used in the study. The application process is 10 minutes.

We performed the first treatment session on 27 subjects. The second session was with an interval of 10 days and was performed on 18 subjects. In the third session, after the 10 days, 11 volunteers were treated. Overall 55 treatments were performed.

The treatments were performed in 10 days intervals and measurements were taken at the baseline and after the treatment as shown in (figure 3, figure 4).



Figure 4: Hydraporation with cosmetic jet.

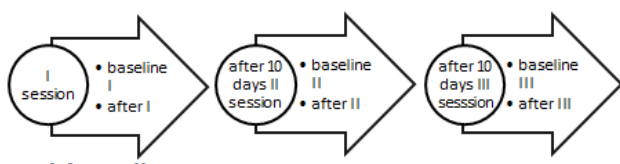


Figure 5: Study timeline and data collection.

Results and Discussion

Hydration results

The results for hydration for each session given in percentage are presented in a high and low bar graphic showing summed up data for all subjects at baseline and after the treatment. Also, for each session a standard column chart to show the overall average increase is given. Finally, the elasticity data at the baseline of each session are compared in order to conclude on the duration of the hydration results.

The first session results per volunteer are given in the chart (Figure. 6)

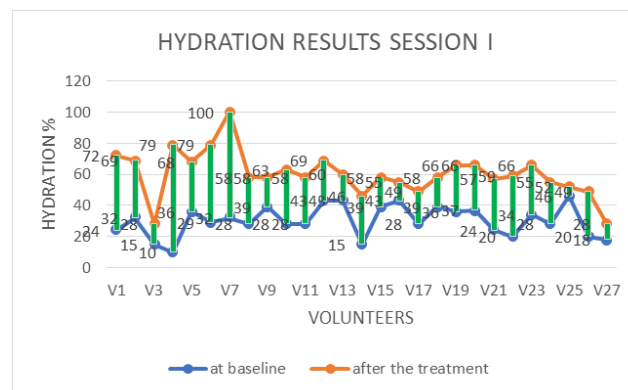


Figure 6: Hydration results at baseline and after the first session for each volunteer

The average increase in skin surface hydration was 30.08% for the first session (Figure.7).

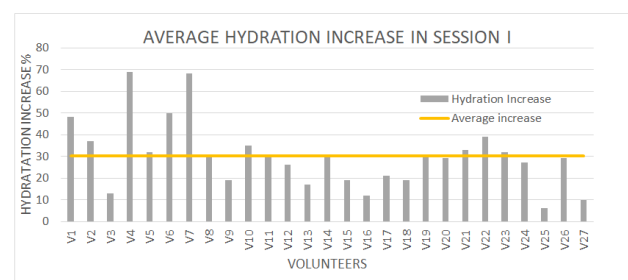


Figure 7: Average hydration increase after 1st session.

The average increase in skin surface hydration was 31.6% for the second session and 27.6% for the third session. The overall average increase in hydration for all 55 treatments is 30.05% with SD value of 12.73%.

Hydration baseline measurement comparison

In order to evaluate the lasting effect of the absolute hydration increase, baseline measurements have been compared. Firstly, the average increase in hydration at baseline of the 2nd in regard to the 1st treatment has been calculated, thus showing the hydration level after 10 days. Secondly, the average of baseline before the 3rd session was evaluated showing the increase after 20 days. Also overall average of total baseline values at each session has been calculated.

The average increase in hydration at baseline before the session 2 was 13.2% and before the session 3 was 19.4%. (Figure .8)

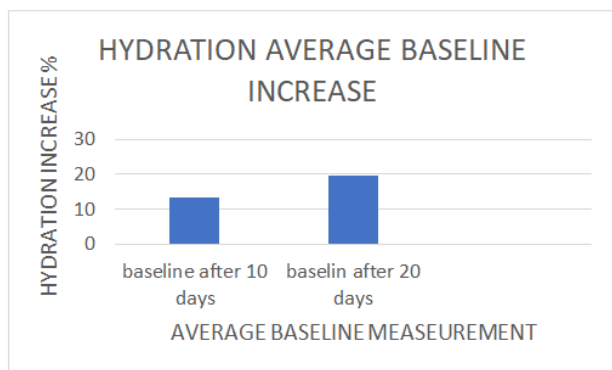


Figure 8: Average baseline increase measured before session 2 (10 days) and before session 3 (20 days).

Discussion of hydration results

It has been shown that the increase of hydration directly after the treatment for each session has been substantial. The mean average increase in hydration from all three sessions is overall average increase in hydration for all 55 treatments 30.05% with SD value of 12.73%. Therefore we can conclude that the hydration is significantly improved after treating the skin with BYTJET system.

The average baseline measurement of the hydration shows an increase of 12% also after the 10 days, *i.e.* prior to the second session. Therefore, it is concluded that the hydration results stay for a longer period of time. Baseline measurement 10 days after the second treatment show average improvement of only 5.1% in comparison to the hydration level at baseline of the second treatment, but 19.4% in comparison to the baseline value of the first treatment, which indicates that the hydration level is growing after each subsequent treatment. Average baseline measurement before the first session was 30.2%, before the second 40% and before the third 47% which shows steady growth in hydration values after each subsequent session proving that the results are lasting. Further treatments are needed to investigate how many treatments still bring increase and how long is the time until the skin hydration falls back to the first baseline level (Figure. 9).

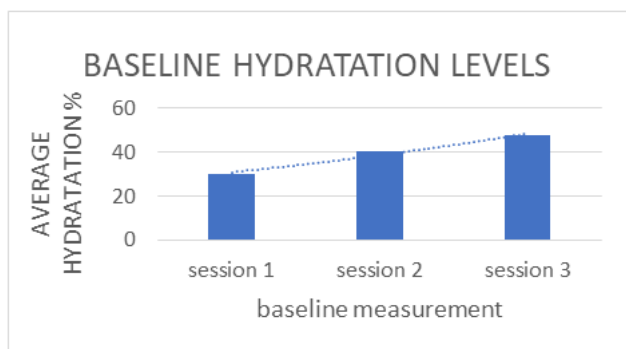


Figure 9: Average hydration levels at baseline for each session.

Elasticity results

The results for elasticity for each session given in percentage are presented in a high and low bar graphic showing summed up data for all subjects at baseline and after the treatment. Also, for each session a standard column chart to show the overall average increase is given.

Finally, the elasticity data at the baseline of each session are compared in order to conclude on the duration of the hydration results.

The first session results per volunteer are given in the chart (Figure. 10).

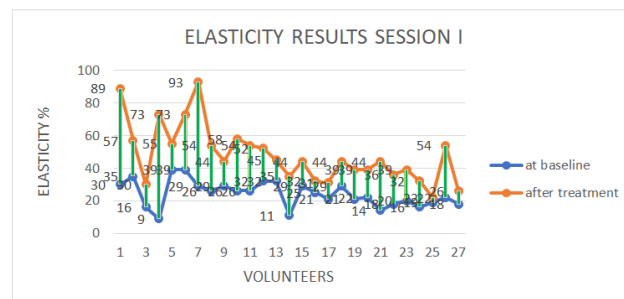


Figure 10: Elasticity measurements results at baseline and after the treatment session 1.

The average increase in skin elasticity was 23.7% for the first session (Figure.8). The average increase in skin elasticity was 24% for the second session and 19.2% for the third session (Figure.11).

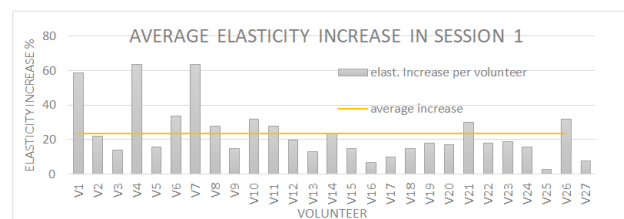


Figure 11: Average increase in elasticity after the treatment session 2.

Elasticity baseline measurement comparison

In order to evaluate the lasting of the elasticity increase baseline measurements have been compared. Firstly, the average increase in elasticity at baseline of the 2nd in regard to the 1st treatment has been calculated, thus showing the elasticity level after 10 days. Moreover, the average of baseline before the 3rd in comparison to the 1st measurement was evaluated in order to see the increase after the second treatment, and finally the 3rd baseline is compared to the 1st to see the overall baseline increase. Also, overall average of total baseline values at each session has been calculated (Figure.12).

The average increase in elasticity at baseline before the 2nd session was 8.1% and before the 3rd session was 13.9%.

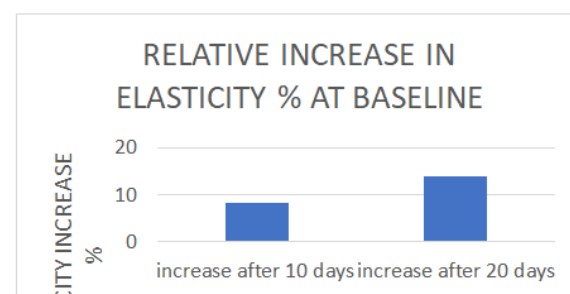


Figure 12: Average increase at baseline before the second and before the third session.

Discussion of elasticity results

Increase of elasticity directly after the treatment for each session has been evident. The overall average increase in elasticity for all 55 treatments 28.25% with SD value of 9.12%. Therefore, we can conclude that the elasticity is significantly improved after treating the skin with BYTJET^T system.

The average baseline measurements of the elasticity are showing an increase of 8.1% also after the 10 days, *i.e.* prior to the second session. Baseline measurement 10 days after the second treatment show average improvement of 13.9% in comparison to baseline of the first treatment, which indicates that the elasticity level is growing after each subsequent treatment, but slower.

Average baseline measurement before the first session of all 27 participants was 24.2%, before the second of 16 volunteers was 30.5% and before the third 34.8% which shows steady growth in hydration values after each subsequent session. Although this is average which takes the whole population it does confirm the growing trend (Figure. 13, Figure. 14).

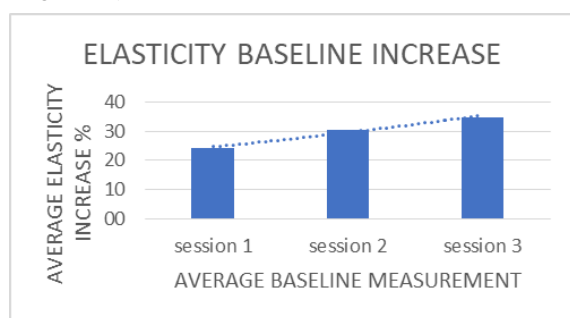


Figure 13: Elasticity average overall baseline measurements for 3 sessions.



Figure 14: Pictures of treatments results for different areas directly after the treatment.

Conclusion

The treatments with cosmetic jet device BYTJET are increasing absolute hydration for about 30% directly after the treatments (measured for 55 treatments 30.05% with SD value of 12.73%). The increase is long lasting since after 10 days the participants had average of 12% more hydration then before the treatment. After the second session hydration level grew even more and in 20 days the measured level was 19.7% which shows that hydration accumulated. Similar results are for elasticity which increased about 28% directly after the treatment and stayed after 10 days to the good 8% higher and after 10 days of the second treatment *i.e.* "Boost" it showed 13.9%. It is evident that both hydration and elasticity level are growing after each subsequent treatment, but slower. The patient self-assessment survey confirmed those results. Further investigations are needed to explore duration of the boosting hydration and elasticity effects and how long are until the values drop back down to the baseline.

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