Anatomical definition of the target structures of a jet-based tissue penetration using an Enerjet

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1. Introduction

Application variables used with Energjet technology target different anatomical structures. It is therefore necessary to find appropriate calibrations for specific anatomical preparations. In addition, optimal settings will enhance precise-visual application results. Both pressure and volume settings of introduced substances are responsible for optimal effectiveness for the principle mechanisms of action.

2. Material and Methods

2.1. At the Anatomical Institute of the University of Graz, two heads (using preparation techniques of the Thiel - Anderhuber method) were used to calculate experimental applications.

2.2. Substances, prescribed for clinical applications (NaCl, 20 mg/ml cross-linked Restylane hyaluronic acid, 20% glucose) were used as injection substances and mixed with anatomical color markers (Pintasol E-WL5 blue, E-WL41 oxide red, E-WL61 oxide green). The dyes were added to mark the exact application location. We observed and documented the indication and precise penetration depth, using staining evidence surrounding anatomical structures.

20200228_141404.jpg

(a)

20200228_141407.jpg

(b)

In both cases, the process was gradual. Pressure, volume and depth parameters were empirically assumed and applied to the entire area of half a face. The applications were then visually inspected and meticulously characterized using a precise dissection technique. The settings were recalibrated and consequently applied to the second half of the face. There was a noticeable and accurate penetration into the target area. The second application was initially only carried out using Pintasol blue in order to observe a specific penetration setting. Afterward, however, all three colors were further applied as on the other face side. The second face side was then visually inspected and meticulously characterized using a precise dissection technique as was for the previous observation.

2.3. A hyaluronic acid mixture (marked in red) was used to characterize the structures in the middle subcutaneous area: medial cheek area, perioral and periocular.

2.4. A green-colored NaCl mixture was introduced to observe submandibular and submental fat body penetration. The procedure mimicked different energy settings of volume and pressure created to be used as chemical lipolysis.

2.5. The Enerjet 2.0 (a) system produced by the Israeli manufacturer PerfAction Technologies Ltd. was used for the jet injection method. The instrument uses compressed air in a controlled and precise pulse to inject active liquid components into the tissue in the form of a jet impulse with a diameter of 0.2 mm and with a speed of up to 150m/s. Parameters of pressure and volume are adjustable.

2.6. A jet beam of active components penetrates the epidermis into the dermis and subcutis layer at high speed. The introduced substances reduce into nanoparticles after the so-called blast and are evenly distributed and integrated into the surrounding tissue. The radius of the distribution zone can be up to 6 mm. An optimal zone for microtrauma and subcision is created within the distribution area initiating contraction of collagen fibers, regeneration of collagen and elastin remodeling.


(a)

2.7. Specifically applied parameter

A left side of head 1
low pressure (50 %)
small volume (50 µl)

B right side of head 1
high pressure (100 %)
high volume (100 µl)

C right side of head 2
low pressure (65 - 75 %)
small volume (70-90 µl)

D left side of head 2
high pressure (90 - 100 %)
high volume (70 - 90 µl)

3. Results (application according to clinical question)

3.1. Fascial and periosteal structures were targeted to test the distribution effectiveness of solutions, which would ultimately initiate lifting. A mixture of 20% glucose, NaCl, lidocaine and blue color marking was used. The superficial temporal fascia, the zygomatic arch and the mandible as well as the SMAS in the lateral cheek area and the retinacula cutis (zygomatic, buccal, mandibular) served as the target structure.

A (head 1 left)

a) 20191217_125323

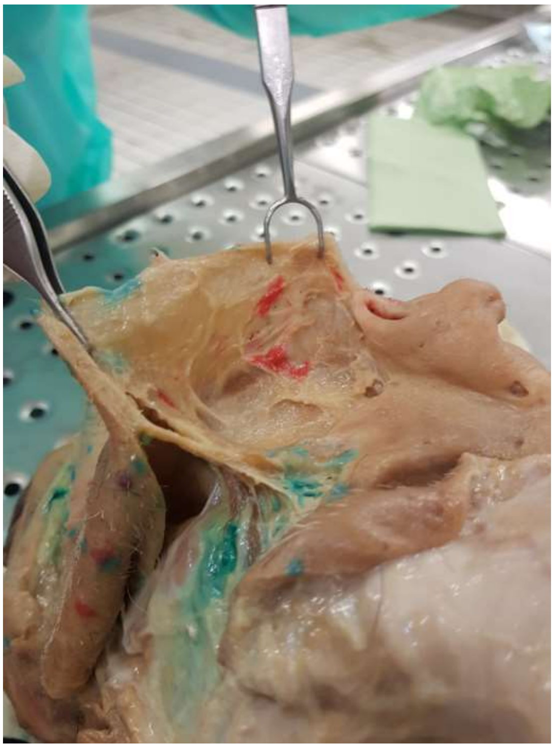
b) 20191217_131919

c) 20191217_131624

Moderate energy was used (35-50%). There is a clear external marking of the Enerjet application (a). However, the glucose-NaCl mixture did not penetrate down to the temporal fascia, the SMAS or the zygomatic arch (b)! In contrast, the same mixture did show a high penetrance into the fat bodies located in the submandibular and submental region(c).

d) 20191217_131051

d) Dermal low-energy application of a red-colored hyaluron-NaCL mixture.



e) 20191217_132255

e) Deeper penetration in the loose perioral tissue (Philtrum) using the same energy as in d).

f) 20191217_132803

f) Both mixtures (**glucose**-**hyaluron**) applied low energy applications showing dermal and subdermal penetration, deep facial structures remain unaffected.

B (head 1 right)

a) 20191217_140216

a) Cutaneous application topography in the cheek area with deep penetration in the submandibular fat body.

b) 20191217_135708

c) 20191217_135749

b+c) Visibly recognizable topography of the fascia temporalis and the upper parts of the zygomatic ligaments(Mcgregor Patch).

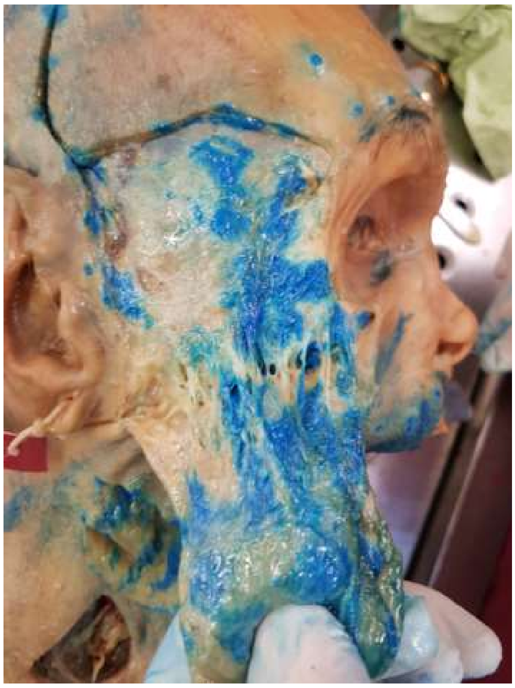
d) 20191217_135905

d) Fascia temporalis and zygomatic ligaments from a lateral perspective.

e) 20191217_140019

f) 20191217_140029

g) 20191217_140035



h) 20191217_145415

e - h) Fascia temporalis, buccomaxillary and masseteric ligaments.

i) 20191217_141448

i) Additional penetration in the superficial malar and melolabial fat bodies.

At high energy levels (pressure 100%, volume 100 µl), deep regions were perforated with the blue colored glucose-NaCl mixture. There was explicit penetration to the temporal fascia, to the periosteal structures as well as to the cheek fat structurally bonding retinacula.

C (head 2 left)

a) 202000228_155400

b) 20200228_155421

c) IMG2936

A more intensive high-pressure application was used (a), indicates sharper penetration markings of the superficial temporal fascia (b), which is also visible after lifting of the temporal fat body (c).

4. Discussion

4.1. Vinshtok: The Enerjet 2.0, using kinetic technology, is an effective therapy method for treating scars, acne scars, keloid scars, stretch marks and burn scars. Furthermore, the jet stream technology is applicable in other aesthetic applications such as kinetic lifting, skin tightening or increased volume of dermal tissue in the areas of the face, neck or décolleté. Initial work on the topic of hyperhidrosis and submental lipolysis is showing promising results. Lastly, the entire area of mesotherapy offers a wide range of applications.

4.2. Sandhofer: Due to the complexity of facial anatomy, precise studies of accessibility and penetration of various structures are necessary and must be documented. Facial skin tightening can be effectively acquired either by manipulation of the deep fascia or retinacula cutis or dermis layer. Fat bodies are primarily submandibular and can be aesthetically disturbing. These fat bodies, however, can also be easily reached using lipolytic substances. Scar therapy requires both superficial and deep applications (depending on the scar thickness). An exact characterization of the affected structures will optimize the quality of the application and treatment result.

The specific application format of Enerjet 2.0 enables several combined aesthetic treatment effects. Volumizations of the active aging process in layers of the dermal and subcutaneous fat with fat or various hyaluronic preparations can minimize or correct the deflation or thining process. Also, facial skin smoothing can be supplemented with fractional laser or radio-frequency methods. Radial shock wave or tightening radio-frequency techniques can also be paired to enhance regenerative treatments. Deactivating facial expressions (botox) can additively complement tissue remodeling. The Enerjet procedure is a pearl in the mosaic of non-surgical facial rejuvenation, once facial anatomy is mastered.

Not all possible structures have been observed; however, we believe that a dense, homogeneous three-dimensional effect is possible through careful, precise application methods.

5. Literature

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