Clinical Study:

Filler injections with the blunt-tip microcannula compared to the sharp hypodermic needle

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Disclosures:
Drs. Dewandre and Fulton are consultants for CosmoFrance, suppliers of the microcannula (dermaSculpt®).
Dr. Caperton has no conflicts of interest to disclose.

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ABSTRACT:

Background:
Minimally invasive cosmetic facial procedures are becoming more popular. For the continued success of these procedures, it is imperative to provide the patient with the least painful techniques possible and with the fewest complications, particularly bruising and ecchymosis. Microcannulas with blunt tips for filler injections have recently been developed for use with dermal fillers. Their utility, ease of use, cosmetic outcomes, perceived pain, and satisfaction ratings amongst patients in terms of comfort and aesthetic outcomes when compared to sharp hypodermic needles has not previously been investigated.

Objective:
To compare injections of filler with microcannulas versus hypodermic needles in terms of ease of use, amount of filler required to achieve desired aesthetic outcome, perceived pain by patient, adverse events such as bleeding and bruising and to demonstrate the advantages of single-port injection technique with the blunt-tip microcannula.

Materials and methods:
Ninety-five patients aged 30-76 years with a desire to augment facial, décolleté and hand features were enrolled in the study. Pregnant and lactating women and patients with systemic diseases were excluded. No patients had received augmentations previously. All patients signed an informed consent and photographic release form. Subjects were recruited in a consecutive manner from patients interested in receiving dermal filler augmentation. Each site was cleaned with alcohol before injection. Anesthesia was obtained with a topical anesthesia peel off mask of lidocaine/tetracaine. Cross-linked hyaluronic acid (20 – 28 mg/ml) was injected into the mid-dermis. The microcannula or a hypodermic needle was inserted the entire length of the fold, depression or lip and the filler was injected in a linear retrograde fashion. The volume injected was variable, depending on the depth and the extent of the defect. The injecting physician assessed the ease of injection. Subjects used the Visual Analog Scale (0-10) for pain assessment. Clinical efficacy was assessed by the patients and the investigators immediately after injection, and at one and six months after injection using the Global Aesthetic Improvement Scale (GAIS) and digital photography. Adverse events and their severity were assessed.

Results:
Overall the Global Aesthetic Improvements Scale(GAIS) results were excellent (55%), moderate (35%), and somewhat improved (10%) one month after the procedure, decreasing to 23%, 44%, and 33%, respectively, at the six month evaluation. There was no significant differences in the GAIS score between the microcannula and the hypodermic needle. However, the Visual Analog Scale for pain assessment during the injections was quite different. The pain was described as 3 (mild) for injections with the microcannula, increasing to 6 (moderate) for injections with the hypodermic needle. Bruising and ecchymosis was more marked following use of the hypodermic needle.

Conclusion:
Using the blunt-tip microcannula as an alternative to the hypodermic needles has simplified filler injections and produced less bruising, ecchymosis and pain with faster recovery. Advantages include an atraumatic injection and the ability to inject an entire lip, nasolabial fold, cheek, temple area, décolleté, or dorsum of the hand using a single or double puncture site. Fewer punctures are necessary with the microcannula as compared to the hypodermic needle; thereby, reducing procedure time, pain, and bleeding. The microcannula provides benefits over hypodermic needles in terms of being less traumatic, less painful, and an easier route of injection for dermal fillers. Also, less dermal fillers are required with the microcannula as the Skin Sculpting Technique stimulates collagen synthesis by itself. The investigators no longer use hypodermic needles for filler injections except for superficial acne and traumatic scars and for vertical upper lip lines.
INTRODUCTION:
Injectable fillers have become popular cosmetic procedures with more than one million injections done annually.¹ These augmentations are usually performed with hypodermic needles, often supplied with the product. Numerous problems maybe associated with needles; including pain, bruising, and vessel laceration. Using a longer blunt cannula may have numerous advantages both for the injector and the patient. There maybe less pain, less bruising, and the operator can freely augment the area with numerous passes with reduced fear of adverse events.²,³ The investigators call this dissection of the dermis with multiple passes the Skin Sculpting Technique.

The investigators compared the 27 gauge hypodermic needle (1/2 or 1 ½ inch) to the 18, 22, 25, 27, or 30 gauge micro-injection cannulas (DermaSCULPT cannula, CosmoFrance, Miami Beach, FL 33139) with a blunt tip and a side port. (Table 1, Figure 1) These cannulas have a Luer-Loc tip and plastic hub to accommodate the most common filler syringes from various companies. The potential advantages of the blunt cannula over the traditional hypodermic needle are the atraumatic injection and the ability to inject an entire lip, nasolabial fold, cheek, forehead, hand or décolleté using a single or a double puncture site. There maybe less injection pain, less edema or bruising than with conventional hypodermic puncture sites. For example, with the microcannula a single entry point is used so the cannula can be inserted through the entire vermilion border of the lip. The filler maybe injected in a single retrograde pass with less pain and less bruising. With the microcannula the Skin Sculpting Technique was used on folds, cheeks and lower lids.

Methods:
Informed consent:
The risks and benefits of this procedure and the risks and benefits of alternative treatments, including no treatment at all, were discussed with the patient. Patients were told to stop blood thinners that may cause bruising at least two weeks prior to the procedure. All the patient’s questions were answered. The facial defects were further documented with digital photography. Each patient signed the Informed Consent and the Release for Photography forms following the ethical guidelines of the 1975 Declaration of Helsinki.

Anesthesia:
Anesthesia was not required in most cases, however, in certain sensitive areas like the lips the following technique was used. The area was swabbed with a mixture of alcohol-acetone (50:50) to remove any lipids. After air-drying, an anesthetic topical mixture of lidocaine 5% and tetracaine 5% in a polyvinyl gel (Anesthetic Peel-off Mask; ApotheCure, Inc. Dallas, Texas75244) was applied. After 20 to 60 minutes of cooling with a fan, the gel was stripped off. The area is ready for injection. (Figure 2) Augmentation of the lips sometimes required additional anesthesia with intraoral injections of lidocaine/epinephrine following the method of Niamtu.⁴

The procedure:
After developing anesthesia (if needed) and cleaning the area with 70% alcohol, a 27 gauge ½ or 1 ½ hypodermic needle or the 18, 22, 25, 27, or 30 gauge microcannula was inserted through the injection port the entire length of the fold or lip. With the microcannula injections a 23 gauge x 1.0 inch or 26 gauge x ½ inch hypodermic needle was used to open a port. The filler (20 [Restylane® or Perlane®], 24 [Juvederm®] or 28 [Hydrelle®]mg/ml cross-linked hyaluronic acid gel) was injected in a linear threading motion while withdrawing. When injecting the lip, the filler was tapered by injecting less laterally and increasing the deposition in the central third of the lip while withdrawing. With the microcannula the Skin Sculpting Technique was incorporated for filling the folds, cheeks, temples, lower lids, hands and décolleté. (Figure 3) Usually, 0.2 to 1.0 centimeters of hyaluronic acid filler was adequate for facial areas. The dorsum of the hands or décolleté areas required more filler(see case studies 5 and 6).
Evaluation:
The investigators used the Global Aesthetic Improvement Scale (GAIS) at one month and at six months after treatment to evaluate the results along with comparisons of digital photography. The injecting physician assessed the ease of injection. Subjects used the Visual Analog Scale (VAS) (1-10) for pain assessment. Adverse events were recorded at each visit.

Results:
The GAIS results were excellent (55%), moderate (35%), and somewhat improved (10%) one month after the procedure, decreasing to excellent (23%), moderate (44%), and somewhat improved (33%) at the six-month evaluation for both the hypodermic needle and microcannula injections (Figures 4-10). The average pain during the injections was described as mild (3 on the VAS) for the microcannula and moderate (6 on the VAS) for the hypodermic injections by the patients. Mild erythema was observed immediately after injection, which spontaneously resolved within a few hours. Bruising was minimal following the microcannula injections but more significant with the hypodermic needle. Several cases developed a hematoma following the hypodermic needle injections. (Figure 4) Following this disappointment by the patients the minimal pain was corrected with the microcannula but more significant with the hypodermic. Several cases developed a hematoma following the hypodermic needle injections. (Figure 4) Following this disappointment by the patients the hypodermic needle was no longer used for dermal augmentations except for filling superficial acne or traumatic scars and the vertical lines on the upper lip.

Several case histories will illustrate our results with the microcannula:

Case 1: This 64 year old bicyclist had repeatedly distorted his nose in cycle accidents over the years. Although embarrassed by the distorted light reflex, he had never thought it was possible to correct the defect. After application of the Anesthetic Peel Off Mask, the defect was corrected with 0.5 ml of cross-linked hyaluronic acid (28mg/ml) using the 25 gauge x 38mm semi-rigid microcannula. The defect required one additional hyaluronic acid (28mg/ml) injection session of 0.25 ml at the one month examination. The defect remained corrected at the six month follow-up examination. (Figure 5)

Case 2: A 65 year old Hispanic female from Bolivia had never smoked but had chewed coca leaves. Her perioral atrophy was immediately improved with replacement of the lost volume in the white line of the vermilion border of the upper and lower lips with 1.0 ml of cross-linked hyaluronic acid(20mg/ml) using the 27 gauge x 38mm flexible microcannula. These results were preserved at the six-month follow-up. (Figure 6)

Case 3: This 58 year old female had mid-cheek acne scarring and atrophic mid-cheek folds developing along the planes of the acne scars. These lines were corrected with 0.5 ml of cross-linked hyaluronic acid(20mg/ml) bilaterally using the 27 gauge x 50mm flexible microcannula. Multiple passes using the Skin Sculpting Technique puffed out the atrophic mid-cheek folds. At the six-month follow-up, the results were ranked as excellent. (Figure 7)

Case 4: This 52 year old female had developed an accentuated frown line. A port was opened in the fold with a 26 gauge x 0.5 inch needle. The cross-linked hyaluronic acid filler (20mg/ml) was injected in a retrograde fashion into the glabellar fold with the blunt 27 gauge x 38mm microcannula. (Figure 8) The lower face was also augmented with hyaluronic acid filler (24mg/ml) bilaterally using the 25 gauge x 38mm semi-rigid blunt-tip microcannula. The lips, nasolabial fold, marionette line, and mid-cheek were augmented from a single injection site lateral to the mouth (Figure 9).

Case 5: This 70 year old female had atrophy of the dorsum of the hands and prominent veins with loss of volume. After application of the topical anesthetic peel off mask for 60 minutes the soft tissue of each dorsum was augmented with cross-linked hyaluronic acid (28mg/ml) through a 18 gauge x 70mm microcannula. There was an immediate improvement of the appearance. Slight edema in the dorsum of the hands resolved in one week and the improvement was apparent at the six month examination. (Figure 10)

Case 6: This 45 year old female developed vertical lines in the décolleté after breast augmentation. These lines were improved with infiltration of cross-linked hyaluronic acid filler (20mg/ml) using a 25 gauge X 50 mm microcannula. Three injection ports were opened with a 23 gauge needle after application of the topical anesthetic peel off mask. The Skin
Sculpting Technique was used to infiltrate the entire central décolleté area. The improvement in the décolleté area persisted at the six month follow-up visit. (Figure 11)

Complications:
Pain was judged by the physicians and the patients as mild (an average of 3 out of 10) for the microcannula and moderate (an average of 6 out of 10) for the hypodermic needle injections on the VAS pain assessment scale. Erythema resolved in three or four days for both the hypodermic needle and microcannula injection sites. Slight edema resolved over two to three weeks. There were several cases of severe purpura and hematomas following use of the hypodermic needles.

Discussion:
The advantages of this blunt cannula over the traditional hypodermic needle are the atraumatic injection and the ability to inject an entire lip, nasolabial fold, cheek, forehead, hand or décolleté using a single or a double puncture site. There was also less injection pain, less edema and bruising than with conventional sharp needles. For example, with the microcannula a single entry point can be used and the cannula can be inserted through the entire vermilion border of the lip. The filler was injected in a single retrograde pass with less pain and less bruising.

The Skin Sculpting Technique was used on folds, cheeks, lower lids, décolleté and hands. As there was little back pressure on the syringe, the procedure required little effort. The atraumatic tip was gentler on the tissues than a sharp bevel-edged needle, which required multiple puncture sites and resulted in excessive bleeding and the development of hematomas in a few cases.

Using the microcannula as an alternative to the hypodermic needle simplified filler injection in selected applications. The device produced less edema and bruising and allowed for faster recovery. This atraumatic filling process also resulted in less local inflammation, which increases the longevity of the filler and its cosmetic benefits. The cannulas were also helpful in areas that require larger volume filling, such as the midface and the temple regions, as one injection port could be used for the entire areas. In short, most filler applications were performed with less trauma and bruising using the cannula instead of a needle. For indications that require more superficial injections, such as acne valleys, depressed scars and the vertical lines of the upper lip, the traditional needle was still utilized.

In this report, the use of the microcannula was combined with the Skin Sculpting Technique. Research suggests that the multiple passes of the microcannula in the dermis stimulates the fibroblast to produce more collagen, even without the addition of fillers. Studies relating the mechanical stimulation of fibroblasts began with Dr. Voorhees and his research team at the University of Michigan. They demonstrated that fibroblast collapse occurred during aging of the skin when fibroblasts lose their dermal attachments. This loss prevents fibroblasts from receiving mechanical information from their dermal support, and as a result, they collapse. The cells produce less collagen and more collagenase. Unfortunately, aging occurs even without further exposure to UV light or oxidants. With the Skin Sculpting Technique plus the deposition of hyaluronic acid, collagen production is stimulated in vivo. This mechanism to stimulate collagen production was first outlined by Albert Harris at the University of North Carolina in 1981. The regulation of the extracellular matrix by mechanical stress of fibroblasts was further outlined by Eastwood at the University College London in 1998 and Matthias Chiquet at the University of Bern in 1999. With the advent of the microcannula in conjunction with the Skin Sculpting Technique, this mechanical stimulation of fibroblasts to increase collagen production can be achieved in clinical practice. The authors are currently further researching the role of the Skin Sculpting Technique. It appears that less filler is needed and more fanning augments the clinical response.

These investigators used cross-linked hyaluronic acid (20-28 mg/ml) in this study. The more fluid fillers (20mg/ml) were used for lower eyelids, lips and fine line augmentations. The denser fillers (24 and 28mg/ml) were used for deeper dermal augmentations, cheekbones, and temporal fossa fillings. The Skin Sculpting Techniques in combination with the microcannulas and these fillers were beneficial in all levels of dermal augmentation.
**Conclusion:**
The microcannula and the Skin Sculpting Technique allows for filler augmentation with less pain, bruising, and/or vessel laceration than a sharp hypodermic needle. The entire lip, nasolabial fold, mandibular sulcus, cheek, or temple area can be augmented through a single puncture site. These cannulas have simplified filler injection and produced less edema and bruising along with a faster recovery. The microcannula should be considered for inclusion in the armamentarium of any cosmetic surgeon who injects facial fillers.

**References:**

**Table 1: The Dermasculpt Cannula**

Available gauges, lengths, and indications for each

<table>
<thead>
<tr>
<th>Microcannula Gauge And Length - All Have Blunt Tips And A Side Injection Port</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 gauge x 25mm flexible microcannula</td>
<td>Lower eyelid dermal stimulation</td>
</tr>
<tr>
<td>27 gauge x 38mm flexible microcannula</td>
<td>For most indications, i.e., the nasolabial folds and lips</td>
</tr>
<tr>
<td>27 gauge x 50mm flexible microcannula</td>
<td>Augmentation of the cheeks</td>
</tr>
<tr>
<td>25 gauge x 38 mm semi-rigid microcannula</td>
<td>For in-depth injections of the cheekbones, chin and temporal fossa, as well as nasolabial folds, marionette lines, midface and lips</td>
</tr>
<tr>
<td>25 gauge x 50 mm flexible microcannula</td>
<td>Augmentation of the decolette and dorsum of the hands</td>
</tr>
<tr>
<td>22 gauge x 50 mm flexible microcannula</td>
<td>For more viscous solutions</td>
</tr>
<tr>
<td>18 gauge x 70 mm semi-rigid microcannula</td>
<td>For the dorsum of the hands and fat grafting</td>
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**FIGURE 1:** The microcannula with blunt tip end and side port. Note the flexibility and the ability of the blunt tip to push aside blood vessels. It is possible with this cannula to do multiple passes in the dermis to stimulate new collagen. The authors call this the Skin Sculpting Technique.
FIGURE 2: The application of the Anesthetic Peel-Off Mask. After twenty to sixty minutes, the Anesthetic Peel Off-Mask (tetracaine 5%, lidocaine 5% in a polyvinyl gel) can be peeled off and the procedure undertaken.

FIGURE 3: The injection sites for facial rejuvenation with the blunt-tip microcannula. This demonstrates the Skin Sculpting Technique, which spreads out the filler and also stimulates new collagen formation. Minimal injection sites and minimal injection volumes are needed to fill a face. The 30 gauge x 25mm cannula is useful for the lower eyelids, the 27 gauge x 50mm cannula will augment the entire cheek area, the 25 gauge x 38mm semi-rigid cannula is used for the temporal fossa augmentation. Other cannulas are useful for augmenting the décolleté and hands. (Table I)
FIGURE 4: A hematoma after filler injections with a 27 gauge 1 ½ hypodermic needle. Following these adverse events the investigators no longer use hypodermic needles for dermal fillers except for acne and traumatic scars or the vertical lines on the upper lip.

FIGURE 5: Case 1: Within ten minutes, the nasal defect was corrected with the 25 gauge x 38mm microcannula. 0.5 ml of cross-linked hyaluronic filler (28mg/ml) was used. This patient required one additional injection session of 0.25 ml of hyaluronic acid filler at the one month follow up examination. The improvement was still apparent at the six-month examination.
FIGURE 6: **Case 2:** The “Paris curl” of the lips returned after augmentation of the white line of the vermilion border of the lips with the 27 gauge x 38mm microcannula. One milliliter of cross-linked hyaluronic acid filler (20 mg/ml) was used to augment the upper and lower lips. Note the improvement in the lips and the vertical lines at the six-month follow-up.

FIGURE 7: **Case 3:** Note the improvement in the mid-cheek six months after application of the Anesthetic Peel-off Mask and augmenting each cheek with 1.0 ml of cross-linked hyaluronic acid (24 mg/ml). The Skin Sculpting Technique was used to stimulate new collagen formation.

FIGURE 8: **Case 4:** Augmenting the glabellar frown line. A port was opened with the 26 gauge x ½ inch needle. The 27 gauge x 38mm flexible cannula was passed down the fold. After several passes with the microcannula the glabellar line was improved with 0.25 ml of hyaluronic acid filler (20 mg/ml). Note the results at the six-month follow-up.
FIGURE 9: Case 4: The 25 gauge x 38 mm microcannula facilitated augmentation of the nasolabial fold, marionette line, midcheek, and lips from a single entry point. From this lateral injection port the procedure is relatively painless and blood loss is negligible compared to injecting through the vermilion border of the lips with a hypodermic needle. 0.5 ml of cross-linked hyaluronic acid filler (20mg/ml) was injected with the Skin Sculpting Technique through the port on each cheek.

FIGURE 10: Case 5: Augmentation of the dorsum of the hand with the 18 gauge X 70 mm microcannula. After application of the topical Anesthetic Peel-off Mask the entire dorsum of the hand was augmented without bruising. Two milliliters of cross-linked hyaluronic filler (28mg/ml) was used in each hand. Slight edema was present for several days after the augmentation. Note the results at six months.

FIGURE 11: Case 6: Note the improvements in the vertical lines in the decollete after using the Skin Sculpting Technique through a 25 gauge X 50 mm semi-flexible microcannula. After removing the Anesthetic Peel-off Mask the vertical lines of the decollete were treated through two injection ports. Two milliliters of cross-linked hyaluronic filler (24mg/ml) were used. Note the masking by new collagen of the superficial veins of the décolleté at the six month follow-up visit.