Blunt-Tipped Microcannulas for the Injection of Soft Tissue Fillers: A Consensus Panel Assessment and Recommendations

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ABSTRACT

As blunt injection microcannulas increase in popularity, clinicians may find it of value to have a systematic review of their current uses. This consensus document is derived from a roundtable discussion between a multi-specialty faculty comprising two U.S.-based dermatologists, one U.S.-based plastic surgeon, and one European cosmetic surgeon, all of whom were early adopters of blunt microcannulas for alloplastic fillers. The purpose of this consensus document is to provide an overview of the utility and clinical applications of blunt microcannulas, guidelines for their safe and efficacious use, and recommendations for the further evidence that needs to be accrued to substantiate the claims that have been made in regard to their superior safety profile and other benefits.


INTRODUCTION

Blunt-tipped cannulas have been used for the injection of autologous fat for volume restoration since the early part of the last century. 1, 2 In recent years, blunt microcannulas of varying gauges and lengths have become available for the injection of alloplastic fillers. 3 Use of these microcannulas was first described in Europe, and they have subsequently been introduced to the United States and other countries.

A number of advantages have been ascribed to the use of blunt microcannulas rather than sharp needles for the injection of fillers. These include the elimination or near elimination of post-injection bleeding and ecchymosis, a decrease in the number of injection entry points, elimination of the risk of inadvertent intravascular injection, and decreased patient discomfort during injection. It has also been hypothesized that the back-and-forth passage of the microcannula through tissue may stimulate collagenesis.

As blunt-tipped microcannulas increase in popularity, clinicians may find it of value to have a systematic review of their current uses. This consensus document is derived from a roundtable discussion between a multi-specialty faculty comprising two U.S.-based dermatologists, one U.S.-based plastic surgeon, and one European cosmetic surgeon, all of whom were early adopters of blunt microcannulas for alloplastic fillers. The purpose of this consensus document is to provide an overview of the utility and clinical applications of blunt microcannulas, guidelines for their safe and efficacious use, and recommendations for the further evidence that needs to be accrued to substantiate the claims that have been made in regard to their superior safety profile and other benefits.

Overview of Available Blunt Microcannula Products and Faculty Experience With Them

The faculty’s experience with blunt microcannulas for injection of alloplastic fillers ranges from two to three years, with all faculty members noting that they were introduced to them in Europe. For several years before this, they have used blunt cannulas of various gauges for the injection of autologous fat. The products that they have used for alloplastic fillers are blunt-tipped, disposable surgical steel microcannulas available in a range of gauges and lengths and designed for single-time use. Three brands of blunt-tipped microcannulas are currently approved by the U.S. Food and Drug Administration (FDA) as 510(k) Hypodermic Single Lumen Needle devices: DermaSculpt (CosmoFrance), Merz (Merz Aesthetics), and Magic Needle (Needle Concept). Several other brands are available in Europe and elsewhere. While the approval of blunt microcannulas enables them to be used for fluid injection or aspiration, it should be noted that injection of soft tissue fillers with them is considered off-label by the FDA, in that each filler product is specifically approved for use with the sharp needle(s) that are packaged with it. Patients should be apprised of this off-label usage as part of the informed consent process before filler injections.
The faculty all have experience using DermaSculpt microcannulas, and three [Pozner, Sundaram, Weinkle] have also used the Merz brand. Other brands with which the faculty specifically cited experience include Magic Needle [Weinkle], Pix’L (Thiebaut) [Sundaram], and Softfill (Soft Medical Aesthetics) [Pozner, Sundaram, Weinkle]. All the faculty have experience using blunt microcannulas to inject a number of hyaluronic acid (HA) filler products available in the U.S.: NASHA (Restylane and Perlane, Medicis), Hylacross HA (Juvederm Ultra and Ultra Plus, Allergan) and Cohesive Polydensified Matrix HA (Belotero Balance, Merz). One [Sundaram] has also used microcannulas to inject low-concentration hydrated HA (Prevelle Silk, Mentor). Three of the faculty [Pozner, Sundaram, Weinkle] have also used blunt microcannulas to inject calcium hydroxylapatite (Radiesse, Merz) and poly-Lactic acid (Sculptra, Valeant), and two [Pozner, Sundaram] have used them for polymethyl methacrylate (Artefill, Suneva).

The entry point for the blunt microcannula is first made with a sharp “pilot” needle, and then the microcannula is carefully inserted and maneuvered until the desired tissue plane is reached. The faculty note that some brands of microcannula (e.g., DermaSculpt, Magic Needle) are supplied with pilot needles of appropriate gauge for each gauge of microcannula. Injectors provide their own pilot needles for other brands (e.g., Merz). Three of the faculty [Dewandre, Pozner, Sundaram] typically use a 26-gauge sharp pilot needle to make the entry point for a 27-gauge microcannula, and a 23-gauge sharp pilot needle for a 25-gauge microcannula. Two [Pozner, Sundaram] note that since the gauge of the pilot needle is close to that of the microcannula, stretching of the skin facilitates passage of the microcannula through the entry hole. This may be achieved by retraction of the skin with the fingers of the nondominant hand while guiding the microcannula with the dominant hand, or with the help of an assistant. Another technique (Weinkle) is to use a larger-gauge pilot needle (e.g., a 21-gauge needle for insertion of a 25-gauge microcannula). The faculty have found that if it is difficult to locate the entry hole after the initial puncture has been made with the pilot needle, gentle rubbing of the area with sterile, gloved fingers can produce slight bleeding through the entry hole that serves to locate the microcannula insertion site. Filler is injected through blunt microcannulas with anterograde or retrograde serial threading or microthreading injection technique. The faculty notes that serial puncture or microaloquoting techniques can be used with sharp injection needles, but not with blunt microcannulas.

The faculty notes differences in the degree of flexibility vs. rigidity of microcannulas that can impact their clinical behavior. For example, one of the brands currently approved for use in the U.S. (DermaSculpt) is markedly flexible. Another brand that a faculty member [Sundaram] has used in Europe (Pix’L) is available in a flexible form (Pix’L) and also in a reinforced, more rigid form (Pix’L+) intended for periorbital use. Longer micro-cannulas (38 mm, 50 mm, or more) tend to be more flexible, while shorter, 25 mm microcannulas are more rigid. A microcannula with a 30 or 27 gauge will tend to be more flexible than one with a gauge of 22. The specific design of a microcannula and its flexibility or rigidity may determine its passage through tissue and injection characteristics. The faculty feel that longer experience and more systematic appraisal are needed to define further how these differences might influence microcannula selection and clinical performance (Figure 1).

Consensus Recommendation #1

Patients should be apprised as part of the informed consent process before treatment that, while the use of blunt injection microcannulas may confer some benefits in the clinician’s opinion, the injection of soft tissue fillers with them is considered off FDA labeling.

Consensus Recommendation #2

In regard to the selection of specific types and sizes of blunt microcannula for different clinical applications, comparative study data are needed to adopt an evidence-based rather than anecdotal approach.

Consensus Recommendation #3

Recommended entry points for blunt-tipped microcannulas when injecting the face (Figure 2).

Evolution in the Use of Blunt Injection Microcannulas and Their Impact Upon Injection Technique

The faculty believe that a great benefit of working with blunt microcannulas is the ability to achieve effective volume restoration with fewer injection entry points. Blunt microcannulas also demonstrate the value of using a longer tool for filler injections and allow the refinement of technique for doing this. Three of the faculty [Pozner, Sundaram, Weinkle] note that their experience with longer microcannulas has serendipitously led them to find utility in long sharp needles for areas that need more precision or definition, or when injecting into the upper half of the dermis, which has increased tissue resistance compared to the subdermal planes. The panel most commonly utilizes the 27-gauge, 1¼ in, 31 mm long sharp needle when injecting calcium hydroxyapatite (CaHA) into the midface. For poly-L-lactic acid (PLLA), the 22-gauge, 70 mm blunt microcannula [Pozner] and 25-gauge, 1½ in, 38 mm needle [Weinkle] are favored. One of the panel [Sundaram] is increasingly using a 22-gauge microcannula with a length of 50 mm or longer for filler implantation to all facial areas. With both, the panel recommends prewarming of PLLA and dilution in a syringe with a volume at least 1 cc larger than the total product volume to decrease the risk of microcannula or needle clogging.

FIGURE 2. Consensus recommendations for blunt microcannula entry points to the face. a) Possible entry points for injecting the lower eyelids, temples, midface, nasolabial folds, lips, chin, and oral commissures/marionette lines are indicated by open circles. Depending on microcannula length, as few as two to four entry points in total may be required for pan-facial treatment. Areas where microcannula entry points are not recommended are indicated by red crosses (Depressor anguli oris muscle and insertion of platysma muscle on the mandibular angle). b-c) Indication of how microcannula entry points may be selected for a specific patient based on desired areas of filler injection.

The faculty panel also finds that slight dilution of HA fillers with lidocaine or saline helps to decrease extrusion force during injections through microcannulas with a diameter that is smaller than 22 gauge. They consider lidocaine without epinephrine to be the diluent of choice. Epinephrine is avoided because it produces a burning sensation when administered [Weinkle], and the skin blanching it induces might mask signs of vascular compromise during or immediately after filler injection [Sundaram]. The faculty feel that there is little or no tissue trauma caused by the appropriate use of blunt microcannulas that are 27 gauge or larger in diameter, and thus epinephrine is not needed to promote local vasoconstriction.

The panel’s consensus is that the greatest utility of blunt microcannulas is for deep, subdermal implantation of fillers to the face, using techniques similar to those developed for autologous fat grafting. A blunt microcannula can cover a significant surface area from one entry point and fanning injection technique allows broad, multi-directional distribution of the filler.
Superficial and deep tissue planes. Two of the faculty [Sundaram] prefer the blunt microcannula technique, with long sharp needles may be used, with the latter often conferring a greater deal of precision.

Consensus Recommendation #4
Blunt microcannulas may be considered the preferred option for implantation of soft tissue fillers to non-facial areas such as the hands and décolleté, and a valuable option for deep (subdermal) filler implantation to the face.

Area-Specific and Product-Specific Strategies for the Use of Blunt Microcannulas

For injection of the temples, three faculty [Dewandre, Pozner, Sundaram] prefer the blunt microcannula technique, with gauge and size ranging from 22-gauge, 70 mm to 25-gauge, 50 mm. This is considered to permit safer injection in both the superficial and deep tissue planes. Two of the faculty [Sundaram, Weinkle] also inject the temples on occasion with sharp needle serial puncture, only in the supraperiosteal plane to avoid damage to the temporal branch of the facial nerve and other vital structures that lie more superficially. They employ a vectoring or fanning technique to deliver the filler product above the hairline for lifting effect. The panel most commonly selects CaHA or PLLA for injection of the temples. Another faculty member [Weinkle] does not inject the upper eyelid but also prefers a shorter, more rigid microcannula to inject along and above the eyebrow.

For the midface, the panel prefers 25-gauge, 50 mm or 22-gauge, 50 mm microcannulas. HA, CaHA, and PLLA are the most commonly used filler products. Three of the faculty members [Pozner, Sundaram, Weinkle] also find sharp needle injection to be of value for correction of focal volume loss with CaHA or HA; this is most commonly done with serial microaliquot technique.

For the lips, the faculty notes that blunt microcannulas or long sharp needles may be used, with the latter often conferring a greater deal of precision.

One faculty member [Sundaram] regularly injects the forehead with fillers but uses a sharp needle to inject non-Tyndall HA (Belotero Balance or Prevelle Silk) into the dermal or superficial subdermal tissue planes.

product. The faculty notes that sharp needles are valuable for precise injection of smaller volumes and for superficial injection, as when effacing fine rhytides. The panel believes blunt microcannulas to be superior in every respect to sharp needles for injection of fillers into non-facial areas such as the dorsum of the hands (Figure 3) and the décolleté. In summary [Sundaram], filler implantation to non-facial areas is viewed as essentially a process of bulk volume restoration, whereas implantation to the face has the objective of bulk volume restoration, and also of smaller volume “fine tuning.” The latter may require injection techniques other than subdermal threading and fanning, such as serial puncture and/or intradermal injection.

### TABLE 1.

<table>
<thead>
<tr>
<th>Area</th>
<th>Microcanna Diameter and Length</th>
<th>Preferred Filler Product(s)</th>
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</thead>
<tbody>
<tr>
<td>Lower eyelid</td>
<td>27 or 25-gauge, 38 mm</td>
<td>HA (may be diluted)</td>
</tr>
<tr>
<td>Upper eyelid and around eyebrow</td>
<td>27-gauge, 25-, or 22-gauge or 38 mm or longer</td>
<td>HA (may be diluted)</td>
</tr>
<tr>
<td>Midface</td>
<td>25 or 22-gauge, 38 mm or longer</td>
<td>HA, CaHA, or PLLA</td>
</tr>
<tr>
<td>Temple</td>
<td>25 or 22-gauge, 38 to 70 mm</td>
<td>CaHA, PLLA, or HA</td>
</tr>
<tr>
<td>Lower face</td>
<td>25 or 22-gauge, 38 mm or longer</td>
<td>CaHA or HA</td>
</tr>
<tr>
<td>Lips</td>
<td>27-gauge, 38 mm</td>
<td>HA</td>
</tr>
<tr>
<td>Hand (dorsum)</td>
<td>25 or 22-gauge, 38 mm or longer</td>
<td>CaHA or HA</td>
</tr>
<tr>
<td>Décolleté</td>
<td>25-gauge, 38 mm</td>
<td>HA</td>
</tr>
</tbody>
</table>

For the periocular region, the consensus of the panel is to use a smaller diameter blunt microcannula for deep (supra-periosteal) implantation of HA fillers. One faculty member [Sundaram] finds that a short microcannula (27-gauge, 25 mm) provides better control when injecting the upper eyelid and below the eyebrow, due to its greater rigidity. She also uses a 22-gauge, 50 mm microcannula more frequently for filler implantation to multiple facial areas, including the periorbital region, for which with the entry point is placed in the superolateral midface to allow access to both the lower eyelid and the lower forehead above the eyebrow.

Images courtesy of Jason Pozner MD.
Recommnded microcannula entry points by panel consensus.
For injecting the hands, the panel prefers the 25- or 22-gauge blunt microcannula, with CaHA (Radiesse) as the filler product of choice and NASHA (Perlane) as a second option. The panel recommends dilution of CaHA with lidocaine to give a final concentration of 0.45%, with further addition of lidocaine or 0.9% saline as considered appropriate to lower viscosity of the filler and facilitate its spread through the tissue after implantation.

The panel notes that microcannula selection may also be product-specific. For example, one faculty member [Dewandre] typically uses 27-gauge and 30-gauge microcannulas for low and medium-density HA products such as Juvederm Ultra and Ultra Plus, Restylane, and Perlane, 25-gauge microcannulas for CaHA (Radiesse) and PDLA (Sculptra), and 22-gauge microcannulas for high-density products such as the HA fillers, Juvederm Voluma and Restylane Sub Q, and for polymethyl methacrylate (PMMA, Artefill).

Consensus Recommendation #5
Preferred blunt-tipped microcannulas for specific facial areas and filler products (Table 1).

Clinical Considerations: Efficacy, Safety, Tolerability, and Potential Patient Benefits of Blunt Microcannulas

Inadvertent Intravascular Injection or Neurovascular Damage
The clinical benefits attributed to blunt microcannulas include elimination or near elimination of the risks of inadvertent intravascular injection and injury to vital neurovascular structures within the areas of injection. The panel is in general agreement that a blunt microcannula of 27 gauge or above is unlikely to penetrate blood vessels or nerves if it is used with appropriate technique but, rather, will push them aside as it traverses the path of least resistance through the tissue. Two of the faculty [Pozner, Sundaram] feel that the most narrow microcannula, of 30 gauge, might have the potential to cause neurovascular injury or even to penetrate a blood vessel if passed through tissue with inappropriately high speed and/or force.

Vascular Compression
The panel notes that the use of blunt microcannulas does not by itself decrease the risk of vascular compromise due to compression by injected filler, as this is technique-dependent. To avoid excessive extrusion force when injecting fillers through blunt microcannulas that are invariably longer than the typical 13 mm to 19 mm sharp needles, a larger gauge is selected. In general, a microcannula of 27-gauge or larger diameter is used in place of a 30-gauge sharp needle, and a microcannula of 25 gauge or larger diameter in place of a 27-gauge sharp needle. The decreased extrusion force facilitates increased flow of filler product that can cause deposition of inappropriately large filler boluses if the injector is unused to the small volume micro-threading technique that is best suited to microcannulas. One faculty member [Sundaram] considers the angular artery during its course through the area of the pyriform aperture and medial midface to be one of the vital structures at greatest risk of compression due to overinjection of fillers. This compression may be likened to a compartment syndrome.

Ecchymosis
The decreased or eliminated risk of piercing a blood vessel with an appropriately used blunt microcannula compared to a sharp needle results in a significantly decreased risk of ecchymosis, which may be particularly noted in regions such as the nasojugal fold, the upper eyelid, and the pre-jowl sulcus. In the faculty’s experience, ecchymosis with blunt microcannulas is minimal and, for many patients, nonexistent. If ecchymosis does occur, it may be at the insertion site of the pilot sharp needle, or in areas of increased tissue resistance if the microcannula is applied with inappropriate force. Increased tissue resistance may be due to fibrosis, in patients who have previously had face-lifting surgery or multiple injection sessions with collagen-stimulating volumizers such as PLLA. These situations may be considered relative contraindications to the use of blunt microcannulas.

Tolerability
In the faculty’s experience, the tolerability of blunt microcannulas is equal to or better than that of sharp needles. Anecdotally, patient discomfort is reduced to the level where topical anesthesia alone consistently suffices even for injection of the lips, and local nerve blocks are not necessary. There may be some discomfort during injection, especially if a microcannula is passed multiple times through a zone of tissue fibrosis. One faculty member [Weinkle] has observed that some patients dislike the noise of a blunt microcannula passing through tissue and recommends forewarning patients of this and playing music to provide auditory distraction during the injection procedure.

Collagenesis
It has been suggested that back-and-forth passage of a blunt microcannula multiple times through an area may stimulate collagenesis. This theory is persuasive by extrapolation from the collagenesis observed with repeated back-and-forth passage of cannulas during liposculpture. However, the panel notes that collagenesis induced by liposculpture typically results from a much larger number of “tunneling” passes through the tissue than would be performed when injecting alloplastic fillers with microcannulas. Given the current lack of evidence for the hypothesis that injection of fillers with blunt microcannulas stimulates collagenesis, the panel recommends controlled studies of microcannula vs. sharp needle injection if it is desired to substantiate this hypothesis. If blunt microcannula use does, indeed, stimulate significant collagenesis, an interesting
consideration is whether previous repeated treatment sessions with microcannulas might at some point be deemed a relative contraindication to their future use, due to the resultant increase in tissue resistance.

In general, the faculty notes that more experience is needed to determine the long-term effects, if any, of using blunt microcannulas.

Consensus Recommendation #6
Blunt microcannulas may be preferred to sharp needles to decrease or eliminate the risk of inadvertent intravascular injection or neurovascular damage, and to decrease the risk of ecchymosis. These safety benefits are contingent upon appropriate use, specifically including the avoidance of inappropriate speed and force as a blunt microcannula is passed through the tissue.

Consensus Recommendation #7
Previous facial surgery or repeated injections with collagen-stimulating fillers may constitute a relative contraindication to the use of blunt microcannulas, due to tissue fibrosis.

Review of Blunt Microcannula Studies to Date and Identification of Further Data that Need to be Obtained to Provide Evidence-Based Substantiation of Clinical Claims
Peer-Reviewed Study Publications
A recent prospective phase II (pre-approval) randomized split-phased, double-blinded study was conducted to assess the safety and efficacy of a proprietary 21-gauge, 30 mm metallic blunt cannula when injecting HA filler into the nasolabial folds. Twenty-five study subjects with a score of 2 to 3 bilaterally for the nasolabial folds (NLF) on the validated seven-point photographic Modified Fitzpatrick Wrinkle Scale (MFWS) were randomly assigned to receive an injection of 0.5 mL HA filler with the cannula to one NLF and with a 30-gauge (13 mm) sharp needle to the other NLF. On evaluation three days after injection, there was a bilateral decrease in MFWS score (indicating improvement in NLF). Study subjects reported decreased pain, hematoma, edema, and erythema on the side treated with the cannula.

The panel notes that the cannula used in this study is somewhat wider and shorter than the microcannulas they most commonly use for alloplastic filler injections (27-gauge, 38 mm). Further controlled studies would be needed to determine whether the specific safety, tolerability and efficacy profiles of this microcannula differ significantly from those of the wider, shorter cannula.

In another study,26 subjects with periorbital hollowing were injected with HA filler using the reinforced, rigid microcannula that was noted above as specifically designed for peri-orbital use (Pix’L + microcannula). Subjects were evaluated immediately after injection, 10 to 25 days afterward and three months after injection. Eighty-eight percent of subjects reported that they were satisfied or very satisfied with treatment. It was observed that there was even distribution of the filler product with excellent aesthetic improvement and a low rate of hematomas or post-treatment edema.

The claims of superior safety and tolerability and decreased risk of ecchymosis with blunt microcannulas compared to sharp needles are reviewed above. The panel is in general agreement with these claims, with the reservations that have been noted.

Consensus Recommendation #9
Controlled studies are needed to substantiate or refute the hypothesis that blunt microcannulas increase the volume efficiency of filler treatment compared to sharp needles.

Combination of Blunt Microcannulas and Sharp Needles: Rationale and Applications
All the faculty members frequently combine blunt microcannulas with sharp needles for the injection of alloplastic fillers. They consider microcannulas a first-line option for deep (subdermal) filler injection to areas of diffuse volume loss, such as facial troughs, the dorsum of the hands, and the décolleté. They add filler injection via sharp needles to precisely address areas of focal volume loss, such as in the midface in some patients, and also for more superficial injection in the intradermal and superficial subdermal tissue planes, as when effacing fine rhytides or the vermilion lip border. For example, one faculty member [Dewandre] routinely uses a 27-gauge, 38 mm microcannula for layered injection of HA to the vermilion lip, in combination with a 30-gauge, 13 mm sharp needle for vertical injection of HA to fine perioral lines. Another [Sundaram] frequently employs multi-plane “sandwich” technique, using a blunt microcannula of 22, 25, or 27 gauge, ranging in length from 38 mm to 70 mm where appro...
appropriate for supraperiosteal or subcutaneous injection of CaHA or NASHA, followed by intradermal or superficial subdermal injection of non-Tyndall HA for a sheeting effect or to efface fine lines, with a sharp needle of 30 or 27 gauge that ranges in length from 13 mm to 32 mm.

Consensus Recommendation #10
For many patients, a combination of blunt microcannula and sharp needle injection of fillers may represent the optimal balance of safety and efficacy, by providing minimally traumatic diffuse contouring plus precise shaping.

CONCLUSION
The panel finds blunt-tipped microcannulas to be a significant advance in nonsurgical rejuvenation and a valuable addition to the options available for injection of soft tissue fillers. With the caveat that the safety and efficacy of filler injections ultimately depend upon the knowledge and skill of the injector, distinct patient benefits that can be identified as a result of using microcannulas include improved safety, and a decreased risk of ecchymosis leading to a faster return to normal daily activities. Some patients also report improved comfort during injection.

The objectives of this consensus document are to generate an overview of the current use of blunt microcannulas by a faculty of relatively early adopters, and to provide the information and guidelines needed for their successful incorporation into aesthetic clinical practice. The consensus recommendations encompass best practice techniques for patient counseling and injection of alloplastic soft tissue fillers with blunt microcannulas, and also identify areas where controlled study data are needed in order to adopt a more evidence-based approach to their applications.

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REFERENCES