

“ The challenge today is to discover the best ways to use microcannula as we progress from revolution to evolution. ”



ADVANCED ANTI-BRUIISING COSMETIC FILLER TECHNIQUES

Garry R. Lee describes his techniques to reduce bruising, pain, and swelling using microcannula instead of needles

COVER
STORY

ABSTRACT

Often, patients are more traumatised by the bruising and swelling resulting from the injection of cosmetic fillers than the treatment itself. Increasingly, physicians are replacing the conventional hypodermic needle for the blunt-tip microcannula to increase injection safety and to decrease bruising, swelling, and pain. To date, there is no general consensus on the best microcannula injection techniques. The author describes microcannula techniques he originated and teaches in the USA.

WHAT IF THERE WAS A SAFER way to inject cosmetic fillers with less bruising, less swelling, and less pain? Well, now we can inject wrinkles without needles. Traditionally, the use of hypodermic needles was the golden standard for cosmetic filler injections as technological innovations focused only upon improvements in the nature and duration of action of the fillers themselves. Unfortunately, bruising^{1,2} and swelling were often expected and it was not uncommon for patients to have as much apprehension for the sequelae as the treatment itself. Indeed, Glogau and Kane observed bruising in up to 24% of their Restylane® and Perlane® patients³; and Tzikas recorded 68% bruising in a small sample of patients injected with Radiesse®⁴.

Consequently, it was revolutionary when attention abruptly shifted from product improvement to improving product delivery—from the sharp-tipped needle to the blunt-tipped microcannula. The challenge today is to discover the best ways to use microcannula as we progress from revolution to evolution. The following microcannula cosmetic filler injection techniques

described herein are the author's techniques; are not definitive in nature; and are not a substitute for the experience of hands-on, personalised instruction.

What is an aesthetic microcannula?

A cannula⁵ is 'a small tube for insertion into a body cavity, duct, or vessel', which originated circa 1684, derived from the Latin for 'reed'. Now commonly called microcannula, reflecting the size, aesthetic medicine usage is perhaps more precisely defined⁶ as a 'small tube with an edge that is not sharp, designed for atraumatic intradermal injections...that can be used for the injection of fillers, like hyaluronic acid, collagen, poly-L-lactic acid, CaHA, etc.' Appearing much like the needle it replaces, the aesthetic microcannula markedly differs in that filler extrusion is only through a tiny opening, or port, near the blunt-end tip.

Less pain, swelling, and bruising

Publications are scarce, but slowly accumulating, supporting the use⁷ of aesthetic microcannula over the traditional hypodermic needle. Niamtu⁸ in 2009, reported less injection pain, less oedema, and less bruising using fat injection cannula for cosmetic filler injections. Fulton et al⁹ also noted less bruising, less ecchymosis, and less pain, which was quantified as 3 (mild) for injections with microcannula, increasing to 6 (moderate) with the hypodermic needle. They found no significant differences in a comparison of cosmetic filler results using the Global Aesthetic Improvements Scale Score between the hypodermic needle and the microcannula. In 2012, Hexel et al¹⁰ performed a double-blind, randomised, controlled clinical trial to compare safety and efficacy >



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KEYWORDS

Microcannula, cosmetic filler, bruising, ecchymosis, hyaluronic acid

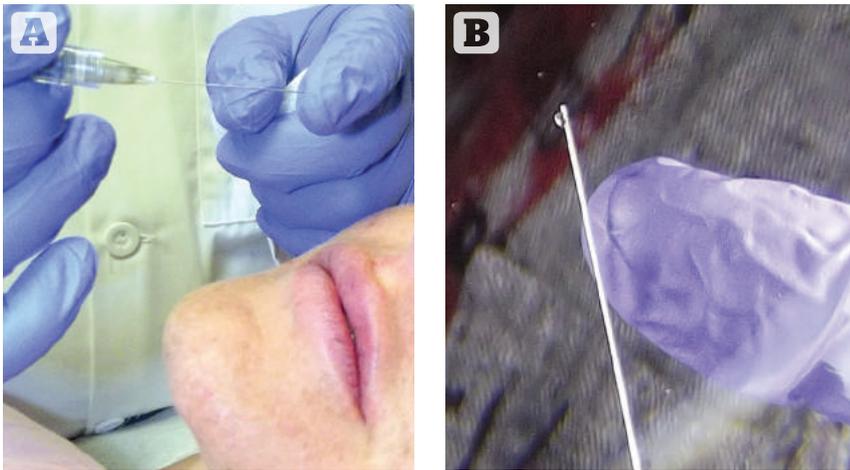


Figure 1 (A) The blunt tip microcannula, (B) TSK by Air-Tite microcannula with port at end of tapered blunt end tip

▷ of a metallic cannula with that of a standard needle for soft tissue augmentation of the nasolabial folds. Hexel concluded cannula were safe and useful to inject hyaluronic acid fillers into nasolabial folds with less pain, oedema, haematoma, and redness than needles.

In 2012, Lazzeri et al¹⁴, surveyed a total of 32 cases in 29 articles on permanent blindness from cosmetic filler injections. There were 15 cases after adipose injections and 17 non-adipose cases using corticosteroids, paraffin, silicone oil, collagen, polymethylmethacrylate, hyaluronic acid, and calcium hydroxyapatite. Lazzeri's prevention recommendation: use microcannulas.

While it is incontrovertible that blunt-tip microcannulas are thought to be less likely to penetrate blood vessels² and other tissue than sharp-tipped hypodermic needles, substantiating research is lacking⁹. Of

course, even a blunt tip does not insure that one cannot penetrate any tissue—if one is forceful and aggressive enough—but safer tools are instrumental in producing better results. Nevertheless, a consensus is growing for the use of microcannula over the hypodermic needle^{14,15}.

Early pioneers used readily available larger gauge

“While it is incontrovertible that blunt-tip microcannulas are thought to be less likely to penetrate blood vessels and other tissue than sharp-tipped hypodermic needles, substantiating research is lacking.”

Figure 2 Pilot needle placement for Juvederm[®] lip enhancement



liposuction (non-disposable) metallic⁸ cannulas which required sterilisation before re-use. However, particular care must be taken to carefully monitor the process to insure there is no risk of disease transmission. Hence, now that disposable microcannulas are affordable and available, the author's preferred choice is to always use disposable microcannulas rather than to sterilise.

Selection of pilot

The microcannula, being blunt tipped, is specifically designed to not penetrate tissue readily so a 'pilot' or introducer needle is necessary to create the opening through the skin. Of course, the larger the opening the easier it is to insert the microcannula, but correspondingly, the greater trauma results in more pain, bruising, and swelling. On the other hand, the smaller the opening, the more difficult it is to insert the microcannula which can result in significant pain upon repeated attempts and failures at entry. Consequently, the ideal selection is dependent upon the dexterity of the individual injector to choose the smallest pilot needle which rarely requires re-entry. The author's choice is a 23 gauge ½" pilot needle for the 27 gauge standard diameters of both Juvederm[®] and Restylane.

Insertion of pilot

The author prefers to insert the pilot needle at a 30° to 45° angle quickly into the superficial subcutaneous tissue in the direction the author wishes the microcannula to travel. Insertion too superficially will not penetrate the skin adequately and create difficulty in traversing the entry for the microcannula. Again, it is more painful to repeatedly attempt to place the microcannula through too shallow or tiny a pilot hole, rather than to just inject once with a hypodermic needle. Insertion too deeply will cause unnecessary trauma to tissue and may precipitate the very bruising the injector wishes to avoid. Leave the needle in place a few seconds to allow for haemostasis and enough time for the needle to create a transitory channel through tissue to ease entry.

Selection of disposable microcannula

The differences between microcannulas are substantial in that some disposable microcannulas are so flexible, you cannot place cosmetic filler precisely where desired, and others are so rigid, you increase the likelihood of penetrating blood vessels as well as increasing the resulting pain. More importantly, the tip of the microcannula is vital to your ability to perform a smooth entry, in that a tapered tip is easier to place than one which is rounded and blunt. The other point to make is that the tip is best tapered for easier entry, but not too pointed that it facilitates entry into blood vessels or is at risk for breakage if weakened structurally. In the author's practice, a tip break has never occurred from any reputable brand after thousands of uses over the years.

The other critical issue in the differentiation of microcannulas is the placement of the extrusion port or opening at the end of the microcannula. Ideally, the ▷

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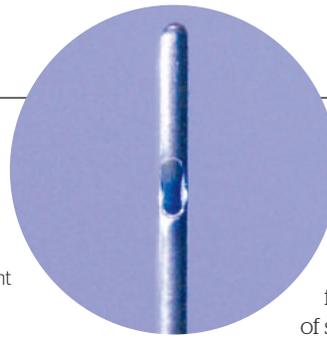
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▷ extrusion port should be as near as possible to the tip to more precisely place the cosmetic filler product exactly where intended. For example, if you wish to inject the most lateral corner of the lip, you don't want the filler to be extruded so medial that you have to attempt to massage it into the intended corner.

Figure 3
Comparison of side port locations among different cannulae.



properties for desired applications, such as Radiesse for the dorsum of hands. He minimises use of fillers that cannot be modified without the need for surgical excision and the resulting risk of scar formation.

Selection of fillers

It seems that a new cosmetic injectable filler always seems to be arriving that is purportedly longer-lasting and smoother. Microcannulas may be used with nearly every type of cosmetic filler, but the nature of the filler will direct the size of the microcannula. Typically, the author matches the size of the microcannula to the gauge of the recommended needle. If difficult to extrude, the author simply selects a larger gauge microcannula. If there is too much entry trauma, bruising, or pain, a smaller gauge microcannula and corresponding pilot needle is selected but extra care must be taken not to inject too forcefully or too quickly to overstress the hub's original design parameters. Another consideration is for those who dilute their cosmetic filler in different manners so that the viscosity of the filler is changed. For example, the author typically dilutes Juvederm Ultra with 1.0 cc of 2% lidocaine when injecting the temporal areas to minimise apparent 'lumpiness' in this thin-skinned area.

The author's cosmetic filler of choice is usually a hyaluronic acid[®], such as Juvederm or Restylane, because any imperfection can easily be remedied with the enzyme hyaluronidase[®]. The author also wants a cosmetic injectable filler that can dissolve almost instantly if there is an accidental cannulation of a blood vessel. Nevertheless, the author recommends physicians try all the comparable products on the market before arriving upon your individual selection. The author does use other fillers if they possess special

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Microcannula basics Traction



Inadequate traction is where most beginner microcannula users often fail. They fail to retract the skin adequately to insert the pilot needle and the blunt tip repeatedly snags on loose skin at attempted entry, causing more pain than if a needle were used. The author uses a technique to create enough skin tension to promote optimal resistance for entry in the direction of the insertion. The

injector would typically place traction in the direction opposite to the injecting direction of the microcannula, with the exception of the lips, where the lip are often pulled into the direction in which the injector wishes the microcannula to travel.

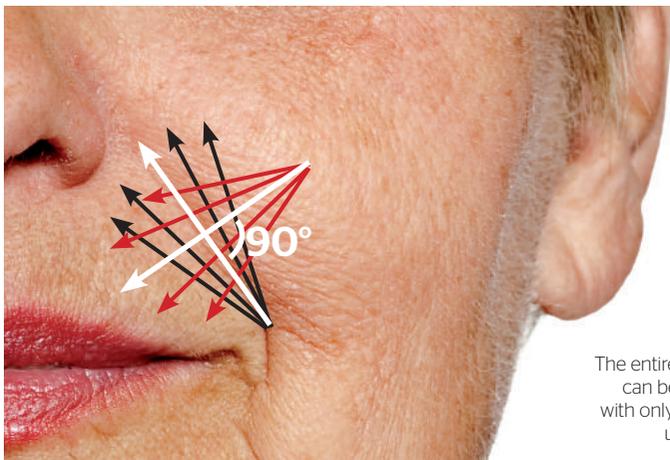
Depth

Originally, injectors were trained to inject into the mid-to-deep dermis for cosmetic filler placement. With microcannula, however, the placement depends upon the cosmetic filler chosen and ranges from the dermal-subcutaneous (dermal-SQ) junction for most hyaluronic acid fillers to supra-periosteal for Juvederm Voluma. A significant change in the duration of action of any given filler by placement in the dermal-SQ junction instead of the dermis itself has yet to be witnessed and the author is unaware of any current research to this effect. Depth adjustment must also be made automatically to be deep enough to hide the appearance of lumpiness and to adjust for the thinness of the skin with ageing. The author observes that the deeper the filler placement—the more you need—and that less product is required with more superficial placement to correct wrinkles.

Long microcannula double cross-hatched fan (LeeXX) technique

Many years ago, the author observed that the short ½” needles included with Juvederm syringes required three traumatic needle insertions to encompass the length of the typical nasolabial fold. He went on to achieve the same results by replacing the ½” needle with the longer 1½” needle—with only one painful injection instead of three. Then, when the microcannula obtained FDA approval and became available in the USA, the author replaced the 1½” needle with the 1½” microcannula. Seeking the best way to use the microcannula, and the least amount of needle trauma for the smoothest and most natural appearing results, the author applied the basic fan technique whereby a single point of entry is made at the base of the nasolabial fold and aimed the microcannula superiorly and medially into the

Figure 4 The long micro-cannula double cross-hatched technique (Lee XX)



The entire nasolabial fold can be encompassed with only two pilot holes using the LeeXX technique



nasolabial fold, injecting retrograde back to the point of entry—without removing the tip of the microcannula. Then, the fan was repeated above and below this baseline to span the entire nasolabial fold.

However, desiring a cross-hatching effect for a more natural appearance, the author bisected the nasolabial fold at right angles and repeated the process whereby the two fans would intersect with the addition of only one other pilot hole, creating 'the long microcannula double cross-hatched fan technique (LeeXX)'. This same technique is adoptable to many other areas which he uses almost exclusively in the nasolabial folds, the marionette lines, the submalar areas, and many body applications.

Wiggle progression technique

Traditionally, needles plunge blindly ahead regardless of obstruction, shearing tiny blood vessels which creates 'the oozing which causes the bruising.' Extravascular blood degrades and discolours over time to create unsightly ecchymosis, which can be more disconcerting to the patient than the treatment itself. Penetration of other soft tissues such as nerves, tendons, ligaments, and muscle invariably leads to swelling and pain. The microcannula advantage is that—with a little experience—the blunt tip makes it possible to almost touch sensitive tissue without actual penetration.

The author's 'wiggle progression' is simply to insert the microcannula through the pilot hole and progress very slowly and gently—constantly prompting the patient to voice any significant pain—which is an indication of directly abutting the tissue we wish to bypass. With any report of pain, simply 'wiggle' back a bit and redirect the tip of the microcannula one or two millimetres in another direction or plane until no obstruction is felt, and then continue insertion. The author estimates a greater than 70% reduction in bruising using microcannula with the 'wiggle.'

Lip technique

In the upper lip, enter at the lateral aspect of the vermillion border, follow the vermillion border to Cupid's Bow, then fan inferiorly into the body of the upper lip as needed. One may also enhance Cupid's Bow and the philtrum. In the lower lip, enter at the lateral aspect of each side of the lip, insert to just past mid-line, then fan

Figure 5 (A) Juvederm Ultra Plus XC Injection into upper Lip with TSK by Air-Tite microcannula. (B) Before and (C) after lips and nasolabial folds injected with microcannula—without bruising

inferiorly into the body of the lower lip as needed. This is so atraumatic that the author invariably uses only topical numbing cream instead of the inferior orbital and mental nerve dental blocks that were so necessary using hypodermic needles. Moreover, since there is so little trauma, it is far easier to create symmetric lips without swelling from multiple injections, which can distort lip anatomy.

Advanced microcannula techniques Hand technique

Often, it is the hands that give away one's age but now it is possible to inject cosmetic fillers such as Radiesse to hide the unsightly extensor surface blood vessels. The microcannula technique on the dorsum of the hand is to place the pilot in the distal mid-hand and to use this ▷

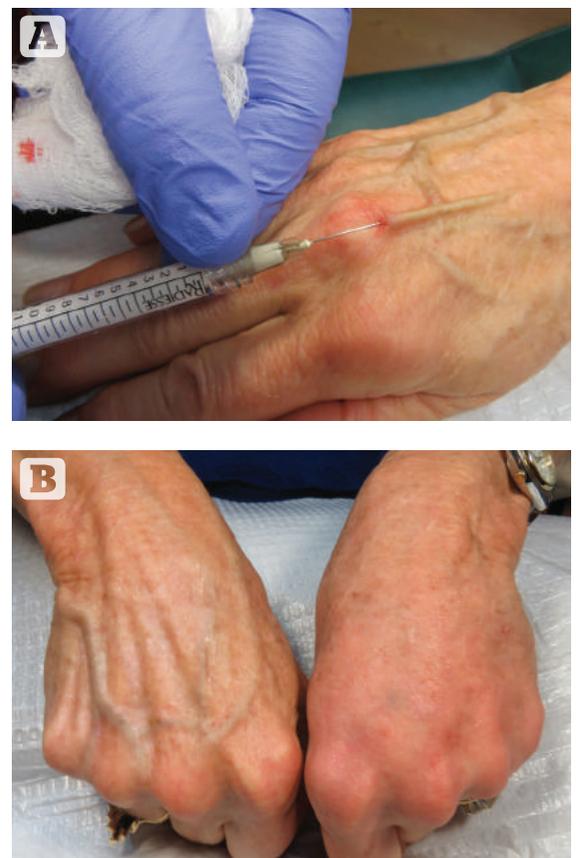


Figure 6 (A) Radiesse injection, with TSK by Air-Tite microcannula, glides over vein. (B) Left hand immediately after Radiesse injection using TSK by Air-Tite microcannula

▷ lone portal to encompass the entire extensor surface of the hand. As you can see (Figure 6), the microcannula can literally glide over blood vessels without penetration using the wiggle progression technique with excellent results using the 1½" microcannula.

Pyramid vertical fan technique

The traditional method of injecting Juvederm Voluma is to demarcate Hinderer's Lines, the two lines that cross the mid-face highlighting the malar prominence of the cheek. Hinderer's lines divide the cheek into four distinct zones which should be injected sequentially in order to give the most efficient lift to the cheek. Line number one is from the lateral canthus to the oral commissure and line number two is from the tragus of ear to upper alar lobule of the nose. These result in the classic four injection sites: the zygomatic arch at sites 1-2 which anchor and lift laterally; the anteromedial zone at site 3; and finally, the submalar zone at site 4. Injections are then made using needles perpendicular to the skin placed supra-periosteal in sites 1-2; and above the periosteum, but into the subcutaneous tissue in the remaining sites. The needles are injected with one single retrograde infusion and immediately removed to inject the next site, not unlike the placement of tent pegs to support canvas.

The fanning technique has the advantage for injections that are horizontal to the plane of the skin of a single painful entry point encompassing a much larger fan area. Consequently, the author believes the same may be accomplished using a fan that was vertical to the plane of the skin. 'The pyramid technique' is simply to insert a pilot needle perpendicular to the skin, and then fan the microcannula vertically in the shape of a 3-4 sided pyramid for greater structural anchoring ability and to minimise injections. Beginning microcannula users find it far easier simply to inject the cheek using hypodermic needles, but with few exceptions, the author now uses microcannula in this area. With Juvederm Voluma, it is essential to inject sequentially as numbered with traction from the lateral-superior aspect to the medial-inferior aspect to anchor the skin so less product is needed medially. This technique also requires enough massage over the injected areas to maintain a smooth appearance.

Neck technique

Microcannula may also be used to inject cosmetic fillers into neck wrinkles, but a great deal of extra care must be taken to avoid the plethora of blood vessels endemic in ▷

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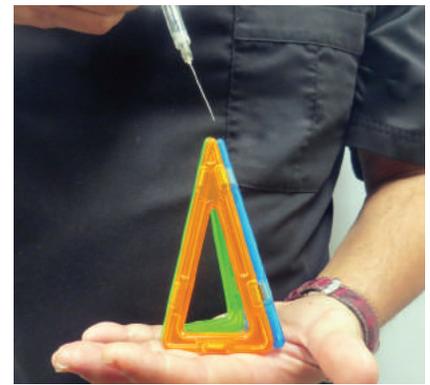


Figure 7 (A) Hinderer's Lines delineating classic injection zone. (B) Pyramid vertical fan technique minimises injections



Figure 8 (A) Before and (B) after cheek treatment using Juvederm Voluma with TSK by Air-Tite microcannula



Figure 9 (A) Before and (B) after neck treatment using Juvederm with Air-Tite Microcannula

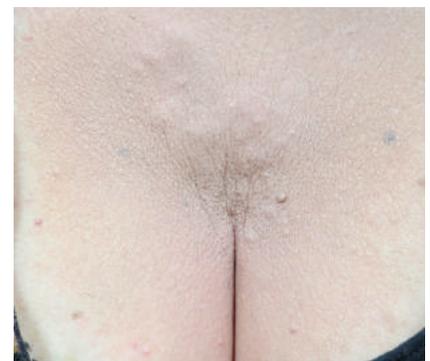


Figure 10 (A) Before and (B) after crinkle treatment using Juvederm Ultra Plus and Voluma with TSK by Air-Tite microcannula

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▷ this area. The author uses a surgical marker to delineate the horizontal grooves with a 1½” microcannula to inject very superficially to avoid any cannulation of blood vessels, then repeats the process until the entire length of the groove is filled. Before injection, it is important to aspirate back on the syringe to further reduce the risk of injecting into a blood vessel. Repeat the process again until the entire length of the desired wrinkle is completed. Sculpting cosmetic filler in the neck is particularly difficult because there are no bony or hard structures against which to mold the filler, so while good results may be obtained, the author is currently testing other non-surgical modalities to better treat this area.

Chrinkle (or chest wrinkle) technique

Patients with large breasts or with too much sun damage may have unsightly wrinkles in the cleavage or décolleté between the breasts from excessive skin laxity. The author originally placed the pilot hole superior to the chrinkle, but found working around the patient’s head difficult, so the pilot is now placed using the inferior approach injecting at the base of the chrinkle. The author uses a 27

Figure 11 (A) Restylane injection showing tip of TSK by Air-Tite microCannula. (B) Before and (C) after 50% correction of tear trough with Restylane using TSK by Air-Tite Microcannula

Gauge 1½” microcannula with Juvederm Ultra Plus XC and occasionally with Juvederm Voluma using the long microcannula double cross-hatched fan technique.

Tear trough technique

The tear trough is an area only for advanced injectors because of the risk of retinal artery cannulation, which may result in permanent blindness¹⁸. Other risks include stroke and necrosis leading to ulcer formation and scarring¹⁸. Microcannula use is deemed safer because the blunt tip is thought to be less likely to penetrate blood vessels. Another particular observation in this area is the natural tendency for hyperpigmentation¹⁹ to be naturally present here, which may create the appearance of volume loss even when corrected. Consequently, the protocol favoured by the author is to take high resolution digital photography prior to treatment and to point out the difference between volume loss and the shadowing effect versus skin discolouration. Indeed, hyperpigmentation may become even more evident when no longer hidden by involution in loose skin folds after cosmetic filler volume correction.



Figure 12 (A) Before and (B) after cosmetic filler injections with TSK by Air-Tite microcannula



Figure 13 (A) Before and (B) after Juvederm treatment of crow’s feet using TSK by Air-Tite microcannula

The author's chosen entry point is ½" to 1" below the tear trough with pilot placement medial and lateral to the inferior orbital nerve. Restylane is then fanned up to no more than 50% correction, typically stopping just below the bony orbital rim. Correction of more than 50% usually results in grossly abnormal swelling—especially the day after injection from water absorption—so the author prefers to make corrections in lesser stages. Overcorrection will occasionally require the use of the enzyme hyaluronidase, which may be used judiciously to sculpt any hyaluronic acid filler. Of course, the wiggle progression technique is indicated for greater safety to minimise any chance of embolization.

Crow's feet (orbicularis oculi) technique

This traditional Botox® treatment area can also be injected with Juvederm Ultra Plus XC for longer lasting results using the long microcannula double cross-hatched fan technique. Cosmetic fillers may be a better and less expensive option, especially for those with large crow's feet muscles, which may require excessive Botox units four times a year.

Glabella technique

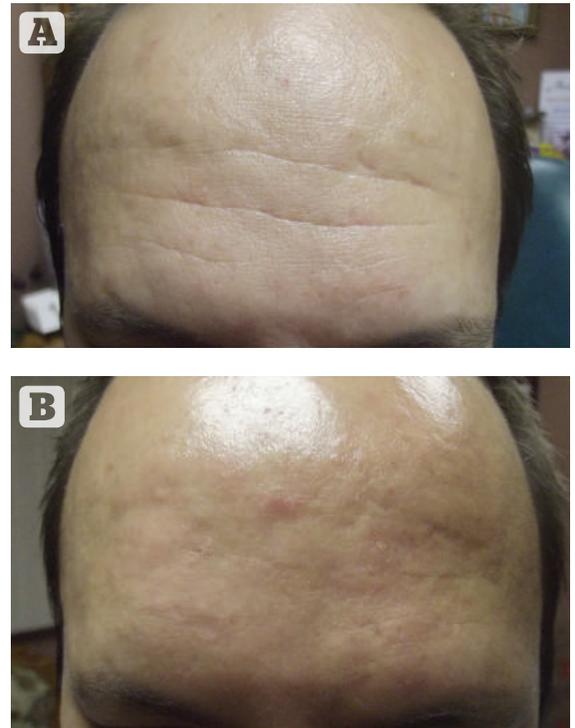
This is a high risk injection area where necrosis and stroke²⁰ have been reported after the accidental cannulation of small calibre vessels branching from supratrochlear arteries, which have minimal collateral circulation²¹. The resulting necrosis often leads to ulceration and ultimately scarring. Nevertheless, static glabella lines may give rise to the connotation of anger even when no such emotion exists. This may be circumvented with the conservative application of Juvederm Ultra in greater safety using microcannula and the wiggle progression technique in place of the needle.

The author's technique is to place the pilot at from above the two vertical lines (i.e. 'the elevens') and to carefully tunnel with the microcannula below the dermis. Upon any resistance or pain, simply redirect the microcannula below the dermis. Upon reaching the desired end point, aspirate the syringe to minimise the risk of injecting filler into blood vessels and upon finding no blood in the syringe, slowly inject retrograde on the way out intentionally under-treating and under-filling to avoid the compression of blood vessels.

Frontalis technique

The frontalis technique applies to both static and dynamic wrinkles and is used most aptly when Botox cannot be used due to the likelihood of brow ptosis; the horizontal wrinkle is too proximal to the levator palpebrae superioris muscle with the risk of eyelid ptosis; the cost of Botox is prohibitive due to the large size of the occipitofrontalis muscle; or Botox is simply ineffective because the wrinkle is static instead of dynamic and can

Figure 14 (A) before and (B) after Frontalis Juvederm treatment using TSK by Air-Tite Microcannula



only be treated with cosmetic filler. The process is to place a pilot needle at one end of a horizontal wrinkle, insert the microcannula using the wiggle progression technique, and to repeat this sequentially until the entire length of the horizontal line is treated.

Temple technique

This is a treatment area which is growing in popularity as we all age. Previously, the author used Sculptra® with success in the temporal fossa, but now often uses ▷

“The frontalis technique applies to both static and dynamic wrinkles and is used most aptly when Botox cannot be used due to the likelihood of brow ptosis.”

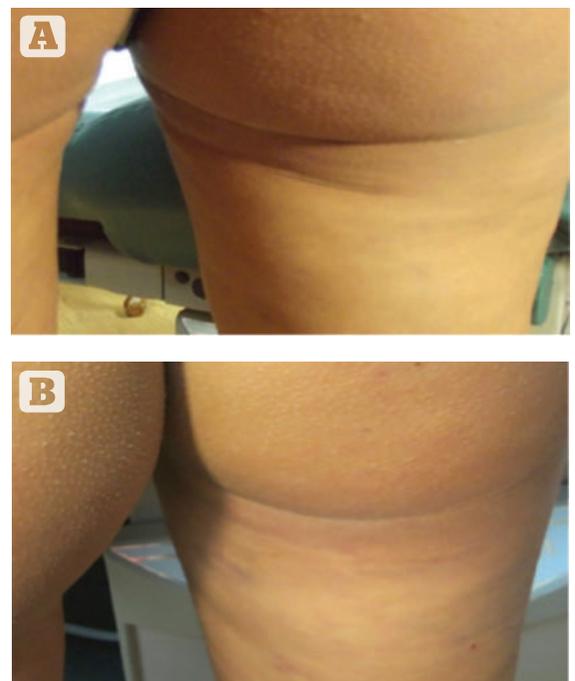


Figure 15 (A) Before and (B) after cosmetic filler using the long microcannula double cross-hatched fan technique for liposuction scar

“I believe that the next frontier in non-invasive cosmetic medicine will be in the combination of microcannula introduced cosmetic fillers with synergistic modalities – such as laser, radiofrequency, microneedling, PRP, stem cells, and microcurrent.”

▷ Juvederm Voluma mixed with 10cc of lidocaine per syringe for smoothness. Again, the author uses the long microcannula double cross-hatched fan with the wiggle progression technique with care to aspirate to prevent cannulation.

Buttocks and body techniques

Although cosmetic fillers are traditionally thought of for injection to the face, the author believes there is no reason to not use it off-label in other appropriate body areas. *Figure 15* shows application made in the upper thigh to correct a groove created from a surgeon's excessive liposuction. The long microcannula double cross-hatched fan technique was used with Juvederm Ultra Plus.

Future trends and conclusions

With the ebbing of the Great Recession, we are beginning to see the re-emergence of interest for cosmetic procedures, particularly non-invasive ones which tend to be less costly procedurally and with minimal downtime. The American Society for Aesthetic Plastic Surgery notes that non-surgical procedures increased in 2013 by 13.1% in the US with 9.5 million procedures²². In particular, hyaluronic acid cosmetic filler procedures increased a tremendous 31.5% in the US over the same time period²². Moreover, we can now create results which were once thought unachievable (see *Figure 16*) using cosmetic fillers alone.

On the horizon, we are beginning to use platelet-rich plasma (PRP) in aesthetics though there is no specific FDA indication and benefits to date are more anecdotal than documentable. I believe that the next frontier in



Figure 16 Non-surgical results with only Juvederm and Restylane cosmetic injections

Key points

- 1 Microcannula are replacing hypodermic needles for the injection of cosmetic fillers
- 2 Microcannula decrease the bruising, swelling, and pain associated with cosmetic filler injections
- 3 Microcannula are thought to be safer than needles by reducing the risk of cannulation of blood vessels
- 4 It is essential to select the appropriate type of pilot needle, microcannula, and cosmetic filler
- 5 Physician and nurse training in basic and advanced microcannula techniques are critical to success

non-invasive cosmetic medicine will be in the combination of microcannula introduced cosmetic fillers with synergistic modalities—such as laser, radiofrequency, microneedling, PRP, stem cells, and microcurrent. The challenge today is how to best integrate these together. What we are seeing is a convergence of technologies in which our incremental advances in non-invasive cosmetic medicine may one day produce results which begin to rival – what we can only see today – with plastic surgery.

► **Declaration of interest** Air-Tite National Director of USA MicroCannula Instruction and Physician Instructor for Allergan, Medicis, and Eclipse Aesthetics, USA

► **Opening image** © David 'Spike' McCormack, **Figures 1-2, 5-16** © Dr Garry R. Lee, **3** © David 'Spike' McCormack, **4 Diagram** © Dr Garry R. Lee, image © Shutterstock

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