Background: Cosmetic physicians are more and more frequently asked for hand rejuvenation. They commonly propose the same techniques as for the face. The authors undertook an anatomical study of the hand dorsum to understand the optimal location for an injected filler and to design the safest technique of placement.

Methods: The first part of the study included dissections of 19 fresh cadaveric hands and duplex ultrasounds investigation of 28 healthy hands. A technique of injection specifically designed from anatomical findings was then tested on 8 fresh cadaveric hands using magnetic resonance imaging and dissection in comparison with 3 other commonly used techniques of rejuvenating injections.

Results: Between the dermis and the tendons, the thickness of the fascial plane was measured from 0.3 to 2.2 mm. Because of numerous fibrous septa, the entire plane was found as a 3-dimensional sponge-like framework. Veins could be located in all levels of this framework. There was no predefined free space. The optimal place for the deposition of a filler was found to be the undersurface of the dermis. The specific technique named Scrape Skin Threading Technique and using a cannula scraping the deep side of the dermis was checked as the only technique which could give a perfect placement of product restricted to the fascial layer.

Conclusion: The Scrape Skin Threading Technique was designed to inject safely and accurately any kind of injectable in contact with the undersurface of the dermis, which appeared anatomically as the optimal location of a filler for enhancing the outer appearance of the dorsum of hands. (Plast. Reconstr. Surg. 136: 258S, 2015.)

Disclosure: Dr. Moradi is a board-certified facial plastic surgeon in private practice in Vista (San Diego County, Calif.) and serves as consultant and researcher for Allergan, Galderma, and Merz North America. He did not receive compensation for this article. Dr. Busso has been a paid consultant for Merz North America and Galderma. Dr. Bucay is a consultant and speaker for Allergan, Galderma, and Merz. Dr. Sutton has no relevant financial disclosures. Dr. Lefebvre-Vilardebo and Dr. Trevidic have no commercial associations or financial disclosures that might pose or create a conflict of interest with information presented in the article. This study was supported by E2e. Scrape Skin Threading Technique and SSTT are registered trademarks of Marc Lefebvre-Vilardebo.
ANATOMICAL RESEARCH RELEVANT TO AN INJECTION TECHNIQUE

The overall anatomical study has been designed to be not only analytic but mainly focused on the ideal place for the safe deposition of an injectable. It took place from mid-2009 to mid-2012.

Anatomical Dissections of the Dorsal Side of Hands

Nineteen fresh cadaveric hands were obtained from the Body Donation Centre of Paris Descartes University, Paris. All hands had their arteries previously washed and injected with colored latex through the brachial artery. Age, gender, and body mass index of the cadavers were unknown. All dissections were performed within 5 days after death. They were done layer by layer from the skin to the bone plane. The incision was made as a straight line on both edges of the dorsum and extended by a crescent-shaped line over the metacarpophalangeal joints. Much attention was given to understand the links between layers and to try to find several planes inside the fascial layer itself. All dissections were recorded in video and pictures.

Duplex Ultrasound Investigations

Ultrasound imaging (still images and video) was performed over the entire dorsum of the hands in 14 healthy volunteers aged 25–72 years (28 hands). All of them had previously given a verbal informed consent in relation with the principles outlined in the Declaration of Helsinki. We used 2 different ultrasound machines (Toshiba Aplio XG Precision Imaging [Japan] and Hitachi Hi-Vision Preirus [Japan]) with high-definition 18-MHz probes. The ultrasonic reference was the tendons, which can be located through their fibers sliding when the fingers are moved.

Dissection allows analysis of the anatomy but often provides little information about the relationship between the various layers. Ultrasonography with the latest technology and high-definition probes are an ideal complement because they accurately show the thickness of the layers and their interconnections.

Results

Between the epidermis and the deep fascia covering the metacarpals and the interosseous muscles, both techniques reveal 3 layers, the dermis, a fascial plane, and the tendons.

On ultrasonographic images, the thickness of the dermis was measured from 0.2 to 0.9 mm, the
fascial plane from 0.3 to 2.2 mm, and the tendon layer from 0.7 to 1.7 mm, for a total thickness of all layers between 2.2 and 4.6 mm.

Because most of our dissected hands were from elderly subjects, the skin was so thin and transparent that it was possible to read printed text through it.

Even if there were tiny adhesions between its deep side and the tendons layer, the fascial plane was always very mobile over the tendons. On the contrary, the outer side of the fascias was tightly stuck onto the undersurface of the dermis. These adhesions between the dermis and the fascial plane were so tight (Fig. 1) that they had to be released using a scalpel; no natural plane of cleavage seemed to exist. They stuck the veins to the dermis and could support arterioles.

Except in 2 cases, even very careful dissections have always failed to separate the fascial layer in several sheets. Here too, no natural plane of cleavage seemed to exist. In ultrasonography, the fascial plane sometimes seemed to be divided in places, forming 2 perfectly distinct layers separated by less echogenic tissues. But more often, it looked like a single layer. Only video-recorded ultrasound dynamic analysis of the thickest fascias showed the key components of the fascial framework. A lot of tiny multidirectional fibrous septa partition the total thickness of the fascial layer, giving a 3-dimensional (3D) framework similar to the “walls” of a sponge around its tunnels (Fig. 2). This feature of multipartitioned superficial fascia is equal to the one already known, at least by many sonographers, in many parts of the body.

The outer global picture of the venous networks seemed to be single layered and covering the entire surface of the dorsum. In fact, although they were interconnected, the veins were located in different levels within the fascial layer (Fig. 3).

They could cross over in space and switch from one plane to another “using the tunnels of the sponge-like fascial framework.” The fascias and septa diverged or split to surround the veins and provide them with support. Veins and fascias were closely linked. These superficial venous networks were also connected to the veins of muscles via perforating veins which enter the deep fascia.

Several procedures of skin tenting were performed on both cadaveric hands during dissection and volunteer hands during ultrasounds imaging. All gave the same results. Because of the tight dermofascial adhesions, pulling on the skin pulled the entire fascial plane along with it. As a consequence, during tenting, the skin and the fascial plane were lifted together. And because of their interconnections with the multiple multidirectional fascial partitions and septa, the veins were dragged into the resultant dermofascial triangle.

The tendons layer was always a complete and well-organized lamina attached to the deep fascia covering the bones and muscles. Tendons were not isolated from each other but interconnected by a thin fibrous sheet, at least over the proximal two thirds of the dorsum. Some arteries and veins perforate the deep fascia and then this tendinous sheet to enter the fascia layer, mainly at the proximal end of the first and fourth intermetacarpal spaces.

Conclusions of the Anatomical Study: Scrape Skin Threading Technique

All these anatomical findings led us to a series of conclusions. The tendons layer and the space between tendons and deep fascia are certainly not a correct place for a volumizing filler:

- because too deep for changing reliably the outer dorsal appearance of the hand,
- because of the unknown longevity within such constantly mobile tissues,
- and because of the potentially harmful effects of products in current use in the tendon space.12

The ideal space should be the fascial layer. But at the time of a rejuvenation requiring volumizing fillers, the thickness of this plane is no more than 1 mm, due to the loss of fat tissue. The blind insertion of a needle or cannula in such a thin place leads to an unpredictable positioning of the injected product. And lifting the skin between 2 fingers (skin tenting) does not help, as it raises the entire fascial layer simultaneously without creating space for the product. To insert a needle is
certainly unsafe because of the vicinity of tendons and intrafascial veins. The best instrument for injecting safely a filler product into the back of the hand is therefore a soft-tipped blunt cannula.

Although it seemed to be virtual in anatomical dissections, the optimal place for injection is the interface between the dermis and the fascial layer. A round-tipped cannula can easily create a subdermal space for injection. The technique of very gentle and progressive retrograde threading injection without massage is selected to avoid a too far away and deep diffusion of product through the “tunnels” of the 3D sponge-like fascial framework. To find and follow the subdermal plane, the undersurface of the dermis has to be scraped with the cannula. We named this procedure “Scrape Skin Threading Technique” (SSTT) to emphasize the importance of scraping the undersurface of the skin when the cannula is being advanced.

Three major steps characterize the SSTT\(^\text{13}\):

1. **Marking out areas to be filled:** Subdermal injection changes the appearance of the hand quickly. It is therefore wise to mark out the areas in most need of filling before the procedure, that is, the triangles corresponding to all interosseous spaces. The spaces in contact with the bone on the medial edge of the fifth metacarpal and along the first metacarpal should not be forgotten. Positioning the cannula entry points at the tops of the triangles makes it easy to inject them in a fan-shaped configuration.

2. **Fig. 2. Illustration of the 3D sponge-like fascial framework on the dorsal side of hands.**

3. **Fig. 3. Ultrasonography of the dorsum of hands: power-Doppler imaging of the multileveled superficial dorsal venous network.**
Cannula insertion: To avoid friction in the to-and-fro movements, the entry points are made with a needle slightly larger than the cannula. The needle’s bevel should be facing down to guide the cannula in the right plane. The incision is crescent shaped. When the cannula is later inserted, it engages in the weakest part of the incision, that is, at the top of the convexity, in direct contact with the undersurface of the dermis.

Injection: The tip of the cannula is introduced through the entry point with the lateral hole pointed up, that is, toward the dermis. This orientation of the side hole further helps to keep injection of the product subdermal. The cannula is then pushed in with a small angle of its tip toward the dermis to scrape easily the undersurface of the dermis. The product is slowly injected as the cannula is retracted.

In this way, tracing injections are progressively carried out in a fan-shaped configuration from a single entry point, gradually covering the marked out space. The aim is to deposit enough product on each passage. A touch-up is always possible. However, it is important to avoid depositing too much product, which would necessitate corrective massaging. Product can always be added, but it can never be taken out. All the marked spaces can be filled in this way. This technique allows remodeling, “real sculpting,” of the hand by adding filler. Gentle massaging can be used to smooth over small local defects, but broad massaging to redistribute the product is contraindicated.

VALIDATION STUDY OF THE SCRAPE SKIN THREADING TECHNIQUE

Once this new specific technique for hand filling was tested and accurately designed on 3 cadaveric hands, we decided to check and validate its reliability in positioning the injected product, compared with others already published techniques.

Materials and Methods

Eight fresh cadaveric hands were obtained from the Body Donation Centre of Paris Descartes University. They were injected using different methods and then examined by magnetic resonance imaging (MRI) to locate the injected product prior to dissection.

Four different injection methods were studied: (1) one single bolus (1 mL injected using a 21-G needle) with no massage; (2) one single bolus (1 mL injected using a 21-G needle) followed by massaging to spread the product out; (3) blind retrograde threading injection of 0.8 mL into the subcutaneous plane, using a 27-G cannula (blind in the sense that the cannula was pushed into the subcutaneous layers without any particular wish to follow a well-defined plane, notably subdermal); and (4) strictly subdermal fine threading retrograde injection (SSTT) of 0.7-mL product using a 21-G cannula. In all boluses procedures, the tip of the needle was inserted in the center of the dermofascial triangle created by lifting the skin (skin tenting), taking care to remain as parallel as possible to the bone plane to minimize the risk of injecting into the tendon layer. The second and third methods are commonly used throughout the world for rejuvenation of the back of the hand. The only real difference between the third and fourth methods is the emphasis on scraping the underside of the skin in the to-and-fro cannula movements to ensure subdermal injection (SSTT). In both methods, cannulas were inserted through slightly larger holes made with a needle. The same fan configuration of injections was used starting at 2 different entry points.

Two hands were injected using each method with the same MRI data acquisition and analysis protocols used for each hand before and after the procedure to make an objective comparison possible. All the hands were then dissected plane by plane. The same product was injected in all cases, that is, calcium hydroxylapatite (CaHA) diluted 2-fold in colored normal saline. The purpose of diluting it was to make the product easy to inject gently and accurately, and the purpose of coloring it was to make it easy to follow in its spread through the tissues and its location in different layers during dissections. Injection methods were allocated as the hands came available, that is, randomly.

Results

One Single Bolus with No Massage.

The first injection was made on an unusually fat hand, due to both the fatness of the cadaver and probably localized premortem edema. The analysis of MRI images after injection showed that the entire product was above the tendon layer, inside the fascial plane as confirmed by the dissection. But such a hand would never be a candidate for augmentation. Nevertheless, this experiment confirmed that injection confined to the fascial plane is possible as long as the layer is thick enough to “accommodate” the product injected.

The second hand injected with a single bolus alone was more compatible with the demand for rejuvenation. MRI and dissection showed that the product was in contact with the deep fascia, between and below the tendons (Fig. 4).

One Single Bolus Followed by a Massage.

Examination of colored tissue through the skin showed that vigorous massage had not been
Injecting boluses into each intermetacarpal space would almost certainly be more effective than a single bolus. However, again in both hands, the product was found in contact with the deep fascia, between and below the tendons.

**Blind Retrograde Threading Injection.**

In both treated areas in both hands, the product was still found in and under the tendon layer.

**Strictly Subdermal Linear Retrograde Injection.**

On all the MRI images (both transverse and axial) of the 2 such injected hands, the product was only found above the tendon layer. Dissection showed that all the injected product stayed in contact with the dermis or in the fascial plane, without any leakage in the underlying space (Fig. 5).

**DISCUSSION**

Our anatomical findings and conclusions diverge from the ones by Bidic et al. We did not find a milfoil cake-like fascial system as they described, but a 3D sponge-like fascial framework as in many other parts of the body. The much higher quality of our imaging due to our high-definition ultrasounds probes is certainly a major explanation of such a divergence.

As already described, the main features of dorsal hand aging are a progressive loss of volume linked to fat atrophy; a skin laxity and dermal atrophy giving too much visible bones, tendons, and veins; and a superficial aspect of crumpled skin. The immediate idea is to use already known injection techniques, intradermal to improve the skin and/or deeper to correct the volume loss. Ultrasound investigations with high-definition probes were the most exciting and fruitful part of our research, as they gave us many key findings as the thickness of the layers and the multipartitions system inside the fascial plane. The 0.2- to 0.9-mm thickness of the dorsal skin must be compared with the 2.56 mm on the cheek or 2.25 mm on the alar of the nose. It seems impossible to reliably inject any filler intradermally. A better approach could be to voluntarily use the immediate subdermal space with SSTT or change for alternative methods such as percutaneous collagen induction or all “lights” devices.

It is surprising that in our time when all the techniques for the face tend to become more and more meticulous and scientifically controlled, the injection techniques in the hands remain as rough and blind. We have not found published investigations of the position of the injected product after bolus and massage or after blind threading. Physicians who insert a needle in the center of a skin tenting believe that they inject in the fascial layer. We showed they are wrong. The product is deeper around the tendons and during a blind threading as well. Because of the multilayered venous network (with 2 main levels) inside the
fascial plane, this area itself is not the safest one for a needle. A soft-tipped cannula is certainly a better tool in hands. Compared with a small caliber cannula, 23-G or 21-G cannula has thicker heads that readily slide against the dermis without snagging inside it. Experience of teaching the technique has consistently shown that the stiffer the cannula, the easier it is to advance it in contact with the skin. However, such a large lumen means learning how to control injection pressure for regular product deposition, particularly since a relatively fluid filler product seems the best as it precludes the need for strong pressure. The underface of the dermis appears to be the optimal location whatever the filler (Figs. 6 and 7).

Already in 2004, Coleman18 stated in his technical book on surgical fat grafting that “the key to structural fat grafting of the dorsum of the hand is purposeful placement of a smooth layer of tissue against the undersurface of the dermis.” The majority of physicians treating aging hands certainly failed to take this guideline into account. We are glad that our purely anatomical approach comes to the same conclusive statement for injecting a synthetic filler.

**CONCLUSIONS**

The SSTT, a strictly subdermal linear retrograde injection, became our preferred treatment approach. It is simple and reliable because it is always easy to follow the undersurface of the dermis with a soft-tipped cannula. It is safe because the cannula is kept far away from the veins and the injected product remains distant from the tendons. Because of the extreme thinness of the dermis and the fascial layer at the time of a request for hand rejuvenation, it appears as the optimal technique for correcting both skin textural changes and subdermal volume depletion.

Nevertheless even if the technique refer to a solid anatomical basis, it must be confirmed by studies of clinical outcomes on patients using systematic high-definition ultrasounds controls, easier to manage, and probably more reliable than MRI.

**REGIONAL APPROACHES**

Amir Moradi, MD; Vista, Calif.

Radiesse is made of CaHA particles suspended in a gel. Approved for facial injections since 2006, physicians have been using Radiesse off-label to correct volume loss in the hands. In February 2015, an FDA Advisory Panel voted favorably to expand the indication to include hand augmentation.

Radiesse is a safe and effective product when injected in the subcutaneous layer of the dorsum of the hand.

The technique demonstrated in this video slightly differs from the protocol used in the FDA Clinical Radiesse Hand Studies and illustrates the author’s technique in his practice.

Thorough knowledge of the anatomy and function of the hand is essential with this procedure. One needs to be aware of the neurovascular location, but also different layers and compartments that exist within the hand (Fig. 8).

Evaluation of the hand includes the visibility of the veins, tendons, and loss of fatty tissue. Although the process of aging includes changes in all structures of the hand, including muscles, tendons, and bone, the injection mainly corrects the loss of tissue and fat in the subcutaneous layer (Fig. 9).
The patient is informed about the common risks and common adverse events associated with this procedure.

Prior to the injection, 0.26 cc of 2% lidocaine HCl will be added to 1.5 cc of Radiesse with 10 mixing strokes using the Radiesse accessory kit.

The patient is instructed to wash both hands with soapy water, and just prior to the injection, both hands are prepped with antiseptic solution such as chlorhexidine. Each hand needs to be evaluated prior to injection to plan the sites of volumization that would give the best aesthetic outcome. The area that can safely be treated is defined proximally by the wrist-hand junction, distally the metacarpal-phalangeal joint, between the 1st and 5th metacarpals (Fig. 10). Using skin tenting, small boluses of 0.2–0.5 cc should be injected in the dorsum of the hand between the subcutaneous and superficial fascia (Fig. 11). In the accompanying video, the author at times uses even smaller volumes to fine tune the effect, which is smaller than the range of volumes used in the FDA clinical trials. After each individual injection, the site should be massaged thoroughly, and ice can be dispensed as necessary. The author recommends focusing the injections in areas that would give the best overall improvement by softening the transitions around the veins and the tendons of the hand. The use of small volumes (0.1–0.2 cc) may improve the aesthetic results through strategic injections and decrease the chance of irregularities based on small volumes. This is based on the author’s hypothesis that large boluses may lead to graduated radial distribution with the larger molecules of CaHA near the center of injection point and the smaller particles including the carrier gel distributed farther radially when massaged. Although during the massaging process we see the filler easily spread radially, this could be a false indication of correction as much of that result could be the glycerin and sodium carboxymethylcellulose. The aesthetic endpoint is to correct the volume deficit and minimize the appearance of veins and tendons. Generally, a 1- to 2-point improvement on the Merz Hand Scale is desired. Although the video demonstrates 3 cc of Radiesse used per hand, smaller volumes can be used as necessary (see Video, Supplemental Digital Content 1, which demonstrates Dr. Moradi’s personal technique using Radiesse for hand volumization, available in the “Related Videos” section of

Fig. 8. Hand cross-section: area of procedure. Illustration depicting a cross-section of the hand.

Fig. 9. A 47-year-old white woman; Fitzpatrick type IV (before and after).
In our experience, there is a significant improvement in the appearance of the hands. The accompanying photographs demonstrate the results at different time frames post injection in different subjects, and some of the subjects retained visible results that lasted beyond 1 year (Figs. 12 through 16).

In our experience, the most common adverse events include edema, erythema, tenderness, and bruising. The patients need to be informed about the possibility of delayed onset swelling and reassured that it will also resolve without intervention.

Mariano Busso, MD; Coconut Grove, Fla.

There has been an increased interest in hand augmentation over the past years.19–28 After the face and neck, hands are the most visible area of skin, with a surface area similar to that of the face. In fact, a person’s age can be estimated by looking at the hands alone.29 Potential patients become interested in hand rejuvenation when there is a discrepancy between the appearance of facial age and hand age. In general, volume replacement of the hands occurs in an older population.30

Youthful hands have fullness and a lack of visible veins and wrinkles. Volume disguises underlying structures (eg, veins, extensor tendons, and bones) and makes the skin tighter. Veins in older hands often appear or are, in fact, dilated because the emptying of dorsal veins during finger flexion decreases with aging. Like in the face, chronological hand aging is a 3D process, but in contrast with the face, gravity does not play an important role in hand aging. Hand wrinkles are a tissue reservoir of motion and not the consequence of gesturing. Other factors that influence volumetric changes of the hands are
rheumatologic diseases, hand injuries, weight changes, and hand dominance.

Although the benefits of fat transfer for hand revolumization have been documented, pre-packaged, ready-to-use fillers provide a cost-effective alternative, particularly for those patients who do not tolerate significant down time. By contrast, fat grafting requires about 10 mL to produce a slight improvement, whereas 20 mL is necessary for significant improvement, and the latter can be associated with edema that lasts 4 months. This article describes a technique to use dermal fillers for hand voluminization.

**Quantification of Volume Loss**

A visual grading scale was developed by Busso to measure volume loss on the dorsum of the hands. This validated scale is based on the extent to which the 3 central tendons are visible, which is proportional to the degree of dorsal hand volume loss. This is a 5-point scale, where 0 denotes no tendon seen and 4 indicates that all 3 central tendons are seen in their full length (Table 1).
Bidic et al. reexamined fat compartmentalization as well as intracompartment and traversing structures of the dorsum of the hand. Using histologic analysis, duplex ultrasound imaging, and lead oxide evaluation of adhesions, they found that there are 3 fatty layers (dorsal superficial, intermediate, and deep laminae) separated by 3 fascial layers (dorsal superficial, intermediate, and deep fasciae) (Fig. 17).

The dorsal superficial lamina is found between the dermis and dorsal superficial fascia; this is the target plane for filler injections. Perpendicular to this lamina, there are 8–12 vessel-containing septa that insert into the dermis. It seems that these vessels traverse through septa from volar deep arch
to dorsal to supply the subdermal plexus. Using blunt cannulae or bolus injections followed by massage decreases the chance of dissecting these septa and of bruising. These septa can also influence the direction of filler spreading.

The dorsal intermediate lamina is situated between the dorsal superficial and intermediate fascial layers. This compartment contains visible veins.

The dorsal deep lamina contains the extensor tendons. The fascial floor of this lamina, the dorsal deep fascia, also covers the dorsal interosseous muscles and metacarpal bones.

**Injection Technique**

**Video, Supplemental Digital Content 2,** demonstrates Dr. Busso’s personal technique using dermal filler for hand volumization. This video is available in the “Related Videos” section of the full-text article on PRSJournal.com or, for Ovid users, at [http://links.lww.com/PRS/B437](http://links.lww.com/PRS/B437).

**Filler Selection**

Although CaHA (Radiesse; Merz North America, Raleigh, N.C.) has proven to be an effective volumizing stimulatory filler, limiting factors have included swelling and lack of reversibility. Hyaluronic acid (HA) derivatives, especially small-gel-particle (SGP)-HA (eg, Restylane; Galderma S.A., Lausanne, Switzerland), provide an effective and safe alternative. A range of 1–4 mL of CaHA or HA per hand is required to decrease tendon visibility in the area bound proximally by the wrist.

**Table 1. Busso Hand Volume Severity Scale***

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>None of the 3 central tendons is exposed</td>
</tr>
<tr>
<td>1</td>
<td>1 or 2 of the 3 central tendons are partially exposed</td>
</tr>
<tr>
<td>2</td>
<td>All of the 3 central tendons are partially exposed</td>
</tr>
<tr>
<td>3</td>
<td>1 or 2 of the 3 central tendons are fully exposed</td>
</tr>
<tr>
<td>4</td>
<td>All 3 central tendons are fully exposed</td>
</tr>
</tbody>
</table>

*All ratings are made with hand at rest.

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**Fig. 16.** Illustrates the needle in the subcutaneous plain where CaHA is injected.

**Fig. 17.** Anatomy of the hand. Adapted from Bidic et al. Reproduced with permission from Bidic SM, Hatef AD, Rohrich RJ. Dorsal hand anatomy relevant to volumetric rejuvenation. *Plast Reconstr Surg.* 2010;126:163–168. Figure 7 from this article. Illustration demonstrating the different fascial layers and fatty laminae, with injection cannula placed within the dorsal superficial lamina.
crease, distally by the metacarpophalangeal joints, and laterally by the second and fifth metacarpal.

**Patient Positioning**
Place the patient in the supine position because there is more control of the venous return from the hand. The hand to be injected should be below the level of the heart to increase vein visibility. Although the dorsal vein vasculature is the prominent marker, identify and mark entry points and plan needle depths. Next, elevate the hand above the level of the heart to collapse veins and decrease chances for bruising.

**Accentuating Target Space through Skin Tenting**
The combined thickness of the dorsum, epidermis, dermis, and subcutaneous is 1–2 mm in most patients. Instead of aiming at the dermal/subdermal space, it is easier to inject into the dorsal superficial lamina. This plane allows better filler distribution and decreases papule formation. Skin tenting magnifies this distensible injection space, which is the areolar fatty plane between the dermis and the superficial dorsal fascia. Skin tenting also provides more separation between the sharp tip of the needle and the veins and tendons that are located at the base of the tent. Avoid intracompartmental injections, below the deep dorsal fascia, as doing so can cause vascular or nerve injury.

**Filler Injection and Massage**
Two main techniques have been used to distribute fillers in the dorsum of the hand: tunneling and bolus injection. In tunneling, the filler is distributed in a weaving pattern, using a blunt cannula. Tunneling is more traumatic to the injection area than bolus injection, but tunneling increases surface exposure to the surrounding tissue. Bolus injections are less traumatic and appropriate for prepackaged fillers. If a single bolus is desired, deliver the full content of the syringe perpendicular to the 3 dorsal tendons using a blunt cannula. Otherwise, split the content of 1 syringe into 4 boluses not too far apart so that a continuous implant can still be achieved, making the filler easier to massage. Figure 18 depicts the techniques described in this section for hand placement, filler injection, and massage.

Although there is abundant literature supporting the use of blunt microcannulas for hand augmentation, the author favors this bolus/massage technique using sharp needles. Microcannulas still require entry points obtained with a higher gauge needle; therefore, the number of entry points can be the same as those requires with regular sharp needles, and advancing a blunt cannula can still dissect septa found in the dorsal superficial lamina.

If fingers require augmentation, inject only in between metacarpophalangeal and proximal interphalangeal joints. Injecting over joints will result in making them more prominent. After injection, perform a blending massage with the hand in hyperflexion until the filler is evenly distributed.

**Postprocedure Instructions**
A few strategies seem to decrease swelling: advise patients to keep hands above the level of the heart and make a fist 5–10 times per hour and maintain a low-salt diet for 2 days. If CaHA mixed with lidocaine is used, further measures such as a compression garment or tape can be added.

**Aesthetic Endpoint**
When a single bolus of CaHA (1.60 mL; range, 0.40–3.30 mL) was injected in the dorsum of the hand, 76% of patients were satisfied with their results at 6 months. Similar results were observed with a SGP-HA derivative with 50% of patients being satisfied at 12 months. Figure 19 shows before and after results with injection of SGP-HA derivative filler.

**Adverse Events**
Adverse reactions are transient and limited to bruising, swelling, pain, redness, and itching. Swelling has been reported to be more prominent when using CaHA mixed with lidocaine. Swelling can start immediately postinjection or within 30 days post injection and can last up to 30 days. Limiting the volume of filler injected per session to 1 mL per hand of SGP-HA or 1.5 mL of CaHA for both hands significantly decreases the incidence of postprocedure swelling. Management of swelling includes...
hand elevation above the level of the heart, compression, and diuretics (eg, triamterene 37.5 mg/hydrochlorothiazide 25 mg [Dyazide; GlaxoSmithKline, Research Triangle Park, N.C.]).

Allison B. Sutton, MD, and Vivian W. Bucay, MD; San Antonio, Tex.

An aged appearance to the hands is a result of both intrinsic aging and extrinsic forces, especially ultraviolet light exposure. Age-related changes in the dorsal hands are characterized by lentigines, actinic keratosis, rhytids, skin laxity, atrophy of the dermis and subcutaneous fat, prominence of bones and tendons, large intermetacarpal spaces, and bulging veins.

After the face, the hands are the most conspicuous part of the human body.28 With facial rejuvenation procedures so commonplace, people have begun to notice the discrepancy between the hands and the face thus driving requests for
treatment of the hands to maintain harmony with a youthful facial appearance.

There are several approaches to address changes of the aging hands. Options to improve textural and pigmentary changes include chemical peels, photodynamic therapy, intense pulsed light, pigment-specific lasers, and fractional lasers.

Volume loss in the hands is manifested as an increased visibility of underlying bones, tendons, and veins. Volume restoration can be accomplished with several injectable agents, including HA, CaHA, poly-l-lactic acid, and autologous fat. The ideal filler for the hands should be moldable, long-lasting, and durable to withstand repeated movements and pressure associated with daily activities, all the while maintaining normal function of the hands.

**Volume Restoration**

Whereas all of the previously mentioned fillers are options for volume restoration of the dorsal hands, we have found that the use of injectable HA in this area to be limited by longevity and the Tyndall effect, which creates a bluish and unnatural appearance. Although poly-l-lactic acid has a longer duration of action, there exists the insignificant risk of nodule formation with its use in the dorsal hands. Autologous fat transfer is complicated by the need to harvest the fat from another site and the variability in the viability of the transplanted fat.

In our practices, we prefer to use CaHA (Radiesse; Merz North America) as our agent of choice in dorsal hand rejuvenation. It is long lasting, is easy to inject and mold, and does not produce a Tyndall effect. In addition, it has had FDA approval in Canada for hand rejuvenation since 2010 and has gained US FDA approval for this indication earlier this year. CaHA is in reality a combination filler, possessing both biostimulatory properties and immediate space filling effects. In addition, because of its white color, CaHA acts as a camouflage, helping to hide structures such as prominent veins that contribute to the aged appearance of the hands.

**Anatomy**

The relevant anatomy in the dorsal hands has been beautifully elucidated by Rohrich and co-workers. They have elegantly shown that 3 fatty layers exist in the dorsal hand. Beneath the dermis lies the dorsal superficial lamina, a layer devoid of nerves and vessels. The dorsal superficial fascia separates this layer from the dorsal intermediate lamina, where the dorsal veins and sensory nerves exist. Beneath this layer is the dorsal deep lamina, where the extensor tendons are found.

These layers are separated by the dorsal intermediate fascia. The dorsal deep fascia is the inferiormost structure and is contiguous with periosteum (Fig. 17).

**How We Do It**

We use a maximum of one 1.5-mL syringe of CaHA per hand. To each syringe, 0.5 mL of 1% lidocaine without epinephrine and 1.0 mL of bacteriostatic 0.9% sodium chloride are added. This is mixed at least 10 times via a female-to-female Luerlock connector (Baxter, Englewood, Colo.) until the product is homogeneous in consistency, yielding a total of 3 mL of filler per hand (see Video, Supplemental Digital Content 3, which demonstrates Dr. Bucay and Dr. Sutton’s personal technique to hand volumization, available in the “Related Videos” section of the full-text article on PRSJournal.com or, for Ovid users, available at http://links.lww.com/PRS/B438).

The dorsal hand is photographed in repose (Fig. 20). If requested by the patient, the area is covered in topical anesthetic for 20–30 minutes. After this time, the topical anesthetic is removed and the area cleansed with chlorhexidine and alcohol. The area to be treated is bound by the second metacarpal medially, the fifth metacarpal laterally, the metacarpophalangeal joints distally, and the wrist proximally. We prefer the use of blunt-tipped cannulas on the hand. We create the first insertion point in the webspace between the second and third metacarpal. A small wheal of 1% lidocaine is placed in an intradermal location, and a 25-G needle is used to create a portal of entry within the lidocaine bleb. A 25-G 50-mm blunt-tipped DermaSculpt cannula (Cosmo-France, Miami, Fla.) is then inserted through this port while the skin is tented upward. This allows...
easy entry of the cannula into the dorsal superficial lamina, a safe plane to inject fillers (Fig. 21). A depot of CaHA is deposited in this location in a retrograde fashion. It is then massaged for even distribution. A second portal of entry is made in a similar fashion at the fourth webspace, and the procedure is repeated. If there are additional sites of volume loss, additional entry points may be used (Figs. 22 through 24).

After the product has been placed, the area is vigorously massaged to disperse the product uniformly over the entire dorsal hand and to ensure no nodules are present. We have found that the use of ultrasound gel is very helpful during the massage. The area is cleansed once again with chlorhexidine. Ice packs are applied to minimize edema. A simple trick to keeping the treated hand iced is to place the hand in a glove and to slide in either frozen gauze or an iced gel pack between the glove and the hand (Fig. 24). Patients are asked to elevate their hands as much as possible during the first 24 hours and are discouraged from doing strenuous tasks in the first week. We also recommend that the hands be elevated using 1 or 2 pillows during sleep. We find correction in this area to last between 12 and 24 months.38

The most common adverse events with this procedure are erythema, pruritus, ecchymoses, and edema. Postprocedure edema can be dramatic...
and last up to 2 weeks or longer.\textsuperscript{38,39,41} The use of judicious ice, hand elevation, massage, carpal tunnel gloves, and avoiding strenuous tasks can all be helpful adjuncts in decreasing swelling.

**CONCLUSIONS**

Addressing aging changes in the dorsal hands is important in maintaining an overall youthful appearance. We have had good success with the use of CaHA and blunt-tipped cannulas for addressing volume loss of the hands and have found it to be a safe and effective procedure that results in high patient satisfaction.

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