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anesthetized with 1% lidocaine with epinephrine, and stab incisions can be made with a No. 15 blade. Tumescent anesthesia consisting of 0.2% tumescent anesthesia solution with 1:500,000 epinephrine should be injected through these incision sites into the donor site. The tumescent solution is administered with a 2-mm infiltrating cannula and a 20-mL syringe in a fanning technique.

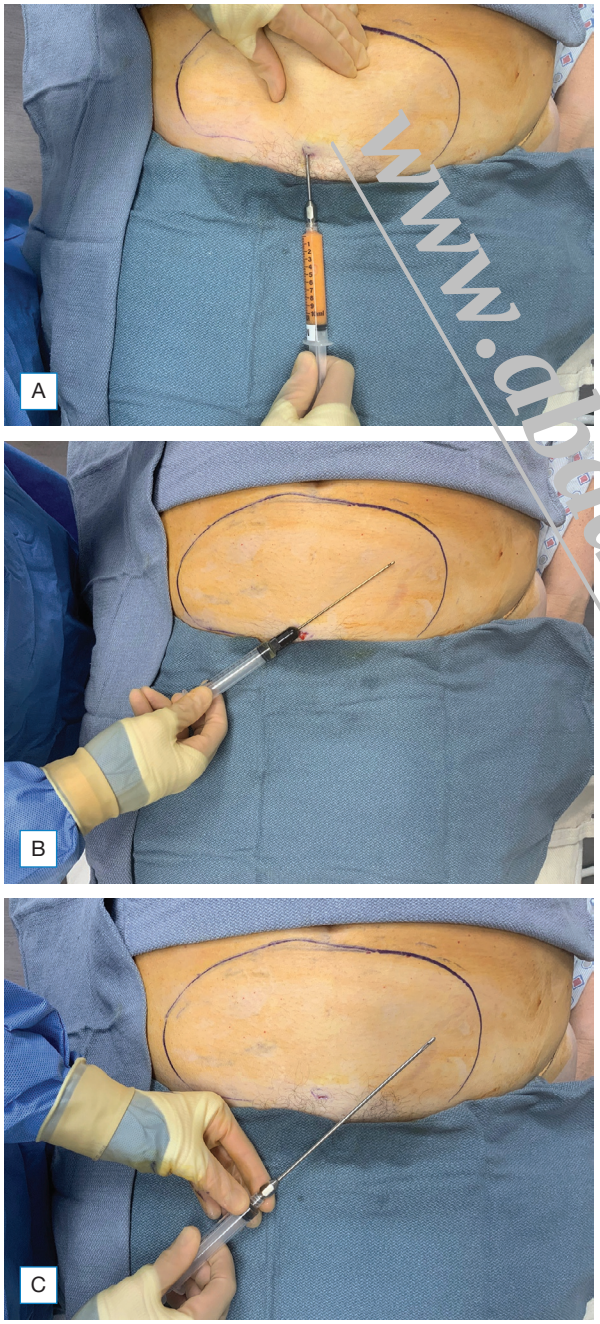

Fig. 12.2 Photographs (A, B, and C) of fat harvesting procedure.

A 10-ml syringe is used for the fat harvesting. Prior to harvesting the fat, 1 mL of 25% albumin (Baxter Pharmaceuticals, Deerfield, IL) should be placed in the syringes to concentrate the fat and restore oncotic pressure. The nanofat should be harvested using a 14-g Carraway Harvester Cannula (Tulip Medical Products, San Diego, CA) (Fig. 12.2B). To harvest the microfat and macrofat grafts, a Byron accelerator cannula (Mentor, Irvine, CA) is used (Fig. 12.2C). Manual suction with 1 to 2 mL suction (< 6 mm Hg) should be used so as to avoid damage to the grafts. Using a gentle, fanning motion, the fat should be gradually collected in the syringes. The filled syringes are inverted and left to decant while the other syringes are filled. Infranatant fluid is expelled and the syringes are topped off again with fat. The incision sites are left open to drain and to heal by secondary intent.

PREPARATION OF GRAFTS

Harvested fat should be centrifuged using a closed system or sterile rotors at no higher than 3000 RPM for about 30 to 60 seconds (Fig. 12.3). This allows for

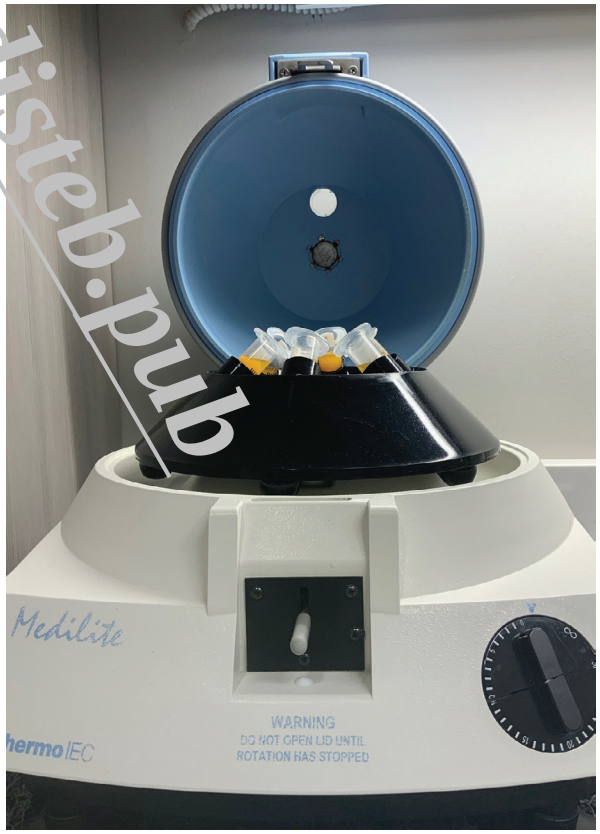

Fig. 12.3 Fat centrifuge.

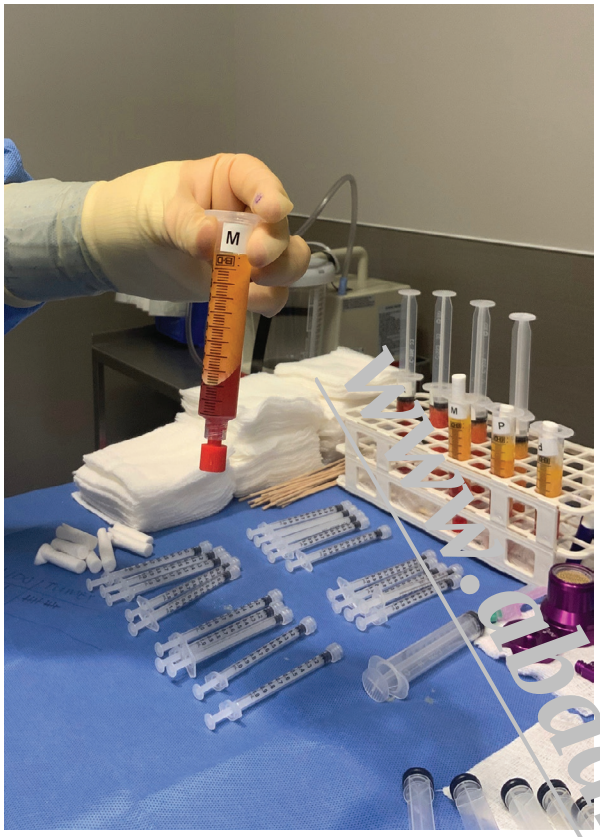

Fig. 12.4 Separation of fat after centrifuge.

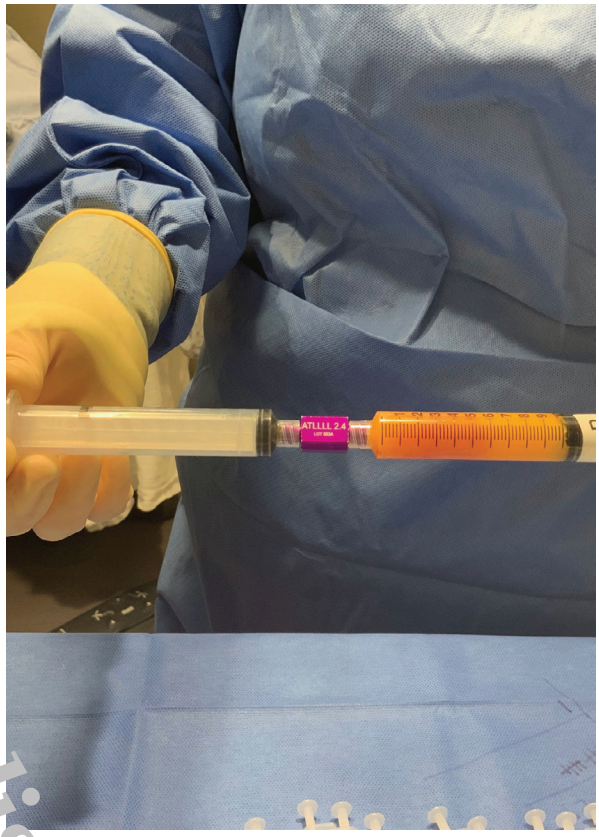

Fig. 12.5 Mechanical processing of nanofat for isolation of adipocyte derived mesenchymal stem cells.

adequate separation of purified fat, concentrated growth factors, and adipose-derived stem cells beneficial to graft retention, while preventing overconcentration and rupture of fat cells. The supernatant is made up of ruptured fat cells and oil and should be wicked from the syringe (Fig. 12.4) using a sterile telfa pad strip or sterile dental rolls. The central part of the centrifuged product is made up of viable adipocytes, stem cells, and growth factors, which will become the fat graft. The infranatant is made up of fluid and can be easily drained from the bottom of the syringe.

Nanofat—Tissue Stromal Vascular Fraction

Nanofat is also referred to as "tissue SVF" (tSVF) in different scientific articles. It implies a mixture of adipocyte-derived stem cells and extracellular matrix cells. To create the nanofat, the fat that was harvested through the Tulip cannula should be micronized and emulsified further. Mechanical processing of nanofat for isolation of adipocyte derived mesenchymal stem cells (AD-MSCs) is performed using the Tulip nanofat system (Tulip Medical Products). First, the fat is passed back and forth through a 2.4-mm luer lock for a total of 20 to 30 passes, followed by a 1.2-mm luer lock for another 20 to 30 passes (Fig. 12.5). The fat will then be pushed through an autologous cellular matrix (ACM) device to filter out the stroma and mature adipocytes while allowing the stem cells to pass through. The micronized fat is pushed through the ACM filter and collected in a syringe with the patient's platelet-rich plasma (PRP). The nanofat will be used in areas of thinner skin to enhance the texture of the skin. Nanofat is not used to volumize an area.

Approximately 1 mL of nanofat or SVF will be added to 9 mL of regular and microfat grafts for stem cell enhancement. Once the fat grafts have been prepared, they should be transferred to 1-mL syringes for injection (Fig. 12.6).

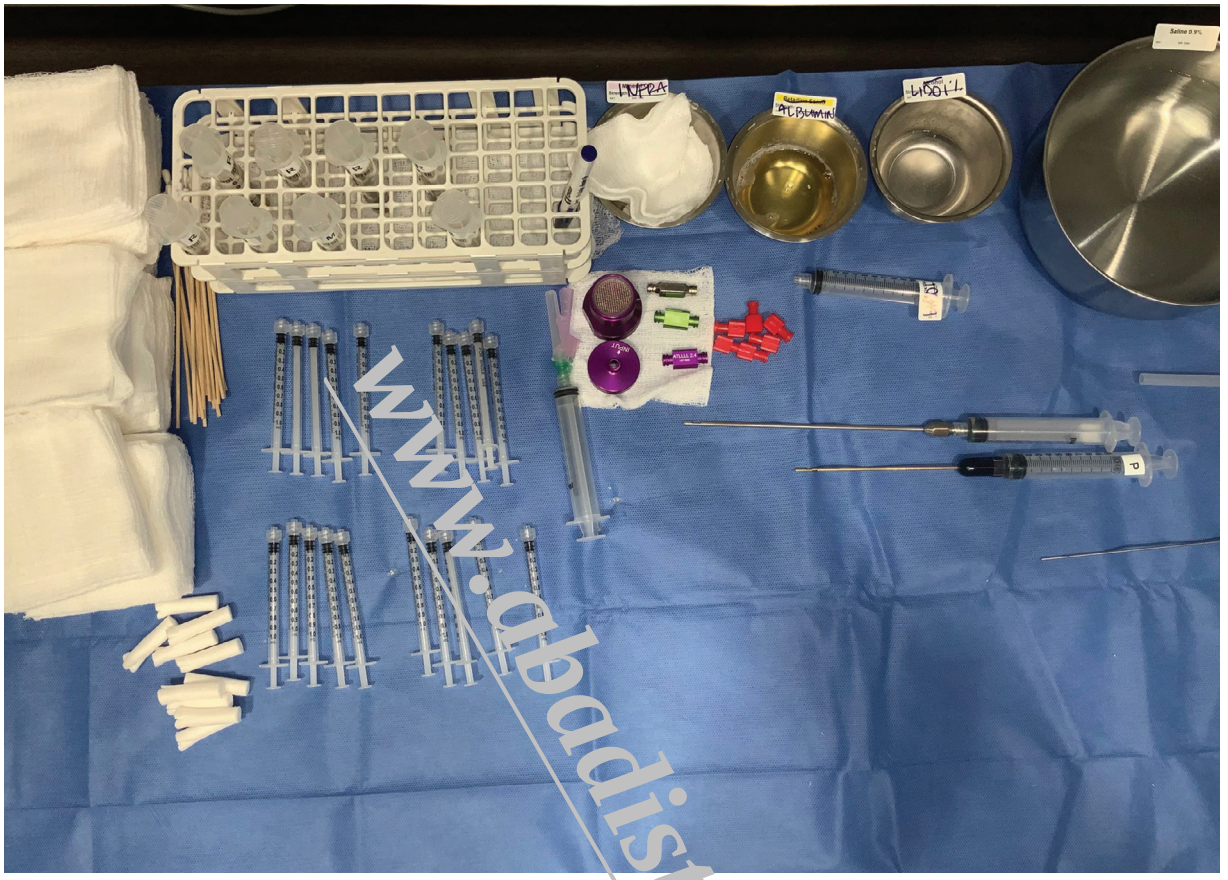

Fig. 12.6 Sterile setup for fat transfer.

GRAFT PLACEMENT

The face should be cleansed thoroughly with 70% alcohol, and preoperative markings should be made to delineate the facial fat compartments designated for revolumization (Fig. 12.7A,B). Upright positioning of the patient during preoperative marking is critical as asymmetry, laxity, and hollowing change with positioning. The markings should be reviewed with the patient prior to the start of the procedure.

Surgical incision points are drawn to accommodate as few access points as possible while still allowing reach and mobility for accurate fat graft placement. This usually involves access points at the midbrow, lateral zygoma, lateral nasolabial fold, and the gonial angle bilaterally (Fig. 12.8). Nerve blocks of the supraorbital, supratrochlear, infraorbital, zygomaticofacial, and mental nerves should be placed with 1% lidocaine with epinephrine according to the desired treatment areas. Proper nerve block placements allow for less tumescent anesthesia to be used to achieve comfort.

Tumescent anesthesia is then injected via a 20-mL syringe connected to a 25-gauge spinal needle to infiltrate the areas of the face not reached by the nerve blocks (Fig. 12.9). Typical volumes of tumescent anesthesia are 15 to 30 mL of 0.2% lidocaine with epinephrine 1:500,000 for the total face.

A 16-gauge No-Kor needle (Becton Dickinson, Franklin Lakes, NJ) is then used to make stab incisions at designated access points (Fig. 12.10). After priming the Coleman II cannula (Mentor, Irvine, CA) (Fig. 12.11) for fat graft placement, care must be taken to ensure that the open port is directed toward the deep tissue. When switching between nanofat and microfat, the cannula should be flushed with normal saline and reprimed.

Fig. 12.7 Preoperative markings to delineate the facial fat compartments designated for revolumization.

Fat is injected using 1-mL syringes to avoid large boluses of fat from being injected into tissue. The goal is to deposit aliquots about 0.05 mL in size into various anatomic levels (Box 12.1). This allows the fat to imbibe nutrients from the surrounding tissue until it establishes a vascular supply. Larger aliquots of fat may result in the outer portion of the graft surviving and the central portion becoming necrotic, giving rise to fat cysts. The palm of the injecting hand should be used to provide gentle pressure on the plunger of the syringe so as to inject tiny aliquots of fat. This gives the surgeon greater control than if using one's thumb to push on the plunger.

All fat grafting incision points are sutured with a single, 5-0 fast absorbing gut suture. The incisions are sutured to minimize the risk of infection and to help ensure that the incisions heal in an inconspicuous manner.

Brows

Nanofat (0.5–1 mL) can be placed in the subdermal plane along the eyebrow and orbital rim through an access point at the mid brow (Fig. 12.12A,B). This superficially placed nanofat is used to enhance skin texture and quality and should be injected in a linear threading technique. With microfat, a small amount (1–2 mL) can be added to the fat pad of the superior brow. A small amount of microfat can also be placed under the brow along the periosteum for added lift. This can also be performed in a linear threading manner.

Temples

Temples can be accessed from the lateral zygoma or along the hairline above the zygomatic arch. This allows access to both the temporal fossa as well as to the lower orbital rim. Approximately 2 to 3 mL of microfat is deposited in the subcutaneous tissue using a zigzag placement to avoid linear strands of fat that may become visible. Placement of fat deep to the temporalis muscle is not recommended as the fat may bulge and become apparent during mastication.

Fig. 12.10 A 16-gauge No-Kor needle (Becton Dickinson, Franklin Lakes, NJ) is then used to make stab incisions at designated access points.

taken to avoid placing too much fat superficially as this can give rise to surface irregularities that can be disfiguring.

Lips

Through the use of an access point just lateral to the oral commissure, the cannula can then be rotated to an upward or downward angle to address both the upper and lower cutaneous lip (Fig. 12.15). The texture and tone of the perioral rhytids can be addressed with the placement of nanofat along the superficial cutaneous lip. Typically, 1 mL of nanofat is placed subdermally in each quadrant around the mouth.

Microfat or macrofat can then be added at a mucosal depth through the same access point at the lateral oral commissure to improve lip volume. Fat should be placed in tiny aliquots with linear threading. Placement of microfat should extend subdermally beyond the vermillion border to provide a smooth transition and further address perioral rhytids. Typically, 1 mL of microfat is placed per quadrant, for a total of 4 mL.

Melolabial Folds

To address the melolabial folds, macrofat can be injected from the lateral zygoma into the subdermal plane using a subcision-like technique. This allows small aliquots of fat to be placed just medial and just under the melolabial fold in a superficial plane. By performing the subcision and placing the fat superficially, one can achieve better effacement of the melolabial fold. The goal is to soften the fold and not to overfill the area. Typically, 1 mL of fat per side is used.

Chin and Melomental Folds

The melomental folds are filled in several planes. At the mandibular border, the fat is placed along the periosteum, intramuscularly, and subdermally. As filling proceeds more cephalad, toward the oral commissures, the fat is placed subdermally as there is no periosteum in this area. This area usually requires 2 to 4 mL per side.

Macrofat can be injected subdermally and at the periosteum to enhance the volume and projection of the chin. Through an entry point along the mandibular border anterior to the mandibular ligament, the lateral zygoma (Fig. 12.16), or through the gonial angle, macrofat can then be injected along the periosteum with a fanning approach to revolumize the medial chin. This area typically requires 3 to 4 mL of macrofat.

Mandible

With aging, the mandible loses both height and width, thus making neck laxity more pronounced. Macrofat can be added through the gonial angle with linear threading to enhance the jawline and address the upward jawline regression observed with aging. Because the skin in this area is thicker, grafts can be placed in a linear fashion. Grafts can be added in multiple planes, including subdermal, intramuscular, and periosteal. The goal of fat grafting in this area is to improve the jawline definition and to lengthen the face. Thus, fat is placed both cephalad and caudad to the mandibular border, allowing for elongation of the face (Fig. 12.17A,B).

Demonstration of facial fat transfer - Video 12.1.

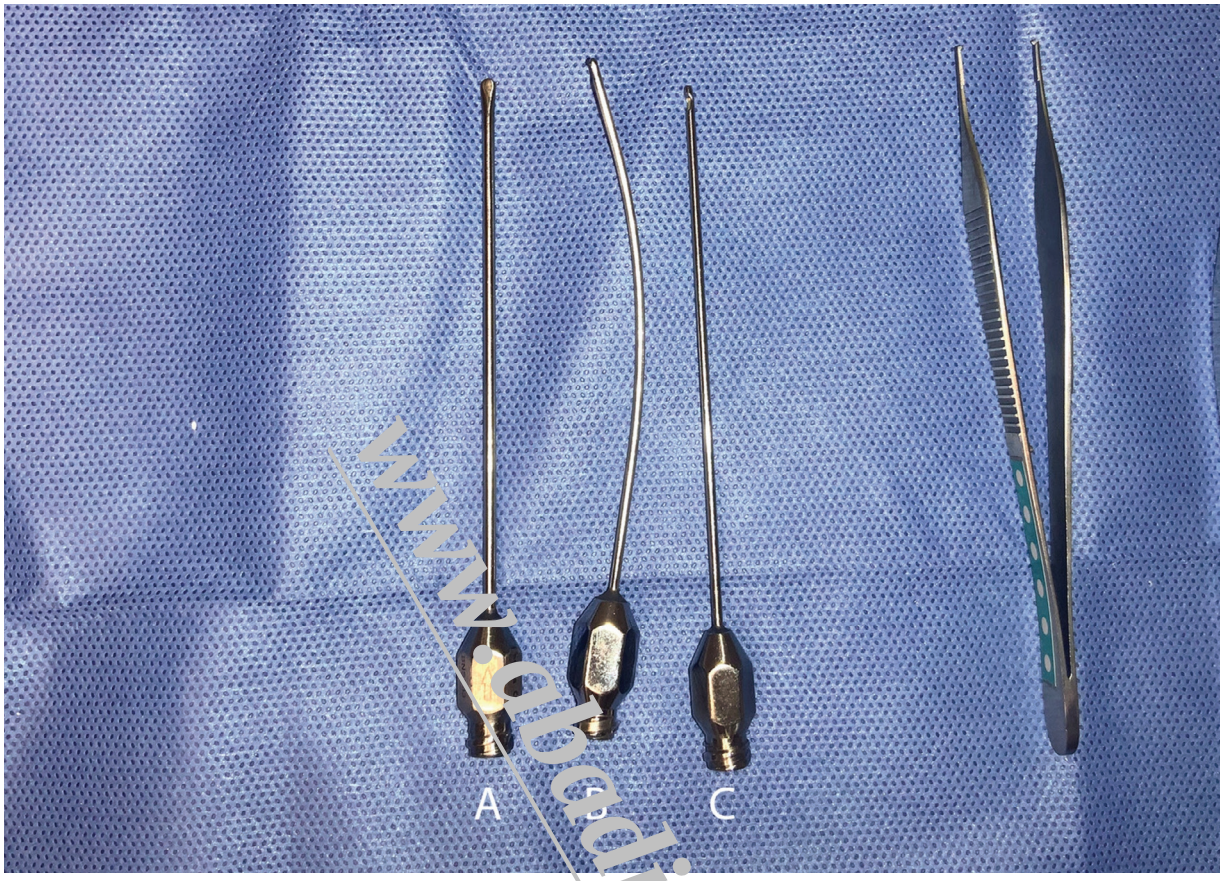

Fig. 12.11 Various micro-fat and nanofat cannulas used for fat transfer.

BOX 12.1 Depth of Fat Graft Placement by Anatomic Location

Anatomic Region	Nanofat	Microfat	Macrofat
Brows[a]	Subdermal plane along eyebrow and orbital rim	Fat pad of the superior brow, periosteum beneath brow	
Temples[a]		Subcutaneous plane	
Orbital rim and tear trough[a]	Subdermal plane along eyebrow and orbital rim	Supraperiosteum	
Zygoma and malar cheeks		Supraperiosteum with small linear aliquots, muscular plane, subcutaneous plane	
Lips	Subdermal along the superficial cutaneous lips	Mucosal with small linear aliquots, Subdermal beyond the vermillion border	Mucosal
Melolabial folds			Subdermal with subcision technique
Chin and melomental folds		Periosteal, intramuscular, and subdermal along mandible, then subdermal along the melomental folds	Subdermal and periosteal at the projection of the chin, Periosteal along the medial chin with a fanning technique
Mandible	Subdermal	Subdermal, intramuscular, and periosteal with linear technique	Subdermal, intramuscular, and periosteal with linear technique

[a]Areas that require a zigzag pattern or nonlinear injection technique to avoid formation of visible fat "rolls."

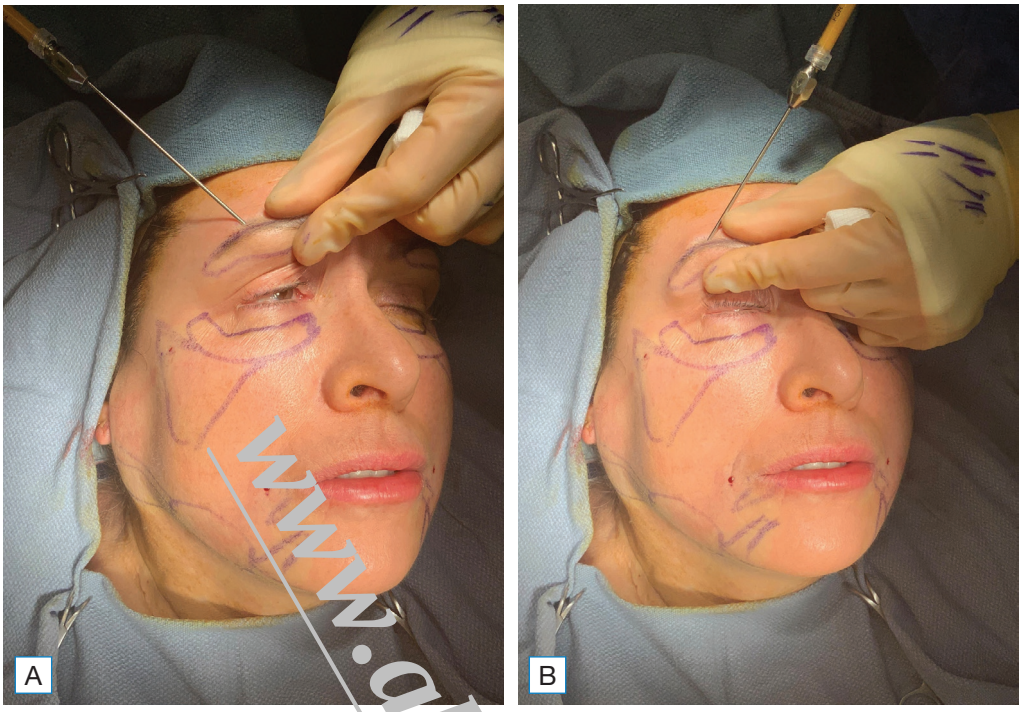

Fig. 12.12 Nanofat (0.5–1 mL) can be placed in the subdermal plane along the eyebrow and orbital rim through an access point at the mid brow.

Fig. 12.13 Through the lateral orbital rim or mid malar region, nanofat can be injected subdermally to enhance skin quality using nonlinear pattern of placement.

Fig. 12.14 Via entry through the lateral zygoma, the cannula can used to place macrofat in small linear aliquots along the periosteum.

Fig. 12.15 Through the use of an access point just lateral t… the oral commissure, the cannula can then be rotated to an up- …ward or downward angle to address both the upper and lower … cutaneous lip.

…g. 12.16 Through an entry point along the mandibular border …terior to the mandibular ligament, the lateral zygoma, or through …gonial angle, macrofat can then be injected along the perios- …tum with a fanning approach to revolumize the medial chin.

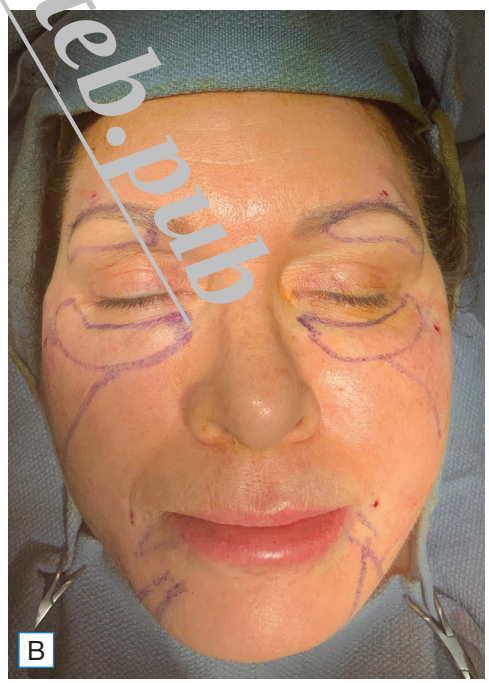

Fig. 12.17 Fat is placed both cephalad and caudad to the mandibular border, allowing for elongation of the face.