



Featured Operative Technique

Rhytidectomy Utilizing Bidirectional Self-Retaining Sutures: The Bidirectional Lift and the Extended Bidirectional Lift

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Abstract

This article outlines a new rhytidectomy technique, developed by the author, that utilizes bidirectional self-retaining (barbed) sutures for superficial musculoaponeurotic system (SMAS) plication and, in some instances, skin closures. Short-scar and traditional versions of the procedure are presented, and the history of purse-string SMAS plication and the advantages for using self-retaining sutures in this application are discussed.

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Minimal incision, or “short-scar,” rhytidectomies (MIRs) have gained significant popularity over the past decade. The reduced scar burden and the potential for decreased anesthetic requirements have proven popular with the aging baby boomer population. The avoidance of scarring posterior to the lobule offers a myriad of advantages for younger, more active patients and for those who favor hairstyles that expose the posterior hairline.

Techniques involving superficial musculoaponeurotic system (SMAS) plication, which achieved early popularity in Europe, have gained increased acceptance in the United States and are now recognized as being equivalent to more complex procedures involving resection or other modifications of the SMAS. In 1999, Saylan¹ introduced the concept of a purse-string suspension of nonundermined SMAS to the zygomatic periosteum combined with an S-shaped skin resection that became known as the S-lift. Tonnard and Verpaele,² with their minimal access cranial suspension (MACS) lift, modified this technique to include a purse-string suspension of the SMAS to the deep temporal fascia combined with a pretemporal hairline incision. While their technique has evolved over the past decade, the need to anchor the SMAS to the deep temporal fascia just superior to the zygomatic arch still remains. While knot palpability has always been a concern in rhytidectomy, the need to dissect through the robust temporal circulation and the inevitable concerns of frontal branch injury have been

drawbacks of the MACS technique. The recent development of bidirectional barbed suture technology has enabled us to address these two very significant issues whereby facial elevation is achieved through plication of nonundermined SMAS without the need for deeper anchoring and without the need for knots. I present herein my technique for an MIR with a double-layer SMAS plication utilizing the Quill Knotless Tissue-Closure Device (Surgical Specialties Corporation, Reading, PA)—the bidirectional lift, also known as the Quill Facelift—as well as a modification of this technique, called the extended bidirectional lift, for patients with cervical laxity.

Optimal candidates for the standard bidirectional lift, those desiring correction of laxity in the lower face and jowl, are usually aged 42 to 54 years. The technique produces some volumization of the malar region and elevation of the neck below the mandibular body but does not substantially improve laxity in the anterior neck. Candidates for the extended bidirectional lift, those with cervical laxity in addition to facial descent and jowl formation, are

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generally older than 54 years. Patients with significant platysma banding are clearly informed that the bands will persist unless they are addressed with an anterior platysma-plasty. Minor banding can be improved postoperatively with Botox.

METHODS

The Standard Bidirectional Lift

In Figure 1A, the patient is marked in the upright position prior to entering the operating room. The patient receives either straight local anesthesia or local anesthesia with monitored intravenous sedation. While administration of general anesthesia is certainly possible, it is not necessary. The head and neck is prepped with providone-iodine and draped in standard fashion. Lidocaine, in a concentration of 0.33% with epinephrine (1:300 000), is used for

subcutaneous injection in the standard bidirectional lift and provides adequate anesthesia, even for those having concurrent submental liposuction. While the technique is applicable, I do not combine an anterior corset platysma-plasty with this procedure. When monitored anesthesia care is utilized, more commonly in the extended bidirectional lift, two Bard (CR Bard, Inc, Covington, GA) 8Fr feeding tubes are placed via a nasal approach for oxygen delivery and capnography. The tuft-sparing incision begins perpendicular to the hair follicles in the pretemporal hair-line and extends high toward the helical root, respecting the hairless recess. I do not believe that triangular zigzags expand significantly in a concertinaed fashion, but I nevertheless utilize a serpentine incision in this area to help negate the forces of scar contracture. The incision continues inferiorly along the helical crus to the tragal rim and then curves around the base of the lobule after crossing the incisura intertragica in perpendicular fashion. A

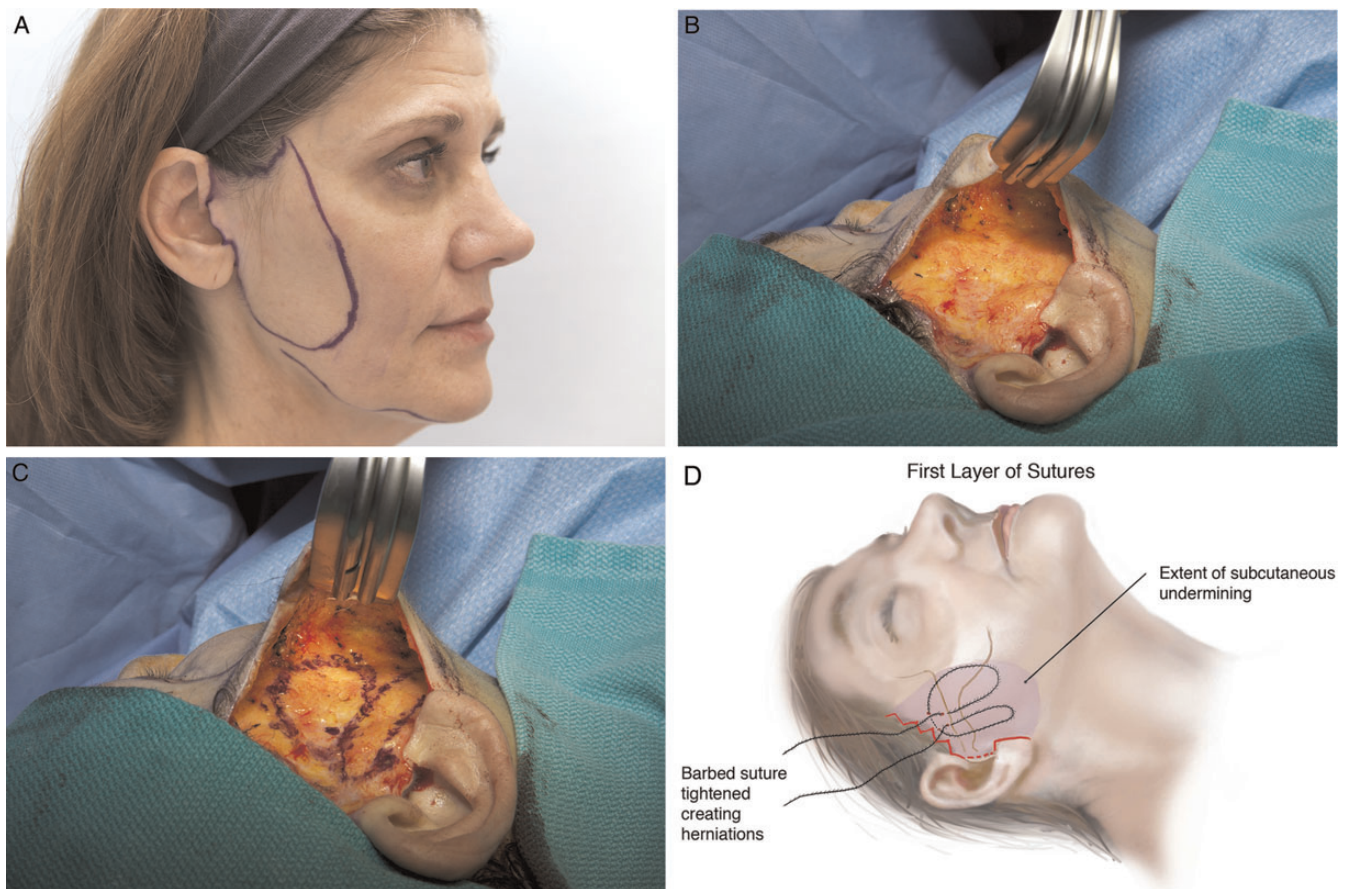


Figure 1. (A) Markings on a 52-year-old woman with lower facial laxity for the standard bidirectional lift. (B) Pre-SMAS pocket dissection in the standard lift. (C) Markings for the purse-string loop suture layer. (D) Illustration of the first suture layer (not perfectly to scale). (E) Appearance of the SMAS after placement of the purse-string loops. Note the pseudoherniated SMAS created by the purse-string loops. (F) Location of the scavenger suture marked in blue for illustration purposes. (G) Illustration of the second (scavenger) suture layer. (H) Appearance of the SMAS after placement of the scavenger suture. (I) Typical excess skin generated following completion of SMAS plication in a standard bidirectional lift.

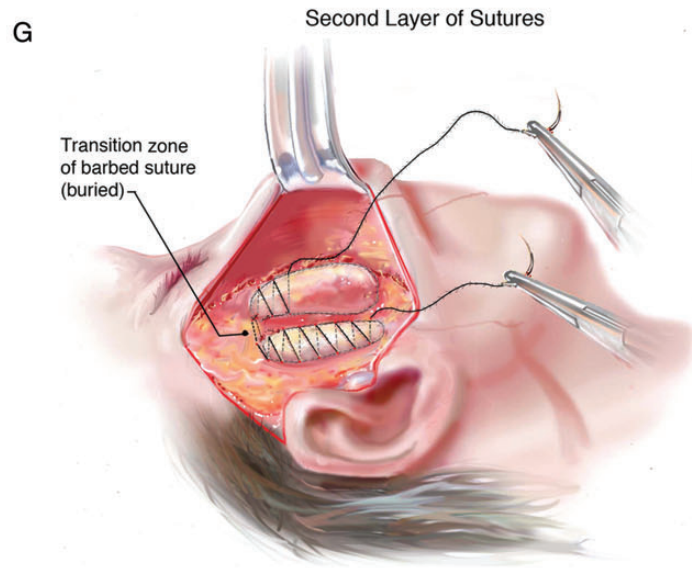


Figure 1. Continued.

subcutaneous flap is elevated superficial to the SMAS, approximately 4 to 5 cm anterior to the tragus, stopping well short of the nasolabial fold and mandibular ligament but exposing the platysma below the mandibular border

(Figure 1B). The inframalar, midfacial perforating vessel is commonly divided. A lighted fiber optic retractor and a microneedle cautery can facilitate the dissection. It is not necessary to divide any osteocutaneous ligaments.

The palpable prominence of the zygomatic arch is noted and 2 loops are drawn—a tight preauricular U-shaped loop that extends inferiorly onto the platysma and originates just superior to the arch, followed by the marking of a more anterior, oblique O-shaped loop (Figure 1C). The loops are independent but usually intersect below the level of the arch. It is important to extend the superior aspect of the “U-loop” (and preferably both) above the zygomatic arch to provide optimal cheek elevation. A 3-0 Quill Monoderm (Surgical Specialties Corporation, Reading, PA) suture with 14-cm limbs is placed with its transition point (the central 2-mm segment of the suture that has no barbs) positioned high, near, or above the point of intersection of the 2 loops. One limb of this bidirectional suture is then used to trace the U-loop through the SMAS and platysma, which is continuously secured quite strongly. This is followed by tracing the wider, oblique O-loop with the remaining limb of this same knotless barbed suture, also continuously secured under tension (Figure 1D). The 2 loops thus interlock upon each other. One or more “J-lock” throws of the suture are utilized before cutting each end flush with the SMAS to ensure suture stability. Noticeable bunching will be created in the areas of both suture loops that may be accompanied by pseudo-herniation of the SMAS within the loops (Figure 1E). The technique does not seem to create the “microimbrications” described by Tonnard.³ A second suture of 3-0 Quill Monoderm, 14 × 14 cm, is then placed in the SMAS to smooth the herniated areas (Figures 1F,G). In the extended lift, the posterior limb of this suture extends inferiorly to provide posterior platysma plication (Figure 4E). I call this suture the “scavenger” suture, and it is similar in concept to Feldman’s “go-anywhere” suture.⁴ The scavenger suture is essentially in the shape of a “U” with the transition point located just above the purse-string loops. (While a second self-retaining suture is preferred for the scavenger layer, it is possible to simply continue the suture used for the purse-string loops. In so doing, a novel surgical situation is created whereby a single suture is utilized for 2 separate layers of tissue approximation. When a single suture is utilized in this fashion, a longer suture is needed, eg, 30 × 30 cm. I do not recommend this, however, out of concern for the potential loss of correction in the event of suture failure.) This suture is placed in an over-and-over fashion with each limb following the direction of the herniation along the 2 purse-string loops. It is important to note that the scavenger does not close the loops but rather provides soft tissue leveling. Using forceps with the nondominant hand to simulate the leveling facilitates this portion of the procedure. Be careful to keep the overall direction of the anterior scavenger limb in a vertical direction to avoid creating a fullness low in the cheek adjacent to the oral commissure. Additional interrupted 5-0 Vicryl (Ethicon, Inc, Somerville, NJ) sutures as well as cautery

fulguration may be used for additional cheek contouring following the placement of the scavenger but are usually not necessary. The final appearance of the plicated SMAS is quite smooth and firm but minor irregularities are acceptable (Figure 1H). Because the dissection occurs above the superficial temporal fascia, the superficial temporal circulation is not exposed. If injury to the superficial temporal vessels or its branches is suspected, the vessel(s) can be ligated. Any tethering at the skin level is released with additional undermining. With hemostasis assured, a halved penrose drain is brought out through the postauricular sulcus and need not be sutured in place.

At this point, a significant amount of excess skin will be noted in both a vertical and posterior direction as a result of the SMAS plication (Figure 1I). The flap is then pared sequentially after placing a buried, absorbable key suture at the helical root. The vector is determined on a case-by-case basis to avoid “dog ears” at the lobule and bunching/excess skin in the pretemporal area and also to ensure adequate tragal coverage when an intratragal approach is utilized. A moderate amount of cutaneous pleating will settle over time in the pretemporal area. The flap is inset in the preauricular area with buried absorbable sutures and with 5-0 nylon for skin closure, with 2-3 mm redundancy without tension in the area of the lobular cheek junction. The tragal flap is defatted and inset without tension utilizing 5-0 Vicryl Rapide. I make a notation of the amount of skin that is pared (in centimeters) upon placing the key suture to facilitate symmetry when inseting the contralateral side of the face (see Figure 2). Dressings consist of Red Cross (Johnson & Johnson, New Brunswick, NJ) cotton and an elastic bandage (ACE Brand; 3M, St Paul, MN) wrap, with the drain enclosed within two 4 × 4-in gauze sponges.



Figure 2. As demonstrated on a 52-year-old woman, this is the typical excess skin and the author’s technique of measuring the location of the first key suture to facilitate symmetry with the contralateral side.

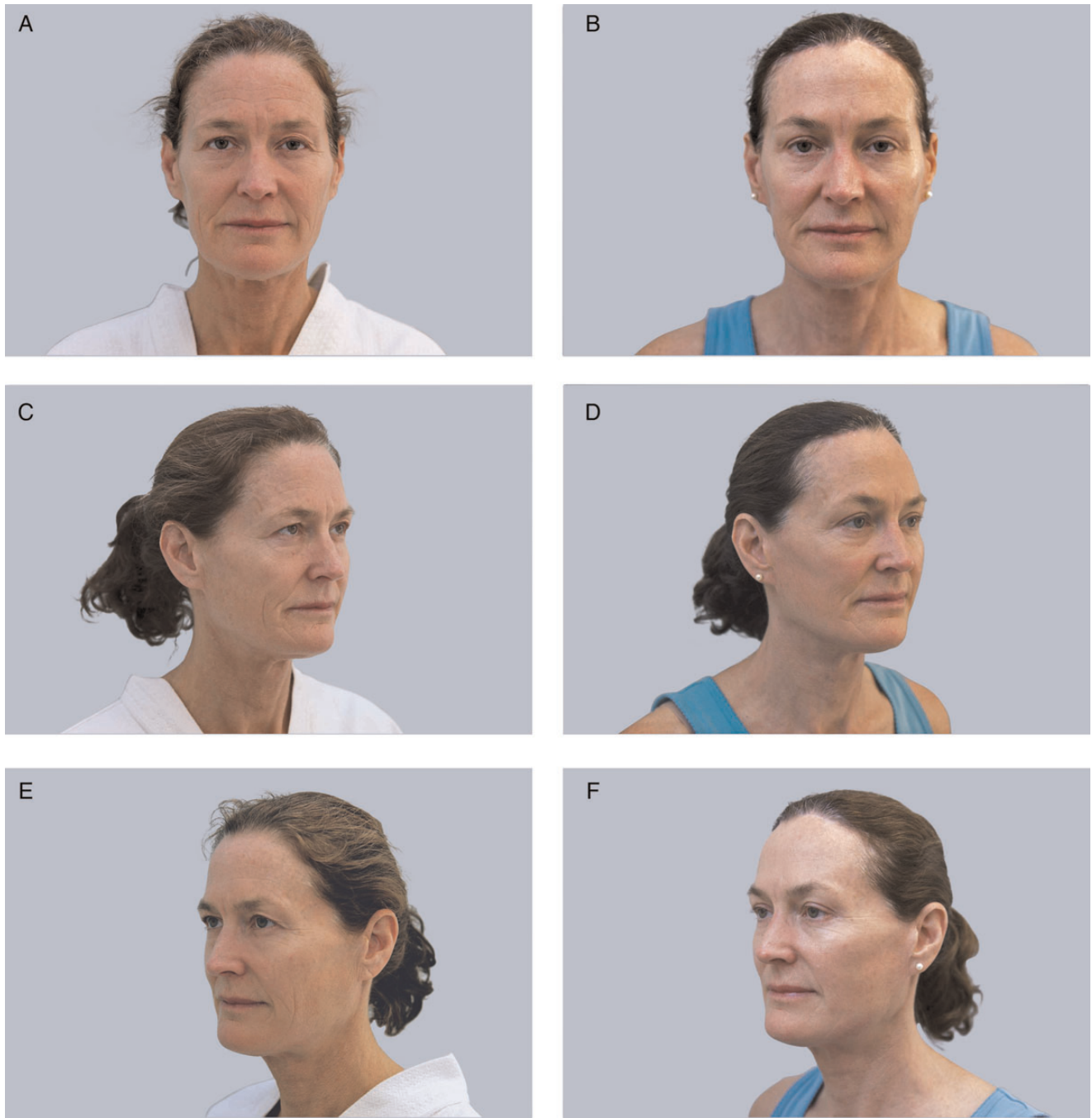


Figure 3. (A, C, E, G, I) Preoperative views of a 51-year-old woman presenting with complaints of upper eyelid dermatochalasis, brow ptosis, forehead rhytids, facial laxity, and jowl formation. (B, D, F, H, J) Postoperative views of the patient 13 months after receiving a standard bidirectional lift. Patient also underwent a prehairline browlift with upper and lower blepharoplasties.

The patient is observed for at least 1 hour and discharged with instructions to minimize talking and chewing and to elevate his/her head at least 45 degrees. The drain is removed the following day. An elastic wrap is reapplied for an additional 24 hours only in those who undergo concomitant submental liposuction. Showering and hair washing is allowed at 48 hours. All sutures are

removed on postoperative day 7. Unrestricted physical activity is allowed at 21 days. Use of hair dryers and curling irons are prohibited until normal sensibility returns. Bruising is minimal when blepharoplasties are not performed. The anterior/inferior border of undermining can be visible in the early postoperative period but fades quickly. Patients are usually able to resume social



Figure 3. Continued.

activities at day 7 with light makeup. A clinical result is shown in Figure 3.

The Extended Bidirectional Lift

For patients desiring correction of cervical laxity, the technique is modified to incorporate a more traditional incisional pattern and platysma tightening. For the extended bidirectional lift, the incision is extended into the post-auricular sulcus and then along the margin of the posterior hairline, terminating as a lazy “J” into the hairline. The inflection point is usually at the level of the inferior crus of the antihelix. The identical lidocaine solution may be used or diluted to a concentration of 0.25% with epinephrine (1:400 000) to address dosing concerns, particularly for those having concurrent blepharoplasties. I utilize monitored intravenous sedation administered by an anesthesiologist for extended bidirectional lifts. Dissection continues in a subcutaneous plane and exposes the platysma as illustrated (Figure 4A). The dissection in the midface extends farther anteriorly, again with no need for release of the mandibular ligament. The midface is managed in identical fashion with 2 purse-string loops of 3-0 Quill Monoderm; however, the

posterior limb of the scavenger layer is extended inferiorly to provide a posterior vector of platysma plication within the mobile posterior one-third of the platysma (Figures 4D-F; Figures 5A,B). Usually a 14 × 14-cm suture is adequate for this purpose. The scavenger suture is quite versatile and may reverse itself and assume any shape necessary to achieve leveling and (in the case of the posterior limb) tightening. An important and unique feature of the extended lift is that the *platysma plication is in 2 complementary layers with 2 different but necessary vectors*. The preauricular, narrow, U-shaped purse-string suture results in a cephalad platysma vector, while the scavenger provides a posterior vector. I believe that cervical laxity is bidirectional and that both anterior and caudal vectors contribute to the aging neck. Because the plication addresses both directions of cervical laxity, this bidirectional platysma movement provides optimal correction in the neck. A 10Fr round, full-fluted Bard Channel Drain (Ref:072226, CR Bard, Covington, GA) is placed in standard fashion to provide drainage for the face and neck and is brought out via a stab wound within the posterior hairline and secured with 3-0 silk. The posterior hairline can be closed with a traditional suture or with an intracuticular 3-0 Quill Monoderm 7 × 7-cm suture to avoid

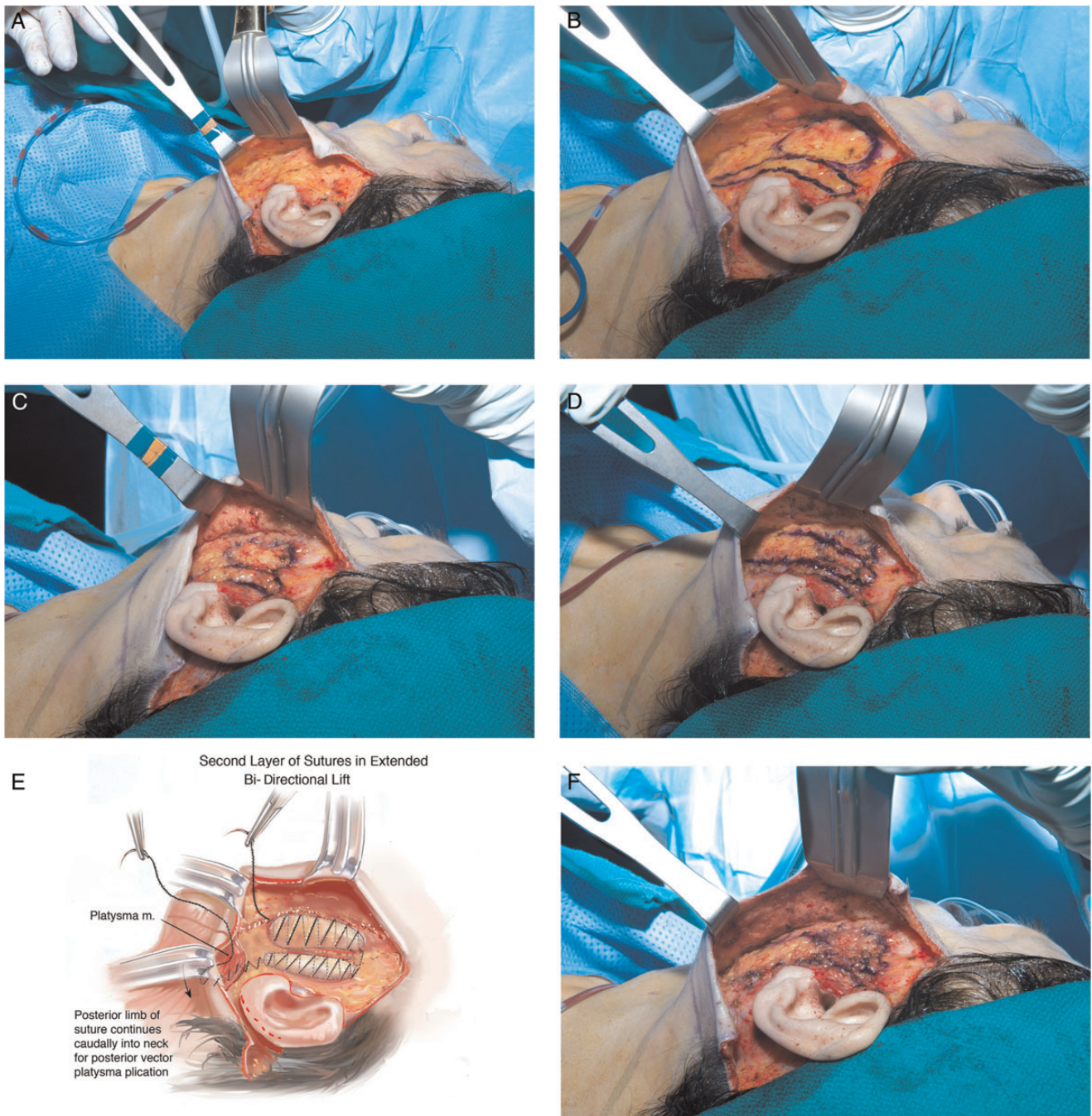


Figure 4. The extended bidirectional lift. (A) Pre-SMAS dissection in a 68-year-old woman undergoing an extended bidirectional lift. (B) Marking for the purse-string layer in the extended bidirectional lift. (C) Appearance of the SMAS following placement of the purse-string layer in the extended bidirectional lift. (D) Markings for the U-shaped scavenger layer drawn in blue over areas of the pseudoherniated SMAS. (E) Illustration showing the second suture layer in the extended lift. (F) Appearance of the SMAS and platysma following placement of the scavenger layer in the extended bidirectional lift.

the prevalent suture marking that tends to form in this area. It is important to not overresect skin when paring the postauricular sulcus; I believe this to be the major cause of unacceptable scarring in this suture line. Dressings are similar to the standard bidirectional lift; however, a

sponge is fitted around the drain and lies along the postauricular area. A clinical result is illustrated in Figure 6. A video demonstrating the standard bidirectional lift and the extended bidirectional lift is available online at www.aestheticsurgeryjournal.com.

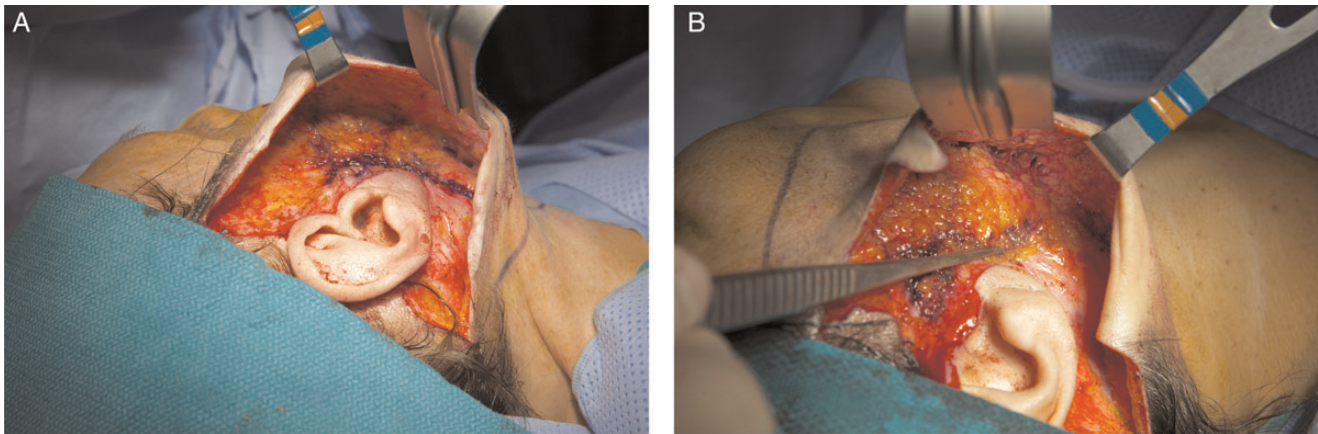


Figure 5. (A) Appearance of the SMAS and platysma following placement of the scavenger layer in an extended bidirectional lift on a 66-year-old woman. Note the blue added over the posterior limb of the scavenger suture to illustrate plication at the posterior border of the platysma. (B) Forceps illustrating platysma plication in a 54-year-old woman undergoing an extended bidirectional lift.

RESULTS

I began using Quill sutures to plicate the SMAS in 2011, and I began utilizing my current technique in May 2013. While my series is still small, there have been no acute returns to the operating room for bleeding, and the majority of the patients have been satisfied with their results. Beginning May 2013, for a 1-year period, I performed 13 standard and 9 extended versions of the bidirectional lift. All patients were female. The mean age for women undergoing the standard lift was 55 years (range, 48-63 years). The mean age for women undergoing the extended lift was 63.7 years (range, 54-69 years). Nine of 13 patients (69%) in the standard group underwent concomitant additional procedures, including submental liposuction. The longest follow-up to date is 14½ months. In the extended lift group, 1 patient had a small recurrent hematoma in the postauricular area, and there was 1 cutaneous infection likely from the patient's use of a nonsterile topical product. One patient had a Quill suture exposure in the postauricular sulcus and a temporary contour irregularity in the cheek. In the standard lift group, 2 patients had minor wound healing problems in the flaps, and there was 1 mildly hypertrophic scar unrelated to the use of barbed sutures. One patient in each group desired additional tightening. One patient in the standard group developed a postoperative respiratory infection. Most importantly, there have been no long-term complications related to the use of Quill sutures for SMAS plication.

DISCUSSION

Early rhytidectomies were performed by resecting the preauricular skin with minimal undermining; hence, short-scar techniques appear to be as old as facelifts themselves.⁵

Virenque was likely one of the first surgeons to use a mini facelift technique with limited skin undermining and 3 tension sutures, and Ansari coined the term “S-lift” that addressed both the skin and the SMAS in German literature in 1983.^{6,7} In 2004, referring to a MIR, Nahai wrote, “Although no one operation is considered the definitive procedure for face lift, it is clear that there is an increasing trend toward simpler procedures with shorter scars, less morbidity, and shorter recoveries.”⁸ While Antell⁹ has shown aesthetic equivalency between traditional and minimal incision rhytidectomy, it is generally believed that a MIR has limited utility in the lax neck, particularly in the setting of anterior, or submental, laxity. As a result, a MIR is most applicable to patients aged 42 to 62 years—baby boomers still in their prime earning years with minimal tolerance for risk and recovery. A separate, albeit related, trend emerging from the 2008 recession is the preference for a rhytidectomy under local anesthesia, with the attendant savings in facility and anesthesia costs. The recent growth of “franchise” lifts have likely contributed to and/or capitalized upon this trend.

Since Mitz and Peyronie's description of the SMAS in 1976,¹⁰ a plethora of techniques for management of the SMAS during rhytidectomy have been developed. With the debate continuing today, these techniques have involved plication, imbrication, excision, division, and undermining. In 1999, Saylan¹ introduced the concept of SMAS plication with two purse-string sutures (Prolene; Ethicon, Inc., Somerville, NJ) with fixation to the zygomatic periosteum. Since publication of their MACS lift in 2002,² Tonnard and Verpaele have refined and modified this technique. Their minimal incision rhytidectomy is aptly named the minimal access cranial suspension (MACS) lift because it *suspends* the lower face to the deep temporal fascia of the upper malar area with 2 purse-string



Figures 6. (A, C, E, G, I) Preoperative views of a 65-year-old woman presenting with complaints of upper eyelid dermatochalasis, jowl formation, and cervical laxity. (B, D, F, H, J) Postoperative views of the patient approximately 14 months following an extended bidirectional lift. (Patient also had upper and lower blepharoplasties, liposuction of neck, and fat transfer to malar areas).

sutures, and their suspension requires both *knots* and dissection into a deeper plane in the area of the superficial temporal circulation. There are important differences between my technique and a MACS lift. The bidirectional lift does not create microimbrications in the SMAS, and the cheek lifting is not purely vertical. There is no suspension whatsoever; rather, the design of the bidirectional

barbed sutures allow an anchoring of the purse-string loops to each other and a similar self-anchoring of each limb of the scavenger suture.

I believe that the power of the purse-string loops of Saylan and Tonnard and Verpaele can be harnessed without the need for deep anchoring. The preauricular U-shaped loop primarily provides a vertical vector for



Figures 6. Continued.

elevating the SMAS and the superior-posterior platysma; the more open, O-shaped loop provides a more oblique SMAS vector that provides jowl elevation. The loops work synergistically to produce a more heart-shaped face that is associated with youthfulness. While I make no effort to visualize Lore's fascia, and I keep my SMAS bites quite superficial, it is likely that some of the power of the narrow preauricular loop derives from incorporating immobile Lore's fascia.¹¹ Similarly, some of the power of the wider loop can be derived from a self-anchoring between the SMAS and the anterior border of the parotid fascia. These concepts are well illustrated by Fogli.¹² While the concepts of minimal access, minimal incision and limited flap dissection have been retained, the technique described herein eliminates the need for access to the deep plane, with its attendant risks.

This approach to SMAS tightening eliminates much of the risks of SMAS mobilization incurred with techniques that employ excisions or incisions, and it completely eliminates the possibility of knot visibility, palpability, or extrusion. The weakest point in any suture line is the knot, and the second weakest point is the portion immediately

adjacent to the knot.¹³ A knot also results in a localized increase in inflammation because of its high density of foreign material,¹⁴ and it is speculated that this can be deleterious to wound healing.¹³ When comparing conventional versus bidirectional barbed subcutaneous closure, Murthy, et al noted a greater propensity for suture extrusion in conventional closures.¹⁵

The power of the bidirectional lift, like all lifts utilizing purse-string loops, is based upon the simultaneous anterior-posterior vertical vectors provided by the purse-string loops. Ruff¹⁶ has illustrated the linear compression and mound creation that result from various configurations of bidirectional barbed sutures. Curved barbed configurations create bunching within the curve, and this can be selectively utilized to achieve the desired effects upon surrounding tissues. (The bunching can actually be inverted in a depressed rather than elevated configuration. In this instance, I still make an effort to level the SMAS with a second layer of barbed suture.) In my technique, the ovals are drawn to optimize cephalad elevation of the platysma and cephalo-posterior elevation of the jowl and adjacent midface. The scavenger suture smoothes

irregularities and provides additional contouring; in the extended lift, it also provides a posterior vector of platysma tightening. Undermining the platysma, criticized in Labbe's cadaver and clinical study of 2006,¹¹ is not necessary.

The reason for the temporal venous and/or arterial circulation being secured during any rhytidectomy is simply because during the dissection, its vessels are "in the way." Troublesome bleeding from this area is well known, including delayed hemorrhaging,¹⁷⁻²⁰ and pseudoaneurysm formation has been reported.²⁰ With the absence of deep dissection and attendant decreased risk of injury to the temporal circulation, our technique minimizes the risk of both acute and delayed bleeding from this source as well as the need to obtain control of the vessels during surgery. Because each throw of the barbed suture locks independently, the potential for "cheese-wiring" in the SMAS is likely decreased. In addition, the Quill device allows fine modifications to the SMAS on a throw-by-throw basis in both plication layers, similar to the "go-anywhere" suture described by Feldman.⁴

While Tonnard's initial technique employed permanent sutures for SMAS plication,² it is likely that equivalent long-term results can be obtained with using absorbable barbed material; Dr Tonnard currently utilizes poliglecaprone 25 sutures for this application. The 2-0 or 3-0 Quill Monoderm that retains tensile strength for 21 days with 90- to 120-day absorption is substantially equivalent to poliglecaprone 25 (Monocryl; Ethicon, Inc, Somerville, NJ) in this regard. As Paul has noted, there are no large data sets of patient experience with the Quill device in facial aesthetic surgery.²¹

CONCLUSIONS

The author presents a new technique for a minimal incision rhytidectomy and a traditional rhytidectomy utilizing bidirectional barbed sutures to produce a 2-layer SMAS plication while reducing the risks of bleeding and nerve injury and eliminating the possibility of knot visibility, palpability, or extrusion. In many cases, the standard bidirectional lift can be performed under local anesthesia with or without minimal oral tranquilization.

Disclosures

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