

Face-Lift Complications

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Abstract

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Avoiding complications of rhytidectomy requires meticulous technique, anatomic knowledge, and insight into perioperative risks. The surgeon must provide a swift diagnosis to resolve any potential complications. The surgeon's goal is to deliver the best results while minimizing procedural risks.

Face-lift surgery has undergone a series of changes over the past century. From early facial rejuvenation lifts that were largely “skin-only” approaches, the operation has progressed into a comprehensive technique that targets anatomic age-related changes of the facial soft tissues. The modern surgeon now works to rejuvenate the face by dissecting the superficial musculoaponeurotic system (SMAS) and/or the deep plane below it. Although face-lift approaches are far from standardized, many of the risks of the procedure remain the same no matter the method of surgery.

The facial plastic surgeon must be aware of the potential complications from face-lift surgery and understand the most appropriate ways to reduce the likelihood of such problems.¹ Through the informed consent process, the surgeon has an obligation to educate and explain the risks, benefits, and alternatives of surgery to the patient. Despite all efforts, it is impossible to completely eliminate the risk of complications from face-lift surgery, and every surgeon performing this procedure must be knowledgeable in how to triage and treat the problems that arise.

Hematoma

The most common and significant complication after rhytidectomy is hematoma, which can occur in up to 15% of cases.^{1–7} Hematomas may present as small collections or may occur as large rapidly expanding bleeds. The most dangerous hematomas occur from arterial bleeding and should be considered acute emergencies. These present

with sudden onset of unilateral or even bilateral facial pain, swelling, firmness, and tightness of the overlying skin, followed by ecchymosis and trismus. Late signs of hematoma include swelling and discoloration of the lips and buccal mucosa. If large enough, an expanding hematoma can lead to dyspnea with ensuing loss of the airway and death. Most major hematomas occur within 10 to 12 hours after surgery and almost all within the first 24 hours after surgery.^{1,5,7}

Whenever a hematoma is suspected, prompt removal of the face-lift bandage and a thorough inspection of the operative site should be conducted. Once an expanding hematoma is recognized, the sutures should be removed at the bedside and clots evacuated immediately to relieve tension on the skin flaps. If necessary, the patient should be returned to the operating room, where under proper lighting and anesthesia, the wound is explored, the remainder of the hematoma evacuated, and any active bleeding controlled. Following prompt identification and successful treatment of a hematoma, it is typical for the final aesthetic result to match the unaffected side. (→ **Figs. 1A to 1C**) However, if a hematoma is not treated promptly, there is a risk of venous congestion and circulatory compromise of the skin flap, which can result in tissue ischemia, partial flap loss, infection, pigmentation changes, hair loss, and skin contour deformities.

Minor hematomas are collections of 2 to 10 mL of blood or serum that are amenable to needle aspiration or expression of blood through an intact suture line. They are typically found in the infra-auricular and postauricular regions of the neck. Recurrence of small hematomas is often the case and

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Figure 1 (A) One week after a right-sided expanding hematoma in both the preauricular and postauricular areas in a patient with von Willebrand's disease. The hematoma was noticed within 12 hours of the operation and the patient was brought back to the operating room for exploration, evacuation, and hemostasis. (B, C) Complete resolution of bruising from the hematoma has occurred within 6 weeks after the surgery with no sequela.

therefore a compression dressing is usually applied with a repeat examination in 24 to 48 hours.

Many studies have reported on the possible causes of hematoma following rhytidectomy. Some of the factors associated with increased risk of hematoma are a diagnosis or family history of a bleeding diathesis, use of anticoagulant medications, history of hypertension, elevated perioperative blood pressure, male gender, and postoperative vomiting.

Although the etiologies of postrhytidectomy hematoma are multifactorial, they have been clearly linked to perioperative blood pressure levels. In a study by Straith and colleagues,⁸ the incidence of hematoma in 500 consecutive face-lifts correlated well with blood pressures of patients on admission; when the blood pressure was above 150/100 mm Hg on admission, hematoma occurred 2.6 times more frequently than in normotensive patients (9.2% versus 1.6%). This is supported by another study of 1078 rhytidectomy patients that demonstrated a significant association between hematoma formation and preoperative systolic blood pressure above 150 mm Hg, with a 3.6 times relative increased risk for hematoma after face-lift surgery.⁹

Postoperative hypertension is also closely associated with hematoma formation. Berner and coworkers¹⁰ studied the preoperative and postoperative blood pressures of 202 face-lift patients and found them to be similar for the first 2 hours after surgery. During the ensuing 3 hours, however, most patients' blood pressure rose above their preoperative blood pressure, and the magnitude of this "reactive hypertension" was positively correlated with the preoperative systolic pressures. Extrinsic factors, such as retching, vomiting, coughing, and hyperactivity in the postoperative period, can also lead to precipitous elevations in blood pressure and thus increase the chance of hematoma.^{11,12} Adequate analgesia and antiemetics should be provided to prevent such reactive blood pressure elevations.

A complete history and physical examination including personal and family history of easy bleeding or bruising needs to be elicited because those indicators may increase hematoma incidence. If such a history exists, then a consultation with a hematologist should be considered. In addition, the preoperative assessment of every patient should include an inventory of the patient's current and recent medications, as they may carry an increased risk of postoperative bleeding. Aspirin and other nonsteroidal anti-inflammatory medications (NSAIDs) are associated with postoperative bleeding due to their antiplatelet effects. Grover and colleagues found that patients who had taken aspirin and NSAIDs within 2 weeks of surgery developed hematomas more frequently than patients stopping the medications for 2 weeks or longer.⁹ Avoidance of aspirin and NSAIDs for 2 weeks prior and 1 week following surgery is thus recommended. All medications, including over-the-counter medications, vitamins, minerals, herbals, and homeopathic remedies, should be reviewed as they also may have adverse clotting effects. Patients need to be specifically asked because they often neglect to consider supplements as medications. St. John's wort, vitamin E, ginkgo biloba, ginger, ginseng, garlic, fish oil supplements, and glucosamine are some of the supplements associated with an increase in bleeding.^{5,13} All such herbal and vitamin supplements must be stopped 2 weeks prior to surgery to lessen the risk of postoperative bleeding.

Furthermore, male gender has been recognized as an independent risk factor for hematoma formation after face-lift surgery, with a 2.8 times increased relative risk.⁹ Although men only represent 10% of all rhytidectomies performed in the United States, their reported incidence of hematoma is twice as common as females and ranges from 7.9 to 12.9%.^{14,15} Men exhibit a higher incidence of hematoma formation due to anatomic skin differences, most importantly the thicker dermis and the increased vascular supply to the

beard and sebaceous glands in male skin.^{14,16} Males have also been found to have an increased postoperative activity level and a lower degree of compliance compared with female patients.³

Marchac and Sándor¹⁷ demonstrated that the use of fibrin glue led to a statistically significant decrease in the rates of ecchymosis, edema of hematoma formation, a rate reduction from 9 to 2%. Fezza and colleagues¹⁸ showed similar results. More recently, Zoumalan and Rizk¹⁹ examined 605 patients who underwent deep plane face-lift surgery without the use of drains, 146 of which were not treated with fibrin glue and 459 of which were sprayed with fibrin glue under the flap prior to flap closure. They concluded that fibrin glue significantly decreased the rate of hematoma formation from 3.4 to 0.4% and also found that fibrin glue may be more helpful in male patients than female patients. However, in contrast to these studies, Grover et al analyzed the effect of fibrin glue independently and found no protective effect on hematoma rates.⁹ It remains unclear whether fibrin glue truly reduces postoperative bleeding and the decision whether to employ this intervention rests with practitioner preference.

The use of postoperative vacuum drains does not seem to significantly affect the incidence of postoperative hematomas. Perkins et al²⁰ did not find a significant difference in hematoma rates in 222 patients who underwent face-lift surgery with (7%) or without (8%) the placement of closed vacuum drains. However, in the first 24 hours after surgery, there was a significant decrease in seroma formation, from 37 to 15%, with the use of a drain. Two additional studies also found that drains do not reduce hematoma formation.^{21,22} Drain placement is undesirable for both the surgeon and the patient. It is unsightly and may necessitate an extra incision and cause more discomfort and malfunction by clogging, leaking, or falling out.

Nerve Injury

Temporary or permanent injury can occur during rhytidectomy to either sensory or motor nerves of the face. Overall, the most common nerve injury caused by face-lift surgery is the great auricular nerve which occurs in up to 7% of procedures.^{5,7} Although patients normally notice transient numbness to the preauricular region, lower part of the ear, and over the cheeks, injury or transection of the great auricular nerve causes permanent loss of sensation to the earlobe and postauricular area, along with pain and paresthesias. This injury occurs when dissection is too deep over the sternocleidomastoid (SCM) muscle. The great auricular nerve becomes superficial as it emerges on the posterior surface of the SCM ~6.5 cm inferior to the bony external auditory canal.²³ The external jugular vein is parallel and 0.5 cm ventral to the nerve at the same point. It then travels deep to the SMAS and the platysma to reach the anterior surface of the SCM. If nerve damage is recognized during the flap elevation in the neck, repair should be performed immediately under loop magnification.

The most commonly injured motor nerve is the facial nerve, with an occurrence ranging from 0.4 to 2.6%.^{7,24} The

nerve is anatomically well protected by the parotid gland over its main trunk and by the superficial fascia and platysma over its distal branches. The most frequently injured branches are the temporal (frontal), marginal mandibular, and cervical branches. The temporal branch is extremely vulnerable at its superficial portion as it crosses the midpoint of the zygomatic arch, halfway between the tragus and the lateral canthus, where it runs beneath the superficial fascia and a thin fibrofatty tissue layer. If complete transection occurs, it will result in complete unilateral paralysis of forehead movement.²⁴

The marginal mandibular branch of the facial nerve is potentially vulnerable during resection of submental and submandibular fat and especially at risk during dissection beneath the platysma muscle in the area of the submandibular gland. The marginal mandibular branch passes in the subplatysmal plane, in the fascia of the submandibular gland, at a distance of approximately two finger breadths below the mandible. Only 15% of the nerve filaments of this branch communicate with the buccal branches, so after complete transection, spontaneous return is unlikely.²⁴ On the other hand, edema may cause nerve dysfunction and once this begins to resolve, a full recovery can be anticipated. Without an observed direct transection of the marginal branch, the great majority of injuries to this portion of the facial nerve resolve over 3 months' time. The deformity produced by palsy of the marginal mandibular branch results primarily from the inaction of the depressor muscles, resulting in an inability to draw the lateral lower lip downward or evert the lower lip vermilion border. This must be distinguished from a "pseudoparalysis" of the marginal mandibular branch of the facial nerve due to cervical branch injury or medial platysma muscle trauma proximal to the mentum. First described by Ellenbogen in 1979, patients with cervical branch injury have transient lip depressor dysfunction, yet can still evert their lip because of a functioning mentalis muscle (→Figs. 2A to 2D).^{25,26} According to Daane and Owsley, risk of injury to this branch can be greatly diminished by limiting the extent of subplatysmal dissection in the lateral danger zone, near the angle of the mandible.²⁶

Based on a cadaveric study, Dingman and Grabb examined the anatomic relationship of the marginal mandibular nerve to the facial vessels in 100 facial halves. They found that anterior to the facial vessels all of the branches of the mandibular nerve were above the inferior border of the mandible, and posterior to the vessels the marginal mandibular nerve was above the inferior border of the mandible 81% of the time.²⁷ Although this study can be used to aid surgeons, it was based on cadavers, which are fixed specimens with stiff, contracted, and less mobile skin and tissues. In clinical experience, the marginal mandibular branch is still found to be 1 to 2 cm below the lower border of the mandible in almost every case.

Injury to the buccal branch occurs most commonly in the loose areolar tissue anterior to the parotid gland, where the nerve becomes superficial to innervate the muscles of the mouth, cheek, and oral commissure. It is especially susceptible to injury during a sub-SMAS dissection as any plication of



Figure 2 (A) Preoperative smiling view. (B) One week after face-lift surgery with a right-sided pseudo-paralysis of the marginal mandibular branch of the facial nerve. (C) Pseudo-paralysis is still present, but improving at 1 month postoperatively. (D) The patient is still able to evert her lower lip with a functioning mentalis muscle. This ability is important in determining a pseudo-paralysis from a true paralysis of the marginal mandibular nerve.

the masseteric fascia risks catching the nerve where it passes over the muscle. However, due to the extensive branching system in the buccal and zygomatic regions involving 90% of nerve filaments, a spontaneous return to function between 3 to 6 months is likely.⁷

Castañares reviewed the possible causes of facial nerve disturbance during rhytidectomy.²⁸ These include trauma from heat of electrocoagulation, local anesthesia injected in the immediate nerve area, deep ligatures or plication sutures, crushing by forceps or clamps, excessive traction and stretching, transection of the nerve during deep dissection, hematoma or edema within the nerve sheath, infection, distortion of the nerve branches by scarring from previous surgery, and

coincidental Bell's palsy or other concomitant neurological pathology. In the preoperative evaluation, the surgeon should inquire about past history of facial nerve problems such as Bell's palsy, as a recurrence during the postoperative period has been reported.²⁸ A careful examination and notation of facial nerve asymmetry or weakness is essential during the preoperative patient analysis and should be brought to the attention of the patient, who is frequently unaware of its presence (→ **Figs. 3A** and **3B**). A temporary paralysis may occur after infiltration of the face with local anesthetic solution which will recover as the drug is diffused and metabolized. Plication sutures need to be placed with extreme care to avoid compression or strangulation of small nerve branches



Figure 3 (A and B) Patient presenting for a face-lift consult with a previous paralysis of the right marginal mandibular branch of the facial nerve after a parotidectomy in Mexico. (A) The patient is able to purse her lips, but (B) she is unable to depress or evert her lower lip on the right side.

especially around the eye. The use of electrocautery for hemostasis should also be done in low heat and with extreme care to avoid local thermal injury to surrounding nerve branches.

Another rare neural injury during face- and neck-lift surgery is the spinal accessory nerve, with only a few cases reported in the literature. This will occur as a result of blind undermining deep in the neck during an extensive cervical lift. Afflicted patients present with dull, constant pain in the shoulder region, weakness of shoulder abduction, a cosmetic deformity related to trapezius atrophy, and flaring of the wing of the scapula.²⁹

Recently, more extensive face-lift techniques have been developed to better treat the aging neck. These techniques potentially increase the risk to the facial nerve, as the surgeon creates lateral platysmal and subplatysmal flaps. Although there has not yet been an increase in facial nerve injuries reported, these techniques should be performed by more experienced surgeons. When transection of a facial nerve branch occurs during rhytidectomy, the surgeon should attempt to immediately repair it by microsurgical techniques. Most often, these injuries are not recognized until the post-operative period. At that time, the management decision becomes whether to do an immediate exploration of the wound for the nerve branches or to wait 3 to 6 months before a definitive treatment. Because a spontaneous return of function occurs in more than 80% of these injuries within 6 months, observation is usually the more prudent choice.²⁴

However, if the surgeon is suspicious of the cause of injury, reexploration may be warranted. If it is decided to wait and observe, then serial testing by electromyography and electro-neuronography may help in determining whether the affected muscles have the capability of rehabilitating themselves spontaneously. These tests have limitations and can only

suggest a trend. Conservative management may include exercises, biofeedback, physiotherapy, or Botox injections to balance asymmetries. It is best that any decision be made with the patient's complete understanding and wishes. In this situation, a good rapport between the patient and the surgeon cannot be overemphasized. Constant and gentle reassurance with sympathetic understanding and attention are required.

Skin/Flap Necrosis

The incidence of skin slough and/or skin necrosis following rhytidectomy has been reported to be between 1.1% and 3.0%.⁷ Skin slough is first recognized as a purple or bluish tinge to the skin flap due to venous congestion or, less commonly, a pallor caused by arteriolar compromise. This skin change is usually noted when the dressing is removed within 24 to 48 hours after surgery and occurs most commonly in the pre- and postauricular areas. These locations are most at risk because the skin flap is the thinnest, the tension is the greatest, and the blood supply to the flap must travel the farthest distance from its origin.⁷ Other factors that contribute to vascular compromise of the facial skin flap include delayed recognition of a hematoma, overly thin skin flap dissection, excessive undermining, significant trauma to the flap from retractors, infection, history of diabetes or radiation therapy, and tobacco use or smoking. Smoking has been reported to increase the risk of skin necrosis 12-fold.³⁰ To see benefit from the cessation of tobacco use, the patient must stop all tobacco and nicotine replacement products, including nicotine skin patches, for a minimum of 2 weeks before and following surgery. Even with smoking cessation, the risk of skin flap necrosis is still higher when compared with patients who have never smoked.¹

All skin necrosis and sloughing should initially be treated conservatively as epithelialization and subsequent granulation of the affected area will occur. If full-thickness flap necrosis occurs, an eschar eventually develops and healing will occur by secondary intention. The eschar should not be debrided as it functions as a biological dressing. Eventually the skin slough will contract leaving a smaller residual defect. Healing is usually satisfactory, but occasionally there may be residual pigmentation, coarseness, hypertrophy, or superficial scarring of the skin. Fortunately, skin defects behind the ear are easy to camouflage. Steroid injections will help to flatten any resulting hypertrophic scarring. However, depending on the size of the slough area, scar excision and advancement of the facial skin may be indicated. As with many of the complications that can follow rhytidectomy, prevention is the best treatment of skin flap necrosis. Some authors have suggested using a topical nitroglycerin ointment to areas of the skin flap suffering from venous congestion or possible ischemia to allow vasodilation and improve the blood supply to an area of compromised tissue. This, however, has not been proven to be beneficial in experimental models.^{31–33}

Hairline Distortions/Scarring

Patients undergoing face-lifts to improve the aesthetic appearance of their face do not consider visible or poor scarring an acceptable result. The final scar is the signature of the surgeon, and a great effort should be made to produce an imperceptible scar. To achieve the most favorable scars after rhytidectomy, incisions need to be carefully and strategically planned and wounds need to be closed without tension and without compromise of the vascular supply. Surgeons must also inquire about the patient's hairstyle and if they wear their hair "up" in a ponytail, as this will affect the incision planning.

Hair patterns and hair distribution require different incisions for male and female patients. Incisions in women should be kept within the hairline whenever possible. The incision in the frontotemporal area is made just inside the natural curvature of the temporal tuft or sideburn region and is curved inferiorly. Before entering the preauricular area, the incision is carried posteriorly to form a wedge at the root of the helix.³⁴ Especially in females, a retrotragal incision is commonly performed as it leaves a discontinuous and a less noticeable scar. Careful attention must be given to avoid distorting the shape or the appearance of the tragus, as this is a telltale sign of face-lift surgery^{3,35} (► **Figs. 4A** and **4B**). The incision is carried around the earlobe freeing it from the underlying subcutaneous tissues. The postauricular incision should be designed onto the medial aspect of the conchal cartilage to allow for contracture of the scar into the sulcus after surgery as healing progresses. Before proceeding with the incision posteriorly onto the mastoid, the incision should run in the depths of the postauricular sulcus to avoid webbing. The incision is then carried onto the scalp, which too should be placed at its greatest point of camouflage. This corresponds to the area where the posterior hairline is closest to the helical rim, usually at the greatest width of the pinna.³⁵ Once the incision has reached the hair-bearing area of the scalp, it should be extended into the hairline and continued 3 to 5 cm posteriorly. Advancement of the cervical flap can lead to a dog ear or "standing cone" at the most inferior edge. Keeping the incision high in the hair will leave space to trim the cone without causing a defect in the hairline.

In men, the frontotemporal incision should also be placed in the hairline, but positioned farther posteriorly as to avoid exposure with lateral temporal hair recession later in life. Unlike in females, the tragal portion of the face-lift incision is usually made anterior to the tragus, in a natural skin crease, so as to not pull the hair-bearing skin around the tragus and into the external ear canal, as this makes shaving facial hair



Figure 4 (A) View of a patient presenting for a revision face-lift after a previous short-scar face-lift. The patient's tragal incisions have migrated to a visible preauricular position. (B) Close-up of the visible tragal incisions.

difficult. However, if a retrotragal incision is used, electrolysis or laser hair removal may be used to improve the final hair pattern. Similarly, the postauricular incision should not be placed medial on the conchal cartilage to avoid hair growth on the concha.

Furthermore, distortions of the natural hairline can occur in the temporal and postauricular areas as a result of poor incision planning. Excessive and unnatural elevation of the temporal hair tuft can occur with significant rotation, elevation, and trimming of the facial flap in this area. This can be prevented by using a more horizontal sideburn incision beneath the tuft to facilitate trimming of the vertically lifted facial skin. Change in the postauricular hairline may also occur when the postauricular flap is not planned appropriately and is not sufficiently pivoted anteriorly to realign the hairline, resulting in a “stair step” effect.^{34,35} This can occur when the postauricular incision is placed too low and close to the hairline. This hairline distortion is more difficult to prevent when there is a significant advancement of cervical skin during face-lift surgery. Radical alteration of the postauricular or mastoid hairline in the male patient needs to be avoided by careful tailoring of the skin flaps and meticulous reconstruction of the hairline. Ultimately, placement of the face-lift incisions should be personalized and is left to the surgeon's preference.

Even with proper incision planning, scarring is a recognized complication of face-lift surgery. Hypertrophic scars occasionally occur in the retroauricular incision and will often appear within the first 12 weeks postrhytidectomy. More specifically, they occur in the position of the incision extending from the postauricular sulcus to the scalp. The skin in this area is very thin and even moderate skin tension on the wound may result in hypertrophic scarring (►Fig. 5). Excessive tension in the temporal and mastoid areas can also result in wide scars with bald spots that can be difficult to camou-



Figure 5 Postauricular scar and scabbing in a patient 2 weeks after a face-lift.

flage if the hair is short or thin. These scars can progress over weeks to months and become wider and even more undesirable (►Figs. 6A and 6B). The incidence of scar widening is reported to be up to 9% following rhytidectomy.²

Treatment for hypertrophic scar formation includes scar massage, serial triamcinolone injections, silicone sheet and gel therapy, and laser intervention. Biweekly steroid injections can result in atrophy of the hypertrophic scar tissue and occasionally no additional scar revision is needed.³⁶ If unsatisfactory results occur, scar revision, dermabrasion, tattooing, and laser skin resurfacing are all possible treatment options. It is preferred to wait at least 6 months and often a year following surgery to perform any scar revision procedures. At that time, scars are more mature and tissues are more supple, allowing for easier surgical manipulation. Again, the best treatment is prevention with minimal tension and a multilayered closure of all incisions.



Figure 6 (A and B) Bilateral hypertrophic scarring around the patient's face-lift incisions after undergoing a face-lift in Europe.

Earlobe distortion, known as the “pixie ear” deformity, is caused by the failure to inset the lobule properly, frequently associated with excessive inferior tension in this region. Consequently, the ear is pulled downward, both lengthening the earlobe and blending it into the skin flap. This pitfall can be prevented by placing a tension-relieving suture beneath the earlobe, serving as a stay suture to tack the lobule more superiorly. Overresection of the skin flap at the base of the lobe is another classic mistake that can lead to a pixie earlobe. When this occurs, the lobe is sutured more inferiorly to the cheek skin and the ear will appear pulled or “stuck on” from the pull of both the cheek and jawline skin flaps. Complete visualization of the pre- and postauricular flaps is important before any flap tailoring and trimming is performed at this site. Repair of this deformity may be accomplished with a multitude of different techniques. Procedures to repair a pixie ear deformity range from suture techniques³⁷ and Z-plasty of the perilobular skin incisions, to redissection of the cheek and infraauricular skin flaps with a V to Y revision of the lobule incision, and even cartilage and dermal grafting to the ear lobe.³⁸

Alopecia

The incidence of alopecia after rhytidectomy is as high as 8.4%,³⁹ with rates of permanent hair loss requiring surgical revision ranging from 1 to 3%.⁴⁰ Patients with thinning hair and those having a tendency for alopecia are prone to greater hair loss after face-lift surgery.¹ Usually hair loss is transient, and patients with healthy scalps can expect their hair to grow back promptly. Temporary hair loss may result after nondestructive injury to the hair follicles from factors leading to decreased skin perfusion, namely smoking, tension, infection, or thin flaps.

Most permanent hair loss occurs in the temporal areas adjacent to the skin incisions rather than in the postauricular area. This can be secondary to several factors: direct trauma to the hair follicles during dissection, either due to transection of follicles or electrocautery; necrosis of hair-bearing skin, infection with destruction of hair follicles; or a hypertrophic scar in which hair cannot grow. To avoid incisional alopecia, hairline incisions are beveled at an ~45-degree angle toward the anterior or inferior edge, allowing hair to grow up through the incision site.⁴¹

Although prevention through meticulous dissection and surgical technique is the best way to limit hair loss, treatment of alopecia usually involves waiting at least 3 months after surgery. Treatment options may include triamcinolone injections, topical application of minoxidil, and scar revision.³ Rarely are restoration measures, such as hair transplantation, needed, but they are possible.⁴²

Infection

Fortunately, infection is a rare complication of face-lift surgery because of the rich vascular supply to the face and neck. The incidence has been reported to be less than 1%. Leroy and colleagues reviewed the records of 6166 consecutive face-lifts and found 11 infections (incidence of 0.18%) requiring hospital admission.⁴³ Most infections occur during the first week after surgery, so proper surveillance during this time is crucial. Patients should also be educated on the early signs and symptoms of infection so that they can aid in earlier diagnosis and treatment. Erythema is often the first sign of infection, followed by an increase in tenderness. Once an infection is recognized, aggressive treatment is advised (→Figs. 7A and 7B). Treatment includes prompt initiation of appropriate antibiotics and incision and drainage of any



Figure 7 (A) Preauricular and postauricular infection in a patient 2 weeks after a face-lift. The cultures from the wound infection grew out coagulase-negative staphylococcus. (B) Interval improvement in the wound infection 1 week later after treatment with oral antibiotics and healing by secondary intention.



Figure 8 (A and B) Bilateral preauricular and postauricular coagulase negative *Staphylococcus* infection in a patient 3 weeks after face-lift surgery.

abscess. Any suspicious fluid or drainage should be cultured and serve as the ultimate guide for a directed antibiotic treatment regimen. The most common causative organism is *Staphylococcus* followed by *Streptococcus* (► **Figs. 8A** and **8B**).⁵ Methicillin-resistant *Staphylococcus aureus* (MRSA), which is now the leading causative pathogen in surgical site infections and skin and soft tissue infections, is a very virulent organism and as a result is difficult to control.⁴⁴ It has been reported following face-lift surgery, so a high suspicion of MRSA as the causative pathogen in a postrhytidectomy infection is necessary, especially if the infection is not responding to various antibiotic treatment regimens.⁴⁴ Additionally, prolonged or recurrent, low-grade granulomas, especially around the incision sites, should trigger the surgeon to think of an infection caused by atypical mycobacteria (► **Figs. 9A** to **9E**).⁴⁵ Special cultures need to be sent to identify this pathogen. Prompt recognition and treatment of these infections is essential. Scar formation may even develop after the resolution of the infection.

Because the medical, psychological, and cosmetic sequelae of wound infections can be devastating, every appropriate step should be taken to prevent wound infections in facial plastic surgery. Prophylactic protocols have been developed as prevention and need to be followed. Preoperative washing and scrubbing with chlorhexidine gluconate (Hibiclens [Molnlycke Health Care Inc., Norcross, GA]) are standard precautions. Chlorhexidine gluconate, when compared with povidone-iodine (E-Z Scrub 201 [Becton Dickinson, Sandy UT]) and chloroxynol (ParaSoft [West Coast Pharmaceutical Works Limited, Ahmedabad, Gujarat, India]), achieved significantly greater bacterial count reduction.⁴⁶ The senior author (D.B.R.) has developed his own preoperative regimen to prevent MRSA infections in his face-lift patients. He advises patients to begin washing their faces, ears, and necks with chlorhexidine gluconate, once a day, starting 3 days before surgery. Then, starting 2 days before the operation, the author

has his patients swab the inside of their nose twice a day with Bactroban (GlaxosmithKline, Philadelphia, PA) ointment. This regimen has further reduced the already low MRSA infection rate in the senior author's face-lift practice. Finally, it is also important to use a new marking pen or other equipment on each patient for preoperative surgical planning.

Perioperative prophylactic antibiotic use and length of treatment is highly variable. In a study by Matarasso et al,⁴⁷ in which a descriptive correlational survey was distributed to all members of the American Society of Plastic and Reconstructive Surgeons, it was found that perioperative antibiotics are used by 72% of surgeons. However, they found a significant correlation between the number of years in practice and the use of prophylactic antibiotics for face-lift surgery. The less experienced surgeons, those in practice less than 5 years, used prophylactic antibiotics 90% of the time, and more experienced surgeons, those in practice greater than 20 years, used prophylactic antibiotics only 8% of the time. Thus, the use of antibiotics is considered conservative as they may potentially help prevent or avoid infections. The authors concluded that less experienced surgeons are more conservative.

In agreement with the guidelines of the Surgical Care Improvement Project, the senior author believes that the infusion of the first antimicrobial agent is to be given within 60 minutes before the surgical incision and the administration of prophylactic antimicrobial agents should be discontinued within 24 hours of the end of the surgery.⁴⁴ There is no strong evidence to support the use of additional prophylactic postoperative antibiotics.¹

Contour Deformities

Contour irregularities, such as skin dimpling, ridging, or a “cobra neck” deformity (hollowing in the submental region between the medial aspects of the SCM muscles) are often a



Figure 9 (A and B) Submental collection in a patient with 3 months of low-grade infections around the face-lift incision sites. After multiple bacterial cultures were negative and antibiotic treatment courses were not working, a special culture was sent and found to be positive for *Mycobacterium fortuitum*, an atypical mycobacterium species. (C, D, E) One-year follow-up pictures from the patient with complete resolution of the infection after a 3-month course of a multidrug antibiotic regimen.



Figure 10 (A–D) Multiple views of a patient who presented for a revision face-lift after she noticed a horizontal pleating of the skin and underlying soft tissues which was apparent after she underwent a minimal access cranial suspension (MACS) lift by another surgeon.

result of irregular cervical liposuction or overly aggressive fat removal both pre- and subplatysmal. This can be prevented by keeping the liposuction cannula port opening away from the skin. Extreme care must be taken to contour the face and neck evenly at the time of surgery to avoid an unnatural look. Symmetrical defatting of the submandibular and submental areas is vital to preventing irregular depressions. Liposuction that is performed in a “crisscross” pattern throughout the region with passes of the cannula directed at right angles to one another often lead to a smooth and uniform result.³ Fat should not be removed simply because it is there, but only to contour and shape the facial structures.⁴² Careful checking of the neck contour between brief stages of submental and cervical fat removal is encouraged. The final defatting should only be performed after the platysmal and SMAS flaps are sutured in the midline, if a platysmaplasty is performed.⁷ Skin

puckering or tethering can also result from bunching or gathering the SMAS with a purse-string suture (→Figs. 10A to 10D) or even localized hematomas not aspirated postoperatively, most of which will resolve over time.

Prevention of contour irregularities emphasizes the importance of conservative fat removal. Proper skin redraping, tailoring, and closure are also important to preventing tethering and puckering of the skin. This can be prevented through appropriate undermining of the skin in the region of closure so that the skin lies smooth and tension free once it is replaced. The use of a postoperative compression dressing further facilitates flap adhesion and eliminates dead space, but it needs to be placed carefully to avoid excessive pressure.

Submental and cervical banding can result after overaggressive liposuction and/or excessive subcutaneous fat removal. In this case, there are frequently scattered areas of

exposed dermis void of subcutaneous fat. If defatting is carried down to the platysma muscle, adhesions between the muscle fibers and the skin cause tethering and puckering with animation.⁷ This deformity is accentuated if the platysma muscles are not adequately sutured in the midline, resulting in an unattractive contour distortion that is difficult to correct.⁵ Submental banding can be prevented by making certain that a thin layer of subcutaneous fat remains beneath the dermis.³ Platysmal banding can also occur and is commonly secondary to inadequate placement of plication sutures, which allows for the platysma muscle to cord up medially and become prominent. Revision surgeries to correct this deformity have been described but place the facial nerve at increased risk of injury.³⁴

Early in the postoperative period, massage and judicious triamcinolone injections may help minimize such irregularities.³ If these interventions fail over a 6- to 12-month period, other treatment options including fat grafting, reapproximation of the platysmal muscle, placement of an intervening graft, or resuspension of the skin flap, can be tried; however, none have been proven to provide great success.⁵

Conclusions

Rhytidectomy has complications that are impossible to completely avoid. The facial plastic surgeon attempts to prevent and minimize the risk of complications with a detail-oriented surgical approach and meticulous technique. When problems do arise, the key for the surgeon is to be attentive, honest, and open to patients about these complications and how they will be addressed and resolved.

Most complications will require conservative treatment and a waiting period. During this time, it is important for the surgeon to have built and maintained a close rapport with the patient, through frequent office visits, patience, sympathetic understanding, and genuine friendly attention.²⁸ It is easy for surgeons to get their patients through the good times, but the best surgeons will be there to get their patients through the difficult times.

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