

Special Topic

# An Unusual Complication Following Rhytidectomy: Iatrogenic Parotid Injury Resulting in Parotid Fistula/Sialocele

George A. Lawson III, MD; Peter Kreyerman, MD; and Foad Nahai, MD

Aesthetic Surgery Journal  
32(7) 814–821  
© 2012 The American Society for  
Aesthetic Plastic Surgery, Inc.  
Reprints and permission:  
[http://www.sagepub.com/  
journalsPermissions.nav](http://www.sagepub.com/journalsPermissions.nav)  
DOI: 10.1177/1090820X12455798  
[www.aestheticsurgeryjournal.com](http://www.aestheticsurgeryjournal.com)  


## Abstract

Rhytidectomy is a common surgical procedure performed by today's aesthetic surgeons. Newer trends and techniques leading to deeper and more aggressive dissection have placed the parotid gland at increased risk for injury during this procedure. Despite there being a relative abundance of literature on traumatic parotid injury, there is a relative paucity of information on iatrogenic parotid injury after rhytidectomy. In addition, there is no consensus on management of these complications. In this article, the authors discuss 3 case reports, review the relevant literature, and propose a treatment algorithm. Early diagnosis and appropriate treatment are essential to properly manage this complication.

## Keywords

face-lift, rhytidectomy, parotid, sialocele, parotid fistula, salivary leak

Accepted for publication March 23, 2012.

Rhytidectomy is one of the more common aesthetic procedures performed by plastic surgeons today. In fact, 127 512 rhytidectomies were performed in the United States in 2010, according to statistics from the American Society for Aesthetic Plastic Surgery (ASAPS).<sup>1</sup> Technical trends in rhytidectomy have led to deeper and more extensive undermining of the tissues in the face, including elevation of the superficial musculoaponeurotic system (SMAS). This aggressive approach for facial rejuvenation puts the parotid gland at increased risk for injury.<sup>2-5</sup>

Parotid injury is a known occurrence after parotid surgery/parotidectomy,<sup>6-10</sup> trauma,<sup>6,10-16</sup> and other surgical procedures to the face,<sup>6,17-19</sup> but this complication after rhytidectomy is rare. There are only 12 previously documented reports in the literature, covering 20 total cases<sup>2-5,20-27</sup> (Table 1).

Injury to the parotid gland may result in the formation of a sialocele or fistula following parenchymal or ductal injury. Parotid injury could cause difficulties with skin flap healing, underlying tissue injury, persistent swelling, significant distress for the patient, and an aesthetically displeasing result.<sup>5,21,25</sup> Despite there being a relative abundance of literature on traumatic parotid injury, there is a relative paucity of information on iatrogenic parotid injury after rhytidectomy. Additionally, there is no consensus on management of these complications.

We report 3 cases of iatrogenic parotid injury after rhytidectomy by the senior author (FN). This author has performed well over 2000 face-lifts and can recall only 4 cases of sialocele or parotid fistula. Three are reported here. We also review the relevant anatomy, the presentation and diagnosis of a parotid injury, and treatment options, and we propose a management algorithm for parotid sialocele or fistula following rhytidectomy.

## PAROTID ANATOMY

It is essential to understand the relevant anatomy of the face and parotid structures to properly execute surgical procedures in this region and also to appropriately diagnose

Dr Lawson is in practice at Forsyth Plastic Surgery in Winston-Salem, North Carolina. Dr Kreyerman is a consulting surgeon in the Division of Plastic and Reconstructive Surgery, Mayo Clinic, Scottsdale, Arizona. Dr Nahai is Adjunct Professor of Surgery at Emory University in Atlanta, Georgia.

### Corresponding Author:

Dr George A. Lawson III, Forsyth Plastic Surgery, 2910 Maplewood Ave, Winston-Salem, NC 27103, USA.  
E-mail: [drlawson@forsythplasticsurgery.com](mailto:drlawson@forsythplasticsurgery.com)

Table 1. Previously Documented Cases of Iatrogenic Parotid Injury After Rhytidectomy

| Author/No. of Cases                              | Time to Presentation, d | Associated Factors                                   | Symptoms  | Diagnostic Testing            | Treatment   | Outcome  |
|--|-------------------------|--|---|-------------------------------|---|--|
| Neto, <sup>27</sup> 1 case                       | —                       | Secondary rhytidectomy                               | —   | —                             | Radiotherapy  | Resolution   |
| Habal, <sup>24</sup> 1 case                      | 15                      | —  | Facial swelling, inflamed Stensen's duct            | Sialogram                     | Percutaneous drainage, pressure dressing, radiotherapy  | Resolution after 4 wk  |
| Bonnefon, <sup>20</sup> 1 case                   | 1                       | Parotid fascia sutured to support the gland          | Facial edema  | —                             | Reexploration, drainage   | Resolution after 60 d  |
| Bansberg and Krugman, <sup>2</sup> 1 case        | 14                      | —  | Soft fluctuant mass over masseter                   | Ultrasound, amylase analysis  | Pressure dressing, serial aspirations   | Resolution   |
| McKinney et al., <sup>25</sup> 6 cases<br>Case 1 | 9                       | Parotid parynchomal laceration                       | Hematoma, fluctuant swelling                        | Amylase analysis              | Serial aspiration, reexploration, drainage  | Resolution at 18 d   |
| Case 2   | 3                       | —  | Pain, facial swelling, increased during meals       | Amylase analysis              | Serial aspiration, propantheline, pressure dressing   | Minor swelling for 3 mo                                      |
| Case 3   | 4                       | —  | —   | —                             | Serial aspirations, drainage  | Resolution at 32 d, tissue defect requiring dermal fat graft |
| Case 4   | 4                       | —  | —   | —                             | Reexploration and drainage  | Intermittent fullness for 3 y                                |
| Case 5   | 4                       | —  | —   | —                             | Serial aspiration, pressure dressing  | Resolution at 17 d   |
| Case 6   | 9                       | —  | —   | —                             | Serial aspiration, drainage   | Resolution at 23 d   |
| Gleason, <sup>23</sup> 2 cases<br>Case 1         | —                       | —  | —   | Sialogram                     | Duct dilation from sialogram  | Resolution   |
| Case 2   | —                       | —  | —   | Sialogram                     | Duct dilation from sialogram  | Resolution   |
| Wolf et al., <sup>5</sup> 3 cases<br>Case 1      | 3                       | Parotid parynchomal injury                           | Preauricular swelling/seroma, drainage while eating | —                             | Aspiration, compression dressing, bland diet  | Resolution at 4 wk   |
| Case 2   | 3                       | —  | Facial edema and swelling                           | Amylase analysis              | Aspiration, reexploration and drainage, compression dressing, atropine, excision of fistula tract | Resolution at 4 wk   |
| Case 3   | 4                       | —  | Preauricular swelling                               | —                             | Aspiration, open incision, drainage   | Intermittent swelling and inflammation for 18 mo             |
| Muirragui, <sup>26</sup> 1 case                  | 4                       | Secondary rhytidectomy, parotid parynchomal exposure | Facial swelling and edema                           | Amylase analysis              | Reexploration, oversewing fistula and drainage, compression dressing                              | Resolution at 4 wk   |
| Feingold, <sup>22</sup> 1 case                   | —                       | —  | —   | —                             | Glycopyrrolate  | —  |
| Barron et al., <sup>3</sup> 1 case               | 7                       | —  | Nonpainful neck swelling, increased during meals    | Amylase analysis, sialography | Sialoendoscopy, drainage, compression dressing  | Resolution   |
| Lapid et al., <sup>4</sup> 1 case                | 12                      | —  | Swelling and pain at cheek                          | Amylase analysis              | Serial aspiration, compression dressing, drainage, transcutaneous scopolamine                     | Resolution at 4 wk   |

(continued)

Table 1. (continued)

| Author/No. of Cases                             | Time to Presentation, d | Associated Factors  | Symptoms   | Diagnostic Testing | Treatment  | Outcome   |
|---|-------------------------|---|--|--------------------|--|---|
| Dressy et al, <sup>21</sup> 1 case              | 13                      | History of repeated silicone injections to face, granulomatous reaction, multiple surgical revisions and cortisone injections | Painless swelling/erythema cheek, serous drainage increased during meals | Amylase analysis   | Transdermal scopolamine and direct botulinum gland injection | Resolution, skin necrosis needing skin grafting |
| Lawson et al (current study), 3 cases<br>Case 1 | 5                       | —   | Neck swelling, erythema, serous drainage                                 | —                  | Drainage, massage, ultrasound                                | Resolution at 24 d                              |
| Case 2  | 5                       | —   | Facial swelling  | —                  | Reexploration, drainage, massage                             | Resolution at 24 d                              |
| Case 3  | 11                      | —   | Facial swelling  | Amylase analysis   | Drainage   | Resolution at 25 d                              |

Dashes (—) represent no available information from the study for that particular data field.

and treat parotid injuries. The parotid gland lies underneath a distinct fascial layer (the SMAS), which is contiguous with the platysma, the temporoparietal fascia, and beyond.<sup>28</sup> It is divided into the fixed and mobile portions. The fixed portion overlies the parotid gland, and the mobile portion overlies the mimetic muscles, facial nerves, and parotid duct. The parotid gland itself is enveloped by a deeper layer that is contiguous with the deep cervical fascia inferiorly and the deep temporal fascia superiorly. This is termed the *parotideomasseteric fascia*.<sup>28</sup> There is a distinct plane between the SMAS and parotideomasseteric fascia underneath the mobile portion of the SMAS.

The fascia and SMAS appear to be most adherent in the location of the inferior portion of the parotid gland that crosses the mandibular angle posterior to the masseter. It is felt that dissection in this region is where parotid glandular injury is most likely to occur during rhytidectomy (Figures 1 and 2). The thinner, superior SMAS flap may also predispose the parotid to exposure.

The parotid gland parenchyma is divided into a superficial and deep portion. It is bounded superiorly by the zygoma, anteriorly by the masseter, and posteriorly by the external auditory canal, and it has an inferior extension of a parotid tail that curves around the mandibular ramus.<sup>11</sup> Stensen's duct forms at the anterolateral portion of the gland and travels along a line from the tragus to the midportion of the upper lip, superficial to the masseter. It pierces the buccinator muscle to enter the oral cavity at the maxillary second molar.<sup>11</sup> The buccal branch of the facial nerve and the transverse facial artery both traverse close to this duct along its course. Innervation to the parotid gland is of parasympathetic origin from the inferior salivary nucleus in the central nervous system (CNS), which becomes the tympanic branch of the glossopharyngeal nerve. After traveling through the middle ear and otic ganglion, the postganglionic fibers are transmitted through the auriculotemporal nerve.<sup>11</sup> This important secretory innervation pattern is relevant in Frey's syndrome as well. In this disorder, injury to the parotid gland damages the secretory parasympathetic fibers. As these fibers regenerate, occasionally an aberrant

communication can occur with postganglionic sympathetic fibers, which innervate the sweat glands and cutaneous vasculature. The result is gustatory sweating and facial flushing with mastication.

## CLINICAL PRESENTATION

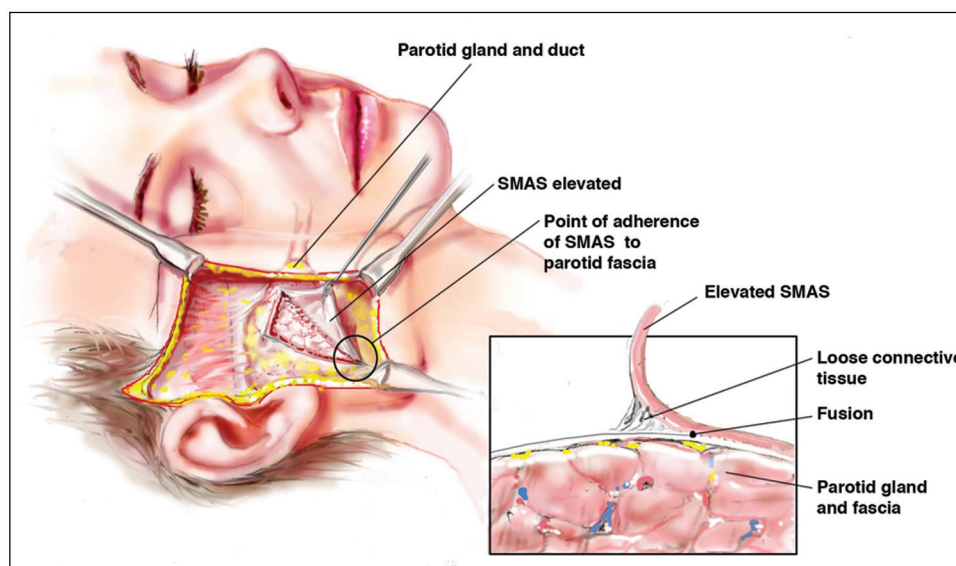
Signs and symptoms during presentation of parotid injuries after rhytidectomy include edema or swelling,<sup>2-5,20,21,24-26</sup> serous drainage through incisions or wounds,<sup>5,21</sup> erythema,<sup>21</sup> and pain.<sup>4,25</sup>

In the literature, traumatic injuries present in largely a similar manner and can often be more easily diagnosed based on the site of injury and open wounds. Swelling and serous drainage from the wound (leaking salivary fluid) are generally the presenting symptoms. Additionally, the patient may experience a change in swelling or drainage when food is present.<sup>11</sup> A sialocele may often be misdiagnosed as a hematoma or part of the soft tissue injury and can present concomitantly with soft tissue infection.<sup>14</sup>

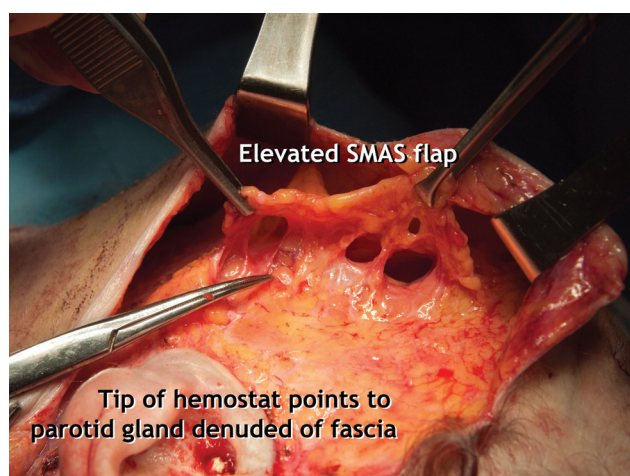
## Case Reports

Below are the case reports of 3 patients who presented to the senior author's practice and illustrate some of the clinical presentation data described above.

**Case 1.** A 60-year-old woman underwent short-scar rhytidectomy with SMAS undermining and plication. On postoperative day 5, the patient's neck appeared more swollen and erythematous on the right side. She was started on an antibiotic regimen for presumed cellulitis. The next day, the patient was reevaluated in the office and found to have additional swelling of the neck. Clear serous drainage was noticed from the right side at the earlobe incision. A few sutures were removed and more clear fluid effluent was expressed. A Penrose drain was placed. The following day, the patient returned with markedly increased serous drainage from around the



**Figure 1.** The parotid gland, its relationship to the overlying superficial musculoaponeurotic system (SMAS), and the most likely location of iatrogenic injury.



**Figure 2.** Intraoperative photograph demonstrating elevated superficial musculoaponeurotic system (SMAS) flap and underlying parotid gland with denuded parotidomasseteric fascia medially.

Penrose drain site. Intraorally, there appeared to be drainage from Stensen's duct on the ipsilateral side. Over the next 10 days, the drainage began decreasing in quantity until the Penrose drain was discontinued (postoperative day 17). There was scant induration of the neck and minimal swelling. She was treated with lymphatic massage and external ultrasound to the area. By postoperative day 24, the fistula was declared healed, without any swelling or drainage noted and no persistent sequelae.

**Case 2.** A 70-year-old woman underwent rhytidectomy with SMAS undermining, excision, and plication. On

postoperative day 5, she presented with unilateral left neck and lower face swelling, and she underwent exploration of the left neck for what was presumed to be a hematoma. Drainage of this area yielded clear effluence consistent with a parotid sialocele. A closed-suction drain was placed at the time of surgery. Five days later, no visible fluid collection was noted, but the patient stated that she continued to notice a significant amount of serous fluid drainage at night. The patient continued massage of the area, and the output began to decrease. By postoperative day 24, the drain had been removed, there was no visible swelling or drainage, and the sialocele was presumed to be healed.

**Case 3.** A 53-year-old woman underwent rhytidectomy with SMAS undermining and elevation. At her first postoperative visit, 6 days after surgery, she appeared to be doing well. At a delayed presentation 11 days later, she presented urgently to the office with unilateral swelling on the left side of her face. The presumed diagnosis was a delayed hematoma. At the time of drainage, a moderate amount of serous fluid was evacuated from the wound bed. Amylase was sent from this fluid and found to be greater than 10 000 U/L. A closed-suction drain was placed in the bed of the drained sialocele. The patient continued to have clear drainage over the next few days. This decreased to a minimal amount of drainage over a period of 48 hours, and the drain was removed. By postoperative day 25, she appeared to be healed and had no further sequelae.

## Diagnosis

Confirming a parotid gland or ductal injury may be straightforward and based on clinical evaluation when these symptoms are present in the corresponding location.

Confirmatory tests exist that may be useful if the diagnosis is not certain.

Simple aspiration or sampling of a fluid collection may be sent for amylase testing, as described in one of our case reports.<sup>3-5,14,25,26</sup> A high amylase exceeding 10 000 U/L is diagnostic.<sup>14</sup> Surgical exploration may be used to identify parenchymal or ductal injury. Retrograde injection of dye into Stensen's duct intraorally may identify dye extravasation at the site of injury.<sup>11-13</sup> Saline or peroxide may be used as well in this manner.<sup>11,16</sup> Muirragui<sup>26</sup> administered chewing gum intraoperatively under local anesthesia to visualize a parenchymal injury and stimulate parotid activity. Direct cannulation of Stensen's duct with lacrimal probes can also demonstrate injuries to the duct.<sup>11</sup>

Radiographically, an ultrasound may be used to identify a fluid collection when the physician is unsure about a swelling, mass, or localized collection.<sup>2</sup> Probably the most useful form of imaging is sialography. Parekh et al<sup>14</sup> performed dynamic parotid flow scans with radioactive technetium pertechnetate to assess healing of parotid salivary fistula/sialoceles in a prospective study of 51 cases. They recommended sialography in all patients who develop swelling after penetrating injury in the parotid region.<sup>14</sup> Barron et al<sup>3</sup> used sialoendoscopy to confirm the diagnosis and help treat a Stensen's duct obstruction.

## TREATMENT

### Traumatic Injury

Although iatrogenic injury to the parotid from rhytidectomy is relatively uncommon, traumatic parotid injury has been well studied. It is surprising, then, that there is so much variation with regard to the management of parotid fistula or sialoceles. In fact, many previously accepted methods of treatment such as radiotherapy and parasympathetic denervation are no longer commonly employed.<sup>4,6,18,27,29-31</sup>

Van Sickels<sup>15</sup> found that breaking down the parotid system into regions may facilitate decision making and predict postoperative problems with regard to traumatic parotid injuries. The 3 regions include Region A, or the glandular portion posterior to the masseter; Region B, or the duct and any glandular portion overlying the masseter; and Region C, which comprises the duct distal to the masseter and its associated papilla.

There is significant evidence that isolated traumatic glandular injury fares much better than ductal injury and that glandular injury can more often be managed with nonoperative treatment, especially in Region A.<sup>11,12,14,16</sup> A prospective study of nonoperative management of traumatic parotid injury demonstrated that 50 of 51 cases went on to heal with conservative management (1 was lost to follow-up).<sup>14</sup> Conservative therapy demonstrated a statistically significant improvement in healing time when nothing by mouth was pursued until complete healing, or if the injury was glandular rather than ductal in nature. The use of compression bandages and antisialagogues provided no difference.

General consensus today appears to be that traumatic ductal injuries must be further assessed because of the

good results obtained with advanced microsurgical techniques and stenting.<sup>13,16,32</sup> If a proximally located laceration is identified, microsurgical anastomosis over a stent should be performed. If the ends cannot be identified or brought together, the proximal stump may be ligated to cause a salivary obstruction and resultant glandular atrophy. Although successful, ligation may lead to a significant amount of pain and swelling.<sup>11,13,16</sup> When the distal duct or papilla cannot be identified, diversion of Stensen's duct intraorally may be needed to create an intraoral fistula.

### Iatrogenic Injury

With regard to the known cases of parotid salivary leaks following rhytidectomy, a myriad of treatment strategies has been employed. Neto<sup>27</sup> and Habal<sup>24</sup> employed radiotherapy. Aspiration (isolated or serial) and drainage strategies (operative with placement of drain) have been commonly employed in these situations.<sup>2-5,20,24-26</sup> This is often combined with compression therapy. A bland diet has been used as an adjunct to therapy.<sup>4,5</sup> Pharmacologic therapy has also been employed, with propantheline, botulinum toxin-A, atropine, scopolamine, and glycopyrrolate all being used in the past.<sup>4,5,21,22,25</sup> It should be mentioned that iatrogenic injury to the parotid duct during rhytidectomy would be even more uncommon than glandular injury. In fact, none of the known cases in the literature seems to suggest a ductal rather than a glandular injury.<sup>2-5,20-27</sup>

Noninvasive forms of treatment for parotid leaks appear to be promising, with the administration of antisialagogue medications to promote healing of the parotid. The most widely used medications to promote these antisecretory effects are anticholinergics, including atropine, benztropine, propantheline, glycopyrrolate, botulinum toxin, ipratropium bromide, and scopolamine.<sup>7-10,11,17,33</sup> Although many of these antisialagogues have been reportedly used to treat such a problem, the oral forms of many of these medications yield numerous unwanted side effects, including constipation, decreased sweating, dryness of the mouth/nose, blurred vision, palpitations, difficulty with micturition, drowsiness, headaches, photophobia, nausea/vomiting, and tiredness.<sup>4,8,9,21,33</sup> The best studied are botulinum toxin and transdermal scopolamine.<sup>4,7-11,17,21,33</sup>

Scopolamine is a known antisialagogue that acts as an acetylcholine muscarinic receptor antagonist.<sup>4,21,34</sup> But unlike the oral form of scopolamine, with its anticipated side effects, the transdermal form appears to have a more limited side-effect profile but still offers significant antisialagogue properties.<sup>4,21,34</sup> This form of scopolamine is administered as a patch behind the ear, where a regulated and stable dose is maintained for 3 days.<sup>4</sup> Lapid et al<sup>4</sup> used transdermal scopolamine in a patient with a postrhytidectomy sialocele after management with aspiration, diet changes, and drainage failed. The patient used 3 patches, each of which were changed after 48 hours. Saliva secretion into the sialocele halted and the patient went on to heal with only transient dry mouth. Dressy et al<sup>21</sup> used

transdermal scopolamine in a patient who developed parotid fistula after rhytidectomy. The patch was replaced every 48 to 72 hours and was continued for 18 days. The fistula decreased in output, but the drainage had not ceased. After 18 days of treatment, botulinum toxin-A was added to the regimen with local injections at the parotid gland. The patient went on to heal with transient complaints of mouth dryness.

Much like transdermal scopolamine, the benefits of using botulinum toxin for its antisialagogue effects lie in its ability to target the parotid gland and minimize systemic side effects. Botulinum toxin inhibits the release of acetylcholine at the presynapse. This causes a neuromuscular blockade that is irreversible over the course of several months and can affect both motor nerves and autonomic cholinergic fibers.<sup>7-10,21,33,35</sup> The autonomic effects of botulinum toxin likely outlast the neuromuscular effects.<sup>33</sup> By targeting the parotid gland directly, these antisecretory effects may augment the ability of the parotid fistula or sialocele to heal due to decreased salivary secretion.

Successful management of parotid secretions with botulinum toxin has been demonstrated in the treatment of sialorrhea with amyotrophic lateral sclerosis,<sup>33</sup> parotid fistula after excision of facial basal cell carcinoma,<sup>17</sup> postparotidectomy parotid fistula,<sup>8,10</sup> parotid sialocele and fistula after parotid trauma,<sup>7,10</sup> Frey's syndrome,<sup>36</sup> and parotid fistula postrhytidectomy.<sup>21</sup> There appears to be no uniform dosage or technique for administration. Anywhere from 10 to 100 units of Botox (Allergan, Irvine, California) or 20 to 350 units of Dysport (Medicis, Inc, Scottsdale, Arizona) has been used to infiltrate the parotid gland.<sup>7,8,10,17,21,33</sup> In the one study in which botulinum toxin was used to successfully address postrhytidectomy salivary leak, Dressy et al<sup>21</sup> injected botulinum toxin-A (Botox) directly into the gland, which led to a cessation in salivary leakage. One hundred units of Botox was diluted with 2.0 mL of sterile normal saline, yielding 5.0 U for each 0.1 mL. The parotid glandular area was directly infiltrated with 20 superficial microinjections of 0.1 mL each using a 30-gauge needle. Marchese-Ragona et al<sup>8</sup> used concomitant electromyography to localize the masseter during injection and avoid intramuscular injection into the masseter.

## DISCUSSION

Although rarely reported in the literature, postrhytidectomy parotid injuries are a known complication that could potentially lead to devastating consequences. Iatrogenic injury to the parotid may lead to persistent sialoceles or fistulae that may compromise the aesthetic result, alarm both the surgeon and patient, and impair healing of the wound bed and flaps. As an example of how truly rare this complication appears to be, the senior author has performed well over 2000 face-lifts. Of these, he can recall only 4 cases of sialocele or parotid fistula. From these reports and the available literature, we can interpret this information to help us avoid these complications in the future and appropriately manage them when needed.

The majority of these patients with injured parotid glands appear to present with unilateral facial or neck swelling. The presentation is not uncommonly late and sudden. This is often mistaken as a more common complication with similar symptoms. In our case reports, the abrupt onset of delayed swelling prompted the early diagnoses of hematoma, but the clear serous fluid and high amylase content after exploration gave the diagnosis away as salivary fluid from iatrogenic parotid injury. This symptom should be in the differential of unilateral swelling after rhytidectomy, particularly if a deeper plane face-lift with elevation of the SMAS was performed.

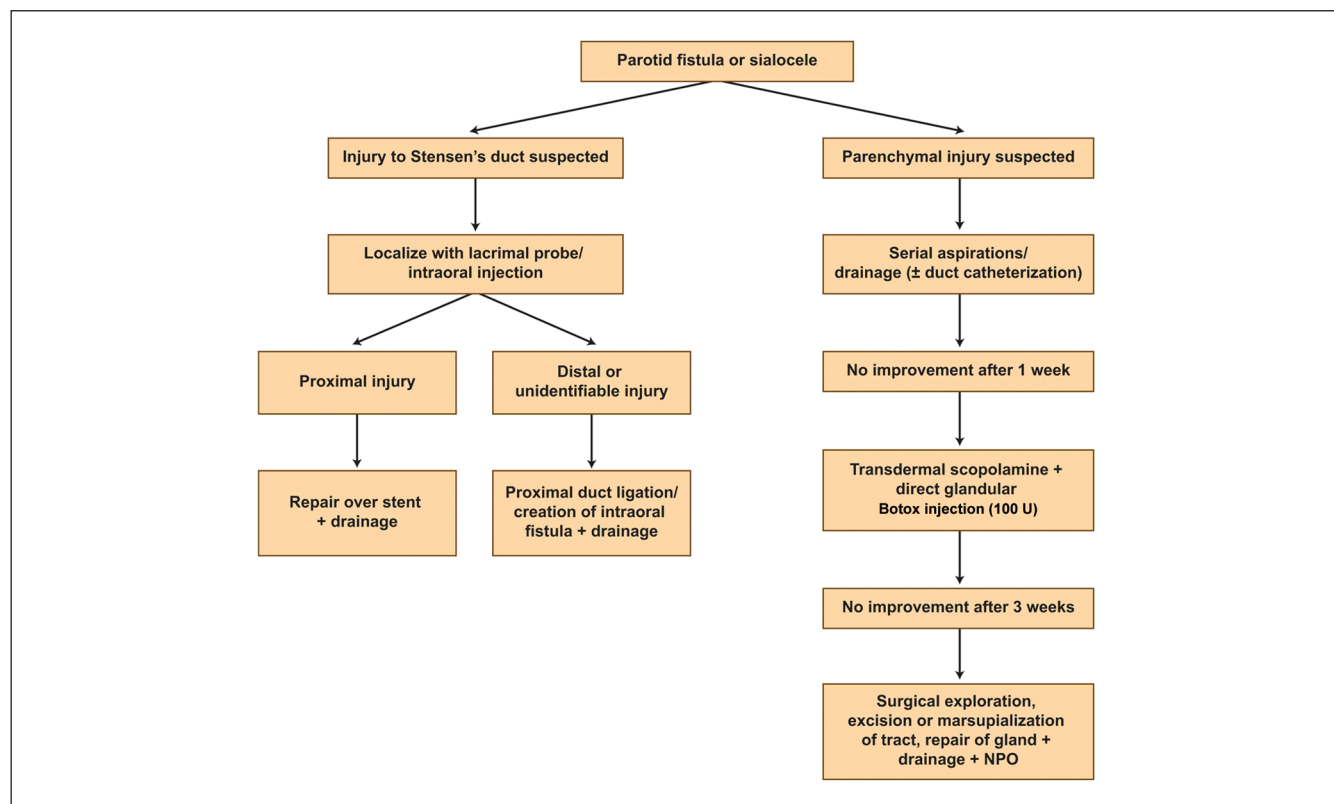
The senior author's technique of subSMAS dissection does expose the fascia and capsule of the parotid gland. How often the fascia is entered we have not determined, but we would assume that it is not a rare occurrence. We feel strongly that surgical technique should be meticulous when dissecting over the adherent subSMAS region during deeper-plane rhytidectomy techniques. In addition, we routinely place suction drains in the subcutaneous position on all face-lift patients (including the 3 presented here) and leave them in place for at least 24 hours.

It may be postulated that the SMAS flap can be used to cover the parotid gland and potentially reduce complications from parenchymal injury. Thomas et al<sup>37</sup> presented their thoughts on superficial parotidectomy for contour refinement during rhytidectomy and described redraping the SMAS flap over the gland. They discussed 3 cases of parotid gland hypertrophy noted preoperatively (2 patients with benign hyperplasia and 1 with pleomorphic adenoma). Using the preauricular approach, bilateral limited superficial parotidectomies were performed underneath the SMAS flaps. The SMAS flaps were redraped and fibrin glue sprayed to cover the raw glandular surfaces. No mention was made of any untoward complications. We do not feel that the advancement of the SMAS flap over the exposed parotid fascia or capsule of the gland would prevent or treat this complication. Any parenchymal injury during rhytidectomy that leads to a clinically significant salivary leak most likely would not be controlled by the thin and pliable SMAS flap. In addition, the more caustic nature of salivary fluid will likely overcome this lean amount of tissue coverage.

## MANAGEMENT ALGORITHM

Given the available literature and data in dealing with parotid sialoceles and fistulae, we believe that the mainstays of treatment should include (1) early drainage/observation and (2) botulinum toxin administration into the parotid gland if symptoms persist. We propose the following comprehensive treatment algorithm (Figure 3) in dealing with parotid salivary leak postrhytidectomy.

If injury to Stensen's duct is suspected based on intraoperative details, the wound should be reexplored and examined for ductal injury. (It should be noted that ductal injury is felt to be much less likely than glandular injury during rhytidectomy.) Lacrimal probes or intraoral dye/



**Figure 3.** Management algorithm for parotid injury after rhytidectomy. NPO, nil per os.

saline can be injected into the duct papilla to confirm diagnosis. If the duct is injured proximally and can be repaired, this should be done over a stent, which should be left in place for 2 weeks. If the duct ends cannot be identified or are too distal, proximal duct ligation or creation of an intraoral fistula should be considered.

If injury to the glandular parenchyma is suspected (which would be much more likely), a trial of nonoperative treatment should be considered first. Serial aspirations or placement of a drain are important early in this period. If large-volume drainage is likely, a closed-suction drain may be more hygienic and easier for the patient to manage. Lower volumes of drainage may be dealt with by use of a Penrose drain. If significant pressure or edema is expected, a catheter should be placed intraorally into Stensen's duct to permit salivary drainage. If the drainage is persistent after 5 to 7 days, the administration of both a transdermal scopolamine patch (changed every 3 days) and localized injection of botulinum toxin-A should be considered. Injection should proceed in a similar manner to that displayed by Dressey et al<sup>21</sup>: dilute 100 units in 2.0 mL of sterile normal saline, yielding 5.0 U for each 0.1 mL. Directly infiltrate the parotid gland with 20 superficial microinjections of 0.1 mL each, using a 30-gauge needle. The patient should be warned of the most likely side effect, dry mouth. If after 3 weeks the drainage has not slowed significantly, consideration should be given to reexplore the wound, excise or marsupialize any fistula or sialocele, suture repair any obvious parenchymal injury,

and place long-term closed-suction drains. At that point, a trial of nothing-by-mouth might be warranted.

It is important to also note that general surgical principles teach us that all fistulas should eventually close in the absence of distal obstruction or pathologic conditions such as radiation, tumor, infection, and so on. If one of these conditions is suspected, this might be a reason to employ sialography as part of the diagnostic evaluation.

## CONCLUSIONS

Iatrogenic injury to the parotid is a rare complication of rhytidectomy. Early diagnosis and appropriate treatment are essential to appropriately manage this complication. A proper treatment algorithm for this entity has not been previously clearly delineated. Our knowledge of traumatic and surgical injury to the parotid augments our ability to propose a treatment algorithm for this unusual problem. Both nonsurgical and surgical treatments have been touted as successful. Botulinum toxin and transdermal scopolamine provide additional therapeutic options for these cases, which may help avoid more invasive treatment.

## Disclosures

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

## Funding

The authors received no financial support for the research, authorship, and publication of this article.

## REFERENCES

1. American Society for Aesthetic Plastic Surgery. Cosmetic surgery national databank statistics, 2010. <http://www.surgery.org/media/statistics>
2. Bansberg SF, Krugman ME. Parotid salivary fistula following rhytidectomy. *Ann Plast Surg.* 1990;24(1):61-62.
3. Barron R, Margulis A, Ickeson M, Zeltser R, Eldad A, Nahlieli O. Iatrogenic parotid sialocele following rhytidectomy: diagnosis and treatment. *Plast Reconstr Surg.* 2001;108(6):1782-1784.
4. Lapid O, Kreiger Y, Sagi A. Transdermal scopolamine use for post-rhytidectomy sialocele. *Aesthetic Plast Surg.* 2004;28(1):24-28.
5. Wolf K, Bostwick J, Dinner M, Jackson IT. Parotid salivary fistula following rhytidectomy. *Plast Reconstr Surg.* 1996;97(3):641-642.
6. Ananthakrishnan N, Parkash S. Parotid fistulas: a review. *Br J Surg.* 1982;69(11):641-643.
7. Marchese Ragona R, Blotta P, Pastore A, Tugnoli V, Eleopra R, De Grandis D. Management of parotid sialocele with botulinum toxin. *Laryngoscope.* 1999;109(8):1344-1346.
8. Marchese-Ragona R, Marioni G, Restivo DA, Staffieri A. The role of botulinum toxin in postparotidectomy fistula treatment: a technical note. *Am J Otolaryngol.* 2006;27(3):221-224.
9. Vargas H, Galati LT, Parnes SM. A pilot study evaluating the treatment of postparotidectomy sialoceles with botulinum toxin type A. *Arch Otolaryngol Head Neck Surg.* 2000;126(3):421-424.
10. von Lindern JJ, Niederhagen B, Appel T, Bergé S, Reich RH. New prospects in the treatment of traumatic and postoperative parotid fistulas with type A botulinum toxin. *Plast Reconstr Surg.* 2002;109(7):2443-2445.
11. Gordin EA, Daniero JJ, Krein H, Boon MS. Parotid gland trauma. *Facial Plast Surg.* 2010;26(6):504-510.
12. Lewis G, Knottenbelt JD. Parotid duct injury: is immediate surgical repair necessary? *Injury.* 1991;22(5):407-409.
13. Lewkowicz AA, Hasson O, Nahlieli O. Traumatic injuries to the parotid gland and duct. *J Oral Maxillofac Surg.* 2002;60(6):676-680.
14. Parekh D, Glezerson G, Stewart M, Esser J, Lawson HH. Post-traumatic parotid fistulae and sialoceles: a prospective study of conservative management in 51 cases. *Ann Surg.* 1989;209(1):105-111.
15. Van Sickels JE. Parotid duct injuries. *Oral Surg Oral Med Oral Pathol.* 1981;52(4):364-367.
16. Van Sickels JE. Management of parotid gland and duct injuries. *Oral Maxillofac Surg Clin North Am.* 2009;21(2):243-246.
17. Hill SE, Mortimer NJ, Hitchcock B, Salmon PJ. Parotid fistula complicating surgical excision of a basal cell carcinoma: successful treatment with botulinum toxin type A. *Dermatol Surg.* 2007;33(11):1365-1367.
18. Shimm DS, Berk FK, Tilsner TJ, Coulthard SW. Low-dose radiation therapy for benign salivary disorders. *Am J Clin Oncol.* 1992;15(1):76-78.
19. Suliman MT. Parotid duct fistula: an unusual complication of epidermoid (sebaceous) cyst excision. *Plast Reconstr Surg.* 2006;117(6):2090.
20. Bonnefon A. A case of parotid fluid effusion after a double face-lift operation. *Ann Chir Plast Esthet.* 1987;32(4):364-366.
21. Dressy LA, Mazzocchi M, Monarca C, Onesti MG, Scuderi N. Combined transdermal scopolamine and botulinum toxin A to treat a parotid fistula after a face-lift in a patient with siliconomas. *Int J Oral Maxillofac Surg.* 2007;36(10):949-952.
22. Feingold RS. Parotid salivary gland fistula following rhytidectomy. *Plast Reconstr Surg.* 1998;101(1):245.
23. Gleason MC. Supposed parotid fistula following rhytidectomy. *Plast Reconstr Surg.* 1996;98(5):908.
24. Habal MB. Parotid retention cysts as a complication of rhytidectomy: case report. *Plast Reconstr Surg.* 1978;61(6):920-921.
25. McKinney P, Zuckerbraun BS, Smith JW, Kawamoto HK, Griffith BH. Management of parotid leakage following rhytidectomy. *Plast Reconstr Surg.* 1996;98(5):795-797.
26. Muirragui AG. Salivary fistula after secondary rhytidoplasty. *Plast Reconstr Surg.* 1997;99(3):919.
27. Neto DS. Rhytidoplasties: study of 170 consecutive cases. *J Int Coll Surg.* 1964;42:208-216.
28. Nahai F. *The Art of Aesthetic Surgery: Principles and Techniques.* 2nd ed. St Louis, MO: QMP; 2011.
29. Davis WE, Holt GR, Templer JW. Parotid fistula and tympanic neurectomy. *Am J Surg.* 1977;133(5):587-589.
30. Mandour MA, El-Sheikh MM, El-Garem F. Tympanic neurectomy for parotid fistula. *Arch Otolaryngol.* 1976;102(6):327-329.
31. Wallenborn WM, Hsu YT, Olinger BR. The experimental production of parotid gland atrophy. *Laryngoscope.* 1968;78(8):1314-1328.
32. Hallock GG. Microsurgical repair of the parotid duct. *Microsurgery.* 1992;13(5):243-246.
33. Bushara KO. Sialorrhea in amyotrophic lateral sclerosis: a hypothesis of a new treatment—botulinum toxin A injections of the parotid glands. *Med Hypotheses.* 1997;48(4):337-339.
34. Talmi YP, Finkelstein Y, Zohar Y, Laurian N. Reduction of salivary flow with Scopoderm TTS. *Ann Otol Rhinol Laryngol.* 1988;97(2, pt 1):128-130.
35. MacKenzie I, Burnstock G, Dolly JO. The effects of purified botulinum neurotoxin type A on cholinergic, adrenergic and non-adrenergic, atropine-resistant autonomic neuromuscular transmission. *Neuroscience.* 1982;7(4):997-1006.
36. Laing TA, Liang ME, O'Sullivan ST. Botulinum toxin for treatment of glandular hypersecretory disorders. *J Plast Reconstr Aesthetic Surg.* 2008;61(9):1024-1028.
37. Thomas DJ, Silfen R, Ritz M, Greensmith A, Southwick G. Superficial parotidectomy for rhytidectomy contour refinement. *Plast Reconstr Surg.* 2009;124(5):255e-256e.