Ptosis: An Underestimated Complication after Autologous Fat Injection into the Upper Eyelid

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Abstract

Background: Autologous fat injection into the upper eyelid is a commonly used technique in plastic surgery for volume restoration. However, ptosis, as one of the potential complications of the procedure, has been less well-discussed than other complications.

Objective: To present five cases of ptosis after autologous fat injection for the correction of sunken eyelid deformity and explore its causes.

Methods: In this retrospective, non-comparative, and interventional case series, we identified five patients with ptosis. All patients had a history of previous autologous fat injection into the upper eyelid, performed by different plastic surgeons. Preoperative, intraoperative, and postoperative photographs were taken to analyze the causes of ptosis.

Results: Five patients developed ptosis after autologous fat injection for upper eyelid augmentation and were referred to our group for treatment. Three of the patients had received two injections of autologous fat each. Grafted fat removal with or without levator aponeurosis advancement was required in all five cases.

Conclusions: Ptosis can develop following autologous fat injection into the upper eyelid. Surgeons should be aware of this complication, which rarely manifests during the procedure itself. Techniques for performing autologous fat injection and knowledge of upper eyelid anatomy should be refined to avoid postprocedural ptosis.

Level of Evidence: 5

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Hollow, creased, and empty eyelids present as a sign of aging. Eyelid aging is impacted by many factors, including gravity, loss of fatty tissue, and sunray damage. Fat atrophy can lead to sunken deformity in the upper eyelids. Additionally, excess fat removal during blepharoplasty can also cause eyelid hollowness. To restore youthful eyelid aesthetics, the use of autologous fat, one of the various soft tissue fillers available, has gained popularity, owing to its advantages: it is abundant in volume, inexpensive, easy to harvest, and autogenic. However, complications of autologous fat injection, such as acute vision loss, hemiplegia due to cerebral embolism, acute fat embolism, hematoma, lipo-granuloma, contour irregularities, sepsis and cellulitis, have been reported. Another complication, ptosis, has not been thoroughly described in the literature. Over the past 6 years, our group has treated five patients who developed ptosis after autologous fat injection by five different plastic surgeons. This study aims to discuss how to avoid this complication, how to treat it, and the need to raise awareness of it among plastic surgeons.

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METHODS

Four clinics which locate at different cities in China. Two patients received fat grafting by two other doctors in our hospital. The others came from three different clinics. All patients who reported experiencing ptosis after an autologous fat injection by plastic surgeons at different clinics, admitted between December 2008 and February 2014, were included in this study. The ethics committees of the Plastic Surgery Hospital, Peking Union Medical College, and the Chinese Academy of Medical Sciences approved this retrospective study. Informed consent was obtained from all of the patients. The review included patient demographic data, clinical presentation, history, photographs, and treatment records.

RESULTS

Clinical characteristics of the five patients with ptosis are summarized in Table 1. At their referral to our group, the duration of the patients’ ptosis varied from 10 months to 2.3 years (Table 1). All five patients were female and had a mean age of 40.6 years (range, 34–50 years). All patients had received autologous fat injections into the upper eyelid and were referred to our department with ptosis. All patients declined any incisional procedure at the same time when they received fat injection. To treat each of the patients’ ptosis, a blepharoplasty including grafted fat removal (with or without levator aponeurosis advancement) was performed. The average follow-up time was 21 months, with a range of 6 months to 5.25 years. Representative cases from this series are shown in Figures 1 and 2 and Supplemental Figure S1.

DISCUSSION

The use of autologous fat for volume restoration has gained popularity over other methods.1–3 This type of graft is biologically reliable, nonimmunogenic, abundant, and durable.4,7 The most commonly reported complications of autologous fat transfer are prolonged edema, bruising, undercorrection, overcorrection, visible fatty deposits, graft necrosis, migration, clumping, infection, damage to underlying structures, and lipogranuloma.1,12 Blindness and stroke are extremely severe and relatively rare complications.1,8–10 There have been a few previous reports of ptosis (an understated and underestimated complication of lipotransfer into the upper eyelids) and its treatment in the literature. In the past 5 years, our senior author has performed fat injection in the eyelids of nearly 70 patients. In our own patient group, there have been no complaints of ptosis following this procedure. However, we have realized the necessity of reporting on this complication after treating the cases described in this study.

In order to treat their ptosis, all patients in this study underwent grafted fat removal, and three underwent levator aponeurosis advancement. Based on our treatment of this complication and experience of lipofilling into the upper eyelids in our own patient group, we have attempted to discern post-fat grafting ptosis’s possible causes and how to most effectively prevent and treat the issue.

During treatment of each of the ptosis cases referred to our group, fatty masses were identified after opening the eyelid with an incision. After removal of the fat graft (performed in all five cases), the patients were asked to open their eyes in order to evaluate the necessity of levator aponeurosis advancement. If the eyelid margin position was normal and near-symmetry was obtained (as in Cases 3 and 5), there was no need for levator aponeurosis advancement. This indicated that ptosis was caused by the mechanical load from the fat graft, and the LPS (levator palpebrae superioris) and other structures associated with eyelid lifting were not damaged.13 Levator aponeurosis advancement was performed in the three other cases (1, 2, and 4), because fat

Table 1. Clinical characteristics of five patients with ptosis following autologous fat injection into the upper eyelid

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex/age (years)</th>
<th>Ptosis</th>
<th>Additional signs</th>
<th>Autologous fat injection</th>
<th>Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Side</td>
<td>Degree</td>
<td>Duration (months)</td>
<td>Number</td>
</tr>
<tr>
<td>1</td>
<td>F/49</td>
<td>B</td>
<td>Moderate</td>
<td>10</td>
<td>2*</td>
</tr>
<tr>
<td>2</td>
<td>F/34</td>
<td>L</td>
<td>Minimal</td>
<td>28</td>
<td>2*</td>
</tr>
<tr>
<td>3</td>
<td>F/36</td>
<td>L</td>
<td>Minimal</td>
<td>12</td>
<td>1*</td>
</tr>
<tr>
<td>4</td>
<td>F/50</td>
<td>L</td>
<td>Moderate</td>
<td>12</td>
<td>1*</td>
</tr>
<tr>
<td>5</td>
<td>F/34</td>
<td>B</td>
<td>Minimal</td>
<td>24</td>
<td>2*</td>
</tr>
</tbody>
</table>

F, female; B, upper eyelid of both sides; L, left; R, right. *Performed by other plastic surgeons-unknown.
A 49-year-old female was referred with a 10-month history of bilateral ptosis after fat injection into upper eyelids. She underwent two injections of fat that had been freshly harvested from the patient’s inner thigh. The volumes of either injection were unknown. Bilateral ptosis presented after the second injection, affecting the right side more severely. Eight months prior to her referral, a revisional surgery to remove the fat graft as well as a secondary blepharoplasty on her right upper eyelid resulted in little improvement, and the patient then visited us. With the patient intravenously sedated with local anesthesia, we performed bilateral grafted fat removal with levator aponeurosis advancement. (A, B) Photographs taken at her first visit show bilateral ptosis and skin adhesion to the underlying tissue accentuated by eyeball movement. Clinical examination disclosed moderate ptosis in bilateral upper eyelids with right and left levator excursion of 6 mm and 7 mm, respectively. (C, D) Intraoperative photographs show fat mass in the preaponeurotic region and fibrous connection with the surrounding tissue in both eyelids (white arrow). We released the fibrous connection and excised some of the grafted fat. The patient was then awakened and prompted to open her eyes to evaluate the necessity of levator aponeurosis advancement. Levator aponeurosis was advanced by 10 mm on the right side and 8 mm on the left side. (E) A photograph taken at the fourth postoperative day displays an acceptable result. (F) Three and a half months later, asymmetry developed with undercorrection on the left side and overcorrection on the right. The patient underwent release on the right side. (G) Five months after the first ptosis correction, the patient received an additional 2 mm levator aponeurosis advancement on the left side. (H) A photograph taken at 1 year shows no ptosis and skin adhesion.
A 34-year-old female, presenting with the complaint of ptosis in the left eyelid for 2 years, underwent grafted fat removal and levator aponeurosis advancement. (A) A photograph taken 4 years ago shows that the pretarsal fold was overly high for her facial structure, and she underwent a blepharoplasty at that time. (B) A photograph taken 1 year after the blepharoplasty shows sunken deformity in both upper eyelids. The photograph was taken before the patient underwent fat injection into both eyelids. Three months later, 4 mL of autologous fat obtained from the patient's lower abdomen was injected into the left upper eyelid to correct the deformity, as well as 2 mL into the right side. (C) Five months after the first autologous fat injection into the upper eyelids, the double fold line on the left side was unnatural. Another injection was administered with 5 mL of fat injected into each eyelid. (D) A photograph taken 2.5 years after the second injection shows ptosis of the left upper eyelid. (E) A lump can be noted on the left upper eyelid at her referral (white arrow). (F) Intraoperative photograph shows a preseptal fat mass (white arrow). A 3-mm levator aponeurosis advancement with simultaneous graft removal was performed on the left upper eyelid with the patient under local anesthesia. Once the fat was removed, the patient expressed relief from eyelid heaviness. (G, H) Photographs taken 6 months after the surgery show that ptosis has been corrected.
removal was not sufficient to correct the patients’ ptosis. In those three cases, the patients had suffered traumatic damage to the LPS.\textsuperscript{13}

We believe that plastic surgeons themselves and the techniques they employ are the main cause of ptosis as a complication following autologous fat injection into the eyelid. Specifically, trauma inflicted during the procedure and increased mechanical load on the eyelids from the fat graft are the primary culprits. When performing the fat injection procedure on the eyelid, violence when performing the injection or performing the injection with a sharp-tipped cannula can injure the underlying eyelid structures and pierce the vessels therein. One patient in our study (Case 2), recalled experiencing a hemorrhage in her left upper eyelid after undergoing a second autologous fat injection. The load on the eyelids increases as hematoma occurs and fibrous connections between the fat graft and the surrounding tissue is formed. When fat is injected in the pre-aponeurotic area, the fibrous bands between the levator aponeurosis and the fat graft further limit lid excursion. In many plastic surgeries, a minimal incision is preferred. However, fat injection with a minimal incision in sites as critical as the eyelid is dangerous, because it amounts to performing the procedure blindly. We recommend that fat be grafted into the retro-orbicularis layer, and no deeper, because the possibility of damage to the underlying eyelid structures and vessels increases as the placement plane goes deeper.

Over-grafting or fat lump formation can increase the load on eyelids and cause ptosis. We also recommend that fat be grafted into the retro-orbicularis layer to help the surgeon to better judge the future survival of the graft during the procedure. The injection layer is of vital importance because the result can be confusing. When fat is injected into deeper sites or migrates to deeper positions, there may be no visible mass, although it can be seen intraoperatively. Eyelid augmentation also cannot be obtained, which can impede the surgeon’s ability to judge eyelid volume loss. So, the surgeon may perform an unnecessary second injection, thus making the total volume of the graft excessive. In such cases, a lump commonly results. Additionally, the centralization of the injection sites and fat migration also both increase the probability of mass development.\textsuperscript{6} Interestingly, in all the ptosis patients who we thought had been affected by eyelid movement (at first), we located a fat lump in their nasal region. When we reviewed cases of upper eyelid lipotransfer in our own patient group, we found that the formation of a fat lump in the nasal region can be a result of several factors. Usually when injecting fat into the upper eyelids, the entry point is usually the lateral side of the pretarsal fold, then the cannula will be advanced to the inner side to place the graft on withdrawal of the syringe. Due to resistance from the flesh, the volume of the first injection tends to be excessive. Degenerative LPS changes can be caused by a long-term burden on it from a fat mass, as seen in Figure 2. In this case, the patient did not undergo revisional surgery until 2 years after permanent damage had already occurred. Moreover, migration can occur due to blepharochalasis or incorrect massage. However, a fat graft placed in the nasal region tends to survive well. We suggest changing the injection method, by advancing the cannula to the middle point of the retro-orbicularis layer when starting that graft, then placing the fat graft in the nasal region.

Primary lipogranuloma after fat injection or migrating lipogranuloma away from injection sites both increase the risk of ptosis.\textsuperscript{14} Lipogranuloma is a granulomatous inflammation in the reticular dermis and subcutaneous tissue associated with injection of lipids or oil-like substances. It commonly develops at injection sites, but it can also form elsewhere in the tissue plane or through lymphatic spread away from the injection site.\textsuperscript{12,14-15} We find that there have been no reports on primary lipogranuloma in the upper eyelids in the literature. The periorbital area is a common site of lipogranuloma following fat injection into the forehead and glabella.\textsuperscript{12,14,16} In such cases, facial muscle movement, gravity, and the extremely thin skin of the periorbital area are possible factors that give rise to migrating lipogranuloma formation.\textsuperscript{15} Cryopreservation of harvested fat tissue is another reason, because it can decrease viable fat cells, consequently increasing the risk of inflammation and adverse reactions to the injected foreign body.\textsuperscript{12,14,16} Lipogranuloma usually presents as a multi-lobulated diffuse cystic mass. On histological examination, lipid vacuoles, and inflammation are its typical features.\textsuperscript{14,16} In this case group, the injection was immediately performed after fresh harvesting and purification. Cryopreservation of harvested fat tissue is rare in China. All five patients in this case group declined liposuction in other facial sites. During the whole course, patients presented with ptosis both accompanied by a mass and not, and none of the patients reported having a history of eyelid swelling, skin discoloration, or other symptoms suspicious of lipogranuloma.\textsuperscript{12} Intraoperatively, there were no signs of inflammation, fibrosis, or fat necrosis in any of the patients. Histological examination of the excised graft from the patient featured in Figure 2 showed normal adipocytes (Figure 3).

Avoiding excessive removal of septal fat is important to prevent volume depletion after blepharoplasty, thus decreasing the necessity of injecting fat into the upper eyelid to compensate for the posttreatment result, as was observed in Case 2.\textsuperscript{2,5} We suggest that no more than 2 mL of filler be injected beneath the orbicularis oculi muscle through a blunt-tipped cannula for each side, to avoid over-grafting and trauma. Instead of overcorrection, undercorrection is preferred, because touch-ups can be performed. Care should be taken to not overlap the injection sites, and centralizing the injection sites should be avoided, to prevent the formation of a lump. For those patients who have undergone multiple procedures in the upper eyelids
or who present with simultaneous blepharochalasis, an open incision procedure will be a better choice for the graft, to maintain safety and avoid migration. Meticulous action should be a must during the procedure.

When a patient presents with ptosis after lipofilling of the upper eyelids, the presence of a lump and levator weakness should be checked. Massage of the injection area may resolve the mass; however, the fat should be removed by an open incision procedure if local massage is not effective. Fat excision through an open incision is preferred, rather than through a cannula, because the latter can cause secondary damage. Ptosis correction will be indicated according to clinical examination and intraoperative findings. In this study, through usual transcutaneous blepharoplasty incision, fat graft was found to be in the preseptal or preaponeurotic region according to the injection plane. The fibrous connection between the graft and the surrounding tissue should be resected and excess fat should be removed. The surgeon then can decide whether it is necessary to perform levator aponeurosis advancement. It is very difficult to predict how the injected fat will settle within the upper eyelid, and the short- and long-term effects of this procedure cannot be foreseen. Figure 1 shows an acceptable result, acquired immediately during the postoperative period. However, in this case there was undercorrection on the left side and overcorrection on the right side after the first ptosis surgery. The graft was found to be in the preaponeurotic region, and it had strong adhesion to the LPS. Adhesion can be recurrent even after wide resection of those fibrous bands. Strong adhesion can limit the lid excursion, which is a possible cause of undercorrection. It is a tough task to treat such patients, due to the trauma from multiple previous procedures and wide, strong adhesion. Long-term follow-up is necessary to further study these complications.

The limitations of this study lie in the small sample size and the lack of further scientific research. The complete original case notes of three of the patients could not be obtained, because they came from different surgeons at different clinics.

**CONCLUSION**

Ptosis may develop following autologous fat injection for upper eyelid augmentation, and more attention should be paid to this complication. Once ptosis is present, it is challenging to correct and achieve positive outcomes. Mastery of upper eyelid anatomy and experienced technique are critical to avoid damage to the eyelid structure.

**Supplementary Material**

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

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