Facial aging is contributed by soft-tissue volume loss, bony resorption, and redistribution of subcutaneous fullness. The loss of skin elasticity, soft-tissue atrophy, and gravitational effects of aging can lead to the appearance of a deep superior sulcus. Upper eyelid filler injection has previously been described as a nonsurgical method to rejuvenate the upper face. Filler injection is a relatively safe office procedure, but complications do occur. These include bruising, swelling, Tyndall effect, nodules, infection, activation of herpes simplex, and granulomatous inflammation. Devastating complications such as blindness, stroke, and skin necrosis have also been documented. To avoid these complications, several measures have been advocated, including slow low-pressure injection using small-bore needles and smaller volumes of filler with each injection.

In this study, we describe a technique of superior sulcus filler injection that minimizes the risk of intravascular injection, which can lead to central retinal artery occlusion or cerebrovascular events. We highlight a case report utilizing this technique and the results achieved.

**METHODS**

**Injection Technique**

After topical anesthetic application with eutectic mixture of local anaesthetics 5% cream (Lidocaine/prilocaine, AstraZeneca, Karlskoga, Sweden) for 20 minutes, the area was cleaned with chlorhexidine 0.05%. We used Juvederm Ultra XC (Allergan, Irvine, Calif.) in the case we described below. We recommend using the provided 30-gauge needle and 1-mL syringe. The injection was performed by “walking the rim, feel the bone”: a finger was used to feel the superior orbital rim to obtain a mental image of the rim and location of the supraorbital notch, if present. This is known to be located at the medial one-third junction of the rim. This was followed by the placement of the needle tip on the bony rim. Once a “hard stop” was felt, the needle was withdrawn slightly to the preperiosteal space just superficial to the bone (Fig. 1). A small amount of filler

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was injected till the soft tissue was seen to lift just slightly. Small multiple injections were given along the superior orbital rim rather than a bolus dose at a single location. Care was taken to avoid the supraorbital and supratrochlear vessels, keeping in mind the surface landmarks of these structures (Fig. 2). A total volume of 0.1–0.2 mL of filler per sulcus was sufficient. A smaller amount was used in the lateral half of the rim. After injection, the area was massaged to achieve a smooth surface contour.

RESULTS

Case Study
A 29-year-old woman of Korean ancestry with history of previous upper blepharoplasty complained of hollowing of the left upper eyelid sulcus and too high a left eyelid crease (Fig. 3A). 0.2 mL of hyaluronic acid filler was injected. She achieved a good reduction of the sulcus deformity and lowering of the eye-
lid crease. Five months later, the patient requested for the right upper eyelid sulcus to be treated and she felt the superior sulcus defect was getting deeper. This was performed uneventfully with good cosmetic result (Fig. 3B). The patient defaulted follow-up and returned 4 years later, requesting a repeated procedure. She reported that the filler effects lasted for 2.5 years. The filler injection was again repeated uneventfully on both sides.

**DISCUSSION**

Filler injection is effective in correcting volume deficiency in upper sulcus deformities. The results can be excellent as demonstrated in our patient. Advantages of filler injection over surgery include its reversibility, convenience, and shorter downtime.

Table 1 summarizes the reports of severe ocular complications after filler or fat injection into the face. The patients usually report almost immediate loss of vision or pain, depending on the ocular structure involved.

| No. | Reference | Injection Substance | Injection Site | Diagnosis | Associated Ocular Symptoms and Other Complications |
|-----|-----------|---------------------|----------------|----------|-----------------------------------------------|
| 1   | Kim and Choi\(^5\) | Calcium hydroxyapatite | Nasal region | Bilateral Ophthamlic artery occlusion | Ptosis, total ophthamlopelgia, skin necrosis, anterior segment ischemia |
| 2   | Park et al\(^6\) | (a) Autologous fat (7) | (a) Glabellar (7) | (a) Ophthamlic artery occlusion (7) | Ophthamlopelgia (6) |
|     |           | (b) Hyaluronic acid (4) | (b) Nasolabial (4) | (b) Central retinal artery occlusion (2) | Stroke (2) |
|     |           | (c) Collagen (1) | (c) Glabellar and nasolabial (1) | (c) Branch retinal artery occlusion (3) | Ptosis (4) |
| 3   | Roberts and Arthurs\(^7\) | Poly-(L)-lactic acid (PLLA) | Lateral nasal and periorbital area | Ophthamlic artery occlusion | Ophthamlopelgia |
| 4   | Lee et al\(^8\) | Autologous fat | Periorbital area | Ophthamlic artery occlusion | Middle cerebral artery infarct |
| 5   | Park and Kim\(^9\) | Autologous fat | Glabellar | Central retinal artery occlusion | Anterior segment ischemia, ophthamlopelgia, hypotony, skin necrosis |
| 6   | Kim et al\(^10\) | Hyaluronic acid | Nasal tip and bridge | Central retinal artery occlusion | Ptosis, ophthamlopelgia, middle cerebral artery infarct |
| 7   | Sung et al\(^11\) | Calcium hydroxyapatite | Nasal region | Anterior segment ischemia | Predis, ophthamlopelgia, middle cerebral artery infarct |
| 8   | Kwon et al\(^12\) | Collagen | Anterior nasal septum | Branch retinal artery occlusion | Oculomotor nerve palsy, skin necrosis |
| 9   | Park et al\(^13\) | Autologous fat | Nasolabial fold | Ophthamlic artery occlusion | Ptosis |
| 10  | Peter and Mennel\(^14\) | Hyaluronic acid (Restylane) | Glabellar and cheek | Branch retinal artery occlusion | Total ophthamlopelgia |
| 11  | Silva and Curi\(^15\) | Polymethyl-methacrylate (PMMA) | Glabellar | Central retinal artery occlusion | Middle cerebral artery infarct, skin necrosis |
| 12  | Apte et al\(^16\) | Intradermal dermal matrix (Cymetra) | Forehead | Ophthamlic artery occlusion | (1) Middle cerebral artery infarct |
| 13  | Danesh-Meyer et al\(^17\) | Autologous fat | Nasal bridge | Ophthamlic artery occlusion | (2) Watershed zone infarct |
| 14  | Feinendegen et al\(^18\) | Autologous fat | (1) Nasolabial fold | Retinal artery occlusion | Thalamic infarct |
|     |           |                   | (2) Periorbital | Ophthamlic artery occlusion | Middle cerebral artery infarct |
| 15  | Lee et al\(^19\) | Autologous fat | Nasolabial groove | Central retinal artery occlusion | Infarct |
| 16  | Egidio et al\(^20\) | Autologous fat | Glabellar | Ophthamlic artery occlusion | Predis, proptosis |
| 17  | Dreizen and Framm\(^21\) | Autologous fat | Glabellar | Ophthamlic artery occlusion | Middle cerebral artery infarct |
| 18  | Teimourian\(^22\) | Autologous fat | Glabellar | Central retinal artery occlusion | Infarct |
vision after filler injection, and other associated ocular symptoms including ptosis and ophthalmoplegia may develop. Park et al. reported 12 patients who had retinal artery occlusion after facial filler injections, and visual prognosis is poor. Autologous fat injection had worse visual outcomes compared with hyaluronic acid or collagen injections. There is no established treatment for this complication, and only one study that used hyaluronic filler injection reported complete recovery of vision after immediate administration of acetazolamide. 

Lee et al. reported a patient who experienced loss of vision and 2 hours later developed neurological symptoms. Early recognition and prompt treatment directed at lowering intraocular pressure and allowing more distal embolization of the filler material are crucial for the remote possibility of recovery.

As the peripheral arteries of the face are small and collapsible, blood may not appear in the delivering syringe during aspiration, despite the needle puncturing and entering an arterial lumen. This makes aspiration before injection less helpful. Injecting local anesthetic with adrenaline in the area before filler injection has also been suggested as a safety measure but distorting the sulcus makes it difficult to titrate the amount of filler required.

The key to safe injection in this area is to bear in mind the surface landmark of the supraorbital foramen or notch and to keep the injections that are sited away from the foramen at a preperiosteal plane, which is devoid of larger bore arterial branches. Depositing multiple small boluses of hyaluronic acid filler along the superior orbital rim in the preperiosteal plane has allowed prominent deep superior sulcus deformities to be dealt with safely, yielding a desirable aesthetic outcome.

CONCLUSIONS

Filler injection is an effective nonsurgical method for improving superior sulcus hollowing. With “walk the rim, feel the bone” approach, one can minimize the risk of blindness and stroke.

Audrey Looi, MBBS, MMed, FRCS(Ed)
Singapore National Eye Centre
11 Third Hospital Avenue, Singapore 168751
E-mail: audrey.looi.lg@snec.com.sg

PATIENT CONSENT

The patient provided written consent for the use of her image.

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