Blindness Caused by Cosmetic Filler Injection: A Review of Cause and Therapy

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Summary: Vascular occlusion causing blindness is a rare yet greatly feared complication of the use of facial aesthetic fillers. The authors performed a review of the aesthetic literature to ascertain the reported cases of blindness and the literature reporting variations in the vascular anatomy of the human face. The authors suggest a small but potentially helpful addition to the accepted management of the acute case. Cases of blindness, mostly irreversible, from aesthetic filler injections have been reported from Asia, Europe, and North America. Autologous fat appears to be the most frequent filler causing blindness. Some cases of partial visual recovery have been reported with hyaluronic acid and calcium hydroxylapatite fillers. The sudden profusion of new medical and nonmedical aesthetic filler injectors raises a new cause for alarm about patient safety. The published reports in the medical literature are made by experienced aesthetic surgeons and thus the actual incidence may be even higher. Also, newer injectors may not be aware of the variations in the pattern of facial vascular arborization. The authors present a summary of the relevant literature to date and a suggested helpful addition to the protocols for urgent management. (*Plast. Reconstr. Surg.* 134: 1197, 2014.)

Blindness after the facial injection of particulate materials was first reported in 1963.[1] The recent remarkable growth in the popularity of the cosmetic filler market has caused a dramatic increase in the number of cases of blindness reported.[2–7] Furthermore, this review shows that, although rare, the affected individual seldom recovers vision.

This review is intended to highlight causative factors and to address prevention and therapy. Our hope is that this information will assist every injector of three-dimensional fillers in enhancing patient safety.

All of the commonly used filling agents have been responsible for embolic events. In one large study, approximately 50 percent of the patients were blinded with cosmetic injections of autologous fat. The equipment and injection technique used for the injection are often not recorded in the article because the authors are the doctors to whom the affected patient was referred rather than the injector who caused the embolus.

In 2010, Sung et al.[2] reported unilateral loss of sight in a young man who desired cosmetic augmentation of his nasal bridge and was treated with calcium hydroxylapatite. Shortly after treatment, he suffered sudden unilateral blindness and excruciating pain in the right eye. He also had right ophthalmoplegia, a fixed dilated pupil, and calcium hydroxyl apatite filler material visible in his conjunctival and retinal vessels on the right side. Fortunately, after 3 months, his visual acuity returned to 20/20 with pinhole, and his necrotic skin healed, but he had retinal damage in his nasal retina.

In 2012, in a European study, Lazzeri et al.[3] published the results of their search of the MEDLINE and Cochrane databases, Google and Google Scholar, Current Contents, and PubMed. They found 29 articles representing 32 cases of post–cosmetic filler vascular occlusion causing blindness. Fifteen of 32 cases were diagnosed with blindness following fat injection of the face for cosmetic reasons. None of the fat-injected subjects recovered any sight. The second group included

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patients ($n = 17$) diagnosed with transitory (three subjects) or permanent blindness (14 subjects) after facial aesthetic injections of a range of other (nonfat) filler materials. The sites of injection were nose, scalp, glabella, and cheek.

In 2012, Park et al. in Asia[4] reported a consecutive series of 12 subjects who suffered ophthalmic, central retinal, and branch retinal vascular occlusions following cosmetic filler injections. In two cases each of ophthalmic artery occlusion and central retinal artery occlusion, there was concomitant cerebral cortex infarction. Optical coherence tomography confirmed the thinning of the choroid in the affected eyes. Occlusion resulted from the injection of autologous fat in seven of the 12 cases, the injection of hyaluronic acid in four cases, and the injection of collagen in one case. None of the subjects who had autologous fat injected recovered any vision, except for one, who kept light perception. The visual outcomes in the hyaluronic acid group were substantially better, with log visual acuities 0.15 to 1 in three subjects but no light perception in the fourth.

In 2013, in North America, Ozturk et al.[5] searched the National Library of Medicine, the Cochrane Library, and Ovid MEDLINE and found 61 cases of facial vascular occlusion caused by fillers other than fat, of which 12 had immediate blindness. In their series, the site of injection most commonly associated with severe visual complications was the nose (32.8 percent), the glabella (26.2 percent), and the nasolabial fold (26.2 percent).The fillers used were hyaluronic acid, calcium hydroxylapatite, poly-L-lactic acid, collagen, and dermal matrix. There was no mention of temple injections in these articles.

In 2012, blindness and orbital infarction were reported after injection of poly-L-lactic acid in the periorbital region of a young man,[6] possibly caused by injection into the middle temporal vein (a little known vessel that gathers blood from various veins including the sentinel vein and drains into the superficial temporal vein). It is connected to the cavernous sinus by means of the periorbital veins. Reversal of flow can occur with filler injection. The middle temporal vein lies between the deep and superficial temporal fasciae in the temporal fat pad and lies in the temporal fossa just above the zygoma. In this instance, there was no recovery of sight.

PROPOSED MECHANISM

It has been suggested that the vascular occlusion is attributable either to external pressure on the vessel or to occlusion by intravascular material. We feel that the latter is more likely because of the extensive arborization of vessels in this area. Only occlusion of the vessel by intravascular material would produce the clinical picture we see.

The final branch of the ophthalmic artery is the central retinal artery. Proximal branches include the supratrochlear, the supraorbital, the dorsal nasal, and the angular artery of the nose. If the tip of a needle or cannula penetrates the artery and pressure is applied to the plunger, the filler may reverse the flow in the artery and the filler will travel as a column proximal to the origin of the retinal artery. At this point, the surgeon ceases pressure on the plunger and the arterial pressure carries the embolus forward into the retinal circulation. As these are small arteries, it does not take a large volume of filler to occlude the retinal circulation, resulting in blindness. If the surgeon had exerted even more pressure on the plunger or for a longer time, the filler could have reversed into the internal carotid artery and then advanced into the cerebral circulation, producing a stroke[7] (Fig. 1).

CLINICAL FEATURES

The signature features of periocular embolism are the instant simultaneous complaints of blindness and excruciating ocular pain. This is in sharp contrast to the nonocular ischemic situation in which there is blanching followed by delayed pain and reticular vascular pattern on facial skin.

THERAPY

The treatment of iatrogenic embolic blindness is usually unsuccessful.[2–7] Hayreh et al.[8] have pointed out that the retinal circulation needs to be restored quickly—within 60 to 90 minutes—if the retina is to survive.

We thus believe that prevention is extremely important and will at present be a more successful strategy than treatment. The following factors appear to be important in preventing this complication:

1. Avoid using large-bore needles.
2. Use blunt cannulas or small-bore needles.
3. Inject epinephrine with the filler to reduce the size of the vessels. Give the epinephrine time to work before completing the full injection.
4. Use smaller syringes, preferably 0.5 to 1 cc, so that less pressure is required on the plunger.
5. Always withdraw before you inject. If the filler is very viscous, you may not be successful with this maneuver. Rheologic customization of the filler before injection may be helpful.

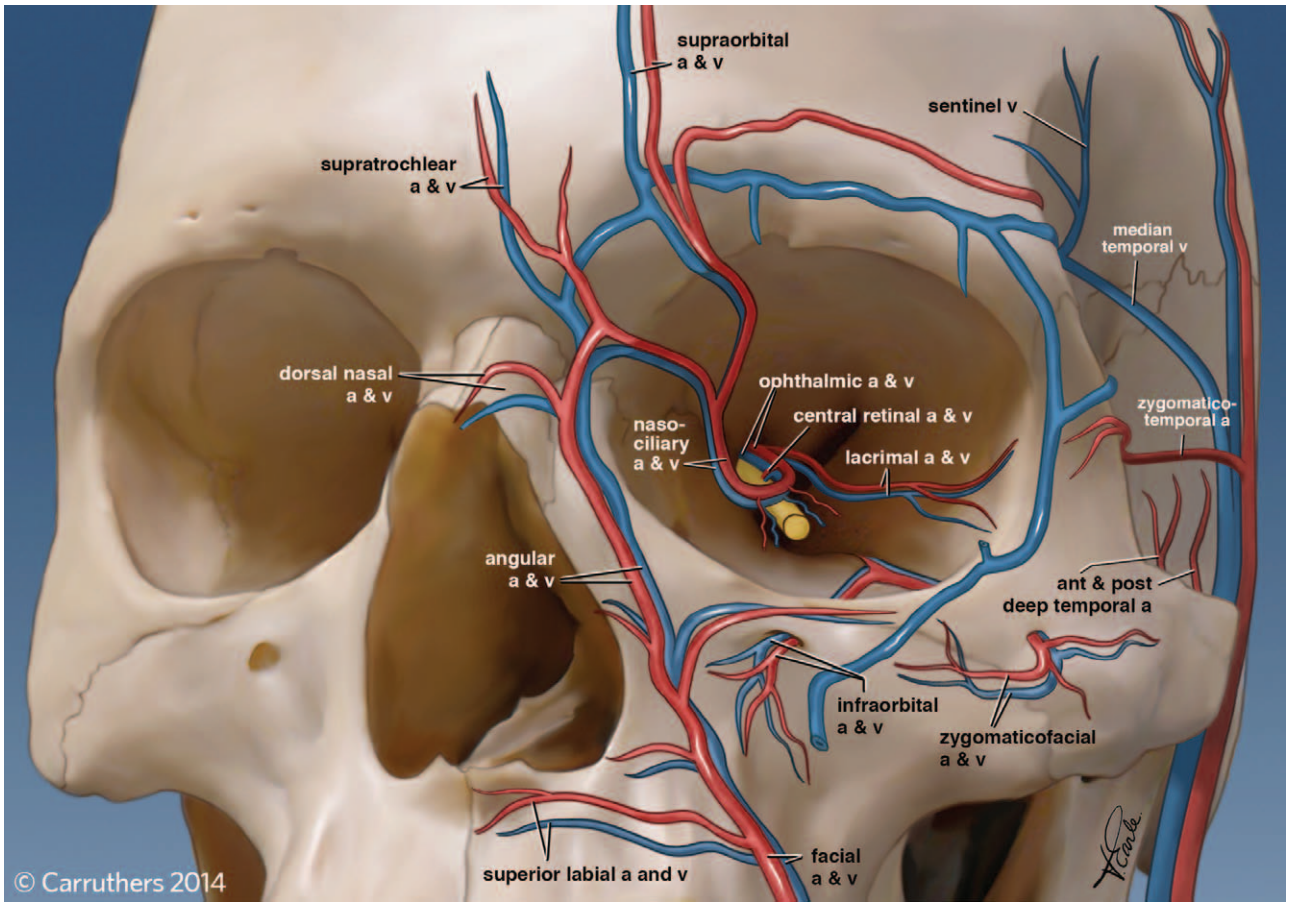

Fig. 1. Vascular anatomy of the periocular region. (Copyright Jean D. Carruthers, M.D., 2014.)

6. Inject slowly, gently, and in small aliquots
7. Never inject in a previously traumatized area (e.g., after recent blunt trauma, blepharoplasty).
8. Know your anatomical plane and depth for each injection.
9. Cease injection immediately if the subject complains of pain or vision loss. Contact an ophthalmologist or oculoplastic colleague immediately and transport the subject to their clinic—not an anonymous referral to a generalized emergency department.

The following factors are important for measurement of visual acuity and funduscopy/photography.

10. Retrobulbar injection of 2 to 4 cc of hyaluronidase (as high a concentration as is possible), as this will decomplex both intravascular hyaluronic acid and hyaluronic acid in the surrounding tissues. Note that different hyaluronic acid fillers respond differentially to hyaluronidase.
11. Another suggestion is direct injection of the ophthalmic artery by a neuroradiologist or massive systemic intravenous injection of hyaluronidase as is done for myocardial infarction.
12. Ocular massage, intravenous mannitol, and Diamox (Duramed Pharmaceuticals, Cincinnati, Ohio) to rapidly reduce intraocular pressure to attempt to move the retinal vascular embolus peripherally.
13. Graefe knife evacuation of the anterior chamber fluid under local anesthesia to attempt to acutely reduce intraocular pressure to move the embolus more peripherally.

RETROBULBAR INJECTION OF HYALURONIDASE

It is recommended to always have a plentiful supply of hyaluronidase in the office in case of emergency.[9–11] As the product has an expiration date, the office team should regularly check that the product is current and adequate.[9,12]

There are many available forms of hyaluronidase. We recommend that the physician order a product that is manufactured without thiomersal and not compounded, as some patients are allergic to components of the material. A skin test before its use is recommended in most circumstances but is not possible in the clinical situation we are discussing. It is therefore best to use a hyaluronidase product with a lower likelihood of allergic response. Hyaluronidase works faster in the Restylane (Galderma S.A., Lausanne, Swtizerland) group of fillers than in the Juvéderm (Allergan, Inc., Irvine, Calif.) group.[9,10]

It has been shown that hyaluronidase injected next to a blood vessel that is clogged with hyaluronic acid will catabolize the hyaluronic acid without needing to actually canalize the affected artery.[10,11] It has been suggested by one of us (S.F.) that, in the case of retinal artery embolization with a hyaluronic acid product, retrobulbar injection of a large volume of hyaluronidase might well be the single most effective option to dissolve the intraorbital intravascular hyaluronan in a time-sensitive manner.[11] Retrobulbar hyaluronidase has been used to clear intraocular vitreous hemorrhage.[13,14] We do not believe that dissection of the orbit to try to directly canalize the ophthalmic artery is either wise or even possible in the extremely limited time available.

RETROBULBAR INJECTION TECHNIQUE

A small bleb of local anesthetic is injected in the lower eyelid over the inferotemporal orbit. A blunt-tip, 25-gauge needle or cannula is advanced in the inferotemporal quadrant of the orbit until it is at least 1 inch in. The needle will be intraconal, inferior and lateral to the optic nerve. Hyaluronidase, 2 to 4 cc (150 to 200 units/ml), is injected into the inferolateral orbit. From cadaver injections, we can see the almost immediate clearing of the intravascular hyaluronic acid when the hyaluronidase is injected alongside the blood vessel.[12]

OTHER THERAPEUTIC POSSIBILITIES

Another therapeutic suggestion is direct injection of the ophthalmic artery by a neuroradiologist or massive systemic intravenous injection of hyaluronidase as is done for myocardial infarction.[15] All these suggestions are still somewhat theoretical, but besides dramatically reducing the intraocular pressure, hyaluronidase injection may help to prevent otherwise almost certain partial or often complete loss of vision.

CONCLUSIONS

Visual loss, including blindness, following filler injections in the periocular area is a feared and increasingly reported complication. Avoiding this complication by appropriate measures is much better than treating it when it has occurred. To date, there has not been any treatment that has been helpful. We feel that treatment may be delayed if the subject is sent to a local emergency department instead of directly to the previously informed ophthalmologist or oculoplastic surgeon. We are encouraged that perivascular injection of hyaluronidase decomplexes intravascular hyaluronic acid.[10–12] We suggest that early recognition and then time-sensitive early retrobulbar injection of large amounts of hyaluronidase is the proposed localized treatment of choice. The rarity of this feared complication, the extremely limited timeline to restore retinal circulation, and the panic and desperation felt by the patient and family should stimulate us all to look prospectively for a simple, safe, and effective remedy.

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