HHS Public Access

Author manuscript

J Dermatol Skin Sci. Author manuscript; available in PMC 2021 July 21.

Published in final edited form as:

J Dermatol Skin Sci. 2021 ; 3(2): 1–4.

Vision Loss and Blindness Following Fillers

Ann Q. Tran, MD[1,2], **Wendy W. Lee, MD, MS**[1]

[1]Bascom Palmer Eye Institute, University of Miami Miller School of Medicine, Miami, FL

[2]Manhattan Eye Ear Throat Hospital, Northwell Health, New York, NY

Abstract

Facial aging associated with volume loss can be addressed with soft tissue fillers. This minimally invasive technique has quickly gained popularity and is commonly performed in many outpatient settings. The composition of injectable dermal fillers includes marketed hyaluronic acid, calcium hydroxyapatite, polylactic acid, silicone and polymethylmethacrylate. Complications, such as vision loss, are rare, but can result in a devastating and irreversible sequala from iatrogenic vascular occlusion. Understanding the facial anatomy, specific filler characteristics, and having a safe injection technique is crucial to assure optimal aesthetics results while avoiding complications. Injectors need to be able to recognize early complications and treat them appropriately, especially if vision loss is encountered. This review will focus on vision loss from fillers, techniques to prevent such complications and possible treatment strategies.

Keywords

Filler complications; Central retinal artery occlusion; Iatrogenic vascular occlusion; Blindness; Vision loss

Introduction

Soft tissue filler injections remains in the top five minimal invasive cosmetic procedures, performed in 2.70 million cases in 2019 alone.[1] Compared to neurotoxins, filler complications occur more commonly and are often more severe. A total of 3,782 adverse events were reported on the U.S. Food and Drug Administration Manufacturer and User Facility Device Experience from 1993 – 2014.[2] The true incidence is unknown due to the lack of universal reporting and minor complications that patients do not address. The most severe filler complications include vascular necrosis (8.5%), anaphylactic reaction (5.5%), autoimmune reactivation (0.7%), strokes (0.1%) and even death (0.1%).[2] Visual disturbances accounted for 1.5% of reported adverse events, most commonly associated with hyaluronic acid and poly-L-lactic acid filler.[2] In cases where litigation is pursued, the mean award amount ranged from $262,000 to $600,000.[3, 4] This review will focus on the relevant facial

[*]**Correspondence:** *Dr. Ann Q. Tran, MD, Bascom Palmer Eye Institute, 900 NW 17th St, Miami, FL, 33136; Tel: 305-326-6434; Fax: 305-482-4568; aqtran821@gmail.com.

Proprietary Interests

The authors have no conflicts of interest.

anatomy, ophthalmic complications that can occur, appropriate injection techniques and treatment protocols if an intravascular occlusion were to occur.

Facial Vasculature

Defining “safe zones” and “danger zones” for injections can be challenging as the vascular anatomy of patients is highly variable with multiple anastomoses.[5] The arterial blood supply of the face arises from the external carotid artery (facial artery, transverse facial artery, and superficial temporary artery) while the arterial blood supply of the orbit arises from the internal carotid artery (ophthalmic artery).[6] Within one-fifth of the population, the cilioretinal artery occurs off a branch of the posterior ciliary artery instead of the ophthalmic artery that allows for an alternate mode of perfusion of the optic nerve and macula.[7] This accounts for preserved vision in cases of central retinal artery occlusion.

Mechanisms of Vision Loss

Intravascular occlusion resulting in vision loss is related to retrograde flow of a small particle from the facial vasculature to the orbital vasculature.[8, 9] This may occur from direct arterial wall perforation or vascular cannulation.[10] The injection force must be greater than the systolic blood pressure to push the resulting embolus. The risk of vascular occlusion is low, occurring in 1 per 5,000 syringes used, with lower occlusion rates associated with microcannulas.[11] While other studies did not note difference in syringe occlusion based on filler particle size, theoretically a 300 um size particle filler could occlude the central retinal artery measuring 160 um in diameter but not the ophthalmic artery measuring 2 mm in diameter.[11, 12]

Anatomical Considerations

The glabella, temple and nasolabial folds are regions where the underlying vasculature can potentially anastomose to the ophthalmic artery. Near the glabella, the supratrochlear and supraorbital arteries are located 17 mm and 27 mm from midline, sometimes within the corrugator crease. Retrograde migration can occur through direct anastomoses from these neurovascular bundles to the ophthalmic artery. The temporal fossa contains the superficial temporal artery located within the superficial temporal fascia. While injections in this region are typically done at the level of the periosteum, injections in the more superficial layer can result in anastomosis with the superficial temporal artery to the supratrochlear and supraorbital artery to the ophthalmic artery. Additionally, a branch off the superficial temporary artery known as the zygomatic-orbital artery, can also provide direct anastomosis to the ophthalmic artery. Below the inferior orbital rim, the infraorbital artery can anastomose to the supraorbital and supratrochlear neurovascular bundles. Within the nasolabial folds, the facial artery gives rise to the angular, dorsal nasal and lateral nasal artery that can directly anastomose to the ophthalmic artery.

Injection Techniques

Certain injection techniques can be utilized to avoid intravascular occlusion and many of the suggestions described below are based on the author’s personal experience.[13] Constriction

of the arterial blood flow with local anesthetic and epinephrine can minimize the possibility of cannulation. Nevertheless, the extra volume from the aesthetic can distort the patient's natural anatomy. To minimize the ejection pressure, small volumes of filler should be injected in a controlled and slow fashion. Constant movement in a retrograde or anterograde fashion with small volumes can minimize the vascular puncture. Digital pressure of the nearby arteries can provide resistance to avoid retrograde flow to the ophthalmic artery. The safety debate of cannula continues to be discussed, where larger cannulas (22 or 25G) may decrease the risk of penetration. [10, 11] However, anatomical studies have shown the ability of a cannula to penetrate an artery.[10, 11] Insertion of needles should be placed perpendicularly to avoid contact with a vessel, as any angle can allow penetration. Smaller gauge needles may easily penetrate a vessel. Aspiration can be performed to ensure no blood is seen through the syringe. However, even small movements of the syringe may change the position in the needle.

The glabella is one of the highest risks of skin necrosis and vascular blindness. Given the delicate region, hyaluronic acid fillers are recommended, as they are reversible and have excellent integration. Superficial injections should be performed in the glabella as the neurovascular bundles are deep in this region. The needle should be placed parallel to the glabella and injected in a linear retrograde fashion.[14] Around 0.3 to 0.5 mL of filler volume is typically required. In the upper forehead, injections should be deep on the periosteum as the vasculature rises mores superficially.

Specific considerations should be taken when injecting within the temporal region. The superficial temporal artery can be palpated. Injections should occur deep on the periosteum, superomedial to the temporal line of fusion and posterior to the hairline. Being 1.5 cm above the zygomatic arch will avoid the middle temporal vein. Alternatively, an injection site 1 cm superior and lateral to the tail of the brow can be performed. Digital pressure of the neurovascular bundles can be applied. Around 0.5–1.0 mL of filler is typically injected on each side.

In the tear troughs, injections should be placed deep on the periosteum. Care should be taken to avoid the infraorbital foramen, in line with the medial limbus. Injections should be placed laterally deep on the periosteum. If an injection medially is required, it can be digitally massaged over or placed with a cannula. Only a small amount of volume 0.05 – 0.1 mL of filler is required.

Along the midface, injections should be placed deep on the periosteum. The needle should be positioned perpendicular to the periosteum along the zygoma. An injected volume of 0.5 to 1.5 mL be placed on each side with the guide of Hinderer's lines.

In the nasolabial region, both deep dermal and superficial subcutaneous injections can be performed on the inferior two-thirds. Injections in the upper third of this region should occur in a pre-periosteal plane and 2–3 mm above the alar groove to avoid cannulation of the facial artery or vein. A fanning technique or deep depot on the periosteum can be considered at the junction of the nose and top of the nasal labial folds.

At the nasal labial folds, the use of retrograde linear threading, fanning and serial puncture can be used. At the oral commissures, cross-hatching above and below outside the vermillion boarder at the corner of lip can be used. The inferior labial artery should be avoided.

No reported cases of blindness have resulted from lip augmentation, but theoretically can occur with anastomosis of the superior labial artery. A small injection with a cannula or needle, parallel to the lip margin allows for a safe technique. Care should be taken at the medial third of the lip where the superior labial artery courses more superficially at the wet-dry mucosal junction of the upper lip. Deep injections should be avoided within the oral mucosa and deep in the oral commissures.

Ophthalmic Complications

In 1988, the first case report of retinal artery occlusion was described from cosmetic facial filler.[15] Currently within the literature, 29 articles with 60 individual cases of hyaluronic acid filler loss have been identified.[16] The most common sites of injection included the nose, glabella and forehead with an injected volume amount of less than 2.0 mL in the majority of cases.[16, 17] There were no reports of vision loss associated with injections in the tear troughs, lips, jawline or chin, even though theoretical anastomoses exist.[16] In some studies, permanent vision loss was reported in 49%, followed by partial vision loss (29%) and full vision recovery (20%).[16]

The degree of vision loss depends on the level of occlusion and that patient's vascular anatomy. Ophthalmic artery occlusions typically result in no light perception vision that are irreversible, given that the ophthalmic artery is the major supply of the orbit. Central retinal artery occlusions result in a cherry red spot seen on dilated funduscopic examination. Most cases of central retinal artery occlusions have severe to complete vision loss, except in cases of patients with an aberrant cilioretinal artery. With a branched retinal artery or posterior cilioretinal artery occlusion, only a portion of the macular arterial supply is affected, accounting for the partial or full vision in these cases. Other causes of vascular obstruction may be due to posterior ischemic optic neuropathy, anterior ischemic optic neuropathy, paracentral acute middle maculopathy and Purtscher's-like retinopathy. [16, 18, 19] In the largest ophthalmic series, the filler composition resulting in vision loss consisted of autologous fat (7 cases), hyaluronic acid (4 cases) and collagen (1 case).[20] Cases of autologous injections fat tended to have more severe ophthalmic presentations and vision loss.

More severe cases include ophthalmoplegia, anterior segment ischemia, and ischemia of the extraocular muscles and levator palpebrae muscle resulting in ptosis and motility defects. In these cases, the majority of patients were blind and nearly 50% of patients required strabismus surgery for diplopia.[21] Other forms of ocular ischemia can result in hypotony, corneal edema, an inflammatory hypopyon and an exudative retinal detachment.[22, 23] In some of these cases, the use of retrobulbar injection of 1,200 U of hyaluronidase allowed for improvement of the extraocular motility but did not improve the vision. Additionally, isolated ischemic nerve palsies can occur.[24] A combination of ophthalmic artery occlusion

and cortical blindness can develop with retrograde movement into the cerebral circulation, where vision loss is permanent.[24]

Treatment of Ophthalmic Complications

No proven treatment has been shown to reverse vision loss; thus, understanding facial anatomy and proper injection technique is key. If vision loss were to occur, prompt recognition and referral to ophthalmology should be performed. Immediately, the injection of filler should be discontinued. A quick visual acuity test and pupil examination should be performed. Typically after 90 minutes, intravascular occlusion from filler will lead to irreversible ischemia and necrosis of the retina.[25]

In-office treatments typically involve attempts to lower the intraocular pressure and dislodge the embolus.[26] The patient should be placed supine, ocular massage can be performed, and intraocular lowering pressure agents can be given, such as topical aqueous suppression drops, acetazolamide or mannitol. An anterior chamber paracentesis can manual removed aqueous to lower the intraocular pressure. The use of hyperbaric oxygen has not improved vision outcomes.[27] Treatment of corticosteroids may improve associated orbital inflammation but again does not restore vision.

Hyaluronic acid filler can be depolymerized by an endogenous enzyme hyaluronidase.[28] In any office where injectables are to be performed, hyaluronidase should be readily available to allow for immediate reversible of soft tissue filler application. Case reports and animal models of hyaluronidase to restore vision loss have not demonstrated the ability to reverse vision loss.[29, 30]

Conclusion

Soft tissue fillers can be utilized to combat facial aging and volume. Appropriate understanding of facial anatomy and injection technique is key to avoid rare and devastating ophthalmic complications. Many of these cases result in irreversible vision loss with no effective treatment for intravascular occlusion. Providers must be aware of early signs of complications and provide prompt treatment.

Acknowledgments

Financial Support

Research support from the NIH Center Core Grant P30EY014801

References

1. American Society of Plastic Surgeons. Plastic Surgery Statistics Report 2019. 2019 Plast Surg Stat. Published online 2019:1–25. https://www.plasticsurgery.org/documents/News/Statistics/2019/plastic-surgery-statistics-full-report-2019.pdf
2. Ortiz AE, Ahluwalia J, Song SS, et al. Analysis of U.S. Food and Drug Administration Data on Soft-Tissue Filler Complications. Dermatol Surg. 2020; 46(7): 958–961. doi:10.1097/DSS.0000000000002208 [PubMed: 31592917]

3. Rayess HM, Svider PF, Hanba C, et al. A cross-sectional analysis of adverse events and litigation for injectable fillers. JAMA Facial Plast Surg. 2018; 20(3): 207–214. doi:10.1001/jamafacial.2017.1888 [PubMed: 29270603]
4. Beauvais D, Ferneini EM. Complications and Litigation Associated With Injectable Facial Fillers: A Cross-Sectional Study. J Oral Maxillofac Surg. 2020; 78(1): 133–140. doi:10.1016/j.joms.2019.08.003 [PubMed: 31493376]
5. Wollina U, Goldman A. Facial vascular danger zones for filler injections. Dermatol Ther. 2020; 33(6): 1–8. doi:10.1111/dth.14285
6. Bertelli E, Regoli M, Bracco S. An update on the variations of the orbital blood supply and hemodynamic. Surg Radiol Anat. 2017; 39(5): 485–496. doi:10.1007/s00276-016-1776-9 [PubMed: 27830321]
7. Justice J. Cilioretinal Arteries. Arch Ophthalmol. 1976; 94(8): 1355. doi:10.1001/archopht.1976.03910040227015 [PubMed: 949278]
8. Li X, Du L, Lu JJ. A novel hypothesis of visual loss secondary to cosmetic facial filler injection. Ann Plast Surg. 2015; 75(3): 258–260. doi:10.1097/SAP.0000000000000572 [PubMed: 26207560]
9. Cho KH, Dalla Pozza E, Toth G, et al. Pathophysiology Study of Filler-Induced Blindness. Aesthet Surg J. 2019; 39(1): 96–115. doi:10.1093/asj/sjy141/5033292 [PubMed: 29873688]
10. Tansatit T, Apinuntrum P, Phetudom T. A Dark Side of the Cannula Injections: How Arterial Wall Perforations and Emboli Occur. Aesthetic Plast Surg. 2017; 41(1): 221–227. doi:10.1007/s00266-016-0725-7 [PubMed: 28008463]
11. Alam M, Kakar R, Dover JS, et al. Rates of Vascular Occlusion Associated with Using Needles vs Cannulas for Filler Injection. JAMA Dermatology. 2021; 157(2): 174–180. doi:10.1001/jamadermatol.2020.5102 [PubMed: 33377939]
12. Chun C, Lee DY, Kim JT, et al. Effect of molecular weight of hyaluronic acid (HA) on viscoelasticity and particle texturing feel of HA dermal biphasic fillers. Biomater Res. 2016; 20(1): 1–7. doi:10.1186/s40824-016-0073-3 [PubMed: 26865985]
13. Scheuer JF, Sieber DA, Pezeshk RA, et al. Facial danger zones: Techniques to maximize safety during soft-tissue filler injections. Plast Reconstr Surg. 2017; 139(5): 1103–1108. doi:10.1097/PRS.0000000000003309 [PubMed: 28445360]
14. Carruthers J, Carruthers A. Volumizing the glabella and forehead. Dermatologic Surg. 2010; 36(SUPPL. 3): 1905–1909. doi:10.1111/j.1524-4725.2010.01738.x
15. Shin H, Lemke BN, Stevens TSLM. Posterior ciliary-artery occlusion after subcutaneous silicone-oil injection. Ann Ophthalmol. 1988; 20(9): 342–344. [PubMed: 3190114]
16. Kapoor KM, Kapoor P, Heydenrych I, et al. Vision Loss Associated with Hyaluronic Acid Fillers: A Systematic Review of Literature. Aesthetic Plast Surg. 2020; 44(3): 929–944. doi:10.1007/s00266-019-01562-8 [PubMed: 31822960]
17. Tran AQ, Staropoli P, Rong AJ, et al. Filler-Associated Vision Loss. Facial Plast Surg Clin North Am. 2019; 27(4): 557–564. doi:10.1016/j.fsc.2019.07.010 [PubMed: 31587773]
18. Sridhar J, Shahlaee A, Shieh WS RE. PARACENTRAL ACUTE MIDDLE MACULOPATHY ASSOCIATED WITH RETINAL ARTERY OCCLUSION AFTER COSMETIC FILLER INJECTION. Retin Cases Br Rep. 2017; 11(1): S216–S218.
19. BRAZILIAN AK. BOOTY RETINOPATHY: PURTSCHER-LIKE RETINOPATHY WITH PARACENTRAL ACUTE MIDDLE MACULOPATHY ASSOCIATED WITH PMMA INJECTION INTO BUTTOCKS. Retin Cases Br Rep. 2018; 12(1): 17–20.
20. Lazzeri S, Figus M, Nardi M, et al. Iatrogenic retinal artery occlusion caused by cosmetic facial filler injections. Am J Ophthalmol. 2013; 155(2): 407–408. doi:10.1016/j.ajo.2012.10.012 [PubMed: 23312444]
21. Yang HK, Lee Y, Woo SJ, et al. Natural Course of Ophthalmoplegia after Iatrogenic Ophthalmic Artery Occlusion Caused by Cosmetic Filler Injections. Plast Reconstr Surg. 2019; 144(1): 28e–34e. doi:10.1097/PRS.0000000000005702
22. Kim YJ, Kim SS, Song WK, et al. Ocular ischemia with hypotony after injection of hyaluronic acid gel. Ophthal Plast Reconstr Surg. 2011; 27(6): e152–e155. doi:10.1097/IOP.0b013e3182078dff

23. Ramesh S, Fiaschetti D, Goldberg RA. Orbital and Ocular Ischemic Syndrome With Blindness After Facial Filler Injection. Ophthal Plast Reconstr Surg. 2018; 34(4): E108–E110. doi:10.1097/IOP.0000000000001104

24. Bae IH, Kim MS, Choi H, et al. Ischemic oculomotor nerve palsy due to hyaluronic acid filler injection. J Cosmet Dermatol. 2018; 17(6): 1016–1018. doi:10.1111/jocd.12498 [PubMed: 29607622]

25. Hayreh SS, Weingeist TA. Experimental occlusion of the central artery of the retina. IV: Retinal tolerance time to acute ischaemia. Br J Ophthalmol. 1980; 64(11): 818–825. doi:10.1136/bjo.64.11.818 [PubMed: 7426553]

26. TJ F. A rationalization of treatment of central retinal artery occlusion. Trans Ophthalmol Soc U K. 1974; 94(2): 468–479. [PubMed: 4619853]

27. Hung JH, Wang CT, Lee CN SS. No TitleUnilateral Vision Loss After Hyaluronic Acid Injection: A Case Report. Ann Plast Surg. 2021; 1(86): S127–S131.

28. Bailey SH, Fagien S RR. Changing role of hyaluronidase in plastic surgery. Plast Reconstr Surg. 2014; 133(2): 127e–132e.

29. Hwang CJ, Mustak H, Gupta AA, et al. Role of Retrobulbar Hyaluronidase in Filler-Associated Blindness: Evaluation of Fundus Perfusion and Electroretinogram Readings in an Animal Model. Ophthalmic Plast Reconstr Surg. 2019; 35(1): 33–37. [PubMed: 29877958]

30. Zhu GZ, Sun ZS, Liao WX, et al. Efficacy of Retrobulbar Hyaluronidase Injection for Vision Loss Resulting from Hyaluronic Acid Filler Embolization. Aesthet Surg J. 2017; 38(1): 12–22. [PubMed: 28333176]