CASE REPORT

Therapeutic Intra-arterial Hyaluronidase Infusion for Ophthalmic Artery Occlusion Following Cosmetic Facial Filler (Hyaluronic Acid) Injection*

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ABSTRACT

Although dermal/subcutaneous injection of filler into the face is a popular aesthetic surgery, severe complications related to arterial occlusion, including skin necrosis and visual loss, have been reported. Herein, we report a case of intra-arterial hyaluronidase infusion in the ophthalmic artery and other arteries supplying the facial skin following hyaluronic acid injection at the glabella and nasal ala. Despite direct hyaluronidase infusion into the ophthalmic artery, retinal arterial perfusion was not restored, but branches of the ophthalmic and facial arteries were recanalised. Skin discoloration was normalised, and partial recovery of retinal and choroidal perfusion and complete recovery of ocular movement were achieved.

Keywords: Hyaluronic acid, hyaluronoglucosaminidase, retinal artery occlusion

INTRODUCTION

Facial dermal/subcutaneous filler injection is a surgical procedure commonly performed for aesthetic purposes. Although it is believed to be a simple and safe procedure, there are many reports^{1–4} of severe complications, including skin necrosis and unilateral vision loss. This visual loss is caused by ischaemic retinal damage resulting from occlusion of the central retinal artery and ophthalmic artery by filler emboli and, thus far, we are unaware of any established therapeutic options. With respect to skin necrosis, which can very rarely occur due to mechanical interruption of the local vasculature after the injection of hyaluronic acid (HA) dermal filler, some aesthetic surgeons empirically inject hyaluronidase to dissolve the peptide bonds of the long-chain proteins within HA. This in turn allows the HA to disperse more

freely as oligoproteins through the tissue.⁵ Herein, we report a case of a patient who received facial HA injections, which resulted in unilateral ophthalmic artery occlusion accompanied by skin discoloration, and the outcome of intra-arterial hyaluronidase infusion to the ophthalmic artery.

Written informed consent was obtained prior to all procedures. The Institutional Review Board (IRB) of Seoul National University Bundang Hospital approved this case report and we adhered to the tenets of the Declaration of Helsinki.

CASE REPORT

A 33-year-old woman was referred to the emergency room presenting with sudden visual loss in her right eye. She had no relevant ophthalmic history and no

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FIGURE 1 A 33-year-old woman with sudden visual loss after hyaluronic acid dermal filler injection (0.7 cc) into the glabella and nasal ala. (A) A fundus photograph shows an ischaemic retina with discontinuous and obliterated arteries. (B) Fundus fluorescein angiography of the right eye shows only minimal central arterial filling without choroidal perfusion. (C) Five minutes after the injection of fluorescein dye, partial choroidal perfusion and partial retinal arterial filling are visible.

systemic diseases. Ten hours earlier, she had undergone HA dermal filler injection (0.7 cc) into the glabella and nasal ala. The procedure was performed for cosmetic reasons by a local plastic surgeon. Immediately after the injection of dermal filler, the patient reported vision loss in the right eye; she had no light perception in the right eye but had normal vision (20/20) in the left eye. Ophthalmic examination revealed a dilated and non-reactive pupil, large-angle exotropia, upper-eyelid ptosis, and total ophthalmoplegia of the right eye. Discoloration of the skin around her right glabella and nasal ala was also observed. Fundus examination (Figure 1A) revealed an ischaemic retina with segmentation of the arterial blood column. Fundus fluorescein angiography (FFA) of the right eye revealed only minimal retinal arterial filling and choroidal perfusion (Figure 1B, C). No other abnormalities were identified by neurologic examination, and magnetic resonance imaging/angiography (MRI/A) of the brain yielded normal findings.

Cerebral angiography was subsequently performed. Selective angiograms of the ophthalmic artery and the branches of the right external carotid artery (ECA) were obtained (Figure 2A, B). As the ophthalmic artery and the branches of the right ECA were occluded by HA, we thought it would be impossible to restore retinal perfusion through the injection of urokinase alone. To degrade HA, we injected 700 units of hyaluronidase (Kuhnle Pharm, Seoul, Korea) and 20,000 units of urokinase (Green Cross, Seoul, Korea) into the ophthalmic artery. Next, 800 units of hyaluronidase were infused into the branches of the right ECA. Angiography performed after hyaluronidase infusion revealed partial recanalisation of the ophthalmic artery and ECA, especially in the anterior deep temporal artery. However, angiography performed after the injection revealed no significant improvement in blood flow around the right orbit (Figure 2C, D).

The next day, the patient had no light perception in the right eye, while the involved skin showed

diminished discoloration. Although fundus photography (Figure 3A) showed improved filling of the retinal vessels, FFA (Figure 3B, C) showed no improvement in retinal arterial perfusion. In primary, horizontal, and vertical gaze photos, the elevation, depression, and adduction of the right eye were almost absent. However, abduction of the right eye almost fully recovered (Figure 4).

After 1 month, vision in her right eye had not improved, and fundus examination of the right eye revealed fibrous membranes and vitreous opacity around the optic disc and major vascular arcades (Figure 5A). At this time, FFA revealed minimal choroidal and retinal perfusion (Figure 5B). At 5 months after the operation, vision in her right eye still lacked light perception. Fundus examination of the right eye showed generalised retinal atrophy, whereas FFA revealed improved choroidal and retinal perfusion (Figure 5C, D). Skin discoloration had resolved completely. Ocular motility and ptosis had recovered substantially. Large-angle exotropia of the right eye had resolved.

After 2 years, although posterior synechiae and cataract had developed, there were no signs of iris atrophy, hypotony, or phthisis bulbi. But a right sensory exotropia was now observed.

DISCUSSION

In the present case of ophthalmic artery occlusion by injected filler (HA), increased tissue pressure likely allowed filler particles to pass through the anastomosis and reach the ophthalmic artery. Subsequently, filler particles moved distally into the central retinal artery and the branches of the ophthalmic artery that supply the extraocular muscles.¹ Generally, soft-tissue augmentation materials such as HA are well tolerated. However, facial filler injections can rarely lead to serious complications, including infection, allergic reactions, and vascular complications such as skin necrosis.⁶ There is no standard treatment option

FIGURE 2 Selective angiogram of the ophthalmic artery after facial hyaluronic acid injection. (A) Occlusion and flow stagnation in the distal segment of the right ophthalmic artery (black arrowhead). Although some branches from the ophthalmic artery are visible, there is no choroidal flush. (B) Venous-phase external carotid angiography shows an occlusion at the peripheral portion of the facial (black arrow), infraorbital (double black arrows), and anterior deep temporal arteries (white arrow) surrounding the right orbit. (C) Angiography after hyaluronidase infusion into the ophthalmic artery showed partial recanalisation with visible branches of the ophthalmic artery (white arrowhead). The absence of a choroidal flush after hyaluronidase infusion was still noted. (D) In comparison with pre-injection angiography, external carotid angiography during the parenchymal phase revealed a slight improvement in branch runoff immediately after the injection of hyaluronidase, especially in the anterior deep temporal artery (open arrow).

FIGURE 3 One day after the intra-arterial infusion of hyaluronidase. Vision in the right eye remained no light perception. (A) The fundus photograph shows partial relief of the patient's retinal ischaemia and visible retinal vessels. (B, C) Fundus fluorescein angiography of the right eye shows improved choroidal perfusion but no improvement in retinal arterial perfusion.

for HA-related skin necrosis; several treatments that have been suggested, including warm compresses, massage to disrupt the filler embolus, the application of a nitroglycerin paste, and subcutaneous injection

of hyaluronidase⁶ to dissolve the peptide bonds in long-chain proteins within HA. This last approach allows HA to disperse freely as oligoproteins through the tissue.⁵ When used early, this approach

FIGURE 4 Elevation, depression, and adduction of the right eye were almost absent in primary, horizontal, and vertical gaze. However, abduction of the right eye almost fully recovered. The discoloration around the right glabella and nasal ala resolved as well.

FIGURE 5 (A) After 1 month, vision in the right eye had not improved: fundus examination of the right eye showed a fibrous membrane and vitreous opacity surrounding the optic disc and major arcade. (B) Fundus fluorescein angiography revealed minimal choroidal and retinal perfusion. (C) At 5 months after the operation, vision in her right eye still had not improved. Fundus examination of the right eye revealed diffuse atrophy of the retina and its associated vasculature. (D) Fundus fluorescein angiography showed improved choroidal and retinal perfusion.

can also decrease skin necrosis due to vascular complications associated with HA fillers.⁷ In complete occlusions of the ophthalmic or central retinal arteries after autologous fat injection, the visual outcome was significantly affected, and visual loss was irreversible even after pharmaco-mechanical thrombolysis therapy.^{2,8–10}

Intra-arterial hyaluronidase injections has previously been used in peripheral arterial occlusive diseases, with no significant complications.¹¹ Although the intra-arterial infusion of hyaluronidase failed to recanalise the central retinal artery and improve vision, we achieved partial recanalisation of the ophthalmic artery and its branches and restored ocular motility. In an earlier case of permanent visual loss and ophthalmoplegia caused by the injection of HA filler and treated with intravenous methylprednisolone, globe movement normalised after 6 months of follow-up, but this change was accompanied by the development of phthisis bulbi.¹² The clinical benefit of intra-arterial hyaluronidase infusion is difficult to define on the basis of this single case alone. Although the treatment did not improve the patient's visual outcome, these findings show that intra-arterial infusion of hyaluronidase can recanalise the ophthalmic and facial arteries faster than conservative treatment without surgical intervention. In selected cases of subtle ophthalmic-artery occlusions caused by the injection of HA filler, immediate intervention using hyaluronidase may restore vision, preserve facial skin, and prevent iris atrophy, hypotony, and phthisis bulbi.

Declaration of Interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Note: Figures 1, 3, 4 and 5 are available in colour online at informahealthcare.com/oph.

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