Early Recognition of Vascular Complication Following Hyaluronic Acid Filler Injection to Prevent Inadvertent Tissue Necrosis: A Case Report

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Abstract

Aesthetic medicine is rapidly gaining wide popularity as a non-surgical method to boost one's outlook. In the facial region, hyaluronic acid dermal fillers are routinely utilised for augmentation of soft tissues. Aesthetic physicians must be familiar with the complications that may occur during their administration and the potential adverse reactions post-injection. Intravascular occlusion of dermal fillers by far reign at the top of the list of potential complications. As initial signs (e.g. the immediate blanching of the soft tissues and pain from vascular compromise) can be masked by the prior injection of local anaesthesia with epinephrine, it is key that physicians must familiarise themselves with the subsequent signs and symptoms as well. Recognising signs of vascular complications at all time intervals is essential in managing its morbidity and is directly linked to its overall severity. In vascular occlusion with hyaluronic acid dermal fillers, early intervention with hyaluronidase in key in mitigating the overall complexity and morbidity, providing the best outcome for the patient. Meticulous follow-up over the subsequent few days post-administration of dermal fillers, is of utmost importance to identify any delayed presentation of complications and to monitor recovery. We present a case of vessel occlusion post-hyaluronic acid dermal filler injection with resolution following early administration of hyaluronidase and follow-up with short review intervals.

Keywords: Hyaluronic acid filler, intravascular complication, tissue necrosis, hyaluronidase

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Aesthetic medicine is rapidly gaining wide acclaim and popularity with the introduction of various minimally invasive treatment modalities for a plethora of conditions to achieve a better overall appearance. Apart from the well documented botulinum toxin for reduction of rhytids, currently dermal fillers, skin boosters and different collagen-stimulating agents are steadily gaining greater traction by the public. Dermal fillers using different active components have been introduced by various manufacturers and countries, including hyaluronic acid, Calcium hydroxyapatite (CaHa), and Poly-ε-caprolactone-based dermal fillers, with the latter two suspended within carboxymethylcellulose hydrogel carriers. Dermal fillers are increasingly being used worldwide for non-surgical soft-tissue augmentation to address various aesthetic concerns such as age-related volume loss, acne scars, traumatic injuries, HIV-associated lipoatrophy, and rhytids, partially due to their impressive safety profiles.

As the usage of dermal fillers is increasing, the absolute number of complications will by proportion also increase. Even in the hands of the most experienced injectors, various complications can still occur. Although most of the complications are transient and mild (e.g. oedema, erythema, local ecchymosis, and nodule formation), there exists some irreversible adverse effects that can cause serious functional and aesthetic deficits, such as tissue ischemia and necrosis. The true incidence of these unwanted events has not been established, which could be due to of the lack of a universal reporting system and underreporting by clinicians [1].

Case Presentation

A 60-year-old Chinese lady presented to our clinic with a main concern of low nasal bridge. She had no previous history of nose surgery or other aesthetic procedure done to her nose and regional tissue prior to this visit. She has no known medical illness or history of allergens as well.

She was offered all minimally invasive nasal bridge augmentation procedures, including nose thread insertion and dermal filler injections. She at first opted for thread insertion. Four threads were inserted into her nasal bridge under local anaesthesia and was able to achieve a more prominent nasal bridge result. Relevant post-procedure care was done, and home care instructions were advised to her.

Six weeks later, she returned to our clinic wanting further augmentation of her nasal bridge (Figure 1). This time, she insisted on injecting dermal fillers for a more three-dimensional effect on her nose. After presenting to her all the different filler options, she chose to proceed with the hyaluronic filler. Pure Lignocaine was injected into her nasal tip and nasal bridge, and some time was allowed for the onset of anaesthesia. Hyaluronic acid filler was then administered via a 22-gauge cannula from the nasal tip towards the nasal bridge, under the nasalis muscle and above the nasal cartilage, in a retrograde fashion with micro boluses. Once half of the syringe was injected, the immediate effect was shown to the patient. Upon seeing the result, she requested for further elevation of the nasal bridge at the sub-intercanthal level. The filler was subsequently injected supra periosteal with a 23-gauge needle.

Following the injection, the patient complained of pain over the nasal bridge and tissue erythema was noted at the site of injection (Figure 2). Firm but gentle massage was done over the affected area to disperse the filler consistently for 5 minutes. The discomfort eventually subsided following tissue massage, but it was noted that the erythema persisted. She was observed for another 15 minutes to monitor her condition; however, it was noticed that the erythema progressively worsened and thus a diagnosis of vascular occlusion from the hyaluronic acid filler was made. Early intervention with hyaluronidase was hence immediately initiated.

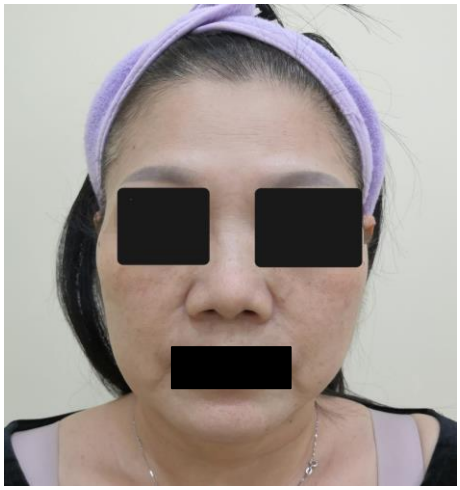

Figure 1 Prior to filler injection

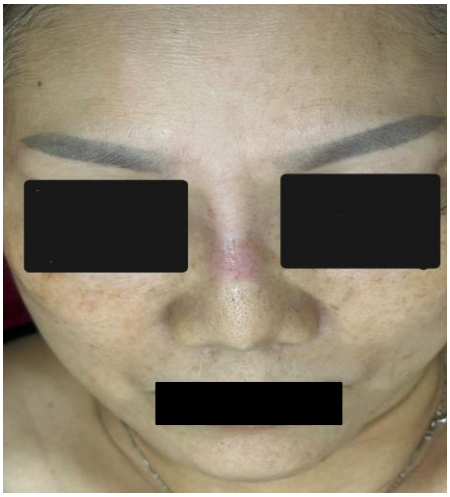

Figure 2 Immediately after filler injection

Management and Outcome

500IU hyaluronidase was injected into the erythematous area and thorough tissue massage was performed. After observation for 5 minutes, no improvement was observed, thus a second dose of 500IU hyaluronidase was injected again, followed by a third dose of 300IU hyaluronidase via a 22-gauge cannula to dissolve the entire column of hyaluronic acid filler. A prophylactic dose of IV Cefuroxime 1.5g was given intravenously as the patient was being identified as high risk for infection due to recent nose thread insertion. She was then monitored for another 30 minutes in our clinic with a reduction of the tissue erythema and discomfort. Surrounding tissues was warm and tissue capillary refill time was within normal range (Figure 3).

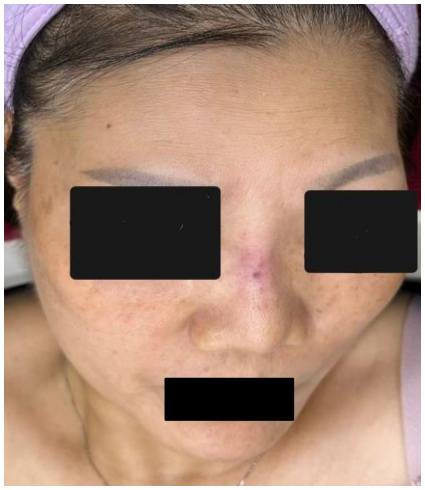

Figure 3 Post 500IU, 500 IU, 300IU Hyaluronidase injection

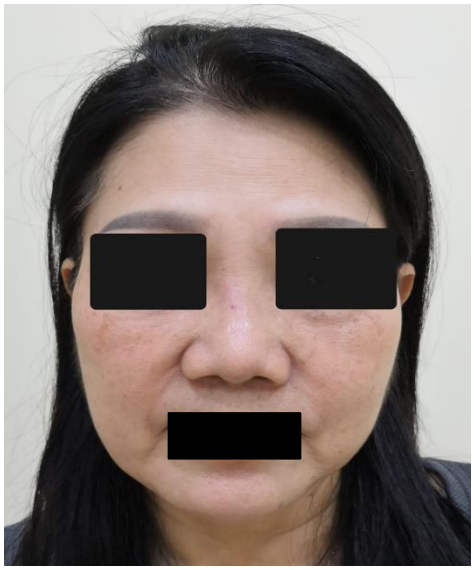

Figure 4 Follow up the next day

The patient was allowed to go home with Tab Cefuroxime 500mg BD for 4 days, Tab Prednisolone 10 mg OD for 5 days, and Tab Paracetamol 1g TDS for 5 days, Tab Papase I/I TDS for 5 days. On a follow-up appointment the next day, her condition was reviewed, and it was noted that her nasal bridge had returned to its previous state prior to the filler injection. She was free of pain and the tissue erythema was resolved (Figure 4). Continuous follow-up was done for the next 5 days and there was no further progression was noted.

Discussion

The success of facial dermal fillers is dependent on a variety of underlying factors. At the initial appointment, a thorough medical history of the patient should be obtained, including information on all prior surgical and aesthetic procedures as these can change the patient's baseline anatomy [2]. Patients who have previously had cosmetic surgery, such as rhinoplasty, may have unpredictable revascularisation and a delicate blood supply in the operated area, which may increase the risk of ischemia, necrosis, and vascular embolism after the filler injection [1].

While tissue ischemia resulting from dermal filler injections has been reported in various facial regions, certain areas of the face (e.g. the glabella, nose bridge and forehead) with extensive anastomoses between vascular territories, pose a higher morbidity of vascular occlusion due to the possibility of occluding adjoining smaller diameter vessels, for example, the central retinal artery. Additionally, areas with a limited source of collateral circulation also pose a higher risk, like the end arteries of the nasal tip and alar of the nose [3].

Signs and symptoms

The typical initial presentation of vascular compromise and occlusion is a disproportionate pain and marked tissue erythema from what is normally be expected from a routine injection. However, if local anaesthesia with epinephrine has been used either in combination with the hyaluronic acid or injected separately, the pain and erythema can be masked to an extent that in most cases, no significant pain or tissue erythema is perceived at all, until the anaesthesia wears off. Fillers containing adrenaline promote vessel constriction, thus lowering the risk of filler embolism. However, it may also obscure the blanching that occurs as a result of occlusion.

The skin changes in an arterial occlusion follow a relatively standardised trajectory that can be broadly categorised as Stages 1 to 5 [4].

Stage 1: Pallor and blanching: Typically manifests immediately and exhibits a pattern that corresponds to the pathway of restricted blood supply.

Stage 2: Livedo reticularis: Due to the build-up of deoxygenated blood within the venous network surrounding, occurs rapidly and usually lasts 24 - 36 hours.

Stage 3: Pustules form as a result of the overgrowth of Staphylococcus aureus. It usually occurs after 72 hours.

Stage 4: Coagulation: It may occur before Stage 3 or at the same time. Pustular overgrowth may mask tissue damage below, which in turn will mask the coagulation. It may take several days to gain visibility.

Stage 5a: The affected tissue will turn sloughy which is moist, creamy and yellow or green in colour.

Stage 5b: Eschar formation.

The inadvertent vessel occlusion from soft-tissue augmentation with dermal fillers can also result in severe complications, such as retinal artery occlusion and cerebral embolism, although very uncommon. Their signs and symptoms such as decreased visual acuity, orbital pain, headache, nausea, dizziness, or ptosis after the procedure, can indicate significant problems that require immediate attention. It is important to seek immediate ophthalmologic and/or neurological consultation if any of these symptoms are present.

Aspiration is often advocated as a method of avoiding intravascular injection: The appearance of blood in the syringe indicating the needle has entered a blood vessel [5]. Nevertheless, it is important to recognize that the lack of blood in the needle hub during aspiration does not ensure complete safety. The

reliability of aspiration test results is impacted by various factors such as the diameter and length of the needle, the type of syringe used, the size of the surrounding vessels and the rheological properties of the filler material [6]. As a result, it is misleading to make general statements about the dependability of aspiration, other than to assert that it may not be entirely reliable.

The utilisation of blunt cannulas can help reduce the likelihood of intravascular injection, however it is important to note that all cannulas, apart from the 10-gauge size, can still penetrate arteries and therefore is not entirely risk-free. An alternative option to minimise the risk of vascular compromise is to inject retrogradely while constantly moving the needle, which prevents the administration of a large deposit in a single area.

Treatment

Vascular occlusion needs to be treated promptly and effectively. In general, arterial occlusion is usually instantly evident. A complete halt of injections is necessary immediately. Warm compresses should be used to promote vasodilation coupled with a vigorous massage of the area to distribute the majority of the filler into surrounding tissues instead of entering the vessel. Additionally, topically applying a 2% nitroglycerine paste can be considered to promote further vasodilation to improve the circulation over the affected area [7].

Intralesional high-dose hyaluronidase remains the mainstay, immediate treatment for arterial obstruction and thromboembolism induced by hyaluronic acid injections [8]. Hyaluronidase is an enzyme that breaks down hyaluronic acid and is a crucial component of the extracellular matrix. Hyaluronidases were first identified in bacteria, and they are also found naturally in a variety of other organisms. In current practice, bovine and synthetic hyaluronidases are being used in medicine as adjuncts to improve the bioavailability of medications or to treat complications related to the injection of hyaluronic acid-based fillers for aesthetic purposes [9]. Hyaluronidases can be used therapeutically to minimize the appearance of nodules or lumps, as well as to treat excessive superficial infiltrations or overcorrections with hyaluronic filler augmentations.

High-dose pulsed hyaluronidase protocols states that the dose should increase consistently with the area of ischaemic tissue to be covered, as there is a minimum effective concentration of hyaluronidase for resolution. In this case, we are unable to identify the specific obstructed vessels and instead, we can only determine its clinical extent by analysing the capillary refill and the colour of the overlying skin [10]. Additional hyaluronidase should be injected (repeating 3–4 cycles) if an improvement is not visible within the first 60 minutes (such as less blanching and a less dusky or violaceous colour).

To attempt the development any further clots as a result of vascular impairment, the patient should be given an immediate dose of Tab Acetylsalicylic acid 300mg followed by 75mg daily until the vascular occlusion has resolved where there are no contraindications [11]. The patient should then be followed up daily to monitor for any improvement or worsening of their condition. Over the following few days, hyaluronidase injections and topical nitroglycerin paste can be continued as necessary according to the patient's clinical condition.

If severe necrosis is noted or there is delayed presentation of the patient in which the tissue is not healing well, hyperbaric oxygen therapy should be considered as another treatment option. Deep oxygen delivery into the skin using hyperbaric oxygen may help to maintain the viability of tissues. It is widely used to speed up wound healing when vascularity is compromised.

For post-treatment management, patients will need regular and intensive wound

care, adequate hydration, frequent proper wound debridement of dead skin, general supportive care, and infection surveillance to prevent worsening of their condition and with the hope of minimising scarring for the patient. Usually, patients who receive an immediate diagnosis and treatment within 24 hours tend to yield the best outcome. A delay in identification and treatment has been linked to varying degrees of skin loss, ulceration, and delayed healing, necessitating up to weeks of wound care and various degrees of scarring [12].

Conclusion

Even the most experienced dermal filler injectors can inadvertently administer fillers intravascularly and to confound matters, typical symptoms like pain or other classical signs might not present itself immediately. Regular, periodic checks should be routine for all patients receiving dermal filler therapy to screen for potential adverse reactions and to catch any said complications early on. In the event of intravascular hyaluronic acid dermal filler administration, early and effective intervention with hyaluronidase is the most predictable way to prevent unwanted outcomes such as tissue necrosis. More severe complications e.g. intravascular filler injection leading to blindness may not be salvageable and warrants rigorous further study. A thorough examination of the patient should be done prior to and after the treatment to ensure that the patient is reasonably safe from any complications before allowing them to leave the clinic in order to minimise delayed catastrophic incidents later.

References

1. Robati RM, Moeineddin F, Almasi-Nasrabadi M. The risk of skin necrosis following hyaluronic acid filler injection in patients with a history of cosmetic rhinoplasty. Aesthetic Surgery Journal. 2018 Jul 13;38(8):883-8.
2. Lohn JW, Penn JW, Norton J, Butler PE. The course and variation of the facial artery and vein: implications for facial transplantation and facial surgery. Annals of Plastic Surgery. 2011 Aug 1;67(2):184-8.
3. van Loghem J, Funt D, Pavicic T, Goldie K, Yutskovskaya Y, Fabi S, Siebenga P, Thuis J, Hkeik J, Kadouch J, Prager W. Managing intravascular complications following treatment with calcium hydroxylapatite: an expert consensus. Journal of Cosmetic Dermatology. 2020 Nov;19(11):2845-58.
4. Murray G, Convery C, Walker L, Davies E. Guideline for the management of hyaluronic acid filler-induced vascular occlusion. The Journal of Clinical and Aesthetic Dermatology. 2021 May;14(5): E61.
5. Mehta P, Kaplan JB, Zhang-Nunes S. Ischemic complications of dermal fillers. Plast Aesthetic Res. 2022; 9:57.
6. Kim BC, Hong GW, Oh SM, Tseng FW. Analysis of blood aspiration patterns during pre-injection tests of injectable fillers. Korean Association for Laser Dermatology And Trichology. 2020 April; 1(1):22-29
7. Sclafani AP, Fagien S. Treatment of injectable soft tissue filler complications. Dermatologic Surgery. 2009 Oct; 35:1672-80.
8. Cassiano D, Miyuki Iida T, Lúcia Recio A, Yarak S. Delayed skin necrosis following hyaluronic acid filler injection: a case report. Journal of Cosmetic Dermatology. 2020 Mar;19(3):582-4.
9. Weber GC, Buhren BA, Schrumpf H, Wohlrab J, Gerber PA. Clinical applications of hyaluronidase. Therapeutic Enzymes: Function and Clinical Implications. 2019:255-77.
10. DeLorenzi C. New high dose pulsed hyaluronidase protocol for hyaluronic acid filler vascular adverse events. Aesthetic Surgery Journal. 2017 Jul 1;37(7):814-25.

11. King M, Walker L, Convery C, Davies E. Management of a vascular occlusion associated with cosmetic injections. The Journal of Clinical and Aesthetic Dermatology. 2020 Jan;13(1): E53.

12. Cohen JL, Biesman BS, Dayan SH, DeLorenzi C, Lambros VS, Nestor MS, Sadick N, Sykes J. Treatment of hyaluronic acid filler–induced impending necrosis with hyaluronidase: consensus recommendations. Aesthetic Surgery Journal. 2015 Sep 1;35(7):844-9.