



Hyperbaric oxygen therapy for treatment of vascular occlusion after permanent dermal filler injection

Kelly Johnson-Arbor, MD

MedStar Georgetown University Hospital; 3800 Reservoir Road NW; Washington, DC 20007; USA

CORRESPONDING AUTHOR: Kelly Johnson-Arbor - kkja@me.com

ABSTRACT

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Introduction: Arterial vascular occlusion is a rare complication of dermal filler injection. This case report describes the successful use of hyperbaric oxygen therapy in a patient with vascular occlusion after a permanent dermal filler was injected.

Case Report: A 51-year-old woman underwent an injection of non-resorbable polymethylmethacrylate microspheres into her nasolabial folds. Several hours later, she experienced dusky discoloration of the right nasolabial fold and surrounding livedo skin changes, consistent with vascular occlusion. Treatment with warm compresses and topical nitroglycerin was initiated, and the patient was referred for hyperbaric oxygen therapy. The tissue discoloration improved significantly after the administration of six hyperbaric treatments.

Discussion: While hyaluronidase is recognized as a treatment option for vascular occlusion associated with using temporary fillers containing hyaluronic acid, it may also be beneficial for patients who experience vascular occlusion after administration of permanent fillers. Hyperbaric oxygen therapy, which results in hyperoxygenation of ischemic tissue and mitigation of the associated inflammatory response, may also benefit patients who experience vascular occlusion after permanent filler injection.

Conclusions: Administration of hyaluronidase and hyperbaric oxygenation should be considered for patients who develop arterial occlusions after dermal filler placement, regardless of the type of injected filler.

Keywords: arterial occlusive disease; dermal fillers; hyperbaric oxygenation; necrosis; polymethyl methacrylate

INTRODUCTION

Arterial vascular occlusion is a rare but potentially catastrophic complication of dermal filler injections. Treating arterial vascular occlusions associated with dermal fillers is multifactorial and includes applying warm compresses, administering pharmacologic vasodilators, and using agents to dissolve filler products. Hyperbaric oxygen therapy (HBO₂) is also available for acute peripheral arterial occlusions, including those that occur after dermal filler injection.

Patients who receive injections of non-resorbable fillers may be considered ineligible for administering HBO₂ or other treatments available for filler-associated arterial occlusion due to the permanent nature of these products. However, treatments, including HBO₂ and hyaluronidase injection, may result in improved clinical outcomes for patients with vascular occlusions related to administering permanent filler agents. This case report describes the successful use of HBO₂ in a patient who experienced acute arterial

occlusion after a permanent filler injection. Written informed consent for case report publication was obtained from the patient.

CASE REPORT

A 51-year-old healthy female underwent a cosmetic injection of a permanent dermal filler into her nasolabial folds. Within hours of the injection, the patient noted the presence of dusky discoloration in the area of the right nasolabial fold. She contacted her injecting physician, who recommended the use of warm compresses and topical nitroglycerin ointment. Hyaluronidase injection was not administered, reportedly due to the permanent nature of the filler received by the patient. When these treatments did not result in clinical improvement over the next 24 hours, the patient inquired about using hyperbaric oxygen therapy and independently sought a hyperbaric medicine consultation. She was evaluated for HBO₂ two days after the injection. On physical examination, dusky discoloration was present in the area of the right nasolabial fold, and a livedo-like appearance was evident in the surrounding facial tissue (Figure 1). The patient was diagnosed with acute peripheral arterial ischemia due to vascular occlusion from a dermal filler injection. After insurance authorization for urgent hyperbaric oxygenation was obtained, the patient began hyperbaric oxygen treatments six days after the injection. The hyperbaric treatment protocol involved daily compression to 2.5 absolute atmospheres (ATA) for 90 minutes, with two five-minute air-breathing periods administered during each treatment to reduce the risk of oxygen toxicity. The patient tolerated these treatments with no identifiable adverse effects. After several days of treatment, the duskeness and livedo improved significantly. After completing six hyperbaric treatments, the discoloration had largely resolved, and the decision was made to discontinue further hyperbaric therapies (Figure 2).

DISCUSSION

Dermal fillers are classified as temporary, semi-permanent, or permanent. The body resorbs temporary and semi-permanent fillers over time, while permanent fillers are non-resorbable. In general, the

cosmetic effects of temporary fillers last for 6-18 months, while permanent fillers last for several years [1]. The main constituent of temporary fillers is often hyaluronic acid, while semi-permanent fillers can contain poly-L-lactic acid or calcium hydroxylapatite [2]. The filler used in the case described above is a permanent filler composed of polymethylmethacrylate microspheres [3].

Arterial vascular occlusion is a rare but significant side effect of dermal filler injection. It can occur after intraarterial filler injection or external mechanical compression of an artery proximal to the injection location [1]. Distal embolization of injected filler can also result in vascular occlusion [4]. Risk factors for vascular occlusion include injections involving the glabella and nasolabial folds, large injection volumes, and high injection pressures [1]. Permanent dermal fillers containing polymethylmethacrylate microspheres are three times more viscous than hyaluronic acid-based fillers and require more force for injection [5]. This physical characteristic may result in an increased risk for vascular occlusion in patients who receive injections of the product.

Clinical signs and symptoms of acute arterial occlusion after filler injection include initial blanching of the affected skin, dusky discoloration, and pain. As described in the case above, these symptoms often occur within hours of the injection. Livedo changes, characterized by violaceous and reticular skin mottling, are also often present in cases of acute arterial occlusion and were also noted in the case presented above [6]. In severe cases, tissue necrosis may occur. Immediate recognition and treatment of impending tissue necrosis can reduce the likelihood of permanent tissue damage and improve the cosmetic outcome of affected patients.

The initial treatment of arterial vascular occlusion involves cessation of any ongoing injection. Local tissue massage and the application of warm compresses may aid in vasodilation. Pharmacologic therapies, including administration of corticosteroids, topical or systemic vasodilators, and antiplatelet agents, are also commonly utilized treatments for arterial vascular occlusion. Administration of hyaluronidase, which degrades hyaluronic acid fillers, is associated with improved outcomes in cases of filler-induced



Figure 1. Dusky discoloration and livedo appearance after filler injection



Figure 2. Improvement of tissue discoloration after six hyperbaric treatments

tissue necrosis [4]. Since permanent fillers do not contain hyaluronic acid, some practitioners may defer the use of this product in cases of vascular occlusion after permanent filler injection. However, since hyaluronidase may dissolve native hyaluronic acid, thereby reducing intravascular pressure, its administration may benefit patients with arterial vascular occlusions [7]. Although the reported benefits of hyaluronidase on ischemia due to permanent filler injection are largely anecdotal, multiple treatment guidelines recommend the use of hyaluronidase for arterial vascular occlusions, regardless of the type of filler used [7,8].

Hyperbaric oxygen therapy is another therapeutic option for patients with arterial occlusion due to filler injection. It has previously been successfully used to treat dermal ischemia related to aesthetic filler placement [9]. Traumatic acute peripheral arterial ischemia, such as that in cases of arterial occlusion related to filler injection, is a recognized indication for using HBO₂. Hyperbaric oxygen therapy involves the administration of 100% oxygen at a depth greater than sea level. Hyperbaric oxygen therapy administration is available in more than 1500 hospitals within the United States, resulting in hyperoxygenation of ischemic tissues [10]. Addi-

tional effects of hyperbaric oxygen therapy, including mitigation of reperfusion injury and reduction of inflammatory mediators, may also benefit patients with arterial vascular occlusion after dermal filler injection. HBO₂ will likely have the highest clinical benefit when treatments are initiated immediately after the vascular occlusion is identified. The side effects of HBO₂, including middle ear barotrauma, confinement anxiety, and oxygen toxicity, can be carefully mitigated or avoided entirely when the treatment is administered in a medical facility by experienced personnel. Since insurance prior authorization requirements for hyperbaric oxygen therapy may result in delays in treatment initiation, prompt referral is warranted whenever urgent or emergent hyperbaric treatments are considered for a patient with arterial occlusion. The number of hyperbaric treatments required for treating patients affected by arterial vascular occlusion varies based on individual patient characteristics and responses. In the case described above, the patient experienced significant clinical improvement after administration of six hyperbaric treatments. While the same clinical

improvement may have been observed even without the use of hyperbaric treatments, this treatment modality should be considered for patients with arterial occlusion due to any dermal filler injection due to the emotionally and physically distressing nature of this condition and due to the relative paucity of other available treatments.

CONCLUSION

Managing acute arterial vascular occlusion associated with permanent dermal filler administration can be challenging. Even though it does not directly dissolve the filler, hyaluronidase administration may reduce intravascular pressure in patients with dermal occlusion of permanent filler agents. In addition, the use of HBO₂, which results in hyperoxygenation of ischemic tissues, may be associated with improved clinical outcomes in this patient population. Medical professionals should consider the use of both hyaluronidase and HBO₂ for the management of vascular occlusions related to permanent dermal filler injection.



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