Injection Filler, Vascular Occlusion and Tissue Necrosis

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ABSTRACT

Over the past several years dermal fillers have been utilized with increasing frequency for soft-tissue augmentation. Injectables have rapidly been gaining in popularity. According to the American Society for Aesthetic Plastic Surgery, over 1.4 million injection procedures were performed in 2010, only 2nd in popularity to Botox[1].Characteristics such as immediate cosmetic improvements, longevity, minimal patient discomfort and relative ease of use, make these an attractive alternative to surgical intervention. As such, available fillers continue to be refined and new materials developed for management of the aging face.

Calcium hydroxylapatite (CaHA) (Radiesse, Bioform Medical, San Mateo, CA) was introduced in the United States in 2000. The majority of complications associated with CaHA have shown to be transient and resolve following a brief period of supportive therapy. The more serious side effects including focal necrosis and ophthalmic injury have been reported.[2-4] Available reports of CaHA injection complications, their proposed etiology, and treatments were reviewed. These reports in combination with our own case study, has formed the basis for our treatment recommendations.

METHODS AND MATERIALS

A MEDLINE-based (2000 to 2011) review of reported complications and treatments of CaHA injectable filler materials was performed for English language journals. Injection area, affected area(s), treatment, and outcomes were recorded.

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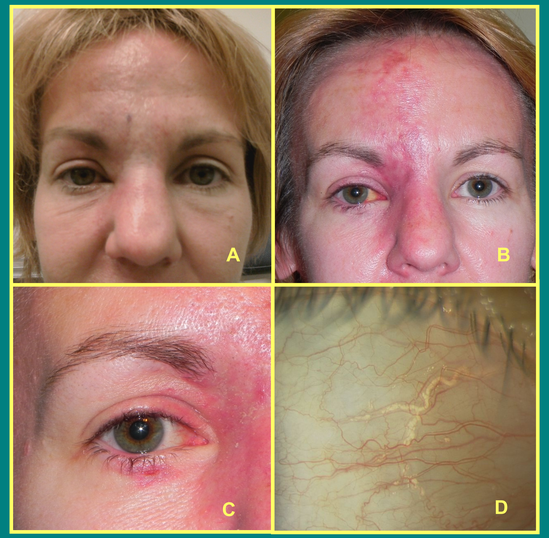

Figure 1A: 24 hours following injection, blanching of glabellar region, painful right eye and blurring of vision. **B**: Reticular patterning of tissues 4 days following injection, conjunctival infection right eye. C: inferior lid area of ulceration. D: intravascular conjunctival deposits of CaHA.

Injection Area	Glabella	Nasolabial folds	Nasal dorsum	Glabella
Affected Area	Glabellar skin necrosis	Nasolabial fold skin necrosis	Necrosis of nose + glabella Oculomotor nerve palsy Anterior segment ischemia	Medial forehead Nasal dorsum Conjunctival emboli Lower lid necrosis
Treatment	Medrol dose pack NTG paste, BID x 7 days Dermabrasion	Keflex 500mg QID Medrol dose pack Dermabrasion	Topical antibiotics IV antibiotics Topical steroids Oral steroids Wet-to-dry dressings	NTG paste and Aquaphor Q6hrs tapered to Q12 Aspirin 800mg QID Keflex 500mg QID Maxitrol topical TID Warm compress
Outcome	Eschar after 3 days Thickened scar at 6 wks Hyperemia at 4 months *OPRS 2009, 25(6)*	Reepithelialized at 3 wks Resolution at 4 months *OPRS 2009, 25(6)*	Scarring at 3 months Resolution of ocular palsy Fixed dilated pupil *OPRS 2010, 26(4)*	Mild persistent hyperemia Resolution of eye pain *Pending publication*

Table 1. Outcomes of CaHA related injection necrosis.

CASE STUDY

An otherwise healthy 47-year-old woman underwent injection of Radiesse into her glabellar creases at an outside institution. 24hrs later she presented to the emergency department reporting right eye pain and swelling surrounding the injection site (Fig 1A). She reported immediate pain with injection, significantly greater than previously experienced. Physician at the time reassured her this was normal and continued injection. Initial visual acuity (VA) assessment revealed 20/30 OD, 20/20 OS. Blanching was noted along the distribution of the right conjunctiva vessels, and pain was elicited with adduction of the right eye. Aspirin therapy was initiated. Nitropaste and Aquaphor were applied Q6 hours and then tapered. Three days following initial intervention vascular congestion was noted on the medial aspect of the globe (Fig B). Right eye keratitis, and lower lid erythema with ulceration was reported (Fig C). Her pain symptoms had improved and visual acuity was recorded at 20/20 OU. Erthromycin ophthalmic was applied and an oral antibiotic was provided in the event that signs of infection should arise. Two months following initial evaluation a pupillary dilated exam revealed areas of linear hypopigmentation at 4 and 6 o'clock. The conjunctival injection was decreased, and on slit lamp examination white patches consistent with subconjunctival Radiesse were noted (Fig D). Three months later an ophthalmoscopic exam of the right eye was significant for retinal pigment epithelia mottling. No previous exam available for comparison, unknown if this was a result of intravascular injection.

We postulate that the CaHA entered a distal branch of the ophthalmic artery, from there moved in a retrograde fashion along the branches into the long posterior ciliary artery. Here the material moved anterograde, giving rise to compromised visual accommodation and pain. The distant lower lid involvement in this case is suspicious for inferior palpebral artery embolization. Unlike previously reported cases of CaHA filler necrosis, here ulceration was noted distal to the injection site. This finding argues for embolic migration of tissue filler.

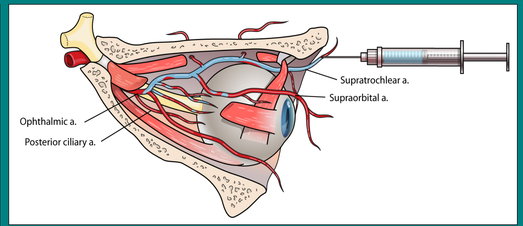

Figure 2: Proposed pathway of arterial vascular occlusion. Retrograde filling of distal branches of the ophthalmic artery, followed by anterograde flow of material.

DISCUSSION

Injection fillers are commonly utilized in the nasolabial fold, oral commissure, glabella, and lip for the correction of facial rhytids and volume loss. Complications have previously been divided into early or delayed type in terms of presentation, minor or severe in relation to severity.[4] The most frequently reported complications are minor and include injection site reactions such as bruising, erythema, pain, edema, and pruritus. These generally resolve with supportive care and require no further intervention. More severe reactions such as tissue necrosis and ophthalmic ischemia occur much less frequently and have a predilection for certain "danger zones." Areas such as the glabella, ala, and nasolabial folds appear to be at the greatest risk.[5] The glabellar region is considered a particularly high-risk area because of small vessel caliber and limited collateral circulation.[6] Necrosis is caused by interruption of the vascular supply to the area by compression, obstruction of the vessel(s) with filler material, and/ or direct injury to the vessel(s).

Ocular involvement after glabellar injections of corticosteroids, autologous fat, and anesthetic agents has been well documented. The commonly proposed pathway follows retrograde flow through peripheral branches of the ophthalmic artery anastomosing with periorbital facial arteries to ophthalmic artery and subsequent distal retinal and choroidal arteries.[7] Retrograde flow of arterial filling material would be possible by high flow pressure while injecting (Fig 2). Little consensus exists in regards to optimal treatment of filler ischemia. The algorithm listed below is an attempt to synthesize preexisting recommendations. Of note, the majority of these recommendations are not utilized exclusively for the treatment of CaHA vascular compromise. The majority of these guidelines have been used when complications of HA injections arise, and are being extended to adverse events encountered with CaHA fillers. (Fig 3). Even less is known in regards to CaHA filler necrosis therapy. To the best of our knowledge, only four cases of CaHA dermal filler induced necrosis have been reported. These four cases are outlined in Table 1.

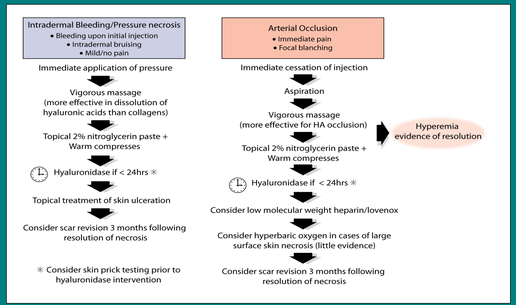

Figure 3. Proposed algorithm for the treatment of dermal filler tissue necrosis. Primarily focusing on HA fillers and extending to use of CaHA

CONCLUSIONS

Calcium hydroxylapatite is difficult to remove when complications such as tissue necrosis and ophthalmic ischemia occur. There is no consensus regarding optimal therapy, however there are some commonly reported guidelines. All reviewed reports emphasize the importance of early recognition, rapid intervention, and prevention of further vascular compromise.
Indirect measures such as massage, hot compresses, nitropaste, oral steroids and hyperbaric oxygen (HBO) have all been suggested. However the utility of these interventions has yet to be proven. HBO has even been refuted in cases of arterial obstruction. [6, 14] In a case of unresponsive necrosis, there is a report suggesting favorable response to local subcutaneous injections of low molecular weight heparin.[8] The best treatment continues to be prevention of vascular compromise. The first step in prevention is careful filler selection. Fillers such as poly-L-lactic acid and CaHA are generally used in subdermal injection. At this depth the risk of intraarterial injection is increased [10]. Extra care should be taken when injecting "danger zones" at this level. Utilizing filler agents that can be placed more superficially, such as CosmoDerm and Prevelle Silk (Mentor Corp., Santa Barbara, California) may decrease risk of necrosis. Consider the use of a hyaluronic acid (HA) based product in higher risk areas. These may respond to hyaluronidase dissolution cases of vascular compromise. Universal techniques such as aspiration prior to injection, low volume, and serial injections should be performed. Manual occlusion at the origin of the supratrochlear vessels while injecting may prevent retrograde filling. 30 gauge or smaller needles are recommended when injecting high risk sites. [15] Although CaHA remains a good choice for deep grooves and deep facial and bony augmentation, it is important to inform patients of the possibility of this rare complication and educate them to contact the office immediately if concerns arise. [11]

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