Vascular Complications of Soft Tissue Fillers

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Disclosure

There are no relevant conflicts of interest to disclose.
Vascular Complications of Soft Tissue Fillers (Not Fat)

Overview

I. Filler categories and characteristics

II. Vascular complications
   - Skin
   - Stroke
   - Eye

III. Nasal Fillers – Injection Rhinoplasty

IV. Strategies for avoiding complications

V. Crash kit
## ASPS Statistics

### Cosmetic Minimally-Invasive Procedures

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Botulinum Toxin Type A (Botox, Dysport)***</td>
<td>6,673,608</td>
<td>6,321,160</td>
<td>786,911</td>
<td>6%</td>
<td>748%</td>
</tr>
<tr>
<td>Cellulite treatment (Velosmooth, Endermology)</td>
<td>29,243</td>
<td>29,318</td>
<td>23,952</td>
<td>0%</td>
<td>22%</td>
</tr>
<tr>
<td>Chemical peel</td>
<td>1,250,059</td>
<td>1,163,333</td>
<td>1,149,457</td>
<td>7%</td>
<td>9%</td>
</tr>
<tr>
<td>Intense Pulsed Light (IPL) treatment</td>
<td>621,724</td>
<td>602,659</td>
<td>*</td>
<td>3%</td>
<td>*</td>
</tr>
<tr>
<td>Laser hair removal</td>
<td>1,112,046</td>
<td>1,077,158</td>
<td>735,996</td>
<td>3%</td>
<td>51%</td>
</tr>
<tr>
<td>Laser skin resurfacing</td>
<td>543,731</td>
<td>511,795</td>
<td>170,951</td>
<td>6%</td>
<td>218%</td>
</tr>
<tr>
<td>Ablative</td>
<td>152,478</td>
<td>146,199</td>
<td>*</td>
<td>4%</td>
<td>*</td>
</tr>
<tr>
<td>Non-ablative (Fraxel, etc.)</td>
<td>391,253</td>
<td>365,596</td>
<td>*</td>
<td>7%</td>
<td>*</td>
</tr>
<tr>
<td>Laser treatment of leg veins</td>
<td>207,790</td>
<td>208,069</td>
<td>245,424</td>
<td>0%</td>
<td>-15%</td>
</tr>
<tr>
<td>Microdermabrasion</td>
<td>881,905</td>
<td>970,343</td>
<td>868,315</td>
<td>-9%</td>
<td>2%</td>
</tr>
<tr>
<td>Sclerotherapy</td>
<td>323,609</td>
<td>321,477</td>
<td>866,555</td>
<td>1%</td>
<td>-63%</td>
</tr>
<tr>
<td>Soft Tissue Fillers</td>
<td>2,301,673</td>
<td>2,242,621</td>
<td>652,885</td>
<td>3%</td>
<td>253%</td>
</tr>
<tr>
<td>Calcium hydroxylapatite (Radiesse)</td>
<td>257,953</td>
<td>284,488</td>
<td>*</td>
<td>-9%</td>
<td>*</td>
</tr>
<tr>
<td>Collagen</td>
<td>22,049</td>
<td>60,565</td>
<td>587,615</td>
<td>-64%</td>
<td>-96%</td>
</tr>
<tr>
<td>Porcine/bovine-based (Evolence, Zyderm, Zyplast)</td>
<td>16,023</td>
<td>14,465</td>
<td>*</td>
<td>11%</td>
<td>*</td>
</tr>
<tr>
<td>Human-based (Cosmoderm, Cosmoplast, Cymetra)</td>
<td>6,026</td>
<td>46,100</td>
<td>*</td>
<td>-87%</td>
<td>*</td>
</tr>
</tbody>
</table>

ASPS Annual Procedure Statistics. 2014.
FDA Warning

- Systematic review showing 61 patients with severe complications from soft-tissue fillers
  - Skin necrosis
  - Blindness

Ozturk CN et al. Complications following injection of soft-tissue fillers. ASJ. 2013.
“Unintentional injection can block blood vessels and restrict blood supply to tissues.”

“Soft tissue fillers should be injected only by health care providers who have appropriate training and experience and who are knowledgeable about the anatomy at and around the injection site.”
I. FILLER CATEGORIES AND CHARACTERISTICS
Soft Tissue Fillers
Categories

• HA gel (Juvederm-Allergan, Restylane-Galderma, Belotero-Merz)
• PLLA (poly-l-lactic acid) (Sculptra)
• Calcium hydroxyapatite (Radiesse)
• PMMA (Bellafill)
*G Prime

*Mathematical description of products tendency to be deformed elastically. (syrup vs. jello)
May not match clinical results.
Filler Characteristics Are Responsible for Their Clinical Effect (HA Fillers)

• **G prime**= Measurement of resistance to deformation, contributes to stiffness, hardness, and elasticity of product
  – The greater the G’ the deeper the injection should be

• **Cross-linking**= Stabilizes HA molecules, increases viscosity by transforming liquid HA to gel, and increases resistance to degradation by native hyaluronidase

• **Concentration**= Increased HA concentration increases longevity and displaces more tissue *must be cross-linked to stabilize HA*

Filler Characteristics Are Responsible for Their Clinical Effect (HA Fillers)

– Small particles = superficial injection
– Large particles = deep injection

• Restylane (Galderma) products are particulate and rely on particle size and G prime for longevity/lift ("G": = 513)
• Juvederm (Allergan) products are a cohesive gel and rely on concentration and cross-linking for longevity/lift ("G": = 274)
• **use different products in different areas**
# Common Fillers

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Manufacturer</th>
<th>Component</th>
<th>Duration of Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restylane Silk</td>
<td>Galderma</td>
<td>HA gel</td>
<td>6-9 months</td>
</tr>
<tr>
<td>Restylane Lyft</td>
<td>Galderma</td>
<td>HA gel</td>
<td>10-18 months</td>
</tr>
<tr>
<td>Juvederm Ultra</td>
<td>Allergan</td>
<td>HA gel</td>
<td>1 year</td>
</tr>
<tr>
<td>Juvederm Ultra Plus</td>
<td>Allergan</td>
<td>HA gel</td>
<td>1 year</td>
</tr>
<tr>
<td>Voluma</td>
<td>Allergan</td>
<td>HA gel</td>
<td>1-2 years</td>
</tr>
<tr>
<td>Belotero Balance</td>
<td>Merz</td>
<td>HA gel</td>
<td>1 year</td>
</tr>
<tr>
<td>Sculptra</td>
<td>Dermik</td>
<td>PLLA</td>
<td>2 years</td>
</tr>
<tr>
<td>Radiesse</td>
<td>Merz</td>
<td>Calcium hydroxylapatite</td>
<td>12-15 months</td>
</tr>
<tr>
<td>Bellafil</td>
<td>Suneva</td>
<td>PMMA</td>
<td>&gt;2 years</td>
</tr>
</tbody>
</table>
### Adverse Events

<table>
<thead>
<tr>
<th>Early Complications</th>
<th>Late Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection site reactions</td>
<td>Infection</td>
</tr>
<tr>
<td>Infection</td>
<td>Granuloma</td>
</tr>
<tr>
<td>Hypersensitivity</td>
<td>Migration</td>
</tr>
<tr>
<td>Lumps, asymmetries, contour irregularities</td>
<td>Immune reaction</td>
</tr>
<tr>
<td>Skin discoloration (Tyndall)</td>
<td>Scarring</td>
</tr>
<tr>
<td>Vascular occlusion</td>
<td>Edema</td>
</tr>
</tbody>
</table>

II. VASCULAR COMPLICATIONS
Vascular Occlusion

1. Ischemia/skin necrosis

2. Stroke

3. Vision loss/blindness
Etiology of Ischemia/Necrosis

1. Arterial embolization by hyaluronic acid particles,

2. External pressure on the arteries (particularly nasal tip and ala)
Signs and Symptoms of Intraarterial Injection

1. Skin
   - PAIN
   - Reticulated erythema
   - Nausea
   - Skin blanching
   - Slow, poor capillary refill
   - Swelling
   - Demarcation

2. Stroke
   - “FAST”: facial drooping, arm weakness, speech impediment, time (act fast!)

3. Eye
   - Vision loss/blindness
## Progression of Skin Changes

<table>
<thead>
<tr>
<th>Findings</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blanching</td>
<td>Seconds</td>
</tr>
<tr>
<td>Reactive hyperemia or livedo pattern</td>
<td>Minutes up to 10 minutes</td>
</tr>
<tr>
<td>Blue-black discoloration</td>
<td>10 minutes to hours</td>
</tr>
<tr>
<td>Blister/bullae formation</td>
<td>Hours to days</td>
</tr>
<tr>
<td>Skin breakdown, ulceration, slough</td>
<td>Days to weeks</td>
</tr>
</tbody>
</table>

Discoloration

Minutes to hours
Blister/Bullae Formation

Hours to days
Skin Breakdown, Ulceration, Slough

Days to weeks
Tissue Necrosis After Intraarterial Injection of Permanent Filler (PMMA)

*weeks later*
Risk Factors For Accidental Intraarterial Injection

• Deep injection near named vessels or tributaries particularly central facially

• Rapid/forceful injection/high pressure injection

• Large volume injected into 1 area

• Small sharp needles

III. Nasal Fillers- Injection Rhinoplasty

*Injections in the nose can be used to improve contour
References


• Most nasal arteries found in the midline are subcutaneous.
• Filler, for nasal contouring improvement, should be injected deeply to avoid vascular injury leading to compromised perfusion at the dorsum or filler emboli at the nasal tip.

Fig. 8 Midline anastomosis between the lateral nasal arteries and the dorsal nasal artery. The dorsal nasal, supraorbital and supratrochlear arteries branch from the ophthalmic artery after the artery emerges from the right orbital septum.
**Fig. 9** Summary of the danger areas during nasal injections. 

a The infratip (square) is highly vascular as it contains cavernous tissue that continues from the nasal submucosa containing an arteriovenous shunt. 

b Three vascular danger points where filler can escape into the arterial lumen; the rhinion where the dorsal nasal anastomosis is occasionally found, the supratip where significant lateral nasal anastomoses form, and the infratip in which the columellar artery enters from below and cavernous tissue infiltrates. The supratip (middle arrow) poses the highest risk. 

c Recommendation of needle trajectory for tip refinement. Even though an artery is injured by the needle, symptomatic emboli could be avoided by retrograde injection of a small droplet at the time of withdrawal.
Nasal Filler Examples - Pre injection

D.G. 26 y/o
Nasal Filler Examples - Post injection

D.G. 26 y/o
IV. STRATEGIES FOR AVOIDING COMPLICATIONS
Even Low Volume Accidental Injection Can Lead to Arterial Occlusion if Injected Intraarterially

High Injection Pressure with Large Volume Can Lead to Retrograde Filler Propagation

How to Avoid Arterial Injection and Retrograde Filler Propagation

- Epinephrine (AFT vasoconstricts)
- Withdraw before injection (Aspirate)
- Avoid deep injection near named vessels
- Low pressure injection
- Avoiding injecting excess volume in one area
- Slow injection
Strategies for Avoiding Complications

- Blunt cannulas
- Small bore
- Microcannula
- Avoiding anatomic danger zones

Blunt Injection Cannula
III. Locations of Iatrogenic Retinal Artery Occlusion

“Central Facial Injection”

- Glabella (50%)
- Nose (33%) – also nasolabial fold
- Forehead (8%)
- Periorbital (8%)

Strategies for Avoiding Complications

• Inject slowly in small aliquots
• Avoid injection in previously traumatized areas due to change in anatomy
• Stop injection if complaints of pain/vision loss
Blindness

How to Avoid Blindness

- Cautious injection in peri-orbital area
- Withdraw before injection
- Low pressure injection
- Small aliquots
V. CRASH KIT

Must be readily available, stored crash kit is an essential component of any office performing injections
Office Staff Education

• Instruct staff on importance of patient phone calls with possible occlusion

• May present later in the day or the next day
Crash Kit
Ischemia/Necrosis

A) Skin

What to do if patient suddenly develops severe pain with blanching or mottled skin discoloration

ASAPS Patient Safety Committee. 2015.
Crash Kit (skin)

* The Key is to identify ASAP

- Aspirate area?
- Warm compress
- Nitropaste
- Baby ASA
- Supplemental O₂
- HYALURONIDASE (early <2 days)
  - 400U into subcutaneous area (2cc in a 3cc syringe with [0.2cc plain lidocaine 2%] 27 g-needle) or (150U in 1cc of saline)
  - non diluted for tissue compromise or for product breakdown, or 50/50 saline
- Papaverine, tanshinone, topical magnesium sulfate, & infrared radiation
Hylenex

• Recombinant human hyaluronidase injection
• 150U (1cc) if concern for intraarterial injection
• **Works only for HA’s**
  - Juvederm Family
  - Restylane Family
  - Belotero
  - Emervel
  - Teosyal
## Managing Vascular Compromise

<table>
<thead>
<tr>
<th></th>
<th>Arterial Occlusion</th>
<th>Venous Occlusion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presentation</strong></td>
<td>Immediate or early, blanching, severe pain</td>
<td>Delayed, dull pain, dark discoloration</td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td>Stop injection, attempt aspiration</td>
<td>Massage</td>
</tr>
<tr>
<td></td>
<td>Massage</td>
<td>Warm compresses</td>
</tr>
<tr>
<td></td>
<td>Warm compresses</td>
<td>2% nitroglycerin paste*</td>
</tr>
<tr>
<td></td>
<td>2% nitroglycerin paste*</td>
<td>Injection of hyaluronidase (if caused by hyaluronic acid product)</td>
</tr>
<tr>
<td></td>
<td>Injection of hyaluronidase (if caused by HA product)</td>
<td>Consider hyperbaric oxygen in cases of impending massive skin necrosis</td>
</tr>
<tr>
<td></td>
<td>Antibiotic therapy (topical, parenteral, or both) in cases of skin breakdown</td>
<td>Antibiotic therapy (topical, parenteral, or both) in cases of skin breakdown</td>
</tr>
<tr>
<td></td>
<td>Conservative debridement</td>
<td>Conservative debridement</td>
</tr>
<tr>
<td></td>
<td>Frequent follow-up</td>
<td>Frequent follow-up</td>
</tr>
<tr>
<td><strong>Prevention</strong></td>
<td>Informed consent</td>
<td>Informed consent</td>
</tr>
<tr>
<td></td>
<td>Smallest possible needle</td>
<td>Smallest possible needle</td>
</tr>
<tr>
<td></td>
<td>Smallest possible volume injected</td>
<td>Smallest possible volume injected</td>
</tr>
<tr>
<td></td>
<td>Proper plane of injection</td>
<td>Proper plane of injection</td>
</tr>
</tbody>
</table>

- Different presentation, same treatment

Pearl

- Blunt, small needle, small volumes, low pressure,
- *Caution at nasal tip/central face*
Crash Kit
Thrombotic/Vision

B) Stroke
  – Standard emergency stroke protocol

C) Vision loss/blindness
  – Urgent ophthalmology consult
  – Retrobulbar hyluronidase injection
Vision Loss/Blindness
Retrobulbar Injection Technique

- Small bleb of local anesthesia injected into lower eyelid over inferotemporal orbit
- Blunt, 25g cannula advanced in inferotemporal quadrant of orbit for 1 inch (will be inferior and lateral to optic nerve)
- 2-4cc hyaluronidase injected

Retrobulbar Injection Technique
Summary

• Awareness that vascular complications are a real event with soft tissue fillers

• Practice strategies to avoid these complications

• Post a protocol in office and have a filler crash kit available
Thank You

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