Goal of sclerotherapy

To cause irreversible endothelial injury in the desired vessels resulting in clinical obliteration of the vessel, while avoiding damage to normal collateral vessels and surrounding tissues.
Goals of Sclerotherapy

What is a sclerosant?

Injectable chemical cauterants intended to scarify and obliterate vascular tissue.
Foam vs. Liquid

Foam sclerosants

Liquid sclerosants

YouTube

ACP
There are many different sclerosants used around the world.

This presentation will focus on the sclerosants you will most likely be using in your practice.
Sclerosant Classes

**Detergent**
- Sodium Tetradecyl Sulfate (Sotradecol, STS)
- Polidocanol (Asclera, Aethoxysclerol, Varithena)
- Sodium Morrhuate (Scleromate)
- Ethanolamine Oleate (Ethamolin)

**Osmotic**
- Hypertonic Saline
- Sodium chloride solution with dextrose (Sclerodex)

**Chemical**
- Chromated Glycerin (Sclermo)
- Polyiodinated iodine
Detergents (STS, POL, SM, EO)

- Detergent sclerosants produce endothelial damage by multiple mechanisms associated with a decrease in endothelial cell surface tension, interference with cell surface lipids, disruption of intercellular cement, and extraction of cell surface proteins (protein theft denaturation).

- Literature shows that the endothelium can be affected with in seconds and irreversible damage in minutes.

- Detergents do not cause hemolysis or provoke direct intravascular coagulation.

Detergents  (STS, POL, SM, EO)

- Sotradecol™ (60 yrs.), Asclera™ (2010) and Varithena™ (2013) are FDA approved
  - In the United States, only 0.5% and 1% POL concentrations are approved specifically for spider and reticular veins.

- Most popular sclerosant type worldwide for the treatment of varicose veins

- The ability to be agitated and foamed increases the potency of detergents between 2 and 4 times by mechanically displacing blood and thus maximizing surface area and time in contact with endothelium.

Detergents  (STS, POL, SM, EO)

Considerations STS

• FDA approved in liquid form 1% and 3%
• Effective sclerosant in entire spectrum of vein disease
  ➢ (0.1% to 3% concentrations can be used)
• Can be readily made into foam
  ➢ (off label use)

Considerations POL

• FDA approved in 0.5% and 1% liquid form
• For treatment of uncomplicated telangiectasias and reticular veins
• Effective sclerosant in entire spectrum of vein disease
• Painless upon injection
  ➢ Originally marketed as a local anesthetic
• Can be readily made into foam
  ➢ (off label use)
FDA Approved Detergents
Osmotics (HS, Sclerodex)

• Thought to cause endothelial death by osmotic cellular dehydration which results in endothelial destruction.

• Osmotics act nonspecifically to destroy all cells – even RBCs with in their osmotic gradients.

• Rapidly diluted in the blood stream and they lose their potency within a short distance of injection.
  – Rarely effective in veins greater then 3-4 mm

Hypertonic Saline

• Most commonly used osmotic agent.

• Not FDA approved for treatment of vein disease

• A popular choice because of low cost, ready availability, no chance of allergic reaction, and rapid clinical effect.

• Cons: post-injection pain and muscle cramping, higher incidence of cutaneous necrosis, higher incidence of hyperpigmentation (hemolysis of RBCs=hemosiderin)

• Concentrations of hypertonic saline used to treat telangiectasias range from 11.7% to 23.4%, the latter being the standard concentration available for use as an abortifacient.
Chemical Irritants injure cells by acting as corrosives.

Chromated Glycerin 72%

- Considered a “weak” sclerosant
  - 10 ml limit
- Not FDA approved for leg telangiectasias
  - Glycerin is approved as a hyperosmotic agent for the treatment of acute intracerebral edema and acute angle glaucoma
- Advantages: Rare incidence of matting, cutaneous necrosis or hemosiderin staining, good clearing of small vessels appreciated
- Disadvantages:
  - Painful on injection (high viscosity)
    - adding lidocaine-epinephrine 1% to CG significantly reduces pain and bleeding at the injection site
  - In large amounts, hematuria has been seen with high doses
<table>
<thead>
<tr>
<th>Sclerosing solution (Brand name)</th>
<th>Class</th>
<th>Allergenicity</th>
<th>Risks</th>
<th>FDA approval</th>
<th>Dose limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertonic saline [11.7–23.4%]</td>
<td>Osmotic</td>
<td>None</td>
<td>Pain* and cramping</td>
<td>Yes, as abortifacient [18–30%]</td>
<td>6–10 ml</td>
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<td></td>
<td></td>
<td>Necrosis of skin</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Hyperpigmentation</td>
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<tr>
<td>Sodium Tetradecyl Sulfate 1%, 3% (Sotradecol® [USA],)</td>
<td>Detergent</td>
<td>Very rare anaphylaxis</td>
<td>Pain* with perivascular injection</td>
<td>Yes</td>
<td>10 ml of 3%</td>
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<tr>
<td></td>
<td></td>
<td>Necrosis of skin (with higher concentrations)</td>
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<tr>
<td></td>
<td></td>
<td>Hyperpigmentation</td>
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</tr>
<tr>
<td>Polidocanol (Asclera® [USA], 0.5%, 1%)</td>
<td>Detergent</td>
<td>Very rare anaphylaxis</td>
<td>Lowest risk of pain</td>
<td>Yes</td>
<td>10 ml of 1%</td>
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<td></td>
<td></td>
<td>Necrosis usually from arteriole injection</td>
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<tr>
<td></td>
<td></td>
<td>Hyperpigmentation (with higher concentrations)</td>
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<tr>
<td></td>
<td></td>
<td>Disulfiram-like reaction</td>
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<tr>
<td>Glycerin [72%] with chromium potassium alum glycerin [72%] diluted 2 : 1 with 1% lidocaine, with or without epinephrine)</td>
<td>Chemical irritant (plain glycerin may be an osmotic agent as well)</td>
<td>Very rare anaphylaxis (none for glycerin alone)</td>
<td>Pain* and cramping</td>
<td>Yes (for treatment of acute intracerebral edema and acute angle glaucoma)</td>
<td>10 ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low risk of hyperpigmentation</td>
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<tr>
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<td></td>
<td>Viscous, difficult to inject Hematuria with injections &gt;10 ml</td>
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</tbody>
</table>

Adapted from *Dermatology* 3rd edition, by Jean L. Bolognia, Joseph L. Jorizzo, and Julie V. Schaffer, electronic copy, Ch. 155, Phlebology and Treatment of Leg Veins
WHAT PARAMETERS EFFECT SCLEROSANT CHOICE?
What size vein are you injecting?

- Telangiectasias
- Reticular veins
Effect of position on strength of sclerosant
Size matters!

The diameter of the vein is more important than the length of the vein.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4</td>
<td>0.32</td>
</tr>
<tr>
<td>0.8</td>
<td>1.00</td>
</tr>
<tr>
<td>0.5</td>
<td>2.55</td>
</tr>
<tr>
<td>0.2</td>
<td>15.92</td>
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<tr>
<td>0.1</td>
<td>63.69</td>
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</table>

Look how far 0.5 ml of sclerosant travels!
Zones of influence

One injection site, high concentration, low volume.

Ci = concentration in the vein
Cs = concentration in the syringe
X = length of vein segment

Aggressive concentration
Effective concentration
Ineffective concentration

Injection site
Sclerosis
Varicose vein
Inflammatory reaction
Zones of influence

One injection site, low concentration, high volume.

- Aggressive concentration
- Effective concentration
- Ineffective concentration

Injection site

Sclerosis

Varicose vein

Goldman et al. Sclerotherapy 4e © 2007 Elsevier Inc.
Zones of influence

Three injection sites, low concentration, low volume (per site).

Aggressive concentration
Effective concentration
Ineffective concentration

Injection site
Injection site
Injection site

Sclerosis

References – reading material

Ch. 12

Ch. 7

Ch. 8
THANK YOU!