Venous (slow-flow) Malformations

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Disclosure

• Cook Medical Inc.
  - Patent licenses/Royalties
- Vascular malformations present in less than 1% of all babies born worldwide

- VM is comprised of 44-64% of all vascular malformations

- Arteriovenous malformations account for the remaining malformations
Therapies in symptomatic VM

- Sclerotherapy is considered the first line of treatment
- Surgery alone or in combination with sclerotherapy is used for small VMs
- Laser may also be applied
Sclerosant agents

- Absolute ethanol
- Sodium Tetradecyl Sulphate – STS
- Polidocanol, Bleomycin, Sodium Morrhuate and Ethanolamine Oleate is less painful and safer and can be performed without general anaesthesia
STS foam - results in 86 pts
FU – 23,5 mo (12-44)

- Positive response in pain - 49,5%
- In mass reduction - 52,7%
- Minor complications - 12,1%
- Recurrence -14,2%

Reduction of VM after two sessions of STS foam sclerotherapy

Ethanol sclerotherapy

- Potent sclerosing agent which allows for cure of VMs
- Requires general anaesthesia
- Needs to be handled by experienced operators as there is an increased risk for complications: necrosis, nerve injury, thrombosis.
● 43 yo female
● Enlarging right chest wall venous malformation
Post-Embo DSA #1a: 5 ml ETOH
Pre-Embo DSA #2
Post-Embo DSA #2a: 5 ml ETOH
Post
- 6 yo male
- Left gluteal venous malformation
Direct puncture spot film demonstrating contrast filling of a large VM compartment. Note the extravasation.

The 21g needle was repositioned into the VM to inject ETOH without extravasation.
Pre-Embo DSA#2
Post-Embo DSA #2a: 3 ml ETOH
• Low flow malformations difficult to distinguish venous from lymphatic
  – Not uncommon to be combined
- 11 yo male
- Worsening diffuse abdominal pain
  - Increasing frequency & intensity
Direct puncture angiograms of LMs can have similar angioarchitectures to VMs.

But lymph fluid confirms the diagnosis.
Post
Wayne F. Yakes MD, FSIR, FCIRSE
Vascular Malformation Center
Englewood, Colorado, USA


Procedures & Complications
Totals
Jan 2002 - Dec 2007

- Head to Toe Vascular malformations
- 1,367 Patients
- 6,798 Procedures
### Totals Jan 2002 - Dec 2007

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM : AVM, &gt;2:1 ratio</td>
<td></td>
</tr>
<tr>
<td>H&amp;N</td>
<td>318</td>
</tr>
<tr>
<td>UE</td>
<td>271</td>
</tr>
<tr>
<td>LE</td>
<td>531</td>
</tr>
<tr>
<td>Chest/Abd</td>
<td>105</td>
</tr>
<tr>
<td>Pelvic/Buttock</td>
<td>147</td>
</tr>
</tbody>
</table>
Over 120,000 ml ETOH Used in 6,798 Procedures
Complications
6,798 Procedures 2002 - 2007

Transient – 5%

- Minor blisters: 69
- Transient nerve injury: 37
- Limited DVT: 20
- Infection: 52
- DIC: 1
Complications

6,798 Procedures 2002 - 2007

Major – 0.4 %

- DVT 4
- PE 3
- Amputation 2
- Pneumothorax 1
- GI Bleed 1
- C-P Arrest 3
- Skin Graft 3
- Permanent Nerve Injury 1
Multistage Ethanol Sclerotherapy of Soft-Tissue Arteriovenous Malformations: Effect on Pulmonary Arterial Pressure

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Cardiovascular Effects and Predictability of Cardiovascular Collapse after Repeated Intravenous Bolus Injections of Absolute Ethanol in Anesthetized Pigs

Byung Seop Shin, MD, Young Soo Do, MD, Hyun Sung Cho, MD, Tae Soo Hahn, MD, Chung Su Kim, MD, Woo Seok Shin, MD, Chul Joong Lee, MD, Sang Hyun Lee, MD, Hyun Seung Jin, MD, Hyoong Gon Song, MD, Kwang Bo Park, MD, Hong Suk Park, MD, Sang Tai Kim, MD, PhD

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Purpose

to evaluate the effects of repeated intravenous bolus injections of absolute ethanol on cardiopulmonary hemodynamic changes and to investigate the predictability of ethanol-induced cardiovascular collapse in anesthetized pigs.
Acute Cor Pulmonale and Right Heart Failure Complicating Ethanol Ablative Therapy: Anesthetic and Radiologic Considerations and Management

Bhiken Naik · Alan H. Matsumoto

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“To summarize, intravascular ethanol levels leads to acute hemolysis and the release of free hemoglobin. The free hemoglobin, not cleared by the hemoglobin scavenging systems, initiates an acute decrease in pulmonary endothelial nitric oxide levels. This precipitates an acute increase in pulmonary vascular resistance and a rise in pulmonary pressure.”

“The total dose of ethanol per treatment session should be limited to 0.5–1 ml/kg, with very close observation of the physiologic parameters if more than 2–3 ml is being injected at any one time [22].”

To reduce hemodynamic complications, the minimum therapeutic amount (0.14 mL/kg body weight/10 min) of 100% ethanol is recommended for bolus intravascular injection.

Conclusion

- Ethanol ablation effective for low flow venous / macrocystic lymphatic malformation
- Permanent cure can be achieved with staged procedures
- Complications can be avoided
  – Controlled delivery and dose
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