Ethanol Embolization of Vascular Malformations: The Northwestern Experience

Vascular Malformation
- Extremely challenging
- Protean manifestations
- Embolization now the treatment of choice
- Ethanol increasingly seen as a preferred agent (Yakes 1986)

Purpose
- Limited number of larger (>30) studies
- Assess results and long-term outcomes of ethanol-embolized vascular malformations in a single-center

Patients
- 46 patients with vascular malformations
  - 31 venous malformations
  - 15 AVMs
    - Upper extremity: 9
    - Lower extremity: 31
    - Chest/Abd/Neck: 6

Patients AVM Types
- Type I: 4
- Type II: 6
- Type IIIa: 3
- Type IIIb: 2
Methods

- All under GA
- Venous malformations: Direct puncture except for occasional outflow occlusion
- AVMs
  - Studied with catheter angiography for architecture and nidus location
  - Type I and I: Direct puncture or transvenous cath of outflow vein
  - Type III: Transcatheter or direct puncture

Ethanol

- 1 ml/kg max dose, most often <0.5 ml

Followup and Results

- Physical exam, imaging and questionnaire regarding sx, pain, recurrence and response
- Pain evaluated by Numeric Rating 0-10
- Treatment success definition
  - Pre vs post treatment sx decreased by 2 or more and rated 3 or less
  - Failure or no change: Pre-post scores of 0 or increased
Imaging Definitions

- MR: Decrease of at least 50% volume or decreased signal
- Angio: Elimination of AV shunting/hypervascularity

Results

- Success not related to any lesion, location, patient or size variable

Complications

- Ethanol typically produces local pain and swelling of varying degrees
- Overall complications: 24%
- Minor: 13%
- Major: 11%
- Permanent ulnar neuropathy (UE VM)
- Finger amputation (Hand AVM)
- Calf compartment syndrome
- Skin ulceration requiring grafting
- Severe sciatic neuropathy x 4 weeks
Complications per treatment

- **Major**
  - AVM: 3.9%
  - VM: 5.4%

- **Minor**
  - AVM: 2%
  - VM: 9.8%

Conclusions

- Ethanol embolotherapy is effective
  - 78% improved or cured regardless of type or location
- AVM best results seen in Type II
  - Similar to Park et al (JVIR 2012)
- Ethanol is a very toxic material which produces complications—use only if experienced and then with caution
  - 11% major

Lessons Learned

- Ethanol should ONLY be injected when the operator is confident that one is intranidal
  - Especially true in AVMs
  - Confusion of tortuous serpentine collaterals or feeding vessels with the nidus can lead to catastrophic damage
  - Increased use of direct puncture to limit this problem
  - Coil embolization of venous outflow Type II

Thank you