The Best Management For AVMs Is Done With Polymerizing Agents (NBCA, Onyx)

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Recent Embolic Agents
Detachable Coils,
Amplater Plugs,
Polyvinilalcohol (PVA), Microspheres,
Ethanol,
N-ButrylCyanoacrylate( Glue),
Onyx,
Squid

Treatment
- Surgery or debulking surgery combined by per/pre embolization or amputation is not feasible as these lesions tend to be diffuse and cross normal tissue planes
- Trans venous
- Trans arterial
- Percutaneous venous
- Combination of techniques and agents

Advantages of Onyx /NBCA
- Rarely glue to the arterial wall,
- Able to penetrate and occlude the abnormal foci (nidus)
- Longer injection time helps more controlled embolization
- Since it is non-adhesive and maintains vessel wall integrity surgical removal of the VM is easier when compared to N-BCA.

VMs
An IDEAL EMBOLIC AGENT should match MORPHOLOGY and HEMODYNAMIC status of VMs

Structure of the Nidus

ONYX
Biocompatible liquid embolic agent consists of;
- ETHYLENE VINYL ALCOHOL COPOYMER dissolved in various concentrations of DIMETHYL SULFOXIDE (DMSO)
- TANTALUM powder
**Onyx/Squid**

- 1.5 ml unit of Onyx:
  - Onyx 18, 18G-700-300
  - Onyx 54, 18G-700-300
- 1.5 ml unit of DMSO

**Plug and Push Technique**

- Detachable microcatheter
- Sonic Microcatheter

*Waiting time* may cause microcatheter occlusion and possibility of reflux.

**Factors Affecting Catheter Retrieval**

**ONYX Modified Technique**

- Dilute ONYX %18 by DMSO;
  - (%60 ONYX %18 + %40 DMSO)
- Use magnified (small field) during injection,
- Flush microcatheter via DMSO when injection finished without reflux
- Extra 1-2 DMSO syringes should be on the table

**Modified Technique**

- Occluded nidus
- Angiography/Cast of Onyx
- Same microcatheter in another feeding artery

**Forearm AVM**

18-y Male, right gluteal local low-flow VM Pain, swelling & varicosity
1. st session

2. nd session

3. rd session

**Advantages of Modified Technique**

- Penetration of Onyx more distally than microcatheter tip can rich,
- Minimize the reflux,
- Makes possible use of microcatheter and macrocatheter more than once,
- which saves time and money.
- and enables to close the whole lesion or most of it.

**Caution!**

- After flushing with DMSO check the lumen of the microcatheter with contrast.
- Never use force to clean the lumen with contrast or saline otherwise reflux to the main artery may happen.
- If microcatheter lumen is occluded pull the microcatheter out and apply a suction with an empty syringe to the 4 F macrocatheter to check the back flow of the blood.

**Onyx Debris from the Macrocatheter**

- Hemodynamic factors such as pressure change during occlusion of the feeder may cause arterial reflux at the final stage of injection.
COMPLICATIONS

- DMSO related vasospasm
- Main artery occlusion
- Bullous form of skin burns due to non-target embolization
- Pulmonary embolism
- Venous reflux
- Nerve damage

Care after embolization

Skin burns result of non-target embolization

Pulmonary Embolism

Venous reflux may occur when Onyx passes through fistulous component of VM's before polymerization

The Reason of Reflux and Non-target Embolization

- Inefficiency of the test injection due to viscosity differences between Onyx and contrast media.
- Complex and unpredictable angiostructure of VMs.
- Short arterial feeders close to the parent arteries.
- Poor radioopacity due to overdilution.

Manoeuvres to Prevent Reflux in high-flow VMs

- external compression to stagnate the flow
- use of high concentration of copolymer
- controlled and slow injection
DISADVANTAGES

- PAIN due to vasospasm caused by DMSO
- GENERAL ANESTHESIA is necessary
- GARLIC LIKE smell of breath
- PRICE
- NEED OF EXTRA SESSIONS at high-flow and diffuse lesions.

Conclusion

- I believe as a Polymerizing Agent (Onyx) is the best choice to treat AVMs when compared to other embolic agents including NBCA.