EMBOLIZATION OF CRANIOFACIAL ARTERIOVENOUS MALFORMATIONS

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Arteriovenous malformations (AVMs) are pathological direct connections between arteries and veins that bypass normal capillaries. They can occur throughout the body.
Natural History

- Mostly arise during fetal development, rarely acquired after birth
- Presentation depends on location
- Symptoms can occur from spontaneous hemorrhage, compression of adjacent structures, vascular steal, pain, overgrowth of the involved body part, or changes related to decreased blood flow
Incidence

- Detection rate in the United States general population: 1.4% per 100,000 cases per year
- Estimated 300,000 Americans have AVMs, 12% exhibit symptoms of varying severity.
- Approximately fifty percent of AVMs are located in the Craniofacial region
- AVMs grow as the age progresses, can be affected by various stimuli: trauma, pregnancy and puberty
Diagnosis

- Clinical/physical exam
  - Schobinger’s Staging
- Magnetic Resonance Imaging
- CT Scan
- Angiography
Treatment

- Observation
- Surgical Resection
- Radiation Therapy
- Embolization
  - Transarterial
  - Transvenous
  - Direct puncture
- Combinations of above
Embolization Materials

- Coils
- Glue
- Onyx
  - Ethylene vinyl copolymer (EVOH), mixed in dimethyl sulfoxide (DMSO)
  - Available in different formulations (18, 34, and 500) based on viscosity
  - Delivered in liquid form
  - Upon contact with blood, DMSO dissipates and copolymer precipitates into solid material that occludes vessels
Embolization Products

Coils, Onyx and Glue
Consultation: Birthmark clinic which is a multidisciplinary clinic consisting of RN Case Managers and Physicians from Specialty areas: Dermatology, Plastic Surgery, Pediatrics, Interventional Radiology and Hand Plastic Surgery

- Physical Exam/ Case Presentation
- Determines best approach by multidisciplinary team
- Candidate for Interventional Procedure
- RN Case Manager follows up diagnostic imaging studies, lab results, pre procedure instructions and coordinates procedure date
Nursing Roles/Responsibilities

- Assessment
- Check pedal pulses
- Check groin and or treatment sites
- Comfort, control bleeding, medication
- Neurocheck
- Monitor for signs and symptoms of early complications: discoloration and ulceration
- Education pre and post procedure
- RN Case Manager: post procedure follow-up
Implications and Discussion

- Management of Craniofacial AVM is difficult
- Risk for adjacent tissue damage and necrosis
- Embolic material can cause focal tissue ischemia, skin sloughing, tissue necrosis and skin ulceration
- Use of tourniquet around the head and inflation of a balloon catheter in the external carotid help in the arrest or slow flow of arterial inflow
Case Series

- 6 patients with craniofacial AVMs
  - 3 scalp
  - 1 face
  - 1 forehead
  - 1 parotid region
Treatment

- Initial transarterial embolization to reduce arterial inflow
  - Tortuosity of distal feeding arteries and abundant collaterals prevented cure by transarterial embolization alone

- Followed by transvenous access
  - Via femoral vein OR
  - Via direct puncture

- Coil placement into venous pouch

- Arrest flow through artery
  - Tourniquet applied around head
  - Inflation of a balloon catheter in the external carotid

- Onyx injected into vein to retrograde fill AVM nidus
Results

- Complete angiographic cure obtained initially in all 6 patients
- 2 patients had surgical removal of AVM after embolization
- Other patients declined surgery
- One year follow up angiogram available in 4 of the 6 patients
  - All 4 remained cured with no recurrence
Case 1

- 22 year old female
- Presented with an enlarging pulsatile left scalp mass and disfiguring purple and blue swelling in her left forehead and orbit
- AVM supplied by bilateral superficial temporal and occipital arteries
- Underwent three stages of transarterial embolization with Onyx which occluded the major feeding arteries from bilateral superficial arteries
Case 2

- 18 year old male with enlarging pulsatile mass in his left parietal scalp.
- Venous pouch receiving AV shunting was accessed with a 19 gauge needle, microcatheter was advanced, few coils were deployed.
- AVM embolized with Onyx 34 and 18.
- Arterial inflow halted by tourniquet around his head.
Case 3

- 59 year old woman with growing pulsatile mass in the left eyebrow.
- Small AVM supplied by Ophthalmic Artery, angular branch of the Facial Artery and small branches of the superficial temporal artery.
- Venous pouch was accessed transfemorally via facial vein, AVM embolized with Onyx 34.
- Post embolization angiogram showed complete obliteration of AV shunting.
Conclusion

- Craniofacial AVMs are typically supplied by many tortuous distal arteries limiting transarterial embolization.
- As a result, it is difficult to obliterate these lesions transarterially without significant risk of tissue necrosis.
- Adjunctive transvenous embolization is safe and effective method to treat these lesions after transient transarterial embolization.
References


- L. Feng, personal communication, December 8, 2011.


