How I Treat Problematic Intraosseous AVMs

Purpose
To determine optimal ethanol endovascular embo treatment strategies for the management of problematic AVM of bone.

Patients
- 36 Patients
- 21 female; 15 male
- Age range: 11 – 48 yrs.
- Mean age: 22 yrs

Patients
- 16 of 36 patients with bone AVMs had 2 or more AVMs
- 44% of patients with bone AVMs had multiple AVMS, whether in soft tissues or other bones
### Outcome
- 33 of 36 patients AVMs cured
- 3 cases on-going Rx
- F/up range: 3 mos. – 83 mos.
- F/up mean: 42 mos.
- 3 patients therapy on-going
- No recurrences noted

### Complications
- 1 patient had coil migration to the lung; coil retrieved.
- 2 patients had skin injuries that healed with conservative care.
- 1 patient had slight weakness in the left quad. fem. muscle group prior to treatment; unchanged with curative embo treatment.

### Endovascular Approaches
- Transarterial
- Direct Puncture
- Retrograde Vein
- ETOH
- ETOH and Coils

### Yakes Type IV AVM
6 year old female with severe ankle pain.
Yakes Type IIIb AVM

15 year old female with Rt mandibular and lower lip AVMs, loose teeth, gingival hemorrhages, and pain syndrome.
Rt mandible AVM supplied by Rt Inferior Alveolar artery.

Rt Inferior Alveolar artery
Rt Internal Maxillary Artery DSA, Lateral

AP Rt Internal Maxillary artery DSA

AP direct puncture DSA intra-osseous position in the Rt mandible with 21g needle
Lateral Rt mandible direct puncture DSA with 21 g needle; note multiple out-flow veins. Yakes Type IIIb AVM.

Direct puncture DSA shows thrombosis in the mandibular AVM.

Rt Internal Maxillary DSA Cure of Rt mandibular AVM

11 month F/up DSA shows persistent cure of the Rt mandibular AVM.

Yakes Type IIIb AVM

8 year old female with Intra-oral intractable intermittent hemorrhages secondary to mandibular AVM.
Ethanol embolization of arteriovenous malformations of the mandible


Abstract

BACKGROUND AND PURPOSE: Absolute ethanol was reported as an effective embolization material for AVMs, but its use to treat AVMs in the mandible is not yet well established. This study presents our clinical experience on treatment of mandibular AVMs with absolute ethanol.

MATERIALS AND METHODS: Eight consecutive patients with symptomatic AVMs of the m. 2007 and September 2008 were enrolled in this study group. Among them, 6 patients underwent embolization with absolute ethanol combined with coils, 1 patient underwent direct puncture of the facial artery with absolute ethanol only, and the last patient had transarterial embolization with absolute ethanol combined with coils. The procedure was performed with the patient under general anesthesia, and the vital signs of the patients were constantly monitored during the procedure. The total amount of absolute ethanol used per session was less than 1 mL/kg of body weight.
In June 2007, W.F. Yakes was invited to present his clinical experience in management of craniofacial AVMs with absolute ethanol at the Chinese National Conference on Oral and Maxillofacial Vascular Anomalies held in Hanzhou, Zhejiang Province. On the basis of the reported experience of Dr. Yakes, we began to embolize mandibular AVMs with absolute ethanol. Here, we report 8 cases of intraosseous mandibular AVMs that were successfully embolized with absolute ethanol.

Yakes Type IIIa AVM

32 year old male school teacher with long-standing pain and severe stiffness in the Lt thigh with hypertrophy of the Lt thigh musculature and fibrosis in the muscular tissues limiting motion.

Lt femur AVM

Partial Rx with 5.035 J-movable core wires

18 g needle Direct puncture DSA

DSA post-24 ml ETOH
38 year old female with severe DJD of her Rt hip. Now requiring total hip replacement. Patient has an Intraosseous Yakes Type IIIb AVM of the proximal Femur. Repeated knee joint bleeds caused the premature DJD in the Lt Femoral head and Acetabulum.
Patient has a second AVM in the Popliteal space. Yakes Type IIIa AVM.
Cure at 3 months Fup. Pt had uneventful Rt total hip replacement.

Yakes Type IIIa AVM

46 year old female with LLE quadraceps femoris weakness (thigh extensors). Exercise intolerance. Cardiac output of 14 lit/min.
Yakes Type IIIb AVMs

Intraosseous Type IIIb AVM of the Left Iliac Wing & soft tissues
Type IIIb Left Femur Intraosseous AVM

33 year-old female with severe left pelvic bone pain due to repeated microfractures in the left iliac wing. Severe pain in the left femur. Severely restricted ability to stand and walk. Exercise intolerance with cardiac outputs were 11 lit/min.
A VM Lt Iliac wing
Vein aneurysms
Massive Lt Iliac wing
Yakes Type IIIb AVM
arterial phase
Venous phase
Note the vein aneurysms
Stainless steel & platinum coils

Direct puncture DSA demonstrating thrombosis of this major AVM compartment with coils alone.
Yakes Type IIIb AVM

Same patient has second intraosseous AVM in the proximal left femur. Multiple in-flow arteries/arterioles shunting into an aneurysmal vein with multiple aneurysmal out-flow veins. These are more challenging to treat as the multiple veins must be treated due to the involvement with AVMs in the vein walls.
Cure of the Yakes Type IIIb AVM by coiling multiple AVM aneurysm compartments

Lest we forget, venous malformations occur in bone and cause significant pain symptoms and deformity…….
Conclusions

- Bone AVMS are rare entities.
- Multiple AVMs possible in 50% of patients.
- Multiple embo approaches are necessary for curative treatment.
- ETOH, ETOH/coils, coils alone embos are proven efficacious and curative.
- Long-term f/up documents cure of treated bone AVMs.
- Bone AVMs typically are of the Yakes Type IIIa/IIIb AVMs.