Staged management of pelvic AVMs with nBCA

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Clinical Presentation of Pelvic AVM

- Pain
- Bleeding – GI, GU
- High Output State/Failure
- Incidentally discovered with no symptoms—physical exam, scan

Patient Evaluation

- History and Physical
- Physical findings rarely impressive in pelvic AVMs – bruits, pulsation
- Imaging – US non-specific, mainstays are CT/CTA, MRI/MRA
- Angiography will be necessary, but generally not until the time of treatment

MRA shows precise arterial supply and venous drainage in addition to multiplanar anatomy

Treat Asymptomatic Lesions?

- Generally yes
- AVMs grow over time
- New collaterals recruited
- Increased cardiac workload – may be well tolerated in young patient, less well with aging

Treatment Options:

Surgery

- Generally not a good idea
- Ligation ineffective
- Complete resection rarely feasible
- Significant risk, recurrence very likely
- Complicates access to nidus for future intervention
LIGATION, “SKELETONIZATION”, and COIL EMBOLIZATION DON’T WORK

- 28 y o female with pelvic pain
- Right sided pelvic AVM with multiple feeders
- 14 hour procedure with ligation of all hypogastric and femoral branches
- Recurrent sx four months post-op

AVM RECURRENCE

- PHYSICAL FACTORS
  - PRESSURE/FLOW RELATIONSHIPS
- MORE COMPLEX PHENOMENA
  - ANGIOGENESIS,
  - LOCAL ISCHEMIA,
  - EVENTS AT CELLULAR LEVEL

Embolization of High Flow Pelvic AVM – step by step

- Full discussion of the condition with pt and family, including natural history – requires preliminary office consultation, not done the day of the procedure
- Full medical evaluation, appropriate specialists consulted
- Cardiac evaluation including echo, c.o. studies
- Review of all imaging studies

Anesthesia

- Recommend general (intubated) anesthesia
- Procedure often prolonged, may be uncomfortable
- Multiple procedures will usually be required – avoid traumatic experience
- Continuous physiologic monitoring
- Ability to suspend respiration for angiographic runs and roadmapping makes procedure faster and safer

Types of Pelvic AVM

- MULTI-VEssel SUPPLY
- SINGLE VEssel SUPPLY (USUALLY HYPOGASTRIC)
- UTERINE

Most Common Feeders

- Hypogasrrics – usually both sides in female patients, often unilateral in males
- IMA
- Middle sacral
- Common femoral and profunda branches
- If there has been prior proximal ligation/embolization, virtually any vessel can become recruited to supply the lesion
Patterns of Shunting

• Large vessel communication with fistula-like physiology – extremely high flow, loss of peripheral resistance, generalized cardiovascular effects common
• Nidus composed of small arterial branches shunting into small venous structures
• Nidus of small arterial branches shunting into (and often draped around) aneurysmal draining vein – more common in males

Embolic agents

• Coils – only for protecting branches or in venous outflow, don’t use intra-arterially. Even the smallest microcoils result in proximal occlusion – don’t use them!
• Plugs -same
• Microspheres – results only temporary
• Ethanol – may be curative but high risk
• nBCA adhesive
• Onyx
• Many others

TREATMENT APPROACHES

• TRANSARTERIAL
• TRANSVENOUS – EITHER BY CATHETER OR DIRECT PUNCTURE
• WHEN THERE IS MASSIVE/ANEURYSMAL DRAINING VEIN

NBCA Preparation

• Typical mixture – equal vol. (0.5cc) NBCA and Ethiodol oily contrast
• Tantalum powder optional – Ethiodol provides adequate radiopacity and slows polymerization
• Small volumes used in each deposition (0.2 – 0.5cc)
• Scrupulous attention to maintaining non-ionic environment (D5W flush, separate table, new gloves)

“The approximate” is the key word here...

GLUE DELIVERY TECHNIQUES

• Use arterial flow to your advantage, allow flow to carry agent distally
• “Continuous column” technique – the ideal, but doesn’t usually work well in real world (avg. volume 1 – 2 cc); only one deposition per microcatheter
• “Push” technique – does not create cast, but ensures distal penetration (avg. volume 0.2 – 0.6 cc, pushed with DSW); may get multiple depositions per microcatheter
• A small amount of glue goes a long way
Glue vs Onyx

Matter of personal preference?
I find glue easier and faster, cheaper
Chronic pain syndrome in some patients post Onyx
Subsequent embolizations difficult due to density of cast
Surgical issues with electrocautery and Onyx

• Once you have taken out the hypogastric feeders, perform a control angiogram from a more proximal position
• You will find:
  – A – if it is a simple unilateral hypogastric lesion, you may be finished
  – B – in the other 90% of cases the angiogram will look like you accomplished nothing and you will be extremely discouraged

35 y o male with pelvic pain

One deposition of 0.3cc nBCA

More likely...

Strategy

• The key is to be patient and keep going, next to the opposite hypogastric
• The next safest trunk will be the middle sacral artery
• The IMA is usually saved for last – it commonly is a feeder and can be responsible for pain and lower GI bleeding or marked colonic venous congestion
• Venous drainage from the IMA component can be via the IMV (caution), or more commonly the hypogastric veins

When IMA is major residual feeder
Generally easy to distinguish IMA branches feeding AVM from normal branches

Multiple feeders embolized – still filling aneurysmal vein via numerous small collaterals

Complex AVM anatomy with multiple feeders – or if arterial access has been sacrificed (prior surgery, proximal embolization)

Direct percutaneous puncture of aneurysmal outflow vein

Accessing the aneurysmal draining vein
Usually possible from anterior approach just over pelvic brim

Direct puncture of outflow vein

Dealing with large outflow vein

Outflow controlled
With Amplatzer Plug

Vein occluded with coils and glue – both can be deposited through 21g needle
To avoid this...

Amplatzer plug placed in outflow, not detached (yet); start coiling again by direct puncture of vein

Amplatzer plug detached after flow has been arrested

Don’t try to fix the entire lesion in one session, even if you have the patience...

Not so fast – massive hematuria 2d later

Direct peri-Urethral injection

Four more procedures (another 6 hours), trip to OR (bad idea)
Pt in hospital for three weeks, eventual full recovery

Extreme Case
63 y o male with h.o. state, pulm htn, pelvic pain, s/p embolization of multiple arterial feeders elsewhere

Disabled due to severe SOB, fatigue
Severely dilated RA, RV, LA
Sig. MR

CTA w 3D Recon to plan approach and size devices

Multiple cardiac occluder devices now available in wide range of sizes – detachable, repositionable

• ASD Device

Transvenous approach, sheath passed from right to left for occluder deployment

First occluder deployed and detached, second occluder deployed but not detached

Coils and glue used after outflow protection in place

Via catheter left beyond occluder By direct percutaneous puncture
Final
Doing well clinically five years later

Summary
• Pelvic AVMs are highly complex lesions
• Multiple approaches, techniques and devices may be necessary
• nBCA is very safe and effective in treating feeding arterial branches – not tissue toxic
• nBCA is also useful in occluding the outflow veins, often in conjunction with coils, plugs, and cardiac devices