Principles of Embolization Techniques for Bleeding, Endoleaks and Beyond

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Disclosures: Dr. Andrew Holden

- Dr. Holden is a Medical Advisory Board Member for Medtronic, Boston Scientific, and Gore
- Dr. Holden is a Clinical Investigator for Medtronic, Boston Scientific, Gore, Abbott, Cagent, Endologix, Intact Vascular, Shockwave, Bard, Cook, Endospan, Intervene, Spectranetics, TriReme, Merit, Reflow, Terumo, Surmodics
- No other relevant disclosures
Catheter Directed Embolization

- A stable catheter position is vital
- Need to avoid catheter displacement during embolization to avoid non-target embolization
- Often support with a guide catheter, catheter and co-axial microcatheter can be used
Embolic Agents - Coils

- Produce permanent occlusion
- Used in small, medium and large arteries
- Some coils are detachable to allow retrieval and re-positioning
Embolic Agents - Plugs

- Achieves focal and complete occlusion of vessel
- Primarily used in medium to large arteries although smaller plugs are now available
Embolic Agents - Particles

- Various particle diameters are now available (e.g., 50 – 1000 µm)
- Permanently block various levels of the arterial bed based on particle size
- Drug-eluting beads are both embolic and deliver chemotherapy
Embolic Agents - Gelatin

- Can be used in pledglets or slurry
- Temporary embolization (eg 24 – 48 hours)
Embolic Agents – Liquid Embolics

- Includes methyl-cyanoacrylate (glue) and Onyx
- Conforms to irregular spaces, completely filling them
Indications for Embolization

- Prophylactic branch artery embolization for EVAR
- Embolization of endoleaks
- Embolization of gastrointestinal tract bleeding
- Embolization of traumatic bleeding
- Tumour embolization
- Embolization of vascular malformations
- Embolization of benign conditions (e.g., benign prostatic hypertrophy, uterine fibroids)
- Venous embolization (e.g., gonadal veins, portal veins)
Prophylactic Branch Artery Embolization for EVAR

- Usually use coils or plugs
- Targets include the Left Subclavian Artery during TEVAR, and the Inferior Mesenteric Artery (IMA) of Internal Iliac Artery during EVAR
Prophylactic Branch Artery Embolization for EVAR
Embolization of Endoleaks

- Type 1 and Type 3 endoleaks expose the aneurysm under arterial pressure so need early treatment to prevent aneurysm rupture.
- Type 2 endoleaks are very common and the best management is controversial – however most clinicians will treat type 2 endoleaks with aneurysm sac expansion > 5mm.
Embolization of Type 2 Endoleaks

- Catheter directed embolization often first approach – using coils and liquid embolic agents
- Type 2 endoleaks are very common and the best management is controversial – however most clinicians will treat type 2 endoleaks with aneurysm sac expansion > 5mm
Embolization of Type 2 Endoleaks
Embolization of Type 2 Endoleaks

“Glue” in endoleak and R L4

Coils in L L4

Pre-treatment

Post-treatment
Embolization of Type 2 Endoleaks

Onyx
Embolization of Type 1 and 3 Endoleaks

- Commonly strategies such as graft extensions and endoanchors are used
- Coils and liquid embolics may be useful, especially gutter T1A endoleaks
Embolization of Type 1 and 3 Endoleaks
Embolization of Type 1 and 3 Endoleaks

Ruby Coils (Penumbra, ...
Embolization of Traumatic Arterial Bleeding

- Common locations include splenic, liver and renal injuries and internal iliac artery branches after pelvic trauma
- Embolization agents commonly in coils, gelfoam, plugs
Embolization of Gastrointestinal Tract Bleeding

• Acute GI tract bleeding tends to stop and start so prompt transfer to the interventional suit is important
• Often use a co-axial microcatheter to get as close to the bleeding source as possible and minimize bowel ischemia
• Usually use coils, particles or glue
Embolicization of Tumours

- Embolization may be performed pre-operatively to reduce blood loss prior to resection (e.g., renal artery embolization in RCC).
- Embolization may be used definitively in hypervascular tumours such as hepatocellular carcinoma.
- Drug eluting beads allow chemotherapy drugs to be targeted to the tumour.
Embolization of Tumours
Venous Embolization Applications

- Embolization may be performed pre-operatively to reduce blood loss prior to resection (eg renal artery embolization in RCC)
Venous Embolization Applications

- Gonadal vein embolization – coils, liquid embolics
Conclusions

• There are multiple tools available for catheter directed embolization
• Experience is required to determine the best embolization strategy for each clinical problem
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