CT guided direct thrombin injection to treat type II endoleak following endovascular repair of abdominal aortic aneurysm

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Objective

Report our experience in treating type II endoleaks with this particular method
Localized enlargement of the aortic lumen diameter (d > 3 cm) or more than 50% larger than normal diameter

AAAs affect 2 - 8% of males and 0.5 – 2 % of females over the age of 65

Can be characterized by
- its size (ectatic, moderate, severe)
- its shape (fusiform, saccular, pseudo-)
- its location (thoracic, thoracoabdominal, abdominal supra-, para-, juxta- & infrarenal etc)

Risk factors: genes, smoking, hypertension, hyperlipidemia, chronic inflammation etc.

Rapture Risk
- <1 % if d < 5 cm
- 10 % if d = 5.5-7 cm
- 33% if d > 7 cm

Treatment
- Open surgery
- EndoVascular Aneurysm Repair (EVAR)
EndoVascular Aortic Repair (EVAR)

- Minimally Invasive technique

- In 2003, EVAR surpassed open aortic surgery as the most common technique for repair of AAA, and in 2010, EVAR accounted for 78% of all intact AAA repair in the United States

- Placement of an expandable stent graft within the aorta to treat aortic disease
  - Techniques: Standard, percutaneous, fenestrated, branched, hybrid
  - Most commonly inserted from femoral artery

- Complications
  - Procedure related: Arterial dissection, contrast-induced renal failure, thromboembolization, ischemic colitis, groin hematoma, wound infection, type II endoleaks, myocardial infarction, congestive heart failure, cardiac arrhythmias, respiratory failure
  
  - Device related: Endograft migration, aneurysm rupture, graft limb stenosis/kinking, type I/III/IV endoleaks or stent graft thrombosis
Endoleaks

An endoleak is a leak into the aneurysm sac after EVAR

Five types:

- **Type I** – Perigraft leakage at attachment sites
- **Type II a/b** – from one (type a) or more (type b) AA branches
  - most common endoleak (occur in 10% to 30% of patients at any time during follow-up)
  - least serious type of endoleak, do not require immediate treatment
  - collateral retrograde flow from the aortic branches (lumbar arteries, inferior mesenteric artery, middle sacral artery)
  - a portion will resolve spontaneously
- **Type III** – Leakage between overlapping parts of the stent or rupture through graftmaterial
- **Type IV** – Graft wall failure
- **Type V** – Non identifiable leak. Also called "endotension"

Endoleak treatment

- Sac growth of > 5 mm or persistent endoleak > 6 months
- Transfemoral embolization, translumbar direct sac embolization, transfemoral transsealing embolization, open and laparoscopic ligation of the lumbar and mesenteric arteries, aneurysm sac placation and open conversion
Thrombin

- Serine protease enzyme
- Thrombin converts soluble fibrinogen into insoluble strands of fibrin
- Catalyzes many other coagulation-related reactions
Thrombin injection as Treatment of Type II endoleak: Materials

- 9 patients with CTA confirmed Type II endoleak
- Toshiba Activion™ 16 Multislice Helical CT System
- Patients full medical background check
  - No reported patient allergies
  - Thrombophilias, blood thinners
  - Blood test confirmed normal renal and Thyroid function
- Iopromide 370 mg I/mL Contrast
- 22/20 gauge Needle(s), non-traumatic
- 5-10ml Lidocaine for local anesthesia
- Recombinant human thrombin Hemostatic Matrix KIT
  - A mixture of thrombin powder, Sodium Chloride, and Gelatin Matrix
1. Initial CT Angiography for confirming feeding artery/ies

1. Determining the point of thrombin administration for maximal efficacy

1. Careful selection of insertion pathway angle and distance
   - translumbar muscle window
   - Avoid intestinal helixes, major arteries and nerves

2. Topical anesthesia for patient comfort
   - 5 to 10 ml Lidocaine at point of needle insertion
   - 1 to 3 cm in depth subcutaneously
   - Aspiration before administration

3. Stepwise propagation of the needle
7. Once the needle is at the optimal place – **continuous slow** administration of thrombin solution
Thrombin injection as Treatment of Type II endoleak:
Results

- 8 patients with complete resolution of the endoleak on post injection CTA and follow up CTA after 24h, 3 & 6 months

- 1 patient with type IIb-partial resolution at CTA after 24h and complete resolution at follow up CTA after 1 month
Conclusion: Our experience

CT guided direct thrombin injection

- Safe – no general anesthesia
- Minimally invasive
- Almost pain free
- Time & cost effective
- Treatment of choice
- Warning: Radiation (!)
Bibliography

Thank You!