Radiation Induced Arterial Disease Causing CLTI: Endovascular Treatments Are Often Effective

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Radiation Effects on Vessels

- High radiosensitivity of endothelial cells
- Fibrosis of the medial and adventitial layers
- Damage to vasa vasorum
- Variable presentation
  - Acute thrombosis or arterial rupture (early)
  - Arterial fibrosis, stenosis and accelerated local atherosclerosis (2 to 47 years)
  - Mimics presentation of severe PAD

Radiation Effects on Vessels

- Varying tolerance to radiation dosage amongst different vascular beds
- Lack of collaterals in radiated field
- Radiographic changes after 39 to 80 Gy (ilio-femoral)
- Sparing of surrounding non-irradiated arteries differentiates from atherosclerosis
- Due to poor outcomes, revascularize only when significant symptoms exist

Endovascular vs. Open Approach

- Surgical access to pathologic artery difficult
- Tissue sclerosis, scar disruption, anastomotic breakdown, and restenosis
- Traditionally - bypass via non-radiated field
- Extra-anatomic route for bypass grafting
  - Increased rate of late prosthetic graft infection (as high as 21%)
  - Use of autogenous graft recommended harvested from an area outside irradiated field

Endovascular vs. Open Approach

- Endovascular approach
  - More often used for short lesions
  - Can be used as main revascularization option vs. bridge to open surgical reconstruction
  - Treat early vs. late complications
  - Percutaneous vs. hybrid approach
  - Lacks long term data
Early Complication Management

- 46-year-old male with right thigh myxoid liposarcoma
- Hemorrhage right thigh 3 months s/p XRT / wide resection
- Repair of right superficial femoral artery pseudoaneurysm with 6 mm x 10 cm covered self expanding stent graft
- 1 year Duplex– patent stent graft

Open Bypass

- 64 y.o. female with Diabetes mellitus; Hyperlipidemia; PAD presented with severe ischemic rest pain of left lower extremity.
- s/p left groin lymphoma treated 26 years ago with chemotherapy and radiation
- Left iliofemoral occlusion
- Aorto-left below-knee popliteal artery bypass via the obturator foramen using a 6 mm ringed polytetrafluoroethylene Graft
- 2.5 years later – widely patent graft

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Hybrid Approach

- 51-year-old woman with recurrent endocervical adenocarcinoma
- Treated with chemotherapy, 4500 cGy external beam radiation to cervix, bladder, and rectum, then 3500 cGy brachytherapy
- Four years later, presented with difficulty ambulating, progressive bilateral rest pain and paresthesia.
- Exam: cachectic woman without palpable femoral or distal pulses bilaterally.
- Feet - discolored with rubor; L toes cyanotic.
- Left foot drop

Studies and complicating factors

- Flat digit waveforms bilaterally with non-obtainable toe pressures
- Management complicated by radiation secondary effects
- Bowel obstruction with perforation, multiple reoperations, creation of a stoma, resultant colovesical fistula, and ureteral obstruction.

Two Stage Revascularization

- Left brachial approach Angioplasty/stenting
- Hybrid Left CFA exposure Angioplasty/stenting
Adjunctive Procedures Often Required

- 8 months later - permanent diversion and management of her colovesical fistula was completed
- Thrombosis of left iliac system to distal CFA.
  - Catheter-directed thrombolysis - resolved within 12 hours
  - No causative lesion was noted.
- 10 mo later, re-thrombosed the left iliac system despite anticoagulation
  - Lysis was again successful, but now fracture of distal stent

Conclusions

- Management of limb ischemia caused by radiation injury is challenging.
- Atypical conduits or tunnels can be used for bypass through or around the radiated area.
- Application of endovascular therapy for revascularization via standard and alternative access sites with or without hybrid arterial adjuncts can be used
- Open bypass remains as a later option
- Follow up mandatory as reintervention often necessary

Thank you