Minimally Invasive Treatment Options for Renal Artery FMD

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Renal Artery FMD

• Seen in ~ 2% of patients imaged
• Imaging manifestations
  – Multifocal or unifocal stenosis
  – Aneurysms
  – Dissections
• Clinical presentations
  – Asymptomatic
  – Hypertension
  – Pain with or without aneurysm rupture
  – Renal emboli +/- infarction
  – Blood in the urine
Renal Artery Stenosis & Aneurysms

FMD with bilateral renal artery aneurysms; aortic dissection
51 yo woman with hypertension: Renal FMD & bilateral aneurysms
FMD - Renal Artery Stenosis

- No good natural history studies;
- New lesions can develop in previously unaffected arteries;
- Can be difficult to determine severity;
- Need to determine translesion gradient;
- If stenosis (unifocal vs. multifocal) is hemodynamically significant → balloon PTA (no Stent)
Renal donors with incidentally detected FMD who were followed for 4 yrs did NOT develop hypertension or renal insufficiency.

Progression to renal failure is rare.

Disease progression appears to arrest around menopause.
FMD → Renal Artery Stenosis

Natural History
18 yo female → left nephrectomy following an unsuccessful attempt @ revascularization.

Angiogram for evaluation of recurrent hypertension 5 yrs later → stenosis
Multifocal FMD

- ~ 75-80% cases of FMD
- Classic “string of beads”
- Media has areas of disruption with fibrous tissue accumulation or medial thinning → aneurysmal dilation

Severity of FMD cannot be determined by visual inspection/estimation.
Balloon PTA - PTRA

FMD
Balloon PTA - PTRA
Multifocal FMD - PTRA

51 yo female with ↑ BP

Multifocal FMD  Post - PTRA  12 Mos F/U
Unifocal FMD

- >5% cases of FMD
- Pediatric & younger patients
- Smooth long stenosis of main or web-like stenosis of branch
- Intimal proliferation with deposition of fibrous material
- Fragmented or duplicated IEL
- Can be progressive → occlusion

There is concentric thickening of the intima. The media and adventitia are relatively normal.

Unifocal FMD - PTRA
27 yo female with 4 yr history of ↑ BP

Pre - PTRA

27 Mos F/U
FMD - PTRA

UVA Experience

- N = 66 Patients (85 Lesions)
- Tech Success = 100% (66/66)
- BP Cured 41% (27/66), Improved 57% (38/66)
- Renal Insufficiency (N = 14)
  - 86% (12/14) Improved
  - 14% (2/14) Stable

FMD - PTRA

F-U RANGE: 1-121 MONTHS
F-U MEAN: 39 MONTHS
F-U MEDIAN: 32 MONTHS

BP mmHg

Meta-regression analysis of renal FMD demonstrating the association between hypertension cure post PTRA and mean age (A) and year of study publication (B).

O'Connor SC, Gornik HL. J Am Heart Assoc 2014
FMD - Renal Artery Aneurysms

- RAAs are seen in ~ 0.1% of autopsies and up to 1% of renal angiograms
- Females >> males
- Most are saccular and non-calcified
- 90% are extraparenchymal
- Etiologies
  - FMD/Segmental Medial Arteriolysis (SMA)
  - Atherosclerosis
  - Inflammatory, infectious, post-traumatic
  - Collagen disorders (Ehlers-Danlos, etc)
Natural History: RAAs

- Not well understood
- Can rupture < 2cm, but rarely
- Females of childbearing age have increased mortality rates
- Mortality rate for RAA rupture with pregnancy → 70%
RAAs: Indications for Rx

- >2.0 cm
- Females considering pregnancy
- Aneurysm “expansion” (> 5mm)
- Symptoms
  - Rupture/AV fistula
  - Pain
  - Refractory hypertension in a young patient
  - Emboli/infarcts
  - Recurrent hematuria
Principles of Endovascular Therapy

- Exclusion – maintains continuity of flow (covered stents; embo aneurysm)
- Isolation – disrupts flow & requires collaterals or results in infarction (embo of inflow & outflow arteries)
- Combination of techniques to treat complex anatomy & avoid surgery
SAA – Exclusion Technique

Landing zones & deliverable
Covered Stents

Fluency (SX)

Graftmaster (BX)

iCAST (BX)

Wallgraft (SX)

Viabahn (SX)
RAA – Covered Stent Therapy

Left renal artery aneurysm – Courtesy Dr. Klaus Hagspiel
RAA – Covered Stent Therapy

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37 yo with FMD; prior PTRA; pain

Covered Stent
Exclusion Technique

Narrow neck - deliverability

coils or thrombin
Exclusion Technique

Narrow neck - deliverability
Case: Renal Artery Aneurysm

S/P PTRA for FMD; Rt flank pain and recurrent hypertension

Angiogram & CTA show branches off aneurysm
Case: RAA Embolization

S/P PTRA for HTN due to FMD; pain & persistent mild HTN

Embolization with detachable coils

2 yr F/U; pain resolved; HTN cured
RAAs: Open vs. Endovascular Repair

- Endovascular → lower complications;
  - ↓ LOS (4 vs. 7 days, p<0.001)
  - lower rates D/C to skilled facility
    (18.9% vs. 39.2%, p=0.001)
- Outcomes better after endovascular repair (Note: selection bias)
48 yo female with flank pain & refractory HTN; Prior gastric banding; bilateral renal aneurysms & FMD of the renals & iliacs
RAAs - FMD

- Prevalence of 0.1 – 1%
- Repair in women contemplating pregnancy
- Repair if > 2cm, enlarging or symptomatic (pain, hematuria, refractory hypertension, emboli)
- Covered stents, embolization, or combo Rx
- Surgical options and complex endovascular solutions are viable options depending upon institutional expertise.
FMD - Renal Artery Dissections

- Primary dissections of the renal artery
  - FMD
  - Segmental Medial Arteriolysis (SMA); associated mesenteric arterial dissections
  - Trauma – blunt or penetrating
- Secondary dissections of the renal artery
  - Related to an aortic dissection
  - Iatrogenic
52 yo otherwise healthy, athletic woman, who developed acute onset of bilateral flank pain, blood in her urine and hypertension
FMD – Spontaneous Renal Artery Dissections

Upper pole left renal artery  Lower pole left renal artery
Clinically doing well; F/U CTA at 6 months.
Anticoagulated for 9 months, then ASA for life; ACEI and amlodipine for hypertension; pain resolved; gradually increasing activity.
FMD - Renal Artery Dissections

- Hard to distinguish from SMA
- Likely will have some renal infarction and secondary hypertension
- Anticoagulation and anti-hypertensive meds
- Minimize manipulating the artery
- Ongoing pain and progression – Rx
  - Stenting
  - Could lead to extension of dissection
FMD of the Renal Arteries

• The natural history of FMD is not well known, but the FMD registry will help to provide us insight.
• FMD is more than just a cause for hypertension.
• For unifocal & multifocal FMD, PTRA works, with cures being age dependent; Stents are rarely needed to treat stenoses due to FMD.
• RAA aneurysms can be observed unless they are symptomatic, enlarging, or > 2cm (pregnancy).
• Primary renal artery dissections may be related to FMD; try to avoid intervening to allow healing.
Thank You!