Management of Complex Renal Aneurysms

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- **Speakers Bureau**: Bard
- **Consultant/Advisory Board**: Medtronic/Covidien, Cordis, Cardinal Health, Hansen Medical
Renal Artery Aneurysms

- Prevalence of renal artery aneurysms is estimated at 0.1%
- More frequent in women
- 20% bilateral and 30% multiple
- Fibromuscular dysplasia is a most common cause of renal artery aneurysms, with degenerative aneurysms, vasculitis, and trauma accounting for most of the others
- Most are found incidentally. Can present with hypertension, hematuria, flank pain, obstruction
Renal Artery Aneurysms: Clinical Presentation

- Mortality from rupture: 10%
- Rupture is more common in pregnancy, with 70% maternal mortality and up to 100% fetal mortality
- Renal aneurysms are associated with hypertension. The precise etiology of hypertension is controversial, however, treatment has been shown to improve blood pressure
Renal Artery Aneurysms: Indications for Treatment

- Symptomatic aneurysm of any size (secondary to rupture, hypertension, hematuria, pain, etc.)
- Pseudoaneurysm of any size
- Asymptomatic patients with aneurysms > 2.0 cm or rapidly expanding over time
- Females who are pregnant or in those contemplating pregnancy
RENNAL ARTERY ANEURYSMS

Principles of Therapy

Occlude artery

Stent Graft

Coil sac

Combinations

Combinations: Stent assisted coiling; Flow diversion; Direct sac puncture
Endovascular treatment options

- **Sac Embolization:**
  - Fill sac with coils to induce thrombosis (packing critical)
  - Need narrow neck
  - Framing coils and longer coils save time and radiation
  - Avoid in false aneurysms, if possible
    - The arterial wall lacks integrity and coil pack may continue to enlarge, leading to rupture
68 y/o woman with 2.5 cm left renal artery aneurysm
Enter Aneurysm
Is Coil Packing Density Important?

- Recent study demonstrated that insufficient coil packing density within visceral aneurysms resulted in an increased incidence of coil compaction and recanalization.

- There was no recanalization or compaction in aneurysms with a packing density of at least 24%.

Endovascular treatment options

- **Covered stent-grafts**
  - Exclude aneurysm with endoluminal lining
  - Advantage of continuous inline flow to end-organ
  - +/- embolization to deal with side branches
    - Coils, glue
  - Maybe difficult to deliver
  - Viabahn, Fluency, Graftmaster
Endovascular treatment options

- **Uncovered Stents**
  - Stents to decrease flow to aneurysm and cause thrombosis
  - Principle of flow diversion
  - Pipeline is an option here

- **Stent Assisted Coiling**
  - Deliver coils through interstices of stent
• Patient is a 47 y.o. female who presented at an OSH with hematuria

• OSH renal ultrasound shows a 2.5 cm right renal artery aneurysm

• Patient is an avid scuba diver, on OCP and there is concern for future rupture
Left Renal Pseudoaneurysm and AV Fistula
Left Renal Pseudoaneurysm and AV Fistula
66 y/o man with CHF

- 66 year old man with a history of hypertension was admitted from the ER for CHF
- Cardiac catheterization revealed an increase in oxygen saturation from 64% in the superior vena cava to 85% in the pulmonary artery reflecting abnormal admixture of oxygenated blood from a significant left-to-right shunt
- Creatinine 1.9 (renal insufficiency)

Durack JC, et al. JVIR 2012; 23: 413-416
Large Renal AVM (patient had no history of trauma so probably not AVF)

Durack JC, et al. JVIR 2012; 23: 413-416
Enlarged right renal artery with no appreciable renal parenchymal contrast opacification

Dilated and tortuous right renal vein and markedly enlarged suprarenal IVC
Options for Dealing with High Flow AVF (to prevent nontarget embolization)

1. Placement of arterial occlusion balloon
2. Placement of venous occlusion balloon
3. Use of both arterial and venous occlusion balloons
4. Use of double microcatheter technique
OptEase IVC Filter Deployed as Scaffold and then 22 mm Amplatzer Placed

Durack JC, et al. JVIR 2012; 23: 413-416
Coils placed proximal to IVC Filter and Amplatzer (note improved perfusion to the upper pole renal parenchyma)

Durack JC, et al. JVIR 2012; 23: 413-416
Outcome

- Patient’s dyspnea, orthopnea and peripheral edema improved
- Resolution of CHF
- Renal function improved (Cr 1.9 → 1.2)

Case: Patient with abdominal bruit and refractory hypertension
6Fr guide catheter in right renal artery
Selective injection past the aneurysm and before the varix showing early filling of the IVC.
6Fr Envoy guiding catheter over a Quick-Cross
Deployment of a 12mm Amplatz vascular plug in feeding artery
Placed an 8mm coil within the Amplatzer plug
Two 8Fr Contra guide sheaths via bilateral groin access with kissing 6x40 Acculink stents in superior and inferior renal arteries over .014 wires.
6 x 40mm Acculink stents deployed
Microcatheter through the interstices of the superior stent and into the renal artery aneurysm
Numerous coils were deployed. This was then packed with traditional platinum detachable coils. A total of 12 coils were deployed within the right renal artery aneurysm.
Case: Patient with abdominal bruit found to have a right renal artery pseudoaneurysm with AV fistula

Case courtesy of Robert Lookstein
Large right renal artery pseudoaneurysm with arteriovenous fistula at bifurcation of upper- and mid-polar branches

Case courtesy of Robert Lookstein
PROCEDURE PLAN – Balloon Assisted Coil Embolization

Large right renal artery pseudoaneurysm with AV fistula at bifurcation of upper- and mid-polar branches
Balloon-Assisted Coil Embolization

- **Access:**
  - R CFA 7-French guide catheter with stabilizer wire and Fathom microwire
  - L CFV 6-French guide catheter
  - Fathom microwire snared from renal artery across pseudoaneurysm to IVC
Balloon-Assisted Coil Embolization

Subselective angiogram at pseudoaneurysm origin

Case courtesy of Robert Lookstein
Balloon-Assisted Coil Embolization

Balloon occlusion

Deployment of coils

Case courtesy of Robert Lookstein
Balloon-Assisted Coil Embolization

- Completion angiogram demonstrates complete occlusion of pseudoaneurysm and arteriovenous fistula
- Complete preservation of nephrogram

Case courtesy of Robert Lookstein

Miami Cardiac & Vascular Institute
Clinical Outcomes
Miami Cardiac & Vascular Institute Experience

Endovascular Treatment of Visceral and Renal Artery Aneurysms

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ABSTRACT

Purpose: To analyze early and midterm results of endovascular treatment of visceral aneurysms regarding technical considerations, technical success rate, aneurysm rupture, and end-organ ischemia.

Materials and Methods: Endovascular treatment of 41 visceral and renal artery aneurysms (VAAs) in 40 consecutive patients (25 women; mean age, 59.4 y ± 16.2) was retrospectively reviewed. The series included 30 true aneurysms and 11 pseudoaneurysms in renal (n = 17), splenic (n = 13), hepatic (n = 4), celiac (n = 4), gastroduodenal (n = 2), and middle colic (n = 1) arteries. Demographic, clinical, procedural, and follow-up data were analyzed.

Results: Forty-one aneurysms underwent endovascular treatment. Hypertension (73%) and hyperlipidemia (32%) were the most common associated comorbidities. Nineteen patients presented with symptoms of pain (15%) or rupture (32%) in 10 pseudoaneurysms (91%) and nine true aneurysms (30%; P = .0007). The most commonly used technique (93%) was coil embolization with (15%) or without (78%) other endovascular agents. The rate of technical success (cessation of hemorrhage or blood flow into aneurysm sac) was 98%. There was no periprocedural mortality. Mean hospital stays were 1 and 2 days for asymptomatic and symptomatic patients, respectively. Mean clinical follow-up was 44.5 months; mean imaging follow-up was 11.7 months. The only complication was an intraprocedural thromboembolic event in one case (3%). Follow-up imaging evidence of end-organ partial infarct was detected in six patients (21%), with no clinical evidence of organ insufficiency.

Conclusions: Endovascular treatment of VAAs is a safe and highly successful procedure. Associated side effects such as distal embolization and end-organ infarcts were not found to be clinically significant.

- Retrospective review conducted for 10 year period (2000-2010)
- 2/3 of the patients had true aneurysms; 1/3 with pseudoaneurysms
- 31.7% of patients presented with rupture
Clinical Outcomes
Miami Cardiac & Vascular Institute Experience

- Technical success in 97.6% of cases
- No periprocedural mortality (<30 days)
- No incidence of arterial dissections or migration of coils
- One complication (3%) – thromboembolic event
- Primary patency rate (97.5%)
- Estimated 9 year survival rate was 92%
  - 2 deaths among treated patients, 9 and 4 years post treatment
  - Cause unknown
Take Home Points

- Most renal aneurysms are treatable with endovascular options
- Method depends on vessel anatomy and inventory available
- Size and indications for therapy are not uniform or universally agreed upon
- Follow up important and may be difficult secondary to artifact