Aneurysmal disease – non atherosclerotic

Prof. Dr. Stefan O. Schoenberg
Professor and Chairman of Radiology

Department of Clinical Radiology and Nuclear Medicine
University Hospital Mannheim
Medical Faculty Mannheim – University of Heidelberg, Germany

Definition of aneurysm

• Dilatation of all three layers of the artery¹
• Most common definition is a 50% increase over the normal diameter
• Arterial diameter dependent on age, gender and body habitus

¹Baxter BT. Cardiovascular Pathology 2005; 14: 185–188

Intracerebral aneurysm

By autopsy: MCA bifurc (25%) = aCom (25%) > pCom (18%)
By DSA (symptomatic): pCom (38%) > aCom (36%) > MCA (21%)
By risk of bleeding: aCom (70% bleed) > pCom

Better visibility of small aneurysms @ 3Tesla

Rupture:
• 28,000 cases / year
• 40-60 years of age
• Rupture size 5-15 mm
• No true critical size of rupture
• aCom 70%

http://www.ma.uni-heidelberg.de/inst/kr/RSNA2007/aneurysmdisease
CE MRA for partially thrombosed aneurysms

Comparative value of different sequences

A – TOF @ 1.5T without contrast agent: coronal 15mm thin MIP

B – CE-MRA @ 1.5T: coronal 15mm thin MIP

C – TOF @ 1.5T with contrast agent: ↑ signal of peripheral vessels, but also ↑ background

Improvements by Time-resolved MRA

Temporal resolution: 1.5 seconds
CE MRA: value after coiling > TOF

TOF 3.0T

CE 3.0T

Natural progression of aneurysms over years

Increased Incidence

- Anomalous vessels
- Aortic coarctation
- Polycystic kidney disease
- Fibromuscular dysplasia
- Connective tissue disorder (Marfan, Ehlers-Danlos)
- High flow states (vascular malformations, fistulae)

Extracranial segments

35 y o male, Incidental aneurysm, no previous trauma

S/P staphylococcus aureus sepsis: increasing incidence (19 → 30% > salmonella infections (38% → 10%))
most common causes: bacteremia (20% of all cases), surgery (20%), soft tissue infections of the head / neck (9%), endocarditis (8%), and dental procedures / infections (8%)

Mycotic aneurysm of left internal carotid artery, partially thrombosed, soft tissue inflammation

FMD of the carotid artery

- Supraaortic vessels
- Aorta and thoracic vessels
- Visceral and retroperitoneal
- Peripheral
- Multifocal involvement

http://www.ma.uni-heidelberg.de/inst/ikr/RSNA2007/aneurysmaldisease
**Marfan’s syndrome**

- Development
- Dysplastic
  - Marfan’s
- Inflammatory
- Traumatic

8 y o child with funnel chest, 2 non-dissected giant aortic aneurysms of the ascending (funnel-like) and descending (saccular) aorta w compression of the supraaortic vessels.

**Dysplastic**

- Flow-related

**Cystic media necrosis: Erdheim-Gsell**

- Development
- Dysplastic
- Inflammatory
- Traumatic
- Flow-related

**Cystic fibrosis**

- Development
- Dysplastic
- Inflammatory
- Traumatic
- Flow-related

Aneurym of dilated bronchial artery

**Cystic fibrosis**

- Development
- Dysplastic
- Inflammatory
- Traumatic
- Flow-related

**Invasive aspergillosis**

- Development
- Dysplastic
- Inflammatory
  - fungal
- Traumatic
- Flow-related

25 y o male with long-term IVDA

**Invasive aspergillosis**

- Development
- Dysplastic
- Inflammatory
  - fungal
- Traumatic
- Flow-related
Invasive aspergillosis

25 y o male with long-term IVDA

Multifocal inflammatory aneurysms

58 y o male with idiopathic pulmonary fibrosis and long-term steroid therapy

Multifocal inflammatory aneurysms

Before and after stent treatment

Abdominal aorta = most common site of salmonella aneurysm

Rate of progression

10/2005

2 weeks earlier

Bilateral subclavian artery aneurysms

Treatment

Before and after stent treatment

Stent implantation: only bridging to reduce acute risk of rupture, definitive therapy by surgical repair

Contents

- Supraaortic vessels
- Aorta
- Visceral and retroperitoneal
- Peripheral
- Multifocal involvement

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**Diffuse ectasia**

**Development**
- Dysplastic
- Inflammatory
- Traumatic
- Flow-related

**Splenic artery aneurysm**

**MRA vs. DSA**

48 y o women with autoimmune hepatitis

**Progression over time**

**PAN of the liver**

**Pseudoaneurysm after biliary stent**

S/P hemihepatectomy (hydatic disease), recurrent CDB stricture

Re-bleeding 4 weeks later

Successful coil embolization

**Aneurysm of the gastroduodenal artery due to pancreatitis**

After 1st coil embolization

After 2nd coil embolization
Fibromuscular dysplasia

FMD + aneurysm in 37% of cases: requires high spatial resolution for CE-MRA (<1mm³)

Higher resolution: FMD @ 3 Tesla

0.9x0.8x0.9 mm, 16 s scan time

Courtesy of J. Paul Finn MD PhD, UCLA

FMD + aneurysm @ 3 Tesla

CE-MRA, 0.9x0.8x0.9 mm, PAT acceleration 3, 16 s scan time

Time-resolved imaging (TREAT) @ 3 Tesla

(Courtesy of Dr. J. Paul Finn, UCLA)

Dissection + aneurysm: postinterventional

23 y o female c HTN

4 months later

Panarteritis nodosa

Kidney most frequently involved organ in PAN (85%)
Panarteritis nodosa

PAN of small vessels without involvement of glomeruli, transmural fibrinoid inflammation
Subarachnoid hemorrhage in upper thoracic spine

Aneurysm of renal vein

53 y o female with liver cirrhosis and extensive porto-caval venous collaterals

Aneurysm of IVC

DSA – late arterial phase

Contents

- Supraaortic vessels
- Aorta
- Visceral and retroperitoneal
- Peripheral
- Multifocal involvement

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PAN of the hands

DSA – late arterial phase

PAN of the hands

DSA – venous phase
ANCA-negative Vasculitis

DSA

arterial

venous

Development

Dysplastic

Inflammatory

vasculitis

Traumatic

Flow-related

Pseudoaneurysm of femoral artery

after puncture of R femoral artery

Development

Dysplastic

Inflammatory

Traumatic

iatrogenic

Flow-related

1. Progressive intimal hyperplasia
2. Partially thrombosed aneurysm of popliteal artery → 3. occlusion

Entrapment

Needle-DSA

Development

Dysplastic

Inflammatory

Traumatic

iatrogenic

mechanical

Flow-related

DD: synovial sarcoma

26 y o female with synovial sarcoma of left knee

Development

Dysplastic

Inflammatory

Traumatic

Flow-related

Contents

• Supraaortic vessels
• Aorta
• Visceral and retroperitoneal
• Peripheral
• Multifocal involvement

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Kawasaki’s Disease

CE-MRA of 2 y o male with multifocal aneurysms

Development

Dysplastic

Inflammatory

Traumatic

iatrogenic

vasculitis?

Flow-related
**Development**

- Dysplastic
- Inflammatory
- Traumatic
- Flow-related

**Whole-body MRA**

- Development
- Dysplastic
- Inflammatory
- Traumatic
- Flow-related

**Incidental small aneurysm of the ICA**

**Fibromuscular dysplasia**

- Development
- Dysplastic
- Inflammatory
- Traumatic
- Flow-related

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