NON-ATHEROSCLEROTIC PATHOLOGY OF THE CAROTID ARTERIES

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DISCLOSURE

- Educational consultant for Philips HealthCare
• Discuss the diagnostic US features of non-atherosclerotic vascular pathology of the carotid arteries
  – Dissections
  – Arterio-venous fistulae
  – Pseudoaneurysms
  – Vasculitis
CCA DISSECTION

• Usu result of extension from a dissection in the aortic arch
• Older pts
• Relatively asymptomatic
  – neck or chest pain
• Often stabilize
  – Rx may not be required
• Only ~ 3-7% assoc with stroke
CCA DISSECTION
CCA DISSECTION

• Look as proximally as possible when dissection extends from thoracic aorta
• May not involve both CCAs
CCA DISSECTION

- Mural hematoma or thrombosed false lumen
POST-TRAUMATIC CAROTID ARTERY DISSECTION

Thrombosed False Lumen
ICA DISSECTION

• Young to middle aged pts
• M = F

• Clinical presentation:
  – headache
  – neck or facial pain
  – hemispheric symptoms
  – cranial nerve palsy
  – Horner syndrome
  – stroke
ICA DISSECTION

- Usually occur secondary to trauma or spontaneous dissection
  - Implies weakness in vessel wall
- Usually start at skull base and dissect down towards bifurcation
- More likely to have a mural hematoma and less likely to have an intimal flap
- Harder to see on US
  - Better evaluated on MR, CT or angio
- More likely to result in stroke
ICA DISSECTION

• Common cause of stroke in young pts
• Others causes:
  – cardiac disease
  – tumor
  – vasculitis
ICA DISSECTION

• US findings:
  – **NORMAL** (remember, it starts at the skull base)
ICA DISSECTION

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  – ICA occlusion in young pt
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  – ICA occlusion in young pt
  – high resistance ICA waveform with no stenosis or plaque at bulb
ICA DISSECTION

- **US findings:**
ICA DISSECTION @ SKULL BASE

RT

LT
ICA DISSECTION @ LT SKULL BASE
ICA DISSECTION

• US findings:
  – NORMAL (remember, it starts at the skull base)
  – ICA occlusion in young pt
  – high resistance ICA waveform in young pt with no stenosis or plaque at bulb
  – smooth tapering ICA stenosis in young pt
    Ø homogeneous, hypoechoic thick wall (intramural hematoma)
    Ø no evidence of atherosclerosis, calcified plaque
    Ø ↑ PSV
ICA DISSECTION

- Smooth, tapering stenosis, thick hypoechoic wall
ICA DISSECTION

- Can confirm presence of blood in vessel wall w/ MR or CT

High signal intensity intramural hematoma
ICA DISSECTION

- Rare to see dissection flap in ICA
ARTERIO-VENOUS FISTULA

• Arteriovenous connection
  – usually btw CCA and IJV

• Etiology:
  – trauma (blunt or penetrating), including iatrogenic
    ➢ attempted neck line or needle placement
    ➢ post surgical
  – erosion in pts w/ malignancy or s/p XRT
  – congenital
ARTERIO-VENOUS FISTULA

• Presentation:
  – hematoma
  – bruit
  – noise or ringing in ear
  – palpable thrill
  – CHF
  – distended IJV

• Rx: carotid stent or surgery
SOFT TISSUE BRUIT

• Increased velocity & pressure changes cause vibration of surrounding soft tissues → color mosaic

• What to do?
  – ↓ gain
  – ↑ scale, PRF
  – ↑ wall filter
  – image in diastole
CCA-IJ FISTULA
CAROTID ARTERY PSA

• Etiology:
  – trauma (usu direct puncture)
  – infection
  – malignancy (erosion)
  – weakened arterial wall
    ➢ XRT, dissection, FMD, Ehlers-Danlos & Marfan syndromes

• Risk: rupture

• Rx: carotid stent or surgery
CAROTID ARTERY PSA

• US findings:
  – cystic mass
  – “yin-yang” appearance of swirling blood flow
  – “to & fro” flow in neck
    ➢ towards PSA in systole
    ➢ away from PSA in diastole
    ➢ depends on size of neck
28 yr old IVDU w/ Neck Pain

CCA PSA, largely thrombosed
28 yr old IVDU w/ Neck Pain

- “To & fro” flow pattern in neck
62 yo Female 5 yrs s/p CEA
Presents w/ TIA & Abnl CT Scan
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PSA ARISING FROM ICA ABOVE CEA SITE
PSA ARISING FROM ICA ABOVE CEA SITE

Attempted stent placement
Coiled & non-retrievable
Converted to open OR
POST-OP COMPLICATIONS: CEA

- 67 yo woman presents w/ enlarging, hard palpable neck mass for 1 yr
- 3 yrs s/p Lt CEA
POST-OP COMPLICATIONS: CEA

- PSA: Swirling or “yin-yang” pattern of blood flow
FIBROMUSCULAR DYSPLASIA

• Arterial dxs of unknown etiology:
  – \( \alpha \)-1-antitrypsin deficiency
  – \( \beta \) ischemic, hormonal, mechanical stress
• Incidence 0.6 – 1.1%
• Most common in 25-50 yr old women
• 3:1 F to M ratio
FIBROMUSCULAR DYSPLASIA

- Medium to large arteries: Renal arteries most commonly involved
- ICA 2\textsuperscript{nd} most common
  - 1/3 have renal artery involvement
  - 10-20% incidence of spontaneous carotid dissections
  - 30% have intracranial aneurysms
- May present with TIA, hemorrhage, stroke, asymptomatic
FIBROMUSCULAR DYSPLASIA

• Beaded appearance of ICA
  – power Doppler best edge resolution
  – 65% bilateral
  – long segment
  – narrow lumen
FIBROMUSCULAR DYSPLASIA

- May see ↑ PSV due to stenosis
- However, PSV may be artificially low 2° to long length of stenosis, multiple tandem lesions
TAKAYASU ARTERITIS

• Aortic arch syndrome, “pulseless disease”
• Presentation:
  – absent pulses in upper extremities
• Inflammatory disease of unknown etiology:
  – granulomatous inflammation affects the wall of the aorta and major branches
  – results in arterial stenosis, thrombosis and aneurysms
TAKAYASU ARTERITIS

• 15-30 yrs
• 8-9 times more common in females
• Higher incidence in Asian women, uncommon in North America
  – most common cause of renovascular hypertension in India
• Rx: steroids, chemotherapy
TAKAYASU ARTERITIS

Courtesy Dr Ed Grant
TAKAYASU ARTERITIS
TAKAYASU ARTERITIS
RADIATION ARTERITIS
RADIATION ARTERITIS

• Delayed effect of cervical XRT
  – Hodgkin disease
  – squamous cell head and neck CA

• Pathology:
  – accelerated atherosclerosis, inflammatory changes, fibrosis

• Surrounding scar tissue/soft tissue fibrosis can also contribute to CCA stenosis or occlusion
RADIATION ARTERITIS

- 30-40% occurrence rate after high dose cervical XRT
- Takes 5-10 yrs to develop
- Stroke rate ~7% after cervical XRT
  - ulcerate, occlude, PSA, rupture
- Rx: stent
- Should pts be screened?
RADIATION ARTERITIS
TEMPORAL ARTERITIS

- Giant cell arteritis
  - chronic systemic inflammatory arteritis
- Women over 50 yrs old
- Presentation: headache, visual abnormalities, systemic myalgias and arthralgias
- Superficial temporal artery may be painful on physical exam
TEMPORAL ARTERITIS

- Primarily involves superficial temporal artery (branch of ECA)
  - can involve any medium to large artery
- US findings: wall thickening, narrowing of lumen, surrounding hypoechoic halo
- May → stroke
- Dx: bx of superficial temporal artery
- Rx: steroids
TEMPORAL ARTERITIS

↓ Diastolic flow in ECA >> CCA
CONCLUSIONS

• Don’t forget to look for non-atherosclerosis related pathology of the carotid arteries during the Doppler US exam

• US is an excellent way to diagnose CCA dissections, AFVs, PSAs
  – not as accurate for ICA or VA dissections
  – may need angio for complete evaluation or to guide stent placement
CONCLUSIONS

- Limited role in the evaluation of vasculitis
- But, consider vasculitis, dissection or XRT arteritis in pts with long segment smooth wall thickening, esp in CCA
- Consider screening pts 5 to 10 yrs s/p cervical XRT