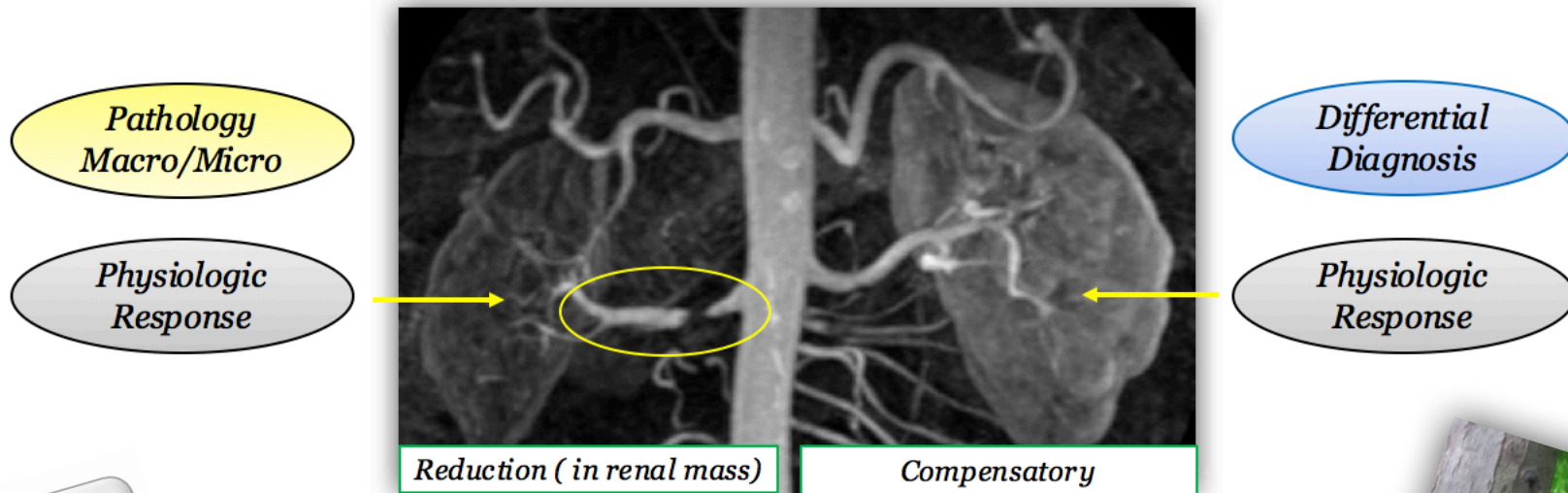


# Renovascular Hypertension for the USMLE Step One Exam



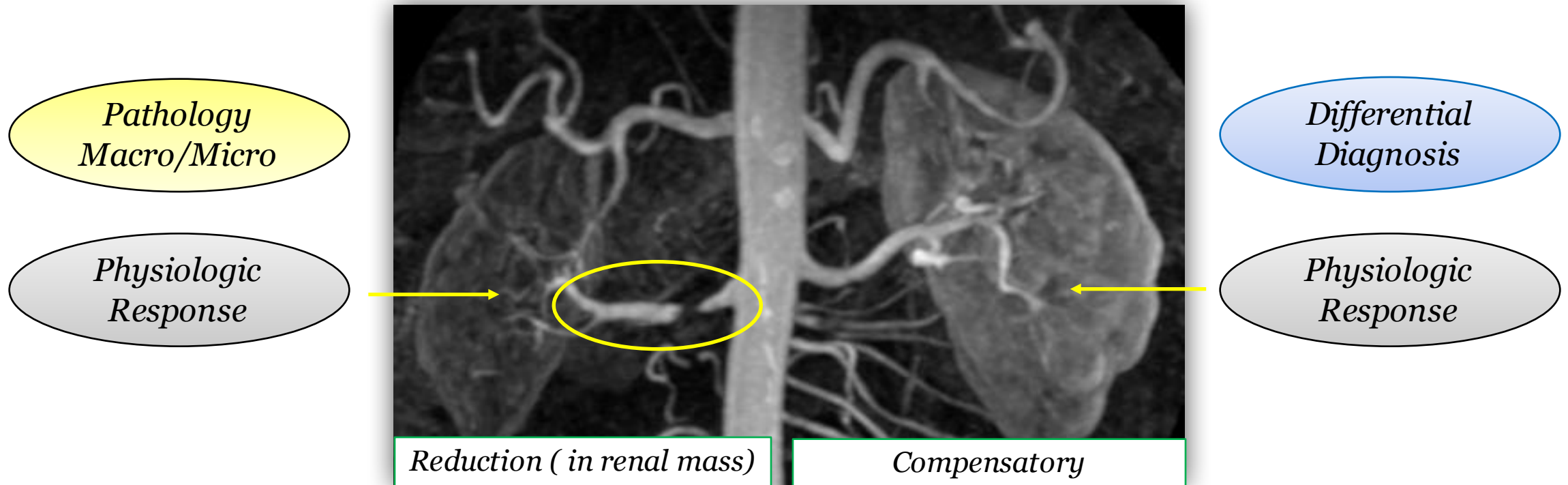
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# Renovascular Disorders: *Renal Artery Stenosis*

- Background

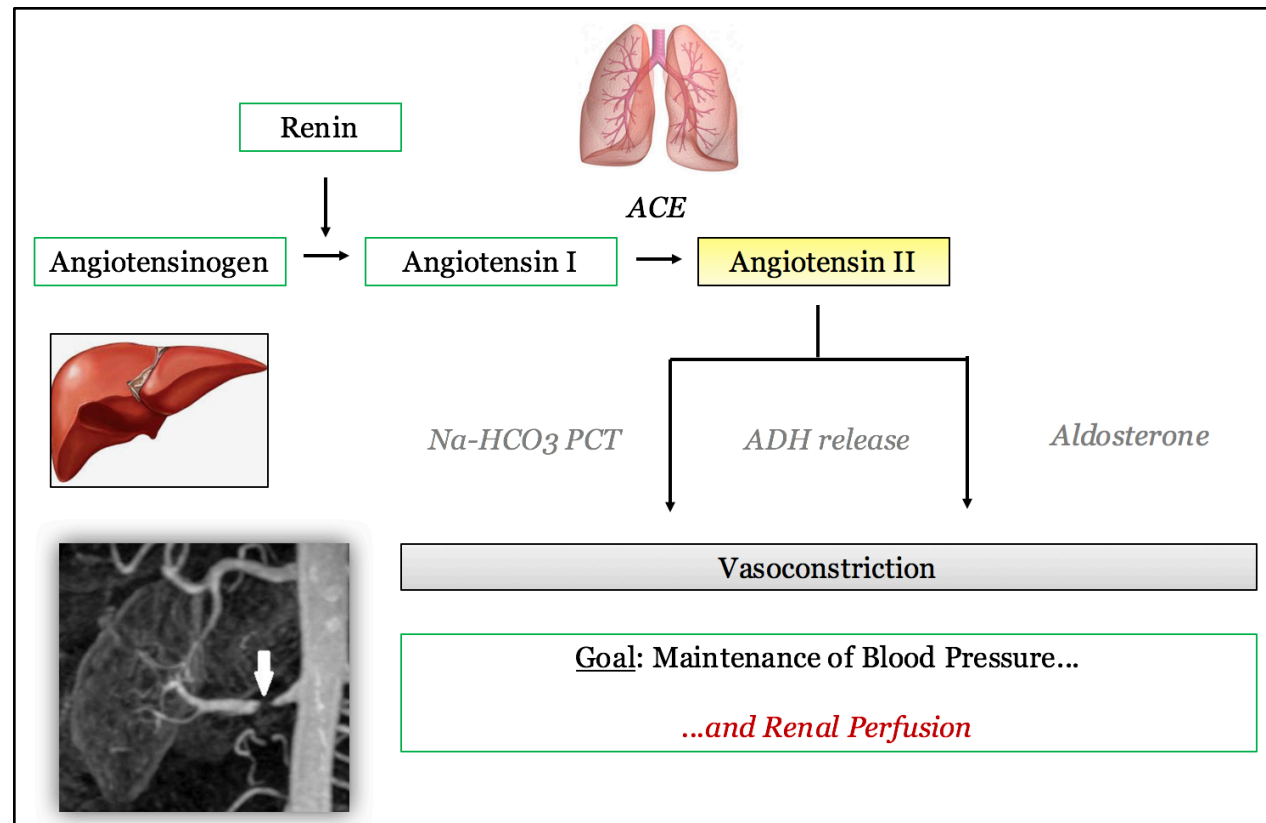
- Prototypic condition for hypoperfusion of one kidney



# Renovascular Disorders: *Renal Artery Stenosis*

- Background

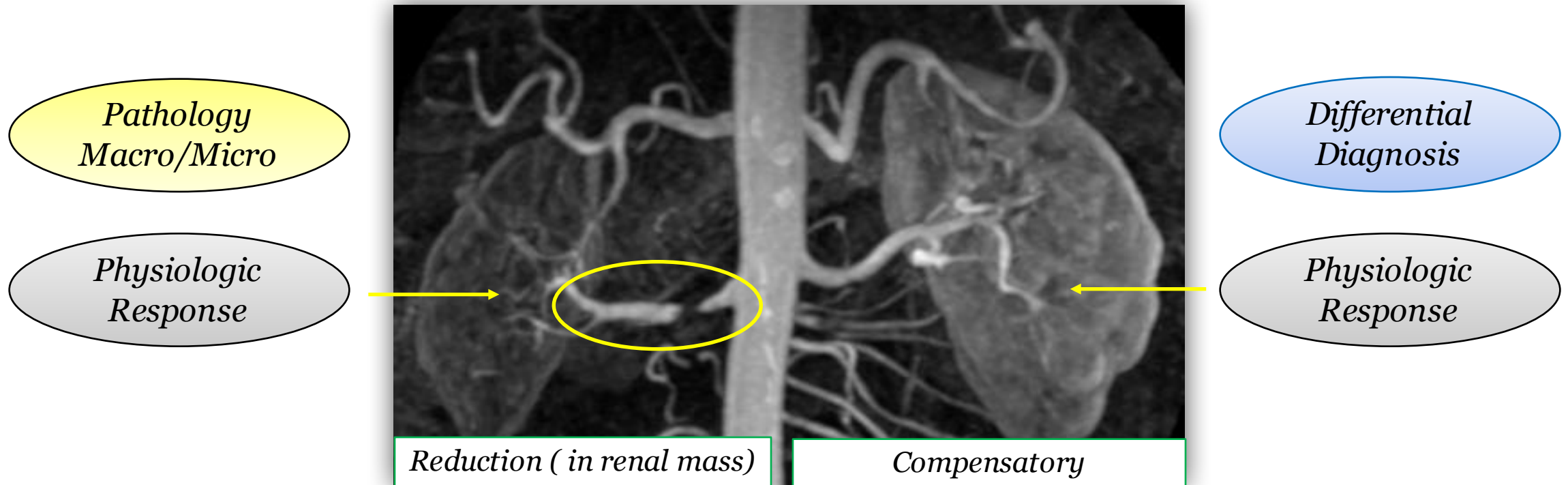
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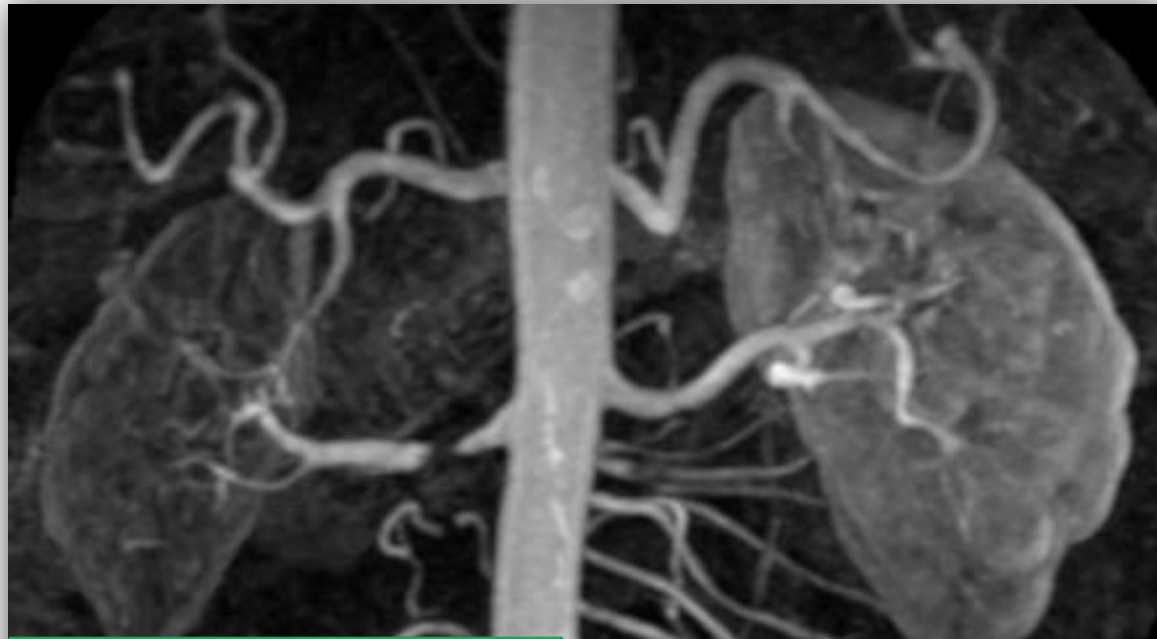
# Renovascular Disorders: *Renal Artery Stenosis*

- Background

- Prototypic condition for hypoperfusion of one kidney



# Renovascular Disorders: *Renal Artery Stenosis*

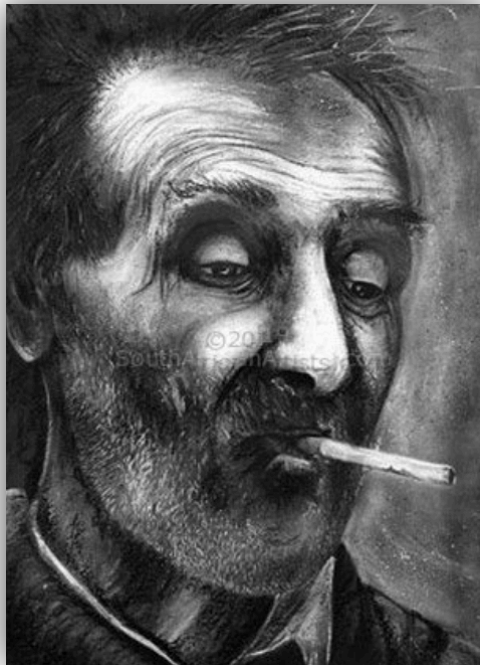


*Reduction ( in renal mass)*

*Compensatory*

# Renovascular Disorders: *Renal Artery Stenosis*

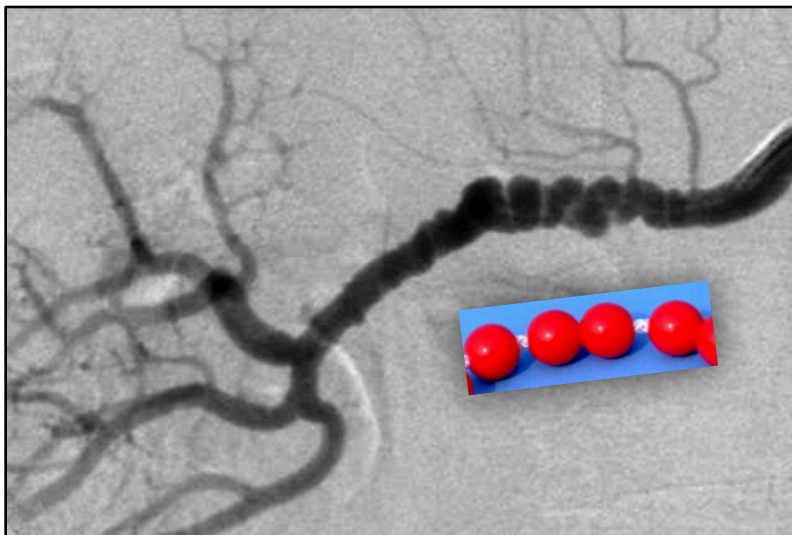
- Presentation:
  - **HTN** in (*older*) patient with **vasculopathy/ASCVD** (i.e. CAD, PVD, TIA/carotid)
  - ‘Play Media’ → Abdominal Bruit (in a vasculopath)



*Bruit*

# Renovascular Disorders: *Renal Artery Hypoperfusion*

- Presentation:
  - Young patient with refractory HTN; angiogram shown
    - Beaded appearance
  - Young Asian woman without a palpable pulse; angiogram shown
    - **Segmental** stenosis with aneurysm formation



*Fibromuscular dysplasia*

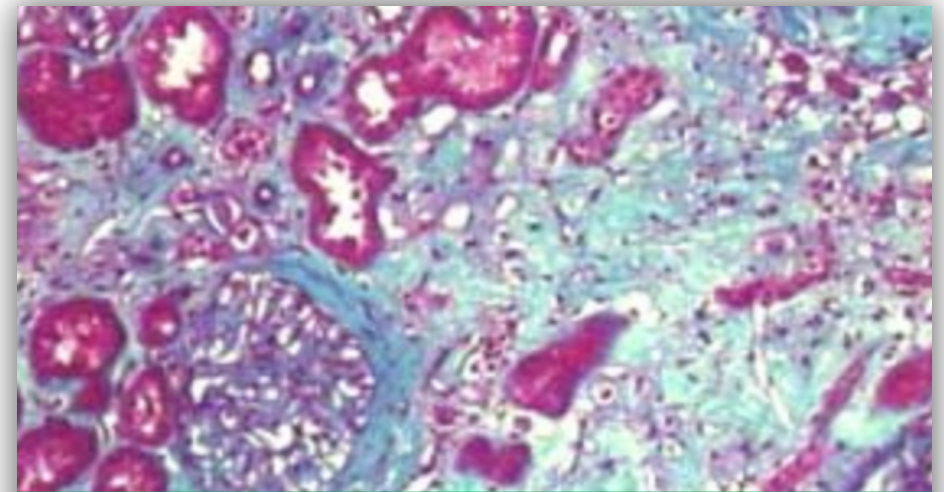
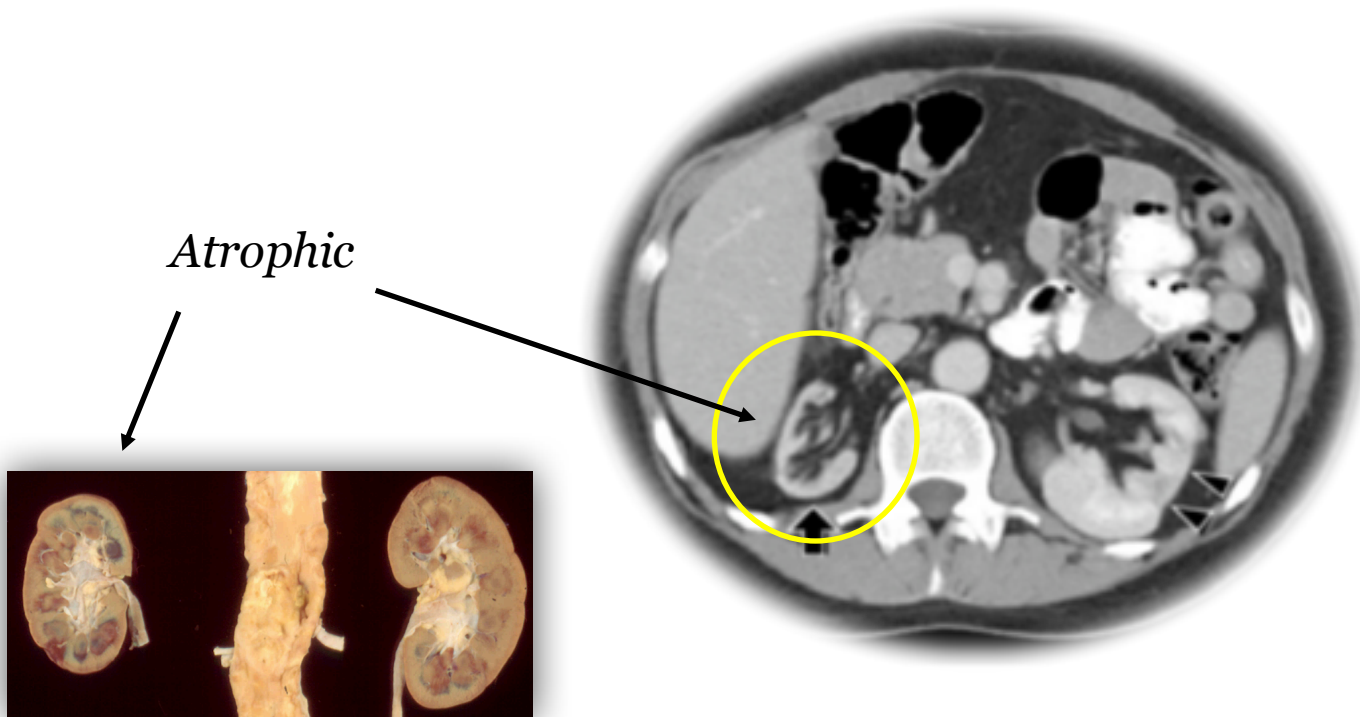


*Takayasu's Arteritis*

# Renovascular Disorders: *Renal Artery Stenosis*

- Pathology

- Gross: unilateral shrunken kidney
- Micro: **atrophy** (tubules, glomeruli), **fibrosis** (interstitium, tubules)



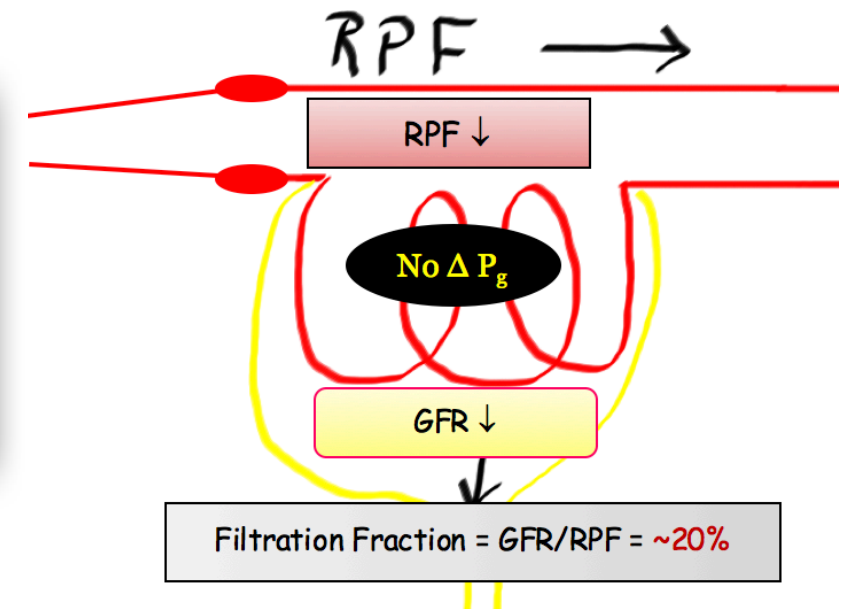
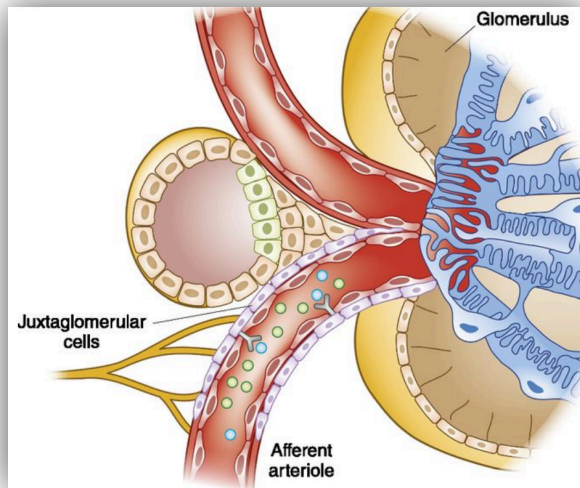
Glomeruli: atrophy, sclerosis  
Tubulointerstitial: atrophy, fibrosis



# Renovascular Disorders: *Renal Artery Stenosis*

## • Physiologic Derivatives

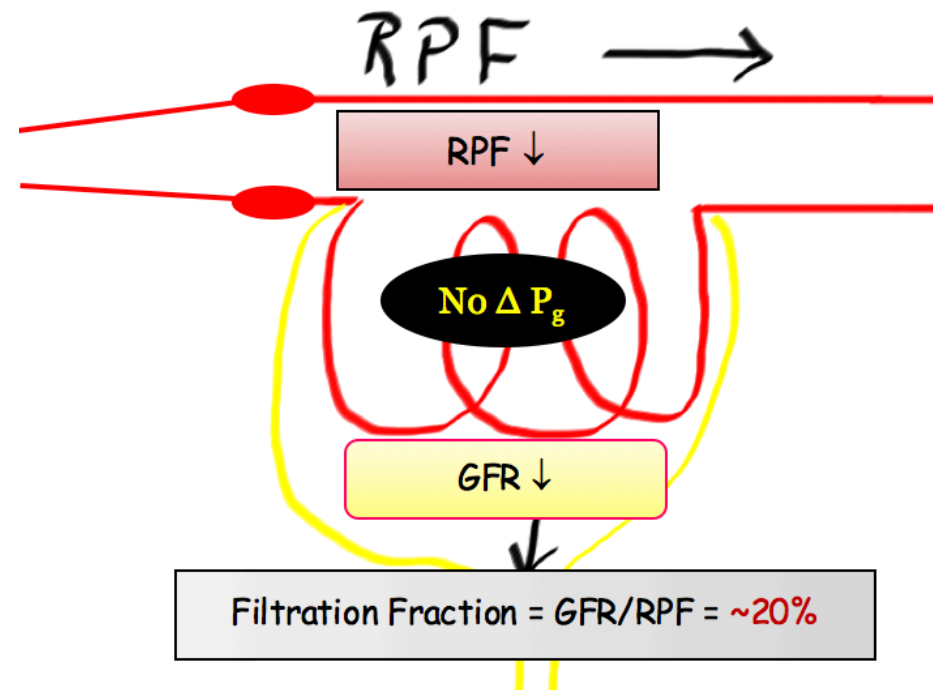
- What is RAA doing in the the hypoperfused kidney? **Activated**
- What is RAA doing in contralateral kidney? **Suppressed**
- What happens to the filtration fraction? **Balanced** (*reduced GFR and RPF*)



# Renovascular Disorders: *Renal Artery Stenosis*

## • Physiologic Derivatives

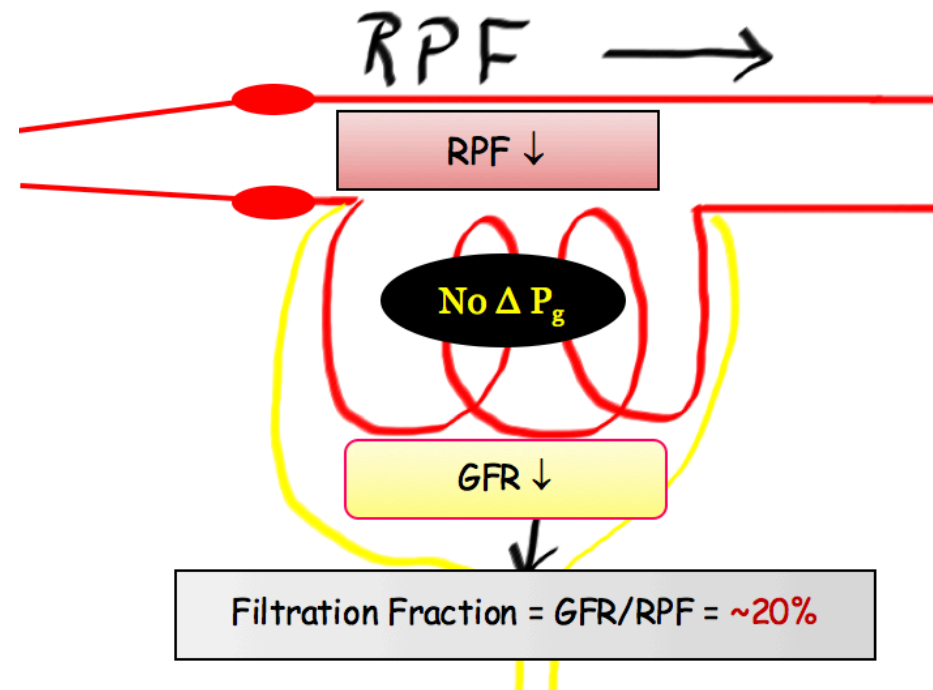
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# Renovascular Disorders: *Renal Artery Stenosis*

- Physiologic Derivatives

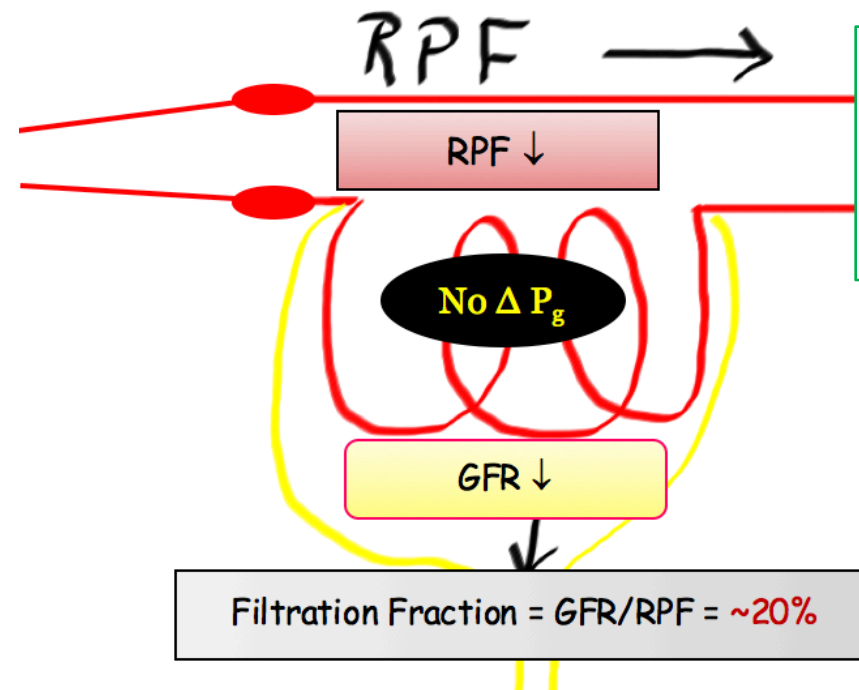
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# Renovascular Disorders: *Renal Artery Stenosis*

- Physiologic Derivatives

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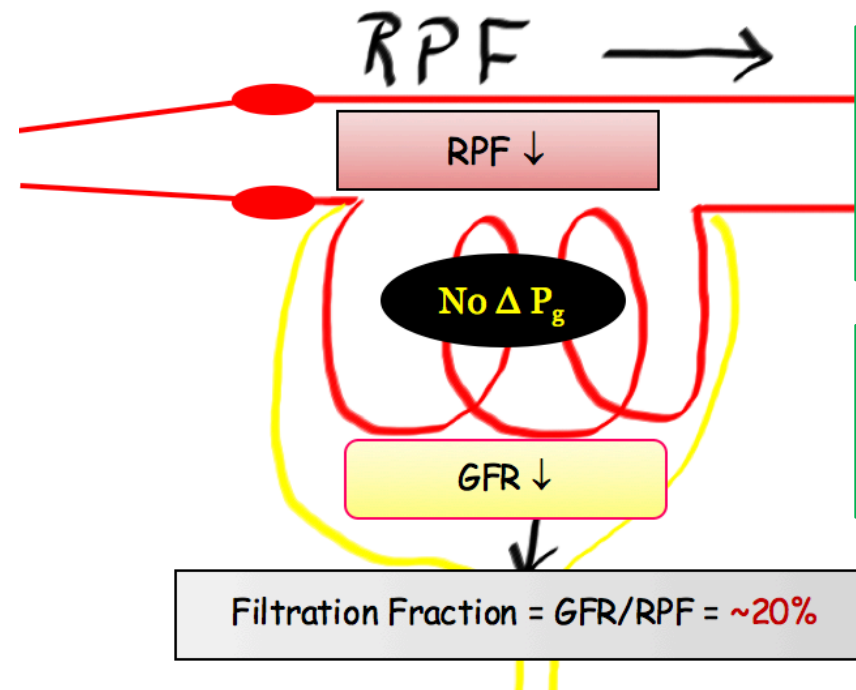


*Patient presents with condition associated with decreased effective circulating volume (ECV). They pop a couple of Aleve. What happens?*

# Renovascular Disorders: *Renal Artery Stenosis*

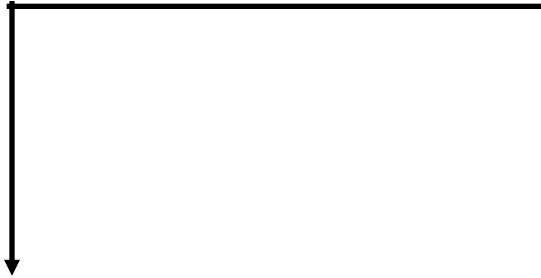
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*Patient presents with condition associated with decreased effective circulating volume (ECV). They pop a couple of Aleve. What happens?*

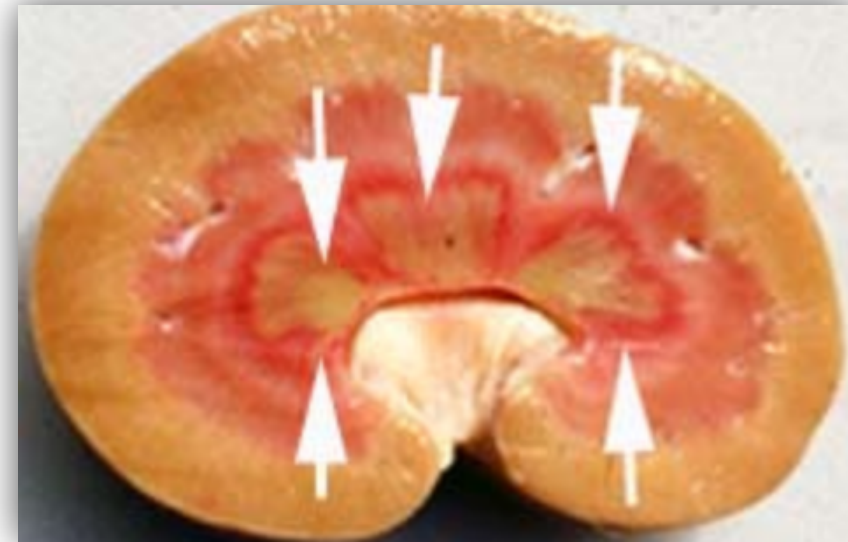
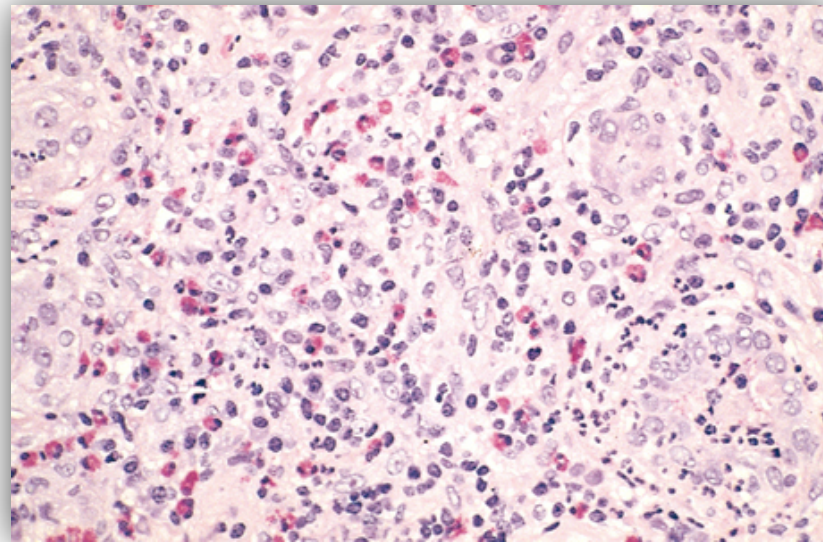
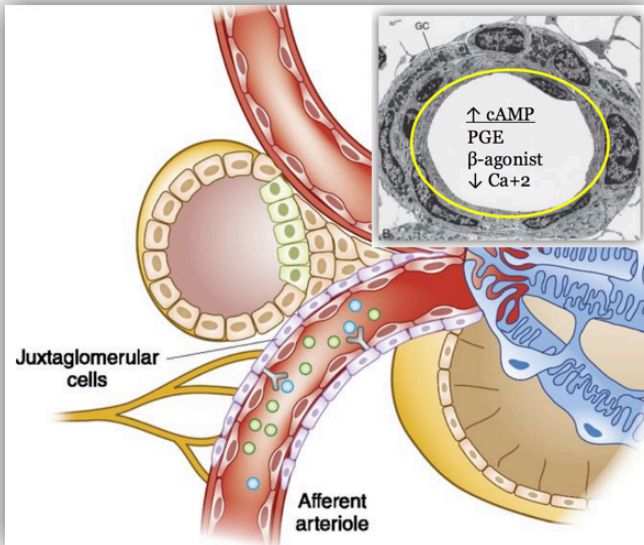
*Filtration fraction is unchanged but failure to vasodilate precipitates acute kidney injury (AKI).*



*PGE mediated vasodilation*

*Interstitial Nephritis*

*Papillary Necrosis*

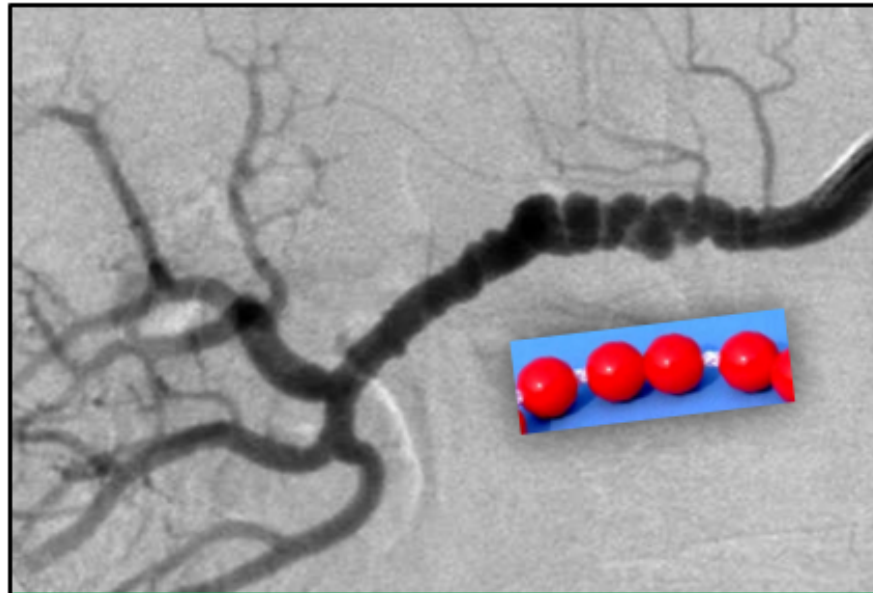


# Renovascular Disorders: *Renal Artery Stenosis*

- Background
  - *Prototypic* condition for hypoperfusion of one kidney
- Presentation:
  - HTN in (older) patient with atherosclerosis/vasculopathy (i.e.CAD/CABG, TIA/carotid)
  - 'Play Media' → Abdominal Bruit (in a patient with vasculopathy)
  - Fibromuscular dysplasia/Takayasu - younger (female) patient
- Pathology
  - Gross: *unilateral shrunken* kidney
  - Micro: *atrophy* (tubules, glomeruli), *fibrosis* (interstitium, tubules)
- Derivatives
  - What is RAA doing in that kidney? *Activated*
  - What is RAA doing in contralateral kidney? *Suppressed*
  - What happens to the filtration fraction? No  $\Delta$  (*balanced reduction in GFR and RPF*)

# Fibromuscular Dysplasia

*(Non-inflammatory, non-atherosclerotic angiopathy)*



*Fibromuscular dysplasia*



# Fibromuscular Dysplasia

*(Non-inflammatory, non-atherosclerotic angiopathy)*

- Background:
  - Common cause of renovascular HTN in *children* and *young adults*.
  - *May be bilateral AND present in other arteries (carotid/vertebral)*
  - *When to suspect:*
    - HTN that is severe accelerating or refractory in a young patient.
    - Bruit may be present
    - Significant drop in GFR (↑ Cr) with initiation of ACE-I (ATII dependence)

Similar *physiology* and *presentation* to RAS (so questions can overlap) **EXCEPT** these are younger patients with different pathology, arteriogram and lack of vasculopathy/ASCVD

# Fibromuscular Dysplasia

*(Non-inflammatory, non-atherosclerotic angiopathy)*

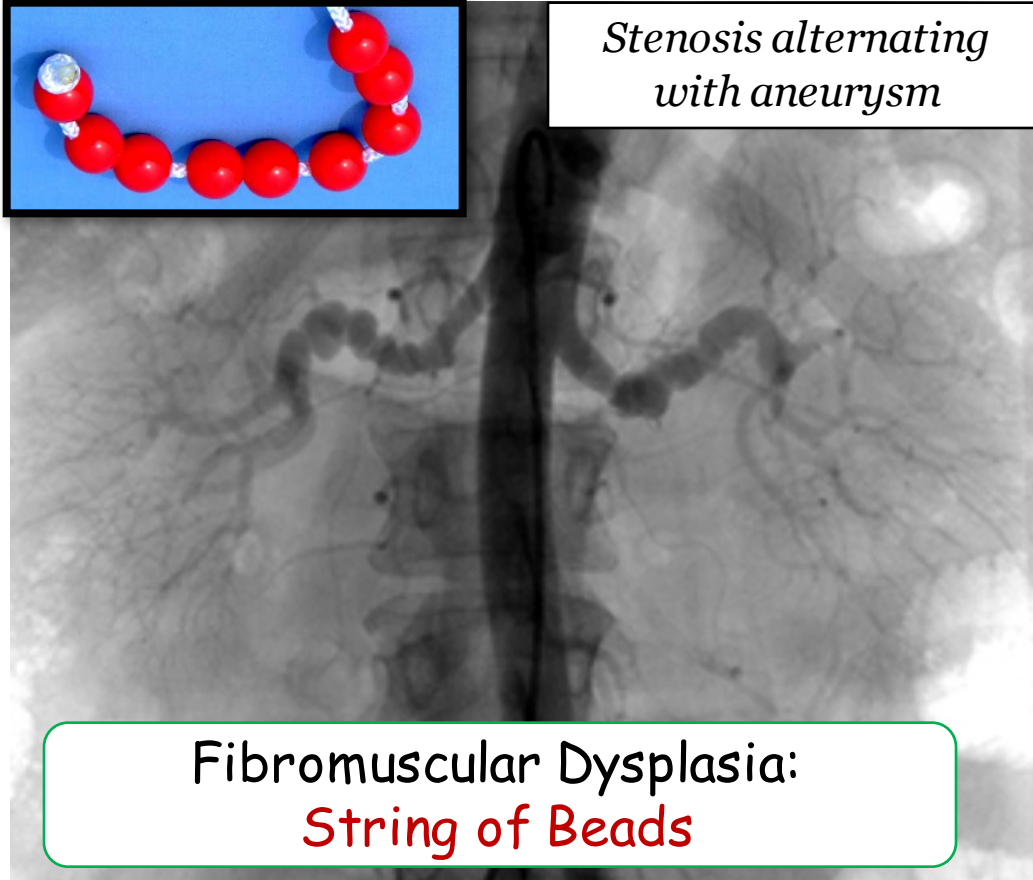
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Similar physiology and presentation to RAS (so questions can overlap) EXCEPT these are younger patients with different pathology, arteriogram and lack of vasculopathy/ASCVD



*Stenosis alternating  
with aneurysm*

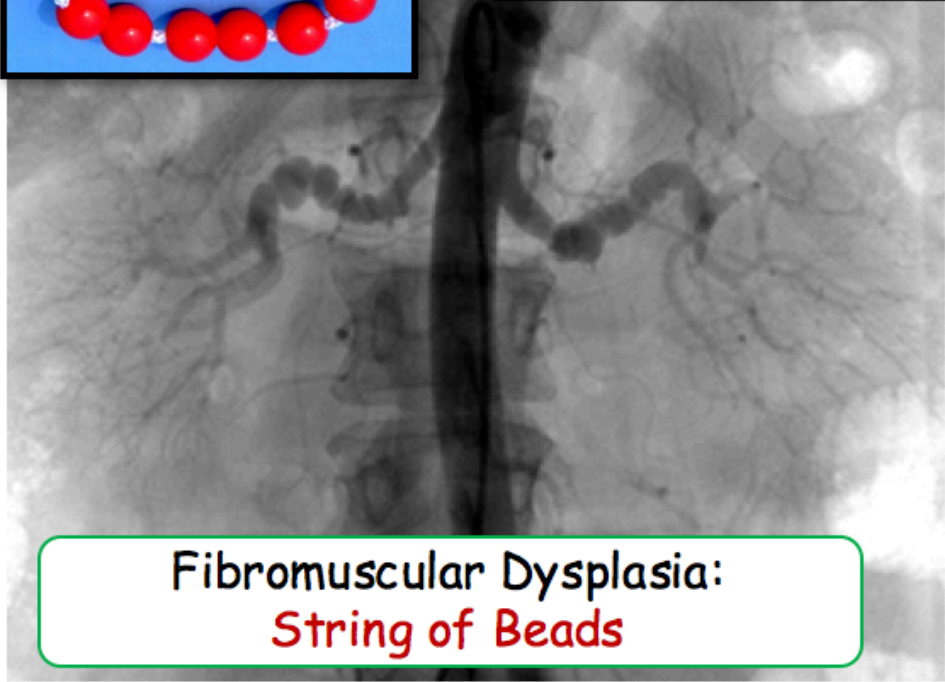


Fibromuscular Dysplasia:  
**String of Beads**

Diagnosis: Arteriogram

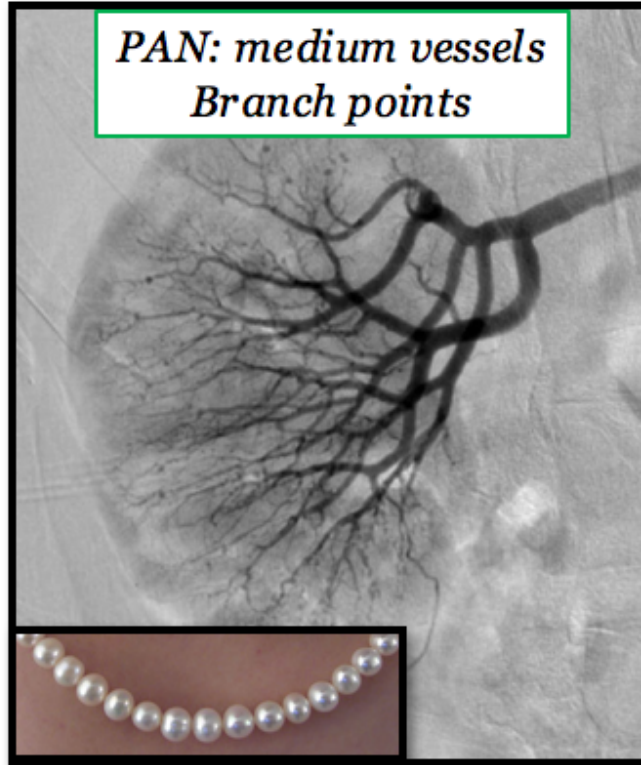


*Stenosis alternating  
with aneurysm*



Fibromuscular Dysplasia:  
**String of Beads**

*PAN: medium vessels  
Branch points*



*Takayasu's Arteritis*

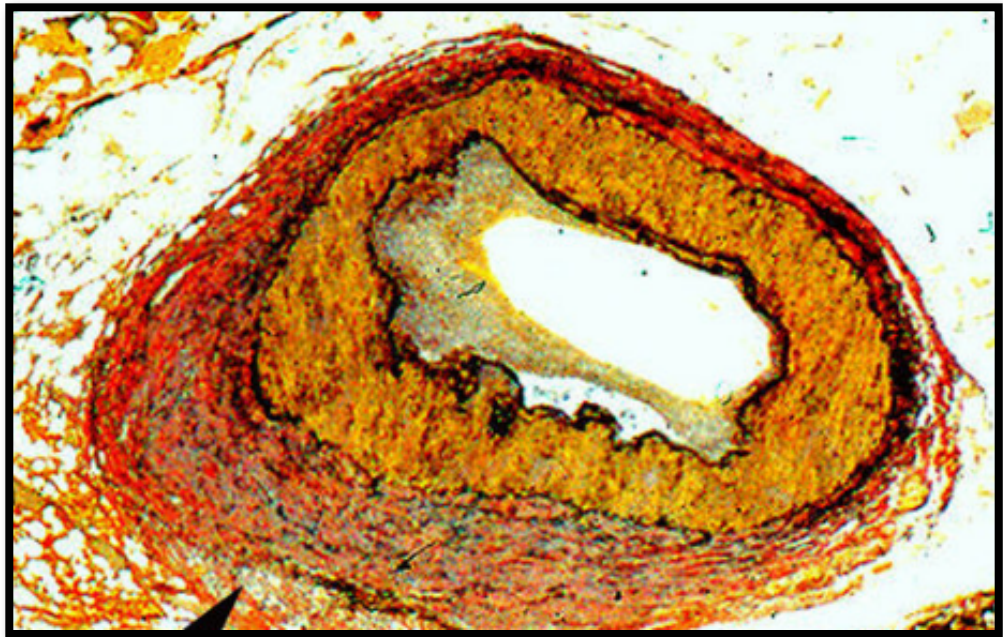
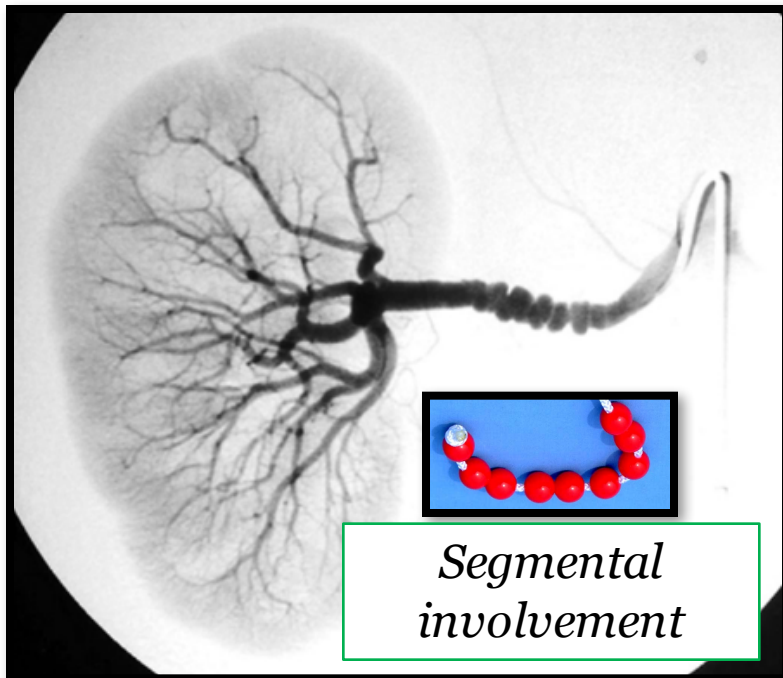
Renal Arteriograms for the Boards

# Fibromuscular Dysplasia

(*Non-inflammatory, non-atherosclerotic angiopathy*)

- Pathology

- Vessel: **Fibromuscular thickening** that may involve the intima, media\* or adventitia.
- Kidney: diffuse ischemic **atrophy** (glomeruli, tubules and interstitial fibrosis).



## Renovascular Disorders (key derivative topics)

- Malignant HTN (physiology, pathology, pharmacology)
- Arteriolosclerosis → Nephrosclerosis (pathology)
- Renal Artery Stenosis (physiology and consequences)
  - Fibromuscular Dysplasia (diagnostics, pathology)
  - *Takayasu's Arteritis (pathology)*

# Renovascular Hypertension for the USMLE Step One Exam



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