RTA

	I	II	IV
	DCT	PCT	DCT/CD
serum K+	↓	↓	↑
urine pH	↑	↓	↓

WBOT blood sm. muscle adipose common

Angiomyolipoma

associated w/ Tuberous sclerosis

- Usually benign neoplasm
- Composed of admixture of blood vessels with hyalinization, smooth muscle and adipose tissue
- Can occur in liver, lungs, retroperitoneal soft tissue
- May be associated with tuberous sclerosis and with TSC2 / PKD1 contiguous gene syndrome
- Usually diagnosed in adults
- Tumors with pleomorphic features may be more aggressive
- Extremely rare cases of malignancy
- May cause retroperitoneal hemorrhage
- Patients with bilateral disease may have renal failure
- Death can occur due to invasion of contiguous organs, particularly blood vessels

★ Von Hippel Lindau
- clear cell type RCC
- Hemangioblastoma ★
  - cerebellar tumor
- pancreatic neuroendocrine
- pheo

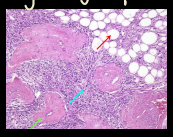
★★ Tuberous Sclerosis AD - Hamartomatous lesions of brain (seizures), lung, kidney
- angiomyolipoma
  WBOT ★ pt presents w/ seizure & renal mass ★
- oncocytoma
- clear cell type RCC
- rhabdomyoma (cardio)

seizures w/ CLEAR "ORA"
cell RCC
oncocytic
rhabdo
myoma

BENIGN

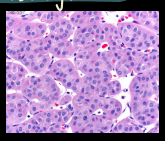
Renal Papillary Adenoma - benign, well circumscribed w/o invasion
small cuboidal cells w/ psammoma bodies, xanthoma cells

★ Angiomyolipoma - benign → blood vessels w/ hyalinization, smooth muscle, & adipose tissue (adults)



★ TUBEROUS SCLEROSIS ; TSC2/PKD1 contiguous gene syndrome → pt px w/ seizures
★ HMB 45 ★
WBOT

Oncocytoma - benign renal cortex (adults) well circumscribed w/ stellate scar



★ TUBEROUS SCLEROSIS & BHD syndrome
- screen for coexisting renal cell carcinoma

MALIGNANT

★★ **Renal cell carcinoma** px: flank pain, hematuria, & flank mass

★ Risk Factors: Tobacco, HTN, AQUIRED cystic kidney dz (A pt who's been on dialysis)

Associated Disorders:

① von Hippel Lindau (both copies of VHL gene)
- tumors & fluid-filled cysts all over
  - ★★ clear cell type renal carcinoma
  - ★ pheochromocytoma
  - ★ pancreatic neuroendocrine
  - ★★ Hemangioblastoma

"CHPP"

can be solitary & detected years or decades after removal of 1° → thyroid nodule w/ chicken wire vasculature WBOT

renal cell carcinoma

von Hippel-Lindau syndrome cysts filled w/ fluid all over

- Inherited disorder characterized by the formation of tumors and fluid-filled cysts in many different parts of the body
- Associated with mutation of VHL gene, a tumor suppressor
- Autosomal dominant inheritance
- Alteration of both copies of the VHL gene needed for tumor and cyst formation
- Tumors most frequently appear during young adulthood
- Cysts commonly in kidneys, pancreas, and genital tract
- Higher risk for clear cell type renal cell carcinoma, adrenal pheochromocytoma and pancreatic neuroendocrine tumor
- Unexpected finding of retinal/CNS hemangioblastoma or the diagnosis of a pheochromocytoma should prompt a search for other associated VHL disease features

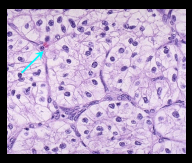
② Hereditary Papillary Renal Cell Carcinoma
- MET mutation (RTK) → hepatocyte growth factor receptor

③ Birt-Hogg-Dubé Syndrome
- germline BHD mutation
- ★ oncocytoma
- ★ chromophobe type RCC

④ Hereditary Leiomyomatosis
- germline fumarate hydratase
- ★ papillary type RCC

Types:

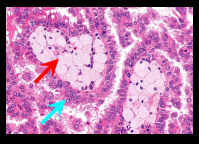
★ Clear cell type RCC - PCT



Risk Factors: smoking, VHL, Tuberous Sclerosis
Histo: intervening blood vessels → "chicken wire"
Markers: cytokeratin & vimentin

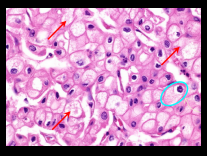
WBOT ★★★

★ Papillary Type RCC - type I = MET mutation; PCT or DCT



Risk Factors: trisomy 7 or 17, male
Histo: finger-like w/ foamy macrophages
Markers: N/A

★ Chromophobe type RCC - intercalated cells



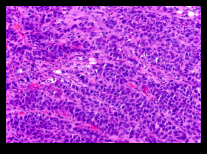
Risk Factors: BHD★
Histo: Eosinophilic, granular cytoplasm w/ perinuclear halos "Raisinoid"
Markers: CK7 & Hale's colloidal iron stain★

★ MiT translocation RCC = only dx w/ molecular studies!

Low yield

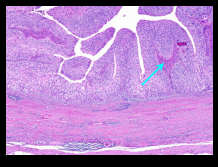
Gene fusion TFE3/TFEB to t(6,11)
"Nested growth pattern"

★ Collecting Duct RCC



Risk Factors: sickle cell trait (younger pts!)
"Hobnail cells"
Rare & infiltrative

★ Urothelial Carcinoma of Renal Pelvis ← it's in the pelvis!

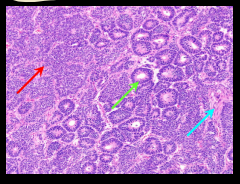


Risk Factors: Tobacco, carcinogens; old men
Px: "painless hematuria" - pathoma
Histo: urothelial diff. w/ or w/o papillary cores

WBOT

★ Pediatric Wilm's Tumor

PAX6 & WT1 — Wilms Aniridia Genitourinary Retardation
WT1 — congenital nephropathy, Wilm's tumor, intersex disorders
IGF-2 aberrant imprinting — congenital exomphalos macroglossia gigantism



Risk Factors: WAGR syndrome, Denys-Drash syndrome, Beckwith-Wiedmann syndrome
Histo: undiff. BLASTEMAL, epithelial elements, fibroblast stroma "parents find mass → need biopsy"
Large necrosis, hemorrhage in a child

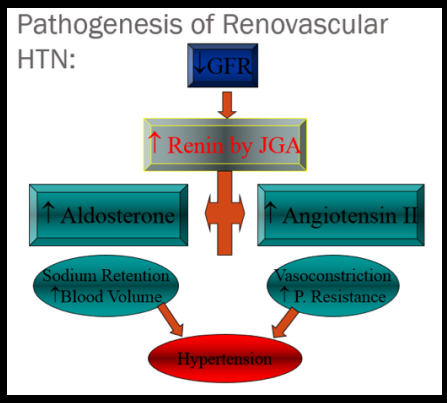
LOI Dz of Renal Vasculature:

★ **Benign Nephrosclerosis**: African Americans, Diabetics, & people w/ inadequately controlled HTN
- ★ HYALINE ARTERIOLOSCLEROSIS: ① Medial hypertrophy ② duplicate internal elastic lamina ③ ↑myofibroblastic tissue of intima — PINK on H&E due to leaking PLASMA PROTEINS
  - can have tubular atrophy & interstitial fibrosis
- ★ granular/bumpy appearance
- ★ NO INFLAMMATION

★ **Malignant Nephrosclerosis**: Acute, rapidly ↑BP w/ target organ damage → Renal Failure, Retinal hemorrhages (Papilledema maybe), Encephalopathy → HA, N/V, LOC, seizures, MI, or rapid heart failure
- ★ Initiating Vascular injury @ kidneys
  - RAAS → Endothelial injury
- on H&E:
  - ★ FIBRINOID NECROSIS: eosinophilic
  - ★ HYPERPLASTIC arteriolosclerosis = onion skin
  - luminal narrowing = ↓Perfusion ↑↑RAAS
  - + petechial hemorrhages

★ **RENAL ARTERY STENOSIS**:

① Atherosclerosis - old men, smokers, diabetes, CAD, SMOKERS
- ★ ELEVATED CREATININE



② Fibromuscular Dysplasia - young females — NORMAL CREATININE
- ★ NOT inflammatory
- ★ also effects coronary arteries → Coronary artery dissection
- ★ MEDIAL FIBROPLASIA "string of pearls"
- ★ SEVERE STENOSIS → Renin → HTN

★ **Unilateral RAS**:
- ★ atrophy of stenotic kidney
- ★ CL kidney = BIG & suppressed RAAS

∴ Results in: ↑RENIN HTN

Renal Infarcts:
- ★ NO collateral supply → coagulative necrosis (wedge-shaped) (pale, blood can't get in.) & eosinophilic
- due to arterial occlusion via emboli or thrombosis

Renal vein Thrombosis: often due to NEPHROTIC SYNDROME
- ★★ WBOT → loss of antithrombin III = HYPERCOAGULABLE
- PX: hematuria, flank pain + lumbar mass
  - PROTEIN IN URINE (>3.5 g/day)
- → Big, dark, swollen kidney (blood trapped)

★ **HUS vs TTP**

HUS	TTP
diarrhea	⊕ neurosxs
shiga-like toxin	ADAMST13 deficiency
Renal failure in CHILDREN	large multimers of vWF cause thrombi
Bacteria toxin damages endothelial cells	

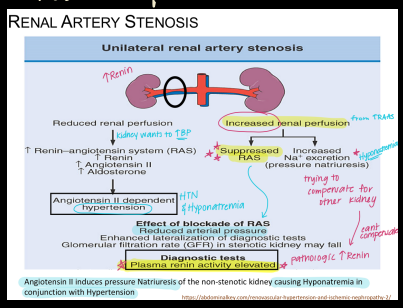
BOTH HUS & TTP:
- ⊕ schistocytes
- Gross: petechiae or cortical necrosis
- micro: glom capillaries occluded by thrombi
  - interlobular arteries show FIBRINOID NECROSIS & HYPERPLASTIC ARTERIOLOSCLEROSIS (like malignant HTN)
- ★★ WBOT

LO2 DRUGS of HTN:

UNILATERAL RAS:

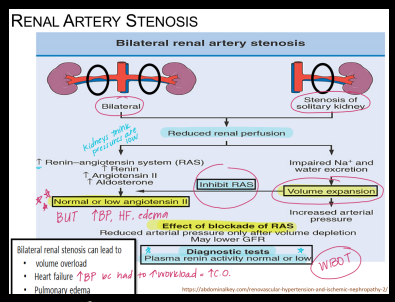
stenotic kidney ↑AT-II & Aldosterone, ↑RENIN = HTN
normal kidney suppresses RAS ↓BP, excreting Na^+ = HYPONATREMIA

↗ the only way normal kidney knows how to compensate



BILATERAL RAS:

↓ kidney perfusion, ∴ kidneys think BP is low
so they ↑Renin & reabsorb Na^+/H_2O
this ↑volume = ↑Pressure
inhibit RAAS system



NORMAL AT-II
= NORMAL RENIN

BUT still volume overloaded + HTN
→ pulmonary edema + CHF

RAS

PT POPULATION:

ATHEROSCLEROSIS
older pt w/ Hx of smoking has ↑creatinine & HTN

FMD
young female w/ HTN & normal creatinine angiogram shows string of pearls
TINNITUS

BOTH px w/ HTN that is difficult to control
worsening renal f(x) after ACE/ARB
abdominal bruit
pulmonary edema
HA, dizziness, vertigo

GOAL: <130/80

TREATMENT

ACE-I: caution in vol. depletion
Renal failure w/ NSAIDs
Hyperkalemia
Angioedema

ARB: ↓Aldosterone secretion
Hyperkalemia +Hypotension
Renal failure w/ NSAIDs

WBDT: **ACE-inhibitors** prevent normal autoregulation of GFR in RAS pts by inhibiting AT-II from constricting effarent arteriole ↓GFR
★ if you add NSAIDs → vasoconstrict affarent arteriole ↓↓↓GFR
(PGE2 dilates affarent)

★ in Hypotensive pts, RBF ↓; ↓GFR ↑AT-II – constrict EA (⊖ ACE)
PGE2 dilates AE
→ ↑GFR

- do not use ACE/ARBs in RAS
- do not use ACE/ARBs or NSAIDs in Hypotensive pts

↑
Naproxen, ibuprofen, diclofenac, or Ketorolac
→ vasoconstrict AA → ↓GFR → ischemic damage
→ can cause HTN or diuretic failure bc NSAIDs reabsorb Na^+/H_2O