Renal Pathology

Glomerular
- proteinuria

Nephritic
→ Hypertension
→ Hematuria
[RBC > 3 RBC/Hpf]
for 3 consecutive urine specimen
→ RBC Casts

Nephrotic
→ Paralysed
massive proteinuria
(>3.5 g/Day)
→ ↑ Lipid - Lipiduria
(waxy casts)
→ Natural anticoagulants
Protein C, S
AT - III
Hypercoagulable
Lost + ↑ Fibrinogen Synthesis (APR - Liver)

Tubulointerstitial
↓
Salt losing nephritis

Hematuria

Glomerular
→ Dysmorphic RBC
Nephritic
- edema (mild)
Na^+/H_2O Retention

Extraglomerular
m/c Idiopathic Hypercalciuria
- Isomorphic RBC
nephrotic
→ edema (Severe)
Initiating - protein loss
Cause of edema - Na^+/H_2O Retention
↑ Hydrostatic pressure > Osmotic Pressure.

M/C Causes

Nephritis

Pediatric - PSGN

Adult - IgA nephropathy

Overall - IgA nephropathy

Nephrotic

Ped - MCD (Minimal change Disease, Lipoid nephrosis)

Adult - FSGS (33%)

elderly - MGN - (30% of adults)

Overall - FSGS.

1° nephrotic > 2° nephrotic

2° nephrotic m/c Cause - DM

Overall FSGS > DM

Genetics

1] NPHS - 1 gene

Nephrin defect.

Congenital Nephrotic Syndrome

Finnish Type

- a/w FSGS

2) NPHS - 2 gene

↓

Podocin

① Steroid Resistant nephrotic Syndrome.

② (II) AR - FSGS

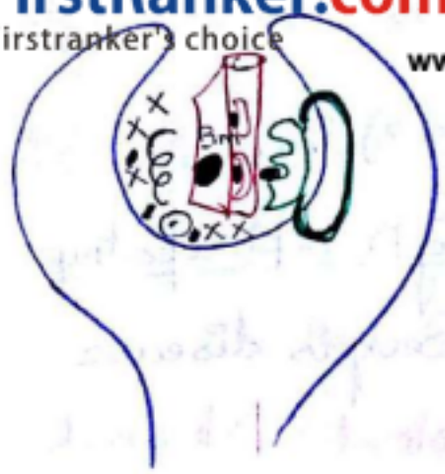
III] α - Actinin - 4 gene:

↓ mutation

AD - FSGS

IV] TRPC - 6 gene - Transient Receptor Potential Calcium - 6 gene

Adult onset - FSGS



VEC - Podocytes
mesangial cells - modified macrophages

1) Subepithelial - PSGN.
NTGN.
RPGN - m/c S.E deposits among 3 types of RPGN.

2) Subendothelial - Between endothelium & Basement membrane
→ NTPGN - I
→ Lupus nephritis (with wire loop lesion)

3) Intramembranous - Between 2 layers of Basement membrane
NTPGN - II

4) Mesangial matrix - IgA Nephropathy.

Post-Streptococcal glomerulonephritis -
Group-A-β Hemolytic Streptococci.

PSGN
Strains - 1, 4, 12
Both pharyngitis (m/c)
skin infection

Rheumatic Heart disease
1, 3, 5, 6, 18
only pharyngitis

Incubation period

1-3 weeks
(7-21 days)

PSGN

→ Transient
Hypocomplementimia
↓
only upto 6-weeks
↓
Normal complement

1) LM 2) EM 3) IFL
↓
Hypercellular
glomeruli
(exocapillary, endocapillary
proliferation) → maximum
PSGN > MPGN

exocapillary - inflammatory
cells ↑ - outside
capillaries

(1-3) days

IgA nephropathy
Berger's disease
C3 level - Normal
& IgA1 - nephritogenic
- mesangial deposits
CD-11

electron EM
(microscopy)
→ Subepithelial Humps
Hump Sign

Immunofluorescence

Lumpy Bumpy
Immunofluorescence
PSGN > RPGN - II (PSGN associat
↓
Acute - Resolve
(CRF) → least PSGN
↓
RPGN - II (PSGN)

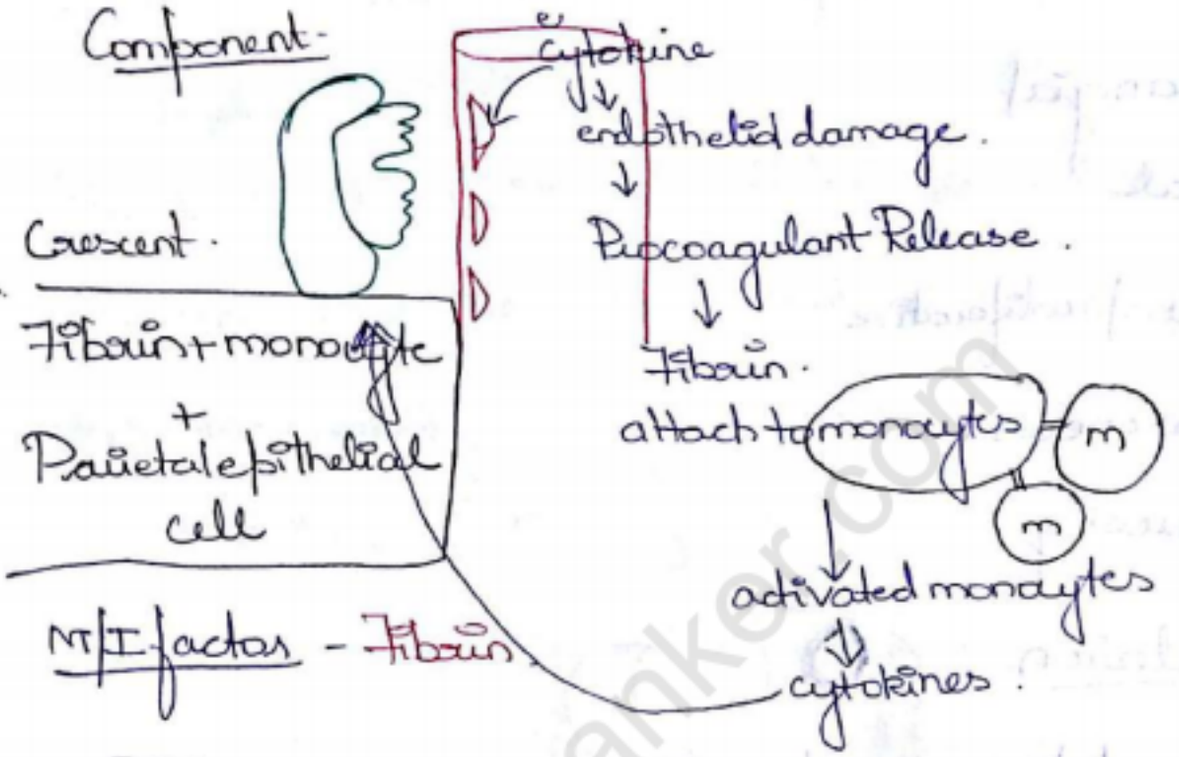
RPGN Crescentic Glomerulonephritis.

→ Most characteristic

→ Prognosis - correlate to number of crescents

[>50% - Poor prognosis]

Component:



RPGN

I	II	III (m/c)
Anti-GBM	Immune complex	Pauci immune
Goodpasture Syndrome.	HSP ; PSGN	No deposits
Ab against.	SLE	ANCA associated.
α3 of Type-IV collagen.	IFL: Granular.	C-ANCA: polyangitis with granulomatosis (wegener's) C-ANCA > P-ANCA
Type-II HSR		P-ANCA: PAN → NO ANCA
Lung affected first > Renal		P-ANCA - microscopic PAN
m/c - LOD - Renal failure.		
IFL: Linear Ribbon like (IgG)		

Ribbon Candy appearance < Good pasture Syndrome
IgG- Bullous pemphigoid

SLE Nephritis. WHO

I - Minimal.
II - Mesangial
III - Focal.
IV - Diffuse proliferative.
V - Membranous
VI - Sclerosing

Wire loop lesion

Subendothelial deposists

IV > II, III

Renal vein thrombosis m/c associated with MGN

↓

V > IV > III > II, I not seen)

IV Wire loop lesion - active & poor prognosis.

Age - 5-20

XL-dominant (m/c)

c/F: Eye - Anterior lenticonus, Lens subluxation

Ear - Sensorineural Deafness.

Renal - Hematuria.

Renal → ab → α_5 Type - IV Collagen. [XLD]

Autosomal disorders - ab against. α_3, α_4 chain.

Electron microscopy - only diagnostic.

Earliest - Thinning of BM.

↓

Thickening (Irregular)

↓

Rupture Splitting of Lamina densa.

↓

Heal by lamellation...

Basket-weave

Nephrotic:

Megalin Ag - Heymann's Nephritis

↓

Mouse

↓

Death

Membranous GN - model

30% Drugs. 70% Idiopathic

Malignancies - Ca-Colon } MGN

Ca-Breast }

Leukemias/Lymphoma

↓

Minimal change Disease

Membranous glomerulonephritis.

Hep-C : m/c - a/w - i) Cryoglobulinemic GN

ii) MTGN

iii) MTPGN

Hep-B - m/c a/w - ped → MTGN

adult → mpGN

Overall - MTGN

MTembranous GN -

LM - Capillary Basement membrane Thickening.

No Rupture of Basement membrane.

EM:

i) effacement of foot process.

ii) Spike dome appearance on PAS (silver staining).

Best Seen in - LM with silver stain.

Subepithelial deposits with intact BM.

Effacement of foot process

→ MCD (effacement + (N) BM)

→ MTGN

→ mpGN

→ FSGN

→ Diabetic Nephropathy

Subepithelial deposits with intact BM.

Electron dense deposits.

II

activation of classical & alternate complement

Both classical alternate

only Alternate complement.

Complement Receptor def.

IgG1

Subendothelial

IgM
No IgG1

Intramembranous

Both types

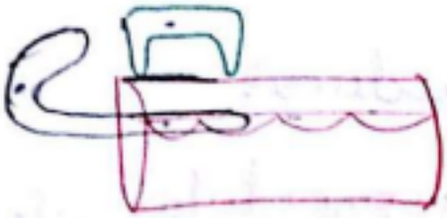
Partial Lipodystrophy

I > II > III

Double Contour/ Tram-Track/Splitting of Basement membrane

↓

Duetomesangial interposition. (Between BM & endothelium)



7 SGIS:

1) Idiopathic 2) Scaring. Sickle cell anaemia.

3) Heroin Abuse

4) HIV → m/c) FSGS - HIV associated Worse prognosis

↓

HIV-AN Worse prognosis → Collapsing type (Histological variant)

3) MGN

4) MPGN.

dx for HIV-AN { EM → Tubuloreticular inclusion within endothelial cells

5) Reflux Nephropathy.

6) HTN Nephropathy

Post Renal agenesis / Renal ablation.

Hallmark - Visceral epithelial damage

Damage in form of - Hypertrophy & necrosis.

Diabetic Nephropathy :-

m/I : Duration of disease.

microscopy

earliest - Capillary Basement membrane thickening.

m/c = Diffuse glomerulosclerosis

m/specific - Kimmelstiel-Wilson nodular Sclerosis.

Nodular Sclerosis - Capsular Drops.

Fibrin Caps.

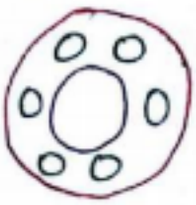
Papillary necrosis -

Necrosis of Blood vessels projecting like papillae into lumen

↓

due to microangiopathic feature

PCT epithelium → Glycogen laden vacuoles



Primary ebstein cells

Vascular:

Benign Nephrosclerosis.

Gross: B/L Symmetrical contraction of kidney.

M/E:

Hyaline arteriosclerosis.

Malignant Nephrosclerosis

Gross - Kidney - variable size (Small / large).

Rupture of arteriole / capillaries.

→ petechial Hemorrhages

Flea Bitten

→ malignant HTN.
→ Inf. endocarditis.
→ HUS.
→ Vasculitis.

Malignant

M/E:

Due to pressure exerted by Blood flow

↓

Tunica media Smooth muscle proliferation

↓

1) Hyperplastic arteriosclerosis

Fibrinoid Necrosis: 2) Fibrin + Immune complexes.

3) Onion — skin.

Cystic Disease of Kidney

AD - PKD

Adults

PKD1 > PKD2

↓

Polycystin-1 ->

extra Renal - m/c

Hepatic cysts > Colonic diverticulosis

Cysts not seen in

Intestine > Brain > Lungs

↓ (very Rare) (Rare)

No cysts

→ Berry's Aneurysm.

m/c COD - Hypertensive Crisis

Nephrocalcinosis.

M Medullary Sponge kidney.

Cysts at Hilum

↓ obstruction

↓ Stasis.

↓ Infection.

↓

Nephro calcinosis

AR - PKD

Pediatrics.

PKHD-1

↓

Fibrocystin.

Hepatic fibrosis + Cysts.

M Medullary Cystic

Cysts at Corticomedullary Junction

↓

Tubulointerstitial disease

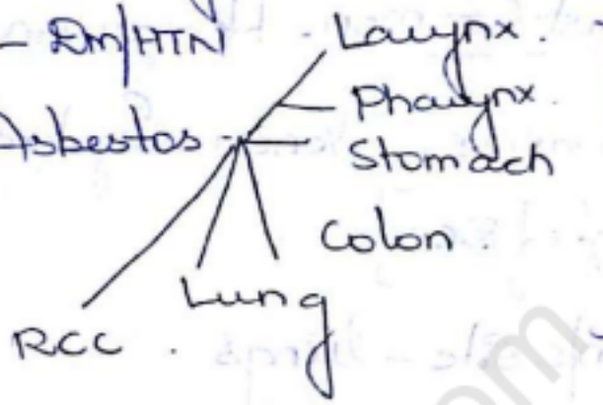
↓

Salt losing nephropathy

- strongly associated with Smoking

Male > female.
3 : 1

Associated with - ↑ estrogen
- DM/HTN
- Asbestos



→ bayeas

→ Sporadic 90% Hereditary (10%) — B/L.

i]- Von Hippel Lindau

Characteristic → Cerebellar Hemangioblastoma
Retinal Angiomas
B/L RCC.

→ AD, chromosome - 3p
m/c Type - clear cell type.

ii] Hereditary Leiomyomatosis with B/L Renal CC: [AD]

→ papillary RCC.

→ more aggressive / more metastasizing > Sporadic.

iii) Birt - Hogg Dube Syndrome Q:

AD.

m/c RCC type - chromophobe.

→ ~~Sickle cell anaemia — Medullary RCC~~

i) Hematuria (m/c)

ii) B/L Renal mass - Abdominal swelling, mass

iii) Abdominal pain.

Wilms tumor: m/c - Abdominal mass.

least common - Hematuria > Fever.

iv) Angioinvasive - Venous System
[10% of RCC]

Metastasis. m/c site - lungs

Paraneoplastic m/c ↑ ESR* Er

→ Hypercalcemia

→ Hypertension.

→ Amyloidosis - AA type.

- Cushings disease (Rare).

Subtypes

i) Clear cell (m/c). PCT.

ii) Papillary. (Chromophilic) → PCT.

iii) Chromophobe.

- Best prognosis.

iv) Bellini duct.

worst prognosis* Er

PCT

Clear vacuoles

Both lipid + glycogen

m/c Cytogenetics

Chromosome-3p(-) m/c

VHL - (-).

t 3 → 6

3 → 8

3 → 11.

PCT

Also

Dialysis associated cystic kidney disease

Cytogenetics

Trisomy-7

16

17.

Hereditary type of papillary RCC

Q. i) Trisomy 2-7

ii) MET. proto oncogene mutation.

Pediatric t(x:1) Q.

Chromophobe

Collecting Duct

loss of multiple chromosomes (1, 3, 15, 6, 8)

↓

extreme Hypodiploidy

Collecting duct

More progressive desmoplastic stroma

[↑ Collagen deposition within tumor mass]

↓

Desmoplasia (poor prognosis)

Desmoplasia m/c in Pancreatic Adenoca

Wilm's Tumor

→ 2-5 years

→ U/L - (80-90%)

→ B/L - also - Nephrogenic Rests (immature glomeruli + fibrous stroma)

Triphasic Histology - 1) Blastemal cells - Small, polygonal

2) Epithelial Component [immature glomeruli + tubules]

3) Stromal Component - fat

m/c Site mets - lungs

Clear Cell Sarcoma variant (Bone tumor) → Bony mets

Glioneuronal tumor

Neuroblastoma - NET.

Sympathetic ganglia.

m/c site - Adrenal medulla.

Age - 2 years (18 months)

> 50% - Cases presents with mets

m/c site - Bones / Bonemarrow.

Lungs Rarely affected

Microscopy - NET.

Nucleus - Salt & pepper nuclear chromatin.

cytoplasm - Neuro Secretory granules.

→ Chromogranin / Synaptophysin

→ Neurofilament / Leucin-7.

→ Bombesin.

Electron microscopy -

Dense Core granules - electron microscopy.

Schwannian stroma.

Rosette. ependymoma

Pseudo — P>T — True.

Homer-Wright rosettes (medullo neuro)

Flexner-Wintersteiner

Clear Space.

Retinoblastoma

Pineoblastoma

PNET

Neuroblastoma } Homer Wright Rosettes

m/I: Medulloblastoma }

	Good Prognosis	Bad Prognosis
Histology:	Gangliocytic differentiation	Absent
	↓	
	Schwannian stroma.	Absent
	Intra-tumoral Calcification (+)	(−)
Cytogenetic	Hyperdiploidy.	Diploidy
	(−)	N-myc amplification.
	Trk-A	Trk-B.
Biochemically		↑
S. Kurtin	(N)	
S. LDH	(N)	↑

Poor prognosis - Neuroendocrine Tumours > other type
Neuroblastoma > Wilms tumor.

Paraganglioma - Cluster of Ball appearance enclosed in fibrovascular stroma.

Zell-Ballen pattern