Renal Pathology

Glomerular

- proteinuria

Nephritic

→ Hypertension

→ Hematuria

[RBC > 3 RBC/Hpf]

for 3 consecutive urine specimen

→ RBC Casts

Hematuria

- glomerular
  - → Dysmorphic RBC
  - Nephritic
  - edema (mild)
  - Na^+/H_2O Retention.
- extraglomerular
  - Isomorphic RBC
  - nephritic

Nephrotic → R

→ Rarely seen massive proteinuria (>3.5 g/Day).

→ ↑ Lipid - Lipiduria (waxy casts)

→ Natural anticoagulants Protein C, S, AT-III lost + ↑ Fibrinogen Synthesis (APR - Liver)

Hypercoagulable

m/c Idiopathic Hypercalciuria

→ edema (Severe)

Initiating - protein loss

Cause of edema - Na^+/H_2O Retention

↑ Hydrostatic pressure > Osmotic Pressure.

Tubulointerstitial.

↓

Salt losing nephritis

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 AR - FSGS

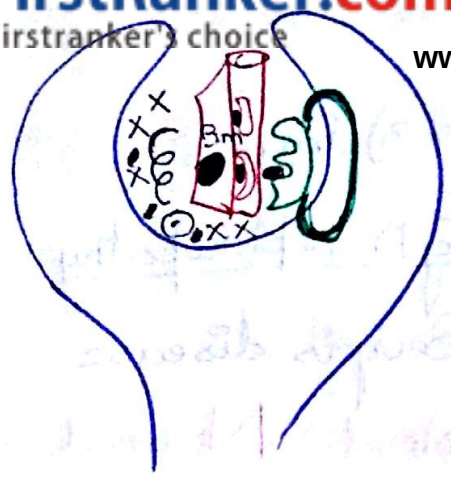
iii] α - Actinin - 4 gene:

↓ 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.
NTGIN.
RPGIN - m/c. S.E deposits among 3 types of RPGIN.

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

3) Intramembranous - Between 2 layers of Basement membrane
NTPGIN - 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 6-8 weeks
↓
Normal complement

1) MT 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

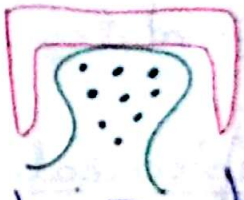
IgA1 - nephritogenic

- mesangial deposits
CD-11

electron EM
(microscopy)

→ Subepithelial Humps
Hump Sign

Immunofluorsuene



Lumpy Bumpy
Immunofluorescence

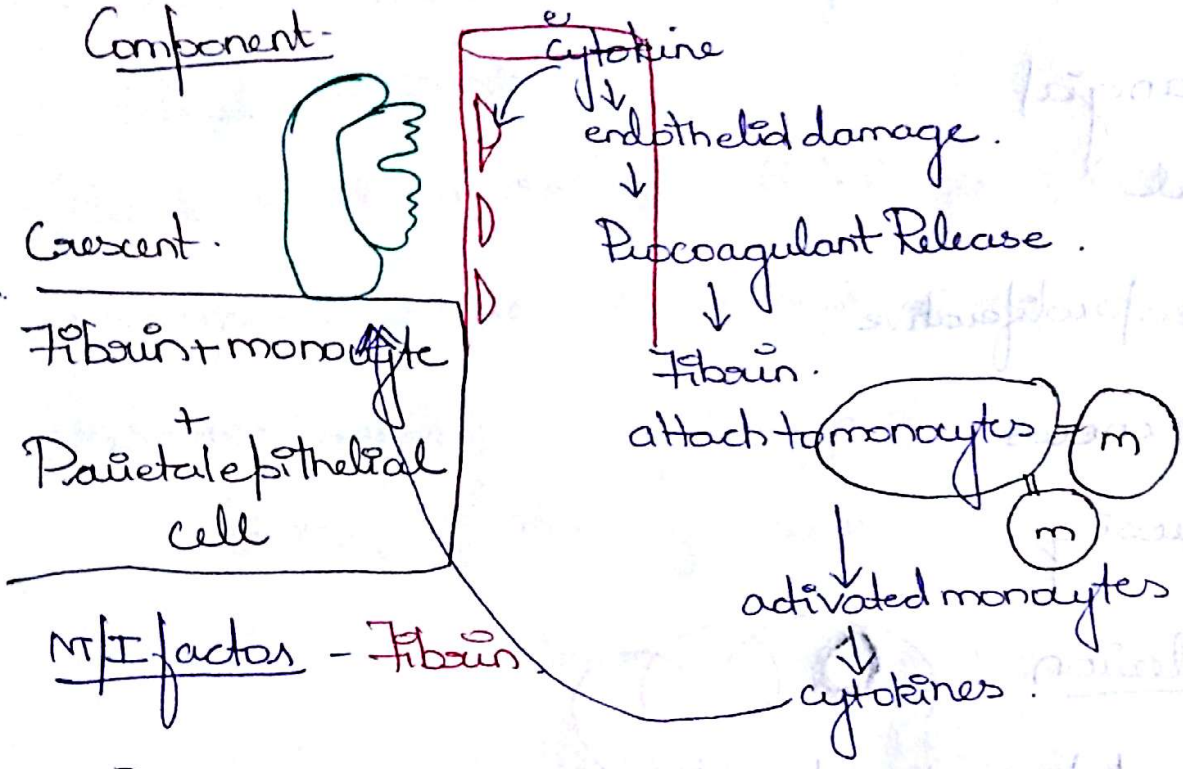
PSGN > RPGN - II (PSGN associat
↓
Acute - Resolve
(CRF) → least PSGN
↓
RPGN - II (PSGN)

RPGN Crescentic Glomerulonephritis.

→ Most characteristic

→ Prognosis - correlate to number of crescents

[>50% - Poor prognosis]



RPGN

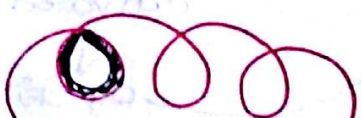
I	II	III (m/c)
Anti-GBM	Immune complex	Pauci immune
Goodpasture syndrome.	HSP ; PSGN	No deposits
Ab against.	SLE	ANCA associated.
α3 of Type-IV collagen.	IFL: Granular.	C-ANCA: polyangitis with granulomatosis (wegeners) C-ANCA > P-ANCA
Type-II HSR		P-ANCA: PAN → NO ANCA
Lung affected first > Renal		P-ANCA - 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 deposits

IV > II, III

Renal vein thrombosis m/c associated with MGN

↓

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

I 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

n. Membranous GN - model.

30% Drugs.

70% Idiopathic

Malignancies - Ca-Colon, Ca-Breast } MGN.

Leukemias/Lymphoma

↓

Minimal change Disease

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

ii) MTGN

iii) MTPGN.

Hep-B - m/c a/w - ped → MTGN

adult → mpGN

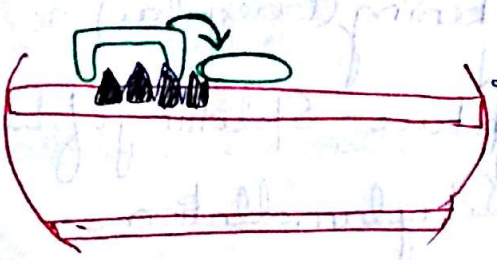
Overall - MTGN

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.

epimembranous deposits.

effacement of foot process

→ MCD (effacement + (N) BM)

→ MTGN

→ mpGN

→ FSGN

→ Diabetic Nephropathy

activation of classical & alternate complement

Both classical alternate.

only Alternate complement.

Complement Receptor def.

IgG1

Subendothelial

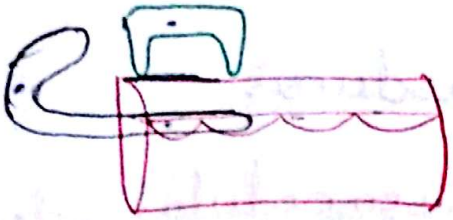
IgM
No IgG1

Intramembranous

Both types

Partial Lipodystrophy

Double Contour/ Tram-Track/Splitting of Basement membrane } I > II > III



↓

Mesangial interposition.

(Between BM & endothelium)

FSGS:

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 variants

3) MCGN

4) MPGN.

dx for HIV-AN { Tubuloreticular inclusion within endothelial cells.

EM →

5) Reflux Nephropathy.

6) HTN Nephropathy

Hyp Renal agenesis / Renal ablation.

Hallmark- Visceral epithelial damage

Damage in form of- Hypertrophy & necrosis.

Diabetic Nephropathy:-

m/I: Duration of disease.

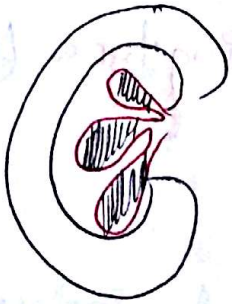
microscopy earliest - Capillary Basement membrane thickening.

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

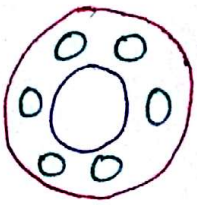
↓

due to microangiopathic feature

PCT epithelium

Glycogen laden vacuoles → PAS +ve

Armanyebstein 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 Diseases 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)

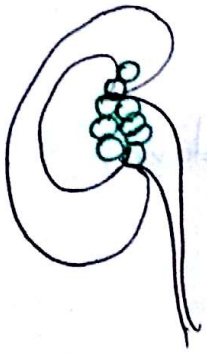
No cysts

→ Berry's Aneurysm.

m/c COD - Hypertensive Crisis

Nephrocalcinosis.

N Medullary Sponge kidney.



Cysts at Hilum

↓

obstruction

↓

Stasis.

↓

Infection.

↓

Nephro calcinosis

AR - PKD

Pediatrics.

PKHD - 1

↓

Fibrocystin.

Hepatic fibrosis + Cysts.

N Medullary Cystic

Cysts at.

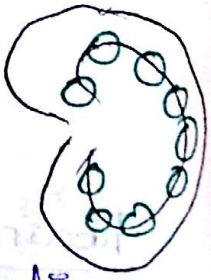
cortico medullary Junction

↓

Tubulointerstitial disease

↓

Salt losing nephropathy



Adenocarcinoma

- strongly associated with Smoking

Male > female.

3 : 1

Associated with - ↑ estrogen

- DM/HTN

- Asbestos → Larynx, Pharynx, Stomach, Colon, Lung, RCC. } > 60 years.

→ 60 years

→ 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) Bellinic 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.

Chromophobe

Collecting Duct

Collecting duct

Dialysis associated cystic kidney disease

Cytogenetics.

Trisomy-7

16

17.

i) Trisomy 2-7

Hereditary type of papillary RCC.

ii) MET. proto oncogene mutation.

Pediatric t(x;1)

loss of multiple chromosomes (1, 3, 5, 6, 8)

↓

extreme Hypodiploidy

Wave progression of 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 - a/w - Nephrogenic Rests (immature glomeruli + fibrous stroma)

Triphasic Histology - 1) Blastemal cells - small, polygonal

2) Epithelial Component [immature glomeruli + tubules]

3) Stromal Component - rhabdomyosarcoma

m/c Site mets - lungs.

Clear Cell Sarcoma variant (Bone tumor) → Bony mets

neuroendocrine tumor

Neuroblastoma - NET.

Sympathetic ganglia.

m/c site - Adrenal medulla.

Age - 2 years (18 months)

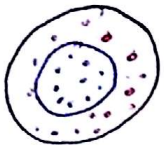
> 50% - Cases presents with mets

m/c site - Bones / Bonemarrow.

Lungs Rarely affected

Microscopy - NET

Nucleus -



Salt & pepper nuclear chromatin.

cytoplasm - Neuro Secretory granules.

→ Chromograin / Synaptophysin

→ Neurofilament / Leuin-7.

→ Bombesin.

Electron microscopy -

Dense Core granules - electron microscopy.

Schwannomin stroma.

Rosette, ependymoma

P>T

Pseudo

Homer-Wright rosettes (medulloblastoma, neuro)

True.

Clear Space.

Retinoblastoma

Flexner-Wintersteiner

Pineoblastoma

PNET

Neuroblastoma } Homer Wright Rosettes

MI: Medulloblastoma

	Good Prognosis	Bad Prognosis
Histology:	Ganglioglyptic differentiation & Schwannomian stroma.	Absent / Absent
Intra-tumoral Calcification	(+)	(−)
Cytogenetic	Hyperdiploidy (−)	Diploidy N-myc amplification.
	Tak-A	Tak-B
Biochemically		↑
S. Ferritin	(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.