Renal Disease

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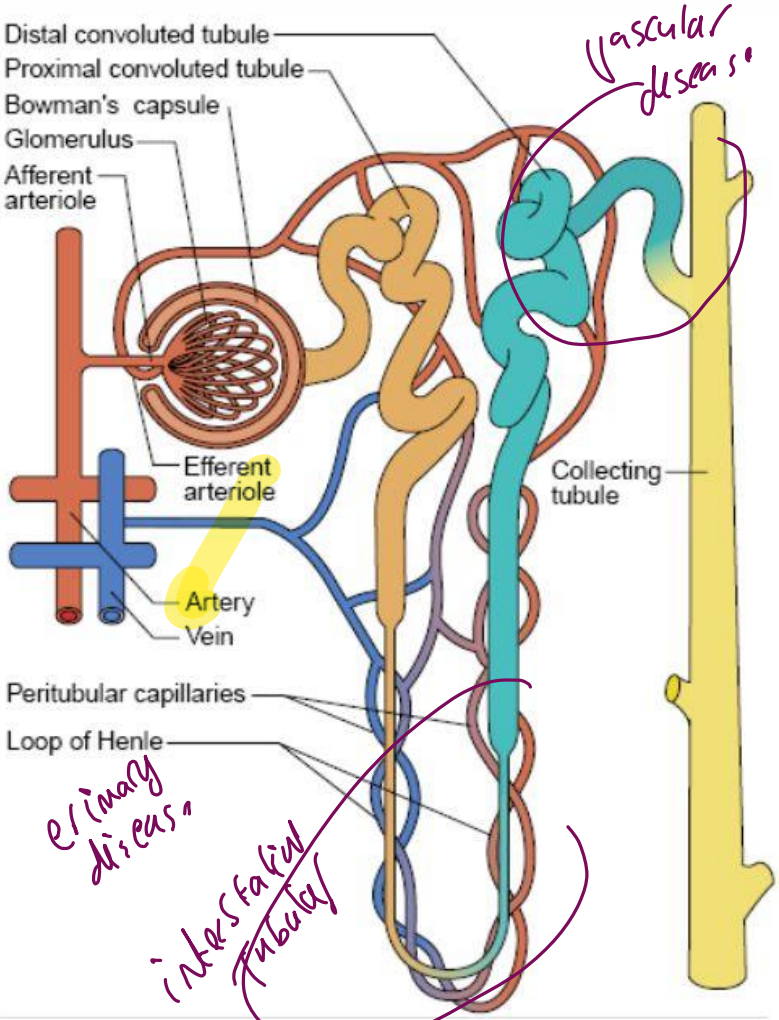

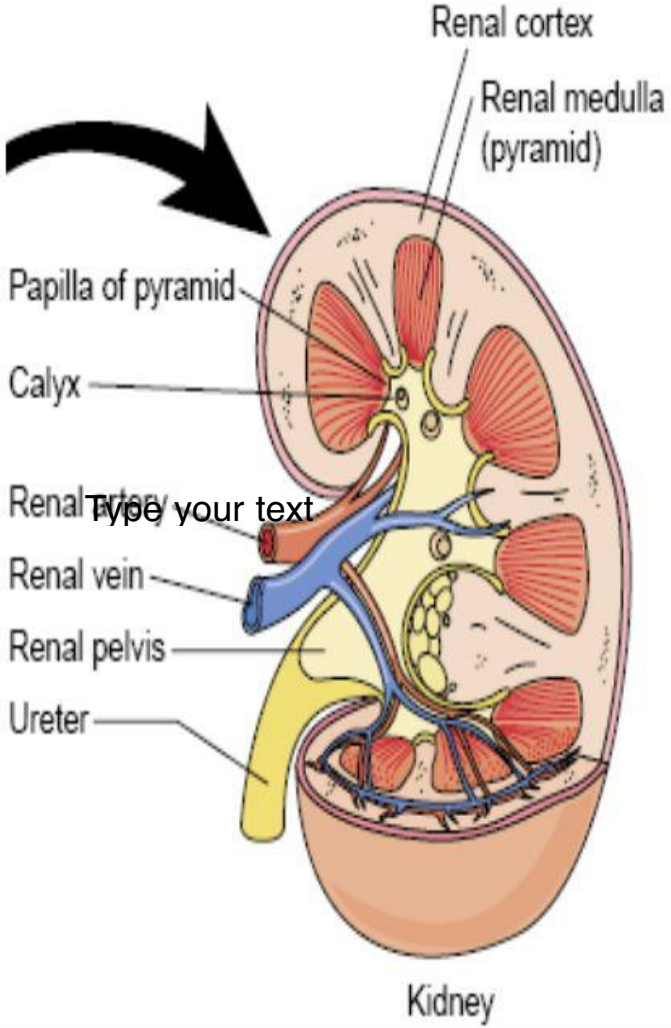

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تبييض الصورة الي فوق

Classification of Renal Diseases:

1. Primary Glomerular Diseases

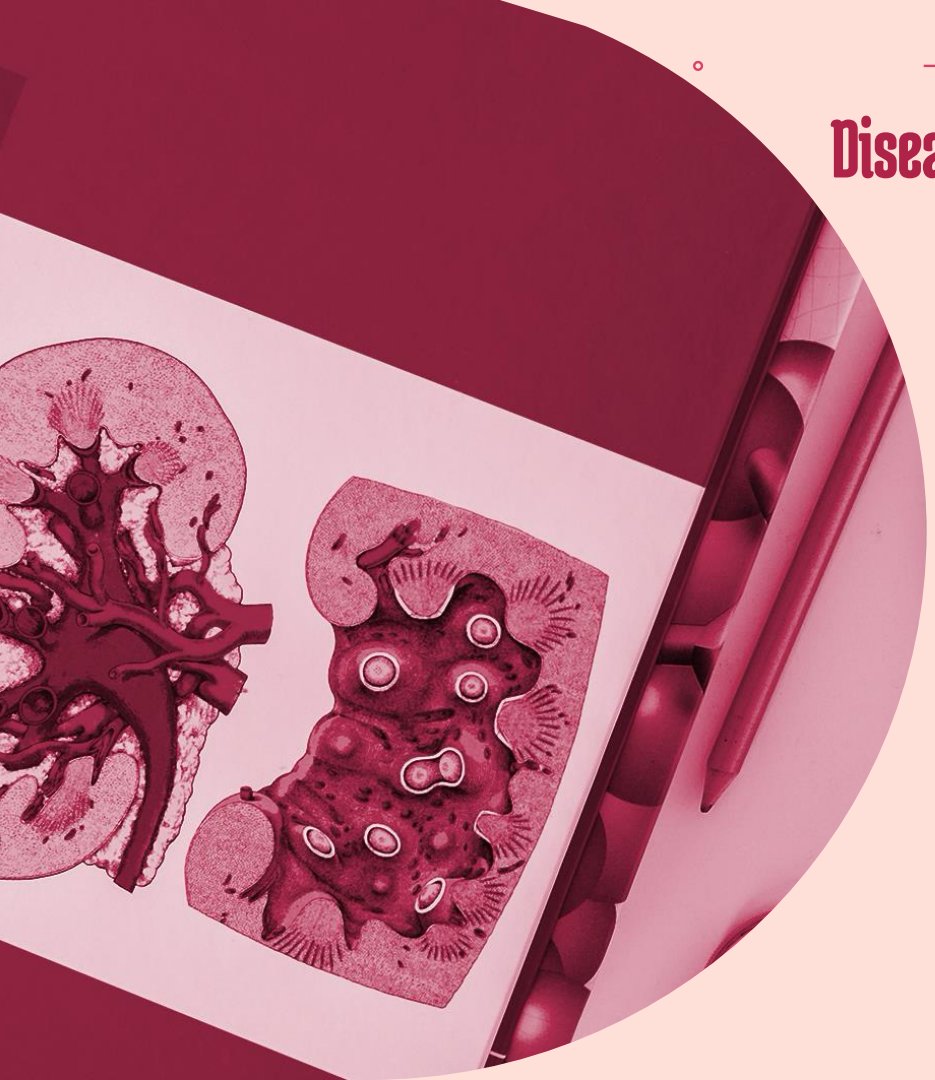
- **Main site affected:**
- **Glomerulus (filtration unit)**
- **Specifically affects the glomerular capillary loops, basement membrane, podocytes, or mesangial cells.**

Tubular and Interstitial Diseases

- **Main site affected:**
- **Renal tubules (proximal tubule, distal tubule, loop of Henle)**
- **Interstitial tissue between tubules.**

Visceral Diseases (Vascular and Collecting System Diseases)

- **Main site affected:**
- **Renal blood vessels (arterioles, arteries)**
- **Collecting ducts and ureters.**



Diseases of the kidney

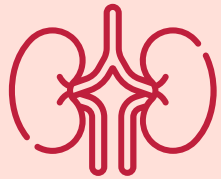
- Kidneys carry out many functions that require a high degree of structural complexity.
- Renal diseases are responsible for a great deal of morbidity & mortality
- Four basic morphologic components: glomeruli, tubules, interstitium, & blood vessels.

CLINICAL MANIFESTATIONS OF RENAL DISEASES

Azotemia an elevation of blood urea nitrogen(BUN) & creatinine levels → usually reflects a decreased glomerular filtration rate (GFR).

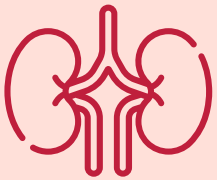
Uremia: When azotemia gives rise to clinical manifestations & systemic biochemical abnormalities.

Failure of renal excretory function + metabolic & endocrine alterations incident to renal damage.



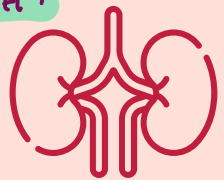
CLINICAL MANIFESTATIONS OF RENAL DISEASES

- **Acute kidney injury** abrupt onset of renal dysfunction; an acute increase in serum creatinine often ass/w oliguria or anuria (decreased or no urine flow, respectively).
- **Chronic kidney disease** results from progressive scarring in the kidney of any cause. Metabolic & electrolyte abnormalities such as hyperphosphatemia, dyslipidemia, & metabolic acidosis. Often asymptomatic until the most advanced stages → symptoms of uremia develop.



CLINICAL MANIFESTATIONS OF RENAL DISEASES

- End-stage renal disease (ESRD) is irreversible loss of renal function requiring dialysis or transplantation typically due to severe progressive scarring in the kidney from any cause.
- Urinary tract infection (UTI) bacteriuria & pyuria (bacteria and leukocytes in the urine). Symptomatic or asymptomatic. Affect the kidney (pyelonephritis) or the bladder (cystitis) only.
- Nephrolithiasis formation of stones in the collecting system. Manifested by renal colic & hematuria



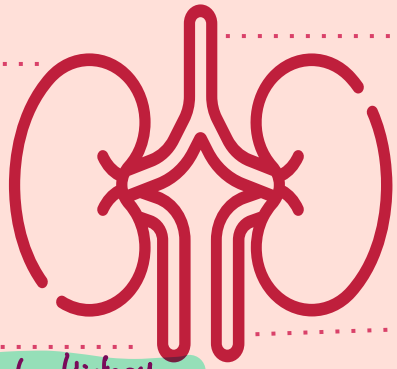
01

GLOMERULAR DISEASES

GLOMERULAR DISEASES

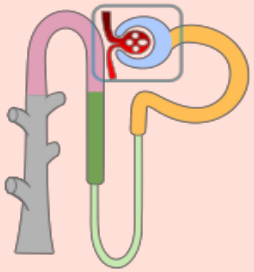
01 A major problems in nephrology; Chronic glomerulonephritis is one of the most common causes of chronic kidney disease

02 The glomerulus: anastomosing network of capillaries invested by two layers of epithelium: visceral & parietal epithelium



03 The visceral epithelium (composed of podocytes) is part of the capillary wall

04 the parietal epithelium encircles Bowman space (urinary space), the cavity in which filtrate of plasma collects.



Renal corpuscle

Myocytes

Afferent arteriole

Bowman's space

Proximal tubule

Glomerulus Capillary

Glomerulus Capillary

Glomerulus Capillary

Glomerulus Capillary

Distal convoluted tubule

Macula densa

Granular cells

Mesangium–Extra-glomerular cell

Juxtaglomerular apparatus

Efferent arteriole

Parietal layer

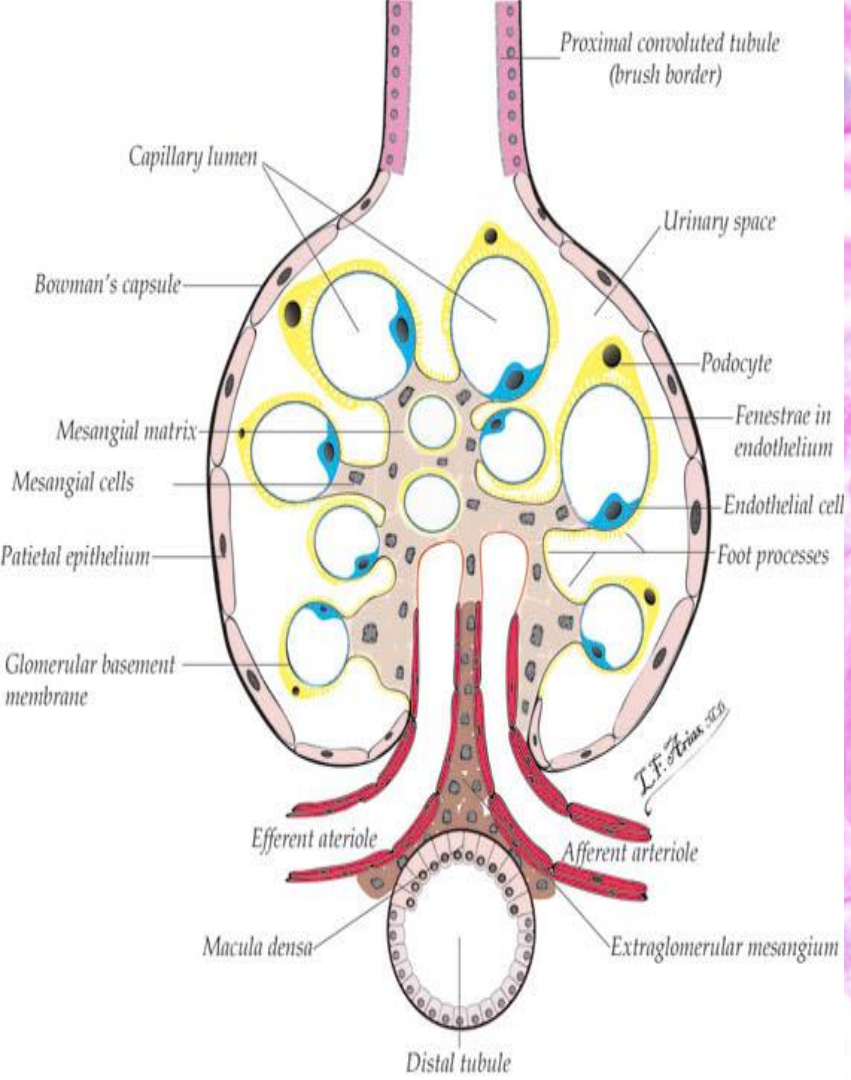
Podocyte Pedicels

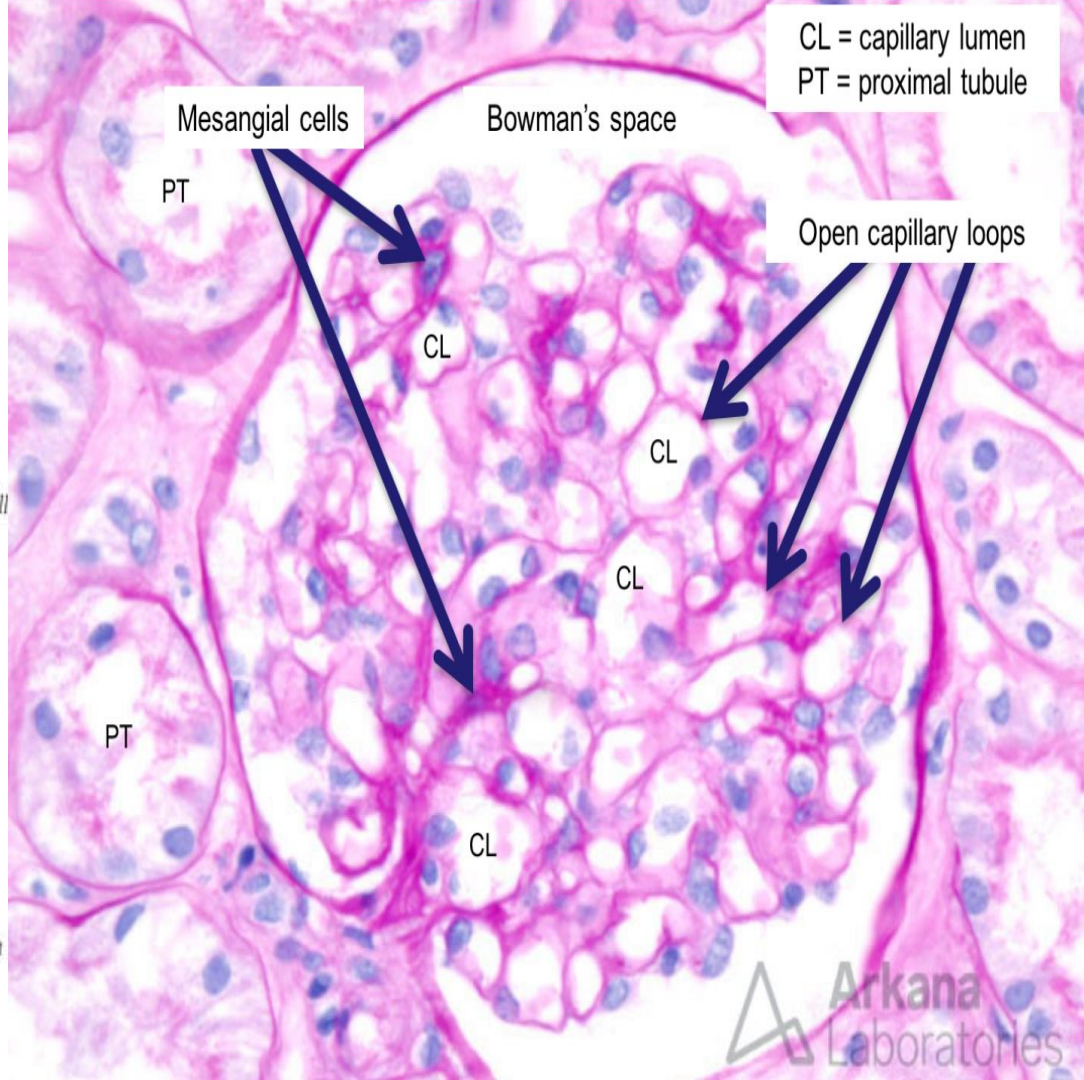
Visceral layer

Bowman's capsule

Mesangium–Intraglomerular cell

Basement membrane


Proximal convoluted tubule
(brush border)
Capillary lumen
Urinary space
Bowman's capsule
Podocyte
Mesangial matrix
Fenestrae in
endothelium
Mesangial cells
Endothelial cell
Patietal epithelium
Foot processes
Glomerular basement
membrane
Efferent ateriole
Afferent arteriole
Macula densa
Extraglomerular mesangium
Distal tubule


CL = capillary lumen
PT = proximal tubule
Mesangial cells
Bowman's space
PT
Open capillary loops
CL
CL
CL
PT
CL
Arkana
Laboratories

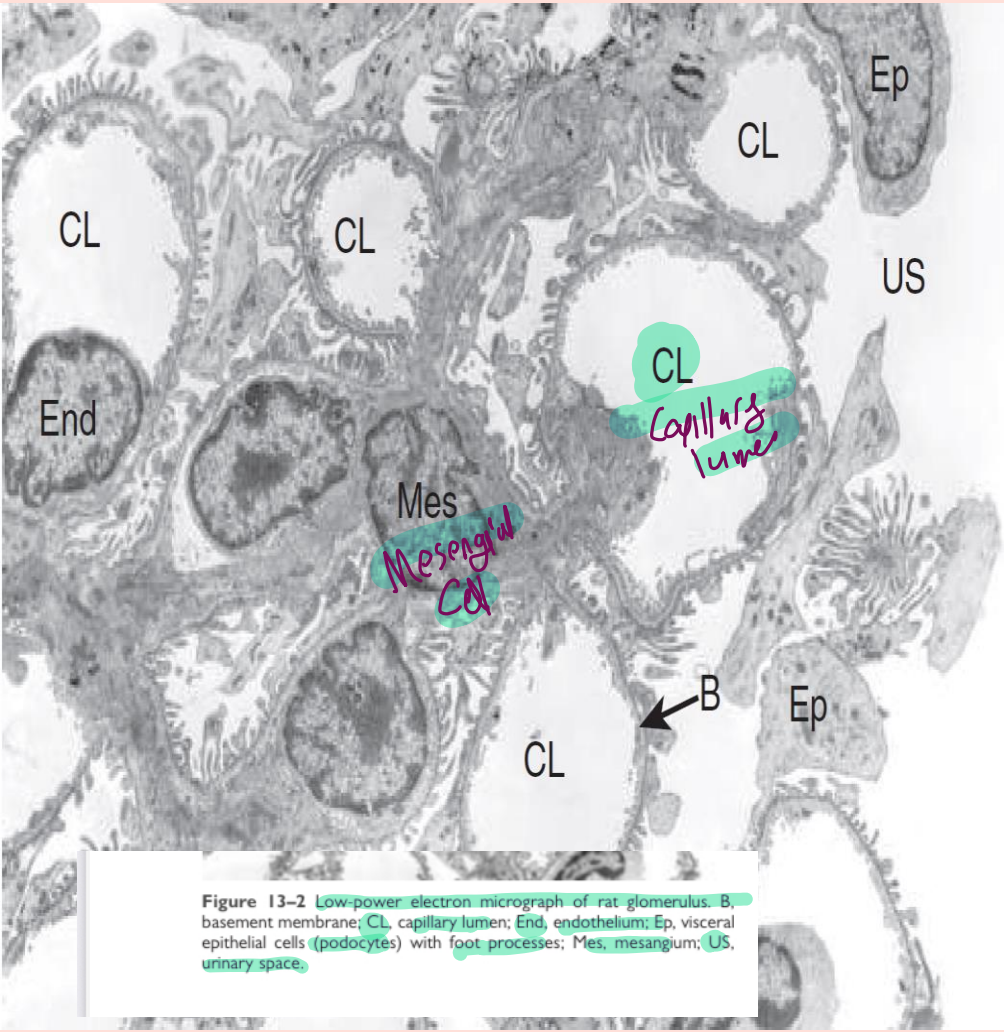
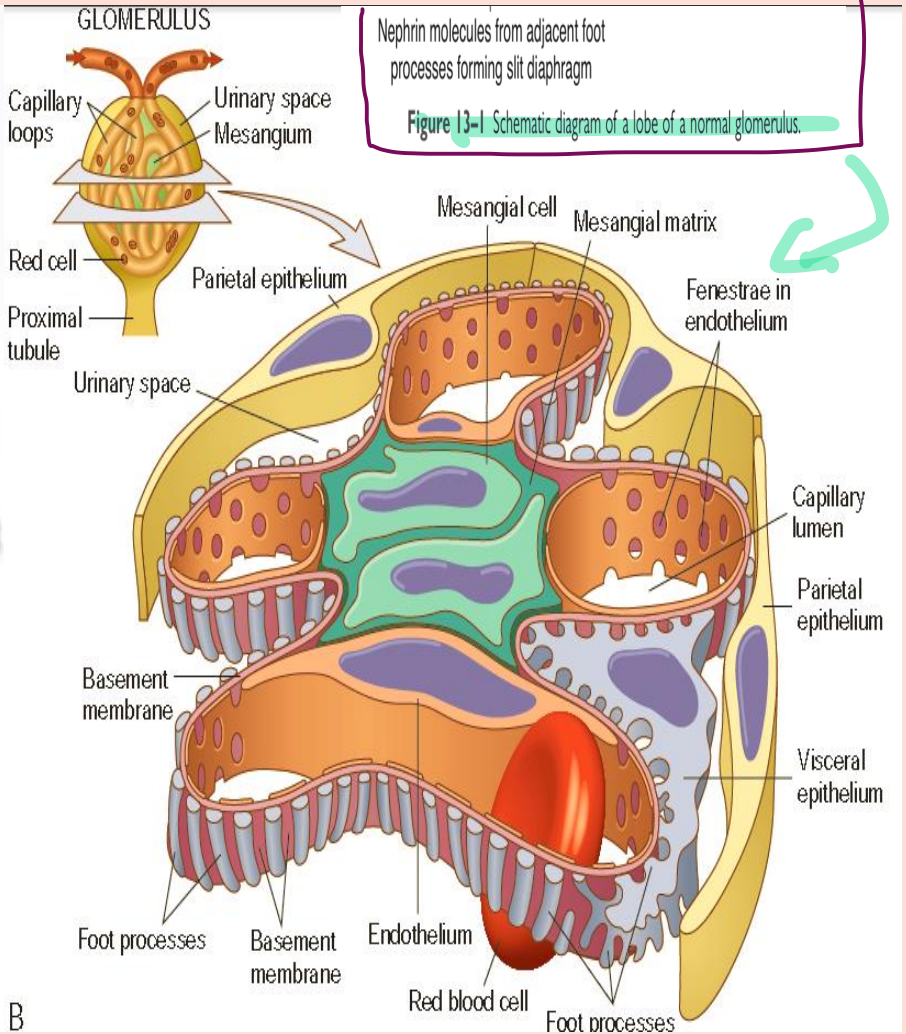
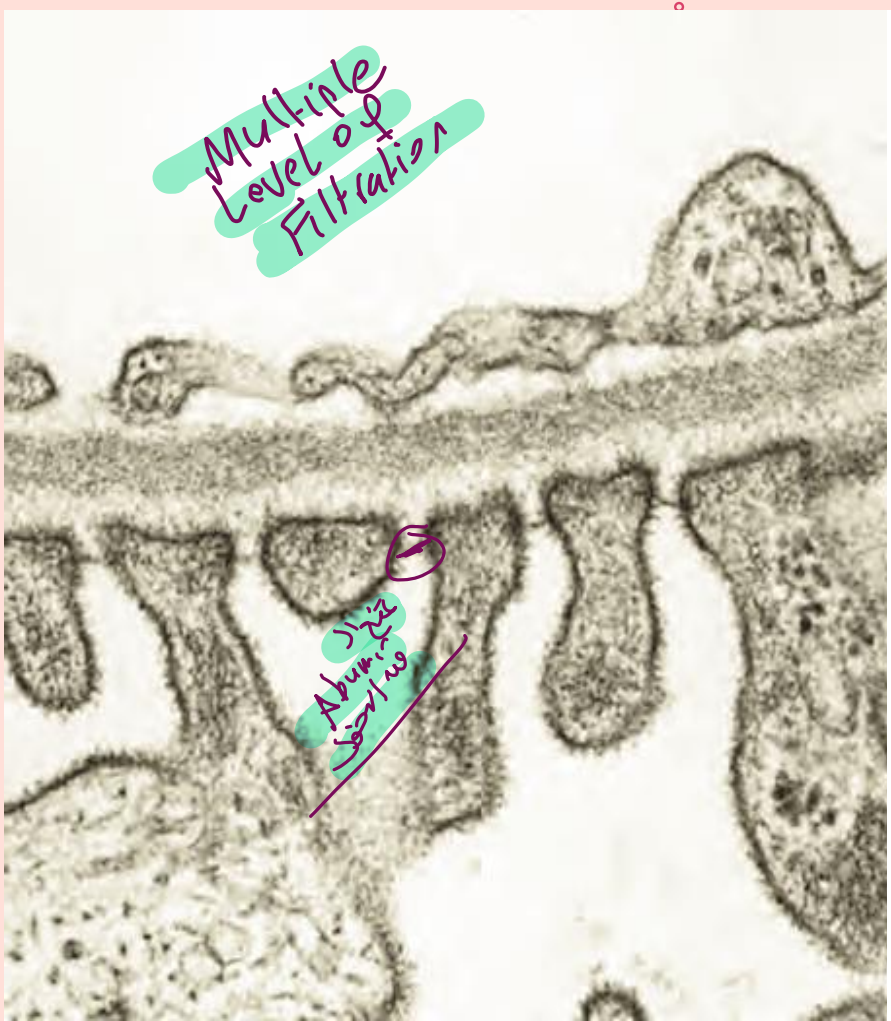


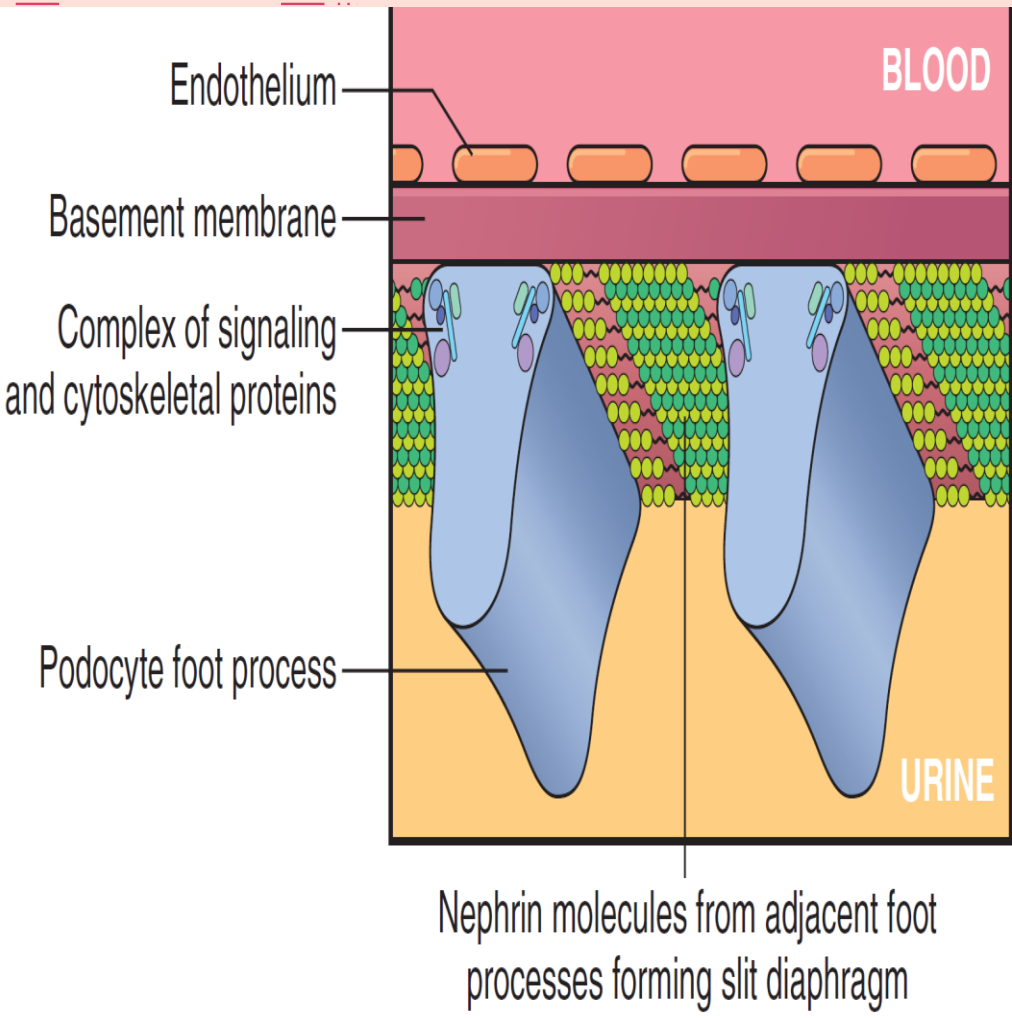
Figure 13–2 Low-power electron micrograph of rat glomerulus. B, basement membrane; CL, capillary lumen; End, endothelium; Ep, visceral epithelial cells (podocytes) with foot processes; Mes, mesangium; US, urinary space.



Nephrin molecules from adjacent foot processes forming slit diaphragm

Figure 13–1 Schematic diagram of a lobe of a normal glomerulus.


Multiple Level of Filtration
تزداد Albumin من الدم


Endothelium
Basement membrane
Complex of signaling and cytoskeletal proteins
Podocyte foot process
BLOOD
URINE
Nephrin molecules from adjacent foot processes forming slit diaphragm

تبييض الصور الي فوق / متعلق
بالهستو أكثر من باثو

1. Renal Corpuscle:
   - Composed of Glomerulus (capillary network) and Bowman's Capsule (double-walled capsule surrounding the glomerulus).
   - Function: Initial site of blood filtration in the nephron.
2. Glomerulus Capillaries:
   - Network of capillaries where blood filtration occurs through fenestrated endothelial cells.
   - Surrounded by Mesangial Cells that provide support, contractile function, and immune defense.
3. Bowman's Capsule:
   - Parietal Layer: Outer simple squamous epithelial layer.
   - Visceral Layer: Inner layer made up of Podocytes (specialized epithelial cells).
   - Bowman's Space (Urinary Space): Space between the two layers where the filtered fluid (filtrate) collects.
4. Podocytes and Pedicels:
   - Podocytes extend foot processes (Pedicels) that wrap around capillaries, forming filtration slits.
5. Basement Membrane (GBM - Glomerular Basement Membrane):
   - Fused basal lamina between capillary endothelial cells and podocytes; critical in filtration barrier function.

6. Afferent Arteriole:

- **Brings blood into the glomerulus.**
- **Surrounded by Granular Cells (Juxtaglomerular Cells) that secrete Renin in response to low blood pressure.**

7. Efferent Arteriole:

- **Drains blood out of the glomerulus after filtration.**

8. Juxtaglomerular Apparatus (JGA):

- **Macula Densa: Specialized cells of the distal convoluted tubule that detect sodium concentration.**
- **Granular (Juxtaglomerular) Cells: Release renin to regulate blood pressure.**
- **Extraglomerular Mesangial Cells: Support communication between Macula Densa and Granular Cells.**

9. Distal Convoluted Tubule:

- **Located close to the afferent and efferent arterioles; involved in fine-tuning electrolyte and pH balance.**

10. Mesangial Cells (Intraglomerular):

- **Located within the glomerulus.**
- **Functions: Structural support, phagocytosis of debris, regulation of glomerular filtration.**

Mechanisms of Glomerular Injury & Disease

01 Glomerular diseases

- Primary: kidney is the only or predominant organ involved
- Secondary: Injured in the course of a systemic diseases [SLE] (common)

02 Immune mechanisms

most types of primary diseases & many of the secondary

Deposition of circulating antigen-antibody complexes in the glomerular capillary wall or mesangium.

Antibodies reacting in situ within the glomerulus, either with fixed (intrinsic) glomerular antigens or with extrinsic molecules that are planted in the glomerulus

Attack

nucleosom complex [SLE] bacterial etc

non glomular Antigen

idiosyncratic Drug

The two most common syndromes associated with glomerular diseases:

01 Nephrotic syndrome

- **Massive Proteinuria**, daily protein loss in the urine of = > 3.5 g
- **Hypoalbuminemia**, with plasma albumin < 3 g/dL
- **Generalized edema**, the most obvious clinical manifestation
- **Hyperlipidemia** and lipiduria

Nephritic syndrome 02

- **Hematuria** (red cells & red cell casts in urine)
- **Proteinuria** (subnephrotic range) with or without edema
- **Azotemia**: elevation of blood urea nitrogen & creatinine levels. Reflects a decreased glomerular filtration rate (GFR).
- **Hypertension**

Nephrotic syndrome

- In children, it is almost always ass/w a primary kidney lesion. Among adult, in contrast , it is often associated with systemic disease.
- The most frequent systemic causes of nephrotic syndrome are; diabetes, amyloidosis, and SLE (systemic lupus erythematosus)
- The most important primary kidney diseases that mostly manifest as Nephrotic Syndrome

1. *Minimal-Change Disease, most common in children*
2. *Focal Segmental Glomerulosclerosis, highest prevalence in adults*
3. *Membranous Nephropathy, most common in older adults*

Minimal-Change Disease (MCD)

01

A relatively benign disorder. The most frequent cause of nephrotic syndrome in children.

02

Characterized by glomeruli that have a normal appearance by light microscopy (minimal).

03

develop at any age, most common at 1-7 years of age.

04

Pathogenesis: Unknown ?, T-cell dysfunction → release factors that damage podocytes & efface foot processes.

05

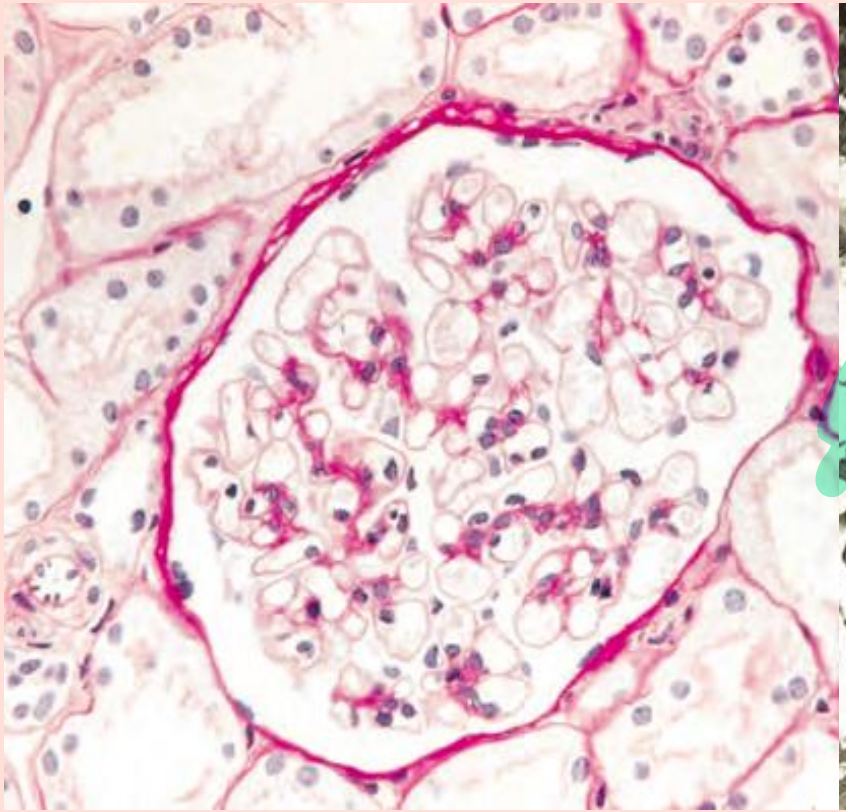
Normal glomeruli on light microscopy (LM) & negative IF

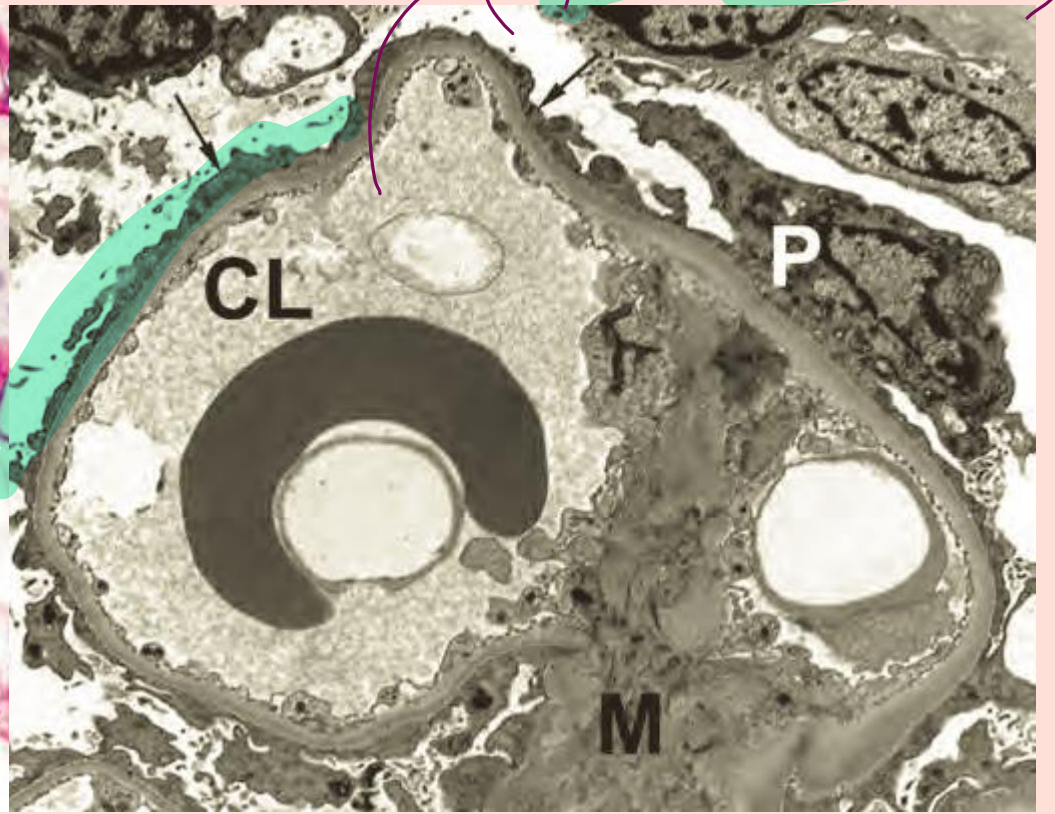
06

The only obvious glomerular abnormality is the diffuse effacement of the foot processes of the podocytes on EM.

Minimal change disease

podocyte - effaced - GFR proteinuria > 3.5 g edema



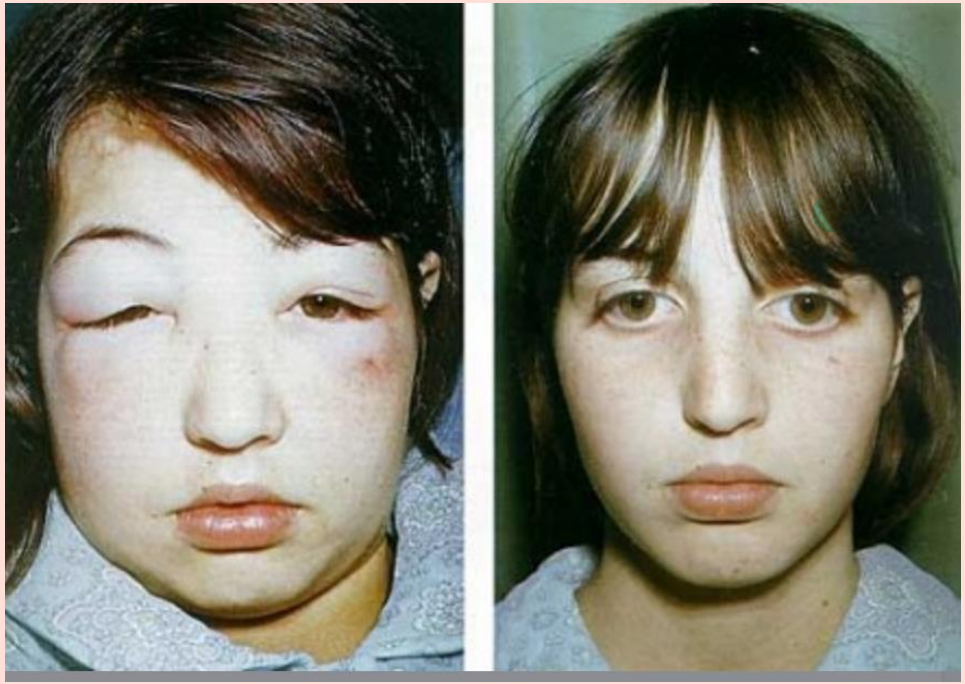


Minimal change disease -Clinical

- Typically abrupt nephrotic syndrome in an otherwise healthy child.
- No hypertension, & renal function is often preserved.
- Protein loss chiefly albumin → selective proteinuria
- Prognosis for children is favorable; > 90% of children respond to a short course of corticosteroid therapy.
- Adults with also respond to steroid therapy, but slower & relapses are more common.
- Less than 5% develop chronic kidney disease after 25 years.

Minimal change disease -Clinical

With long-standing or heavy proteinuria → serum albumin is decreased→ hypoalbuminemia
→ a drop in plasma colloid osmotic pressure → leakage of fluid from the blood into extravascular spaces.



Focal segmental glomerulosclerosis (FSGS)

01

Characterized by sclerosis of some (but not all) glomeruli (focal) that involves only a part of each affected glomerulus (segmental).

02

May be primary (idiopathic) or secondary

03

Secondary causes: HIV infection (5-10% of HIV patients), Heroin abuse, other forms of GN (IgA nephropathy), nephron loss

04

Pathogenesis: not fully understood; Injury to podocytes is thought to represent the initiating event of primary FSGS

05

Hyaline deposition in the glomeruli → caused by entrapment of plasma proteins & lipids in foci of injury → sclerosis.

06

50% develop renal failure in 10 years . The response to corticosteroid therapy is poor.

اسئلة mcqs علو الجزء الاول

1. Which of the following is a clinical hallmark of nephrotic syndrome?
A) Hematuria with red cell casts
B) Massive proteinuria (> 3.5 g/day)
C) Azotemia
D) Hyperphosphatemia

Answer: B) Massive proteinuria (> 3.5 g/day)

---

2. Which glomerular disease is characterized by normal glomeruli on light microscopy but diffuse podocyte foot process effacement on electron microscopy?
A) Focal Segmental Glomerulosclerosis (FSGS)
B) Minimal Change Disease (MCD)
C) Membranous Nephropathy
D) Diabetic Nephropathy

Answer: B) Minimal Change Disease (MCD)

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3. Which of the following statements about Focal Segmental Glomerulosclerosis (FSGS) is TRUE?
A) It has a high response rate to corticosteroids.
B) It affects all glomeruli globally.
C) It commonly progresses to renal failure within 10 years.
D) It is most common in children aged 1–7 years.

Answer: C) It commonly progresses to renal failure within 10 years.

4. What is the most common cause of nephrotic syndrome in children?
A) Focal Segmental Glomerulosclerosis
B) Diabetic nephropathy
C) Minimal Change Disease
D) Membranous nephropathy

Answer: C) Minimal Change Disease

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5. Which of the following features is most characteristic of nephritic syndrome?
A) Massive proteinuria without hematuria
B) Generalized edema and hyperlipidemia
C) Hematuria with red cell casts, hypertension, and azotemia
D) Normal blood pressure and minimal urinary abnormalities

Answer: C) Hematuria with red cell casts, hypertension, and azotemia

---

6. Which condition represents an irreversible loss of renal function requiring dialysis or transplantation?
A) Acute kidney injury
B) End-stage renal disease (ESRD)
C) Chronic kidney disease (early stage)
D) Minimal change disease

Answer: B) End-stage renal disease (ESRD)

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7. In Minimal Change Disease (MCD), what is the expected clinical course in most children after corticosteroid therapy?
A) Poor response and rapid progression to renal failure
B) Good response with complete remission in most cases
C) Development of hypertension and azotemia
D) Persistence of heavy hematuria

Answer: B) Good response with complete remission in most cases

دعواتكم لنا🌸
وفقكم الله

FSGS - Morphology

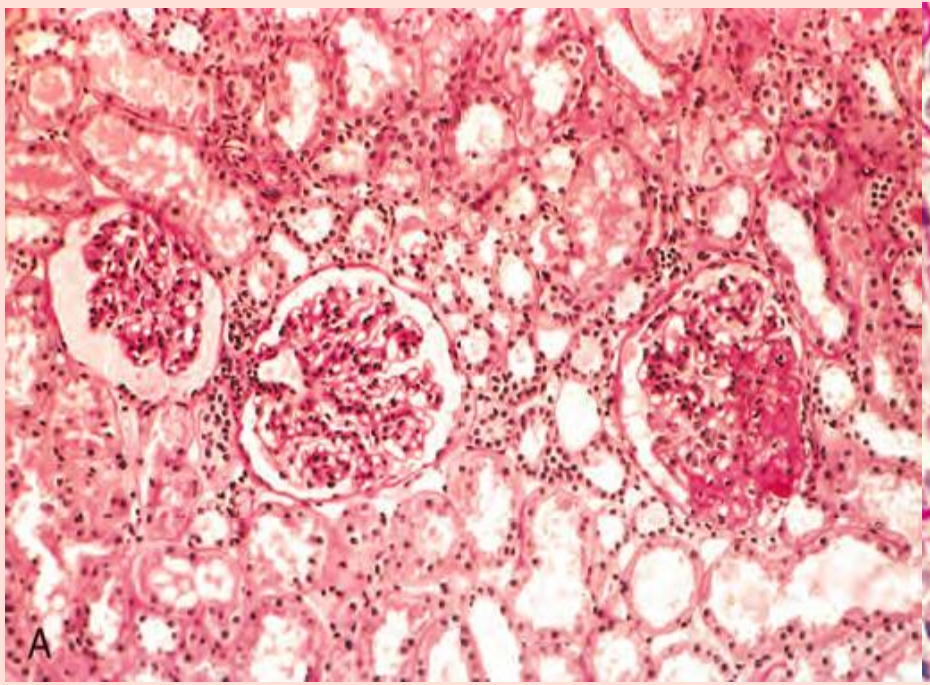
- LM: Sclerosis in some glomeruli not all of them; & in a segment not all of the affected glomerulus
- IF: In affected glomeruli, negative or nonspecific trapping of immunoglobulins,
- EM: Podocytes exhibit effacement of foot processes as in minimal-change disease.

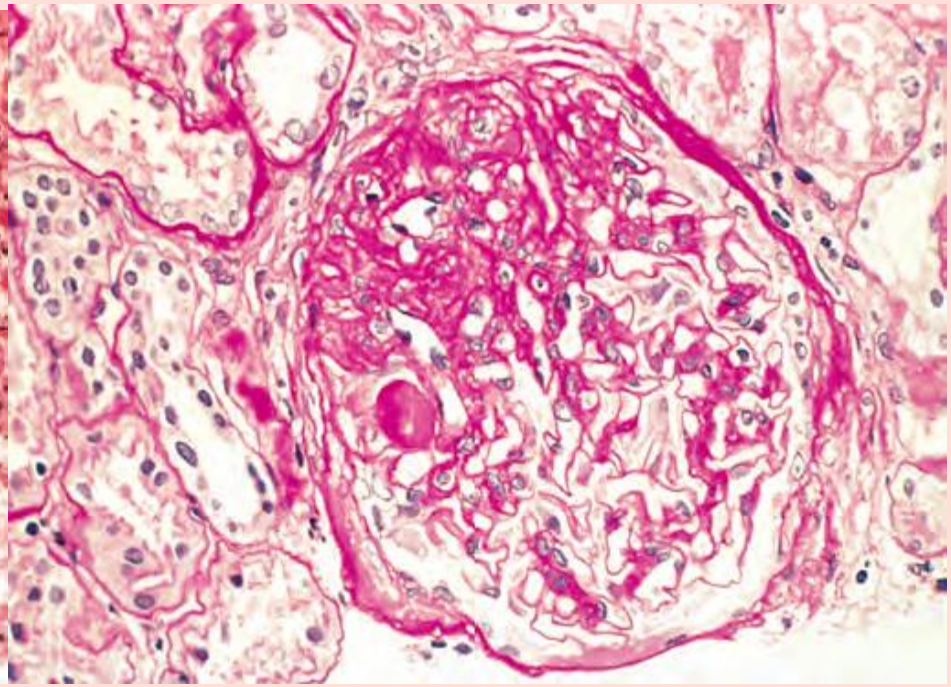
Immune Glomeruli

At the same time appear in LM

- Collapsing glomerulopathy- FSGS morphologic variant
  - Collapse glomerular tuft & epithelial cell hyperplasia.
  - severe form with worse prognosis
  - Can be: idiopathic, ass/with HIV infection, or drug-induced toxicities

FSGS - Morphology

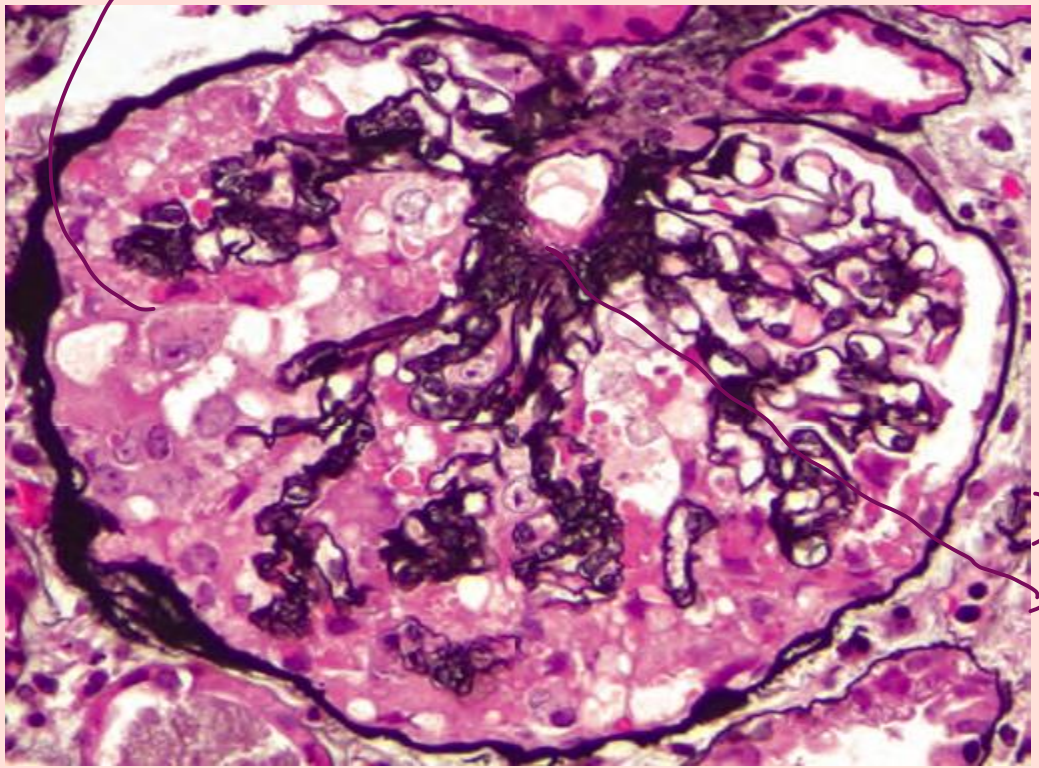




hyperplasia parietal cell epithelium

FSGS - Morphology

poor prognosis
poor Response To Steroid



stem like → Capillary Lumen is blocked

Collapsing glomerulopathy- FSGS morphologic variant

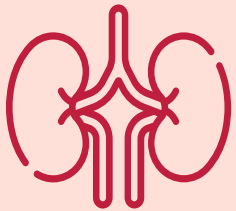
GBM :- (أفضل للمجهر)

MCD vs FSGS

It is important to distinguish FSGS from minimal-change disease, because the clinical courses &responses to therapy are markedly different.

	MCD	FSGS
Hematuria.	Absent	Present
Hypertension	Absent	Present
Proteinuria	Selective	nonselective
Response to corticosteroid	Excellent	Poor

Membranous Nephropathy



01 Chronic immune complex glomerulonephritis (immune complex)

- Antibodies reacting in situ to endogenous antigens
- Antibodies reacting in situ to planted glomerular antigens
  - medication
  - infection

02 75% of cases are Primary (أولية) (called idiopathic)

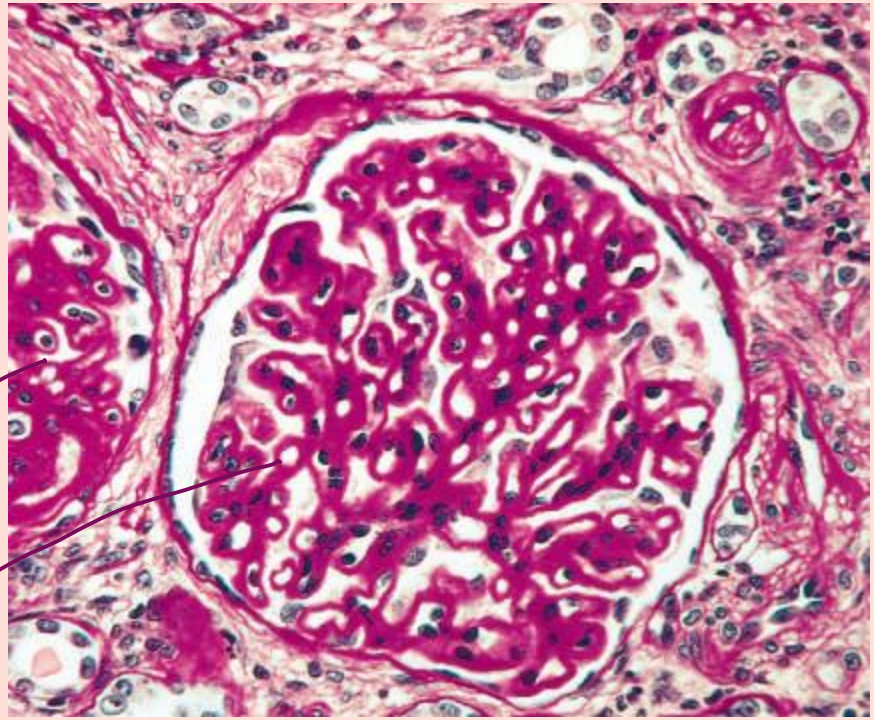
Antibodies against the podocyte antigen phospholipase A2 receptor (PLA2R)
(phospholipase)

03 Secondary (25% → less common)

- Infections: chronic HBV, malaria , syphilis
- Malignancies ; Ca. of lung & colon, melanoma
- Autoimmune diseases, particularly SLE
- Exposure to inorganic salts (gold, mercury)
- Drugs (penicillamine, captopril, NSAIDs).

Membranous Nephropathy - Morphology -LM

The main histologic feature is **diffuse thickening** of the capillary wall (GBM glomerular basement membrane)on routine H&E stains



No inflammatory cells just Diffuse thickning

* Thickness
* Diffuse
Capillary
involves
every where

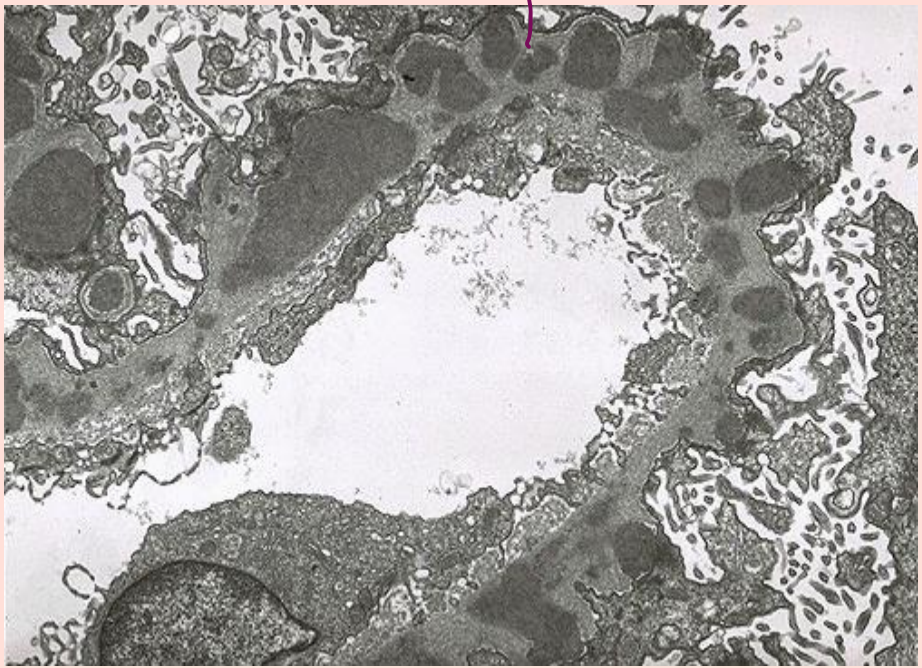
Membranous Nephropathy - Morphology - EM

EM reveals that thickening is caused by subepithelial deposits, which nestle against the GBM & are separated from each other by small, spike-like protrusions of GBM matrix that form in reaction to the deposits (spike & dome pattern)

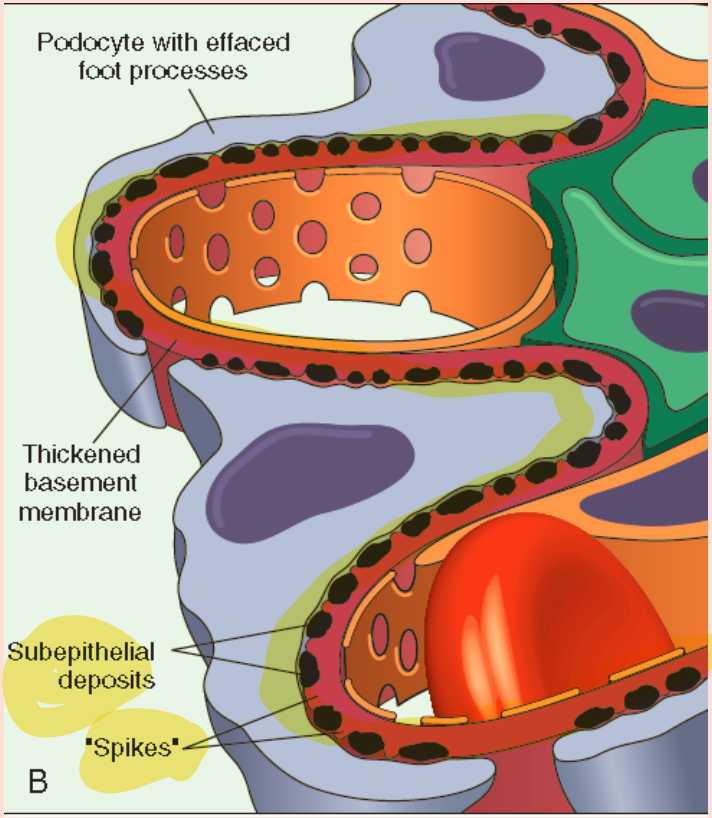
Basement Membrane

Dense Deposite in basmant membrane

Dense deposite subepithelium

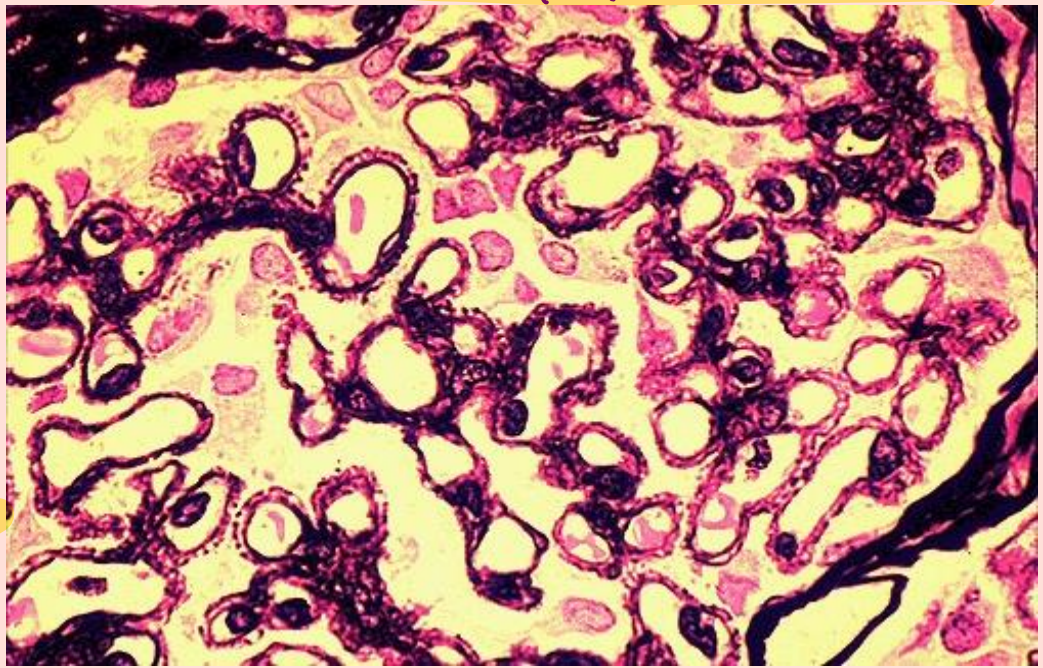


Membranous Nephropathy - Morphology -LM



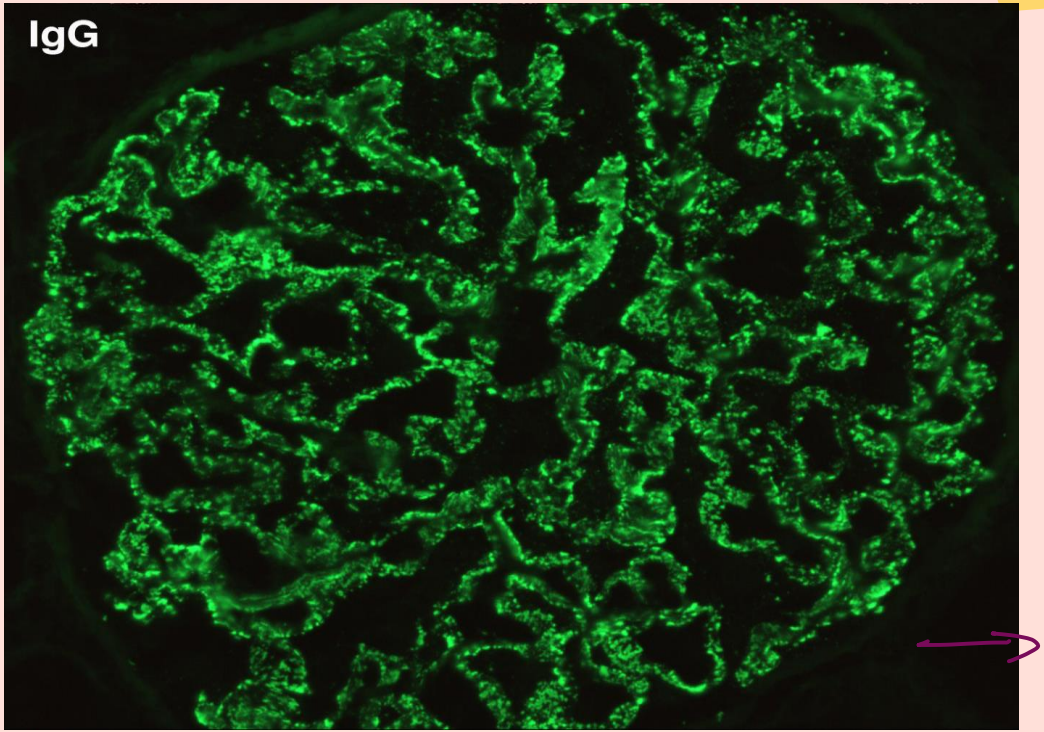
A silver stain (black) of the GBM → appears with characteristics spikes (projections in capillary loops)

↳ Reaction of basement membrane



Membranous Nephropathy - Morphology -IF

Antibody – Antigen process



IFmicroscopy demonstrates that the granular deposits contain both immunoglobulins & complement

Against IgG

→ Dome Deposition – granular pattern

Membranous Nephropathy -Clinical

- Sudden onset full-blown nephrotic syndrome
- In contrast to MCD, the proteinuria is nonselective
- Usually fails to respond to corticosteroid therapy
- Secondary causes should always be ruled out Although only 25%,
- Variable prognosis:
  - Proteinuria persists in > 60% of patients
  - ~ 40% progress to renal failure over 2 to 20 years.
  - 10-30% benign course → partial or complete remission of proteinuria.

Nephritic syndrome

- Often characterized by inflammation in the glomeruli; proliferation of the cells in glomeruli & leukocytic infiltrate.
- Inflammation causes injury in capillaries → permeable to RBCs & other contents → **hematuria**
- ↓↓ GFR + augmented Renin/aldosterone (fluid retention & ↑↑ plasma volume) → Hypertension
- The acute nephritic syndrome may be caused by primary glomerular diseases; postinfectious glomerulonephritis (GN) & various forms of crescentic GN, diffuse proliferative GN, IgA nephropathy or as a result of systemic disorders such as SLE

Membrano-proliferative Glomerulonephritis (MPGN)

01 **Best considered as a pattern of immune mediated injury rather than a specific disease;**

Alterations in the GBM & mesangium, & proliferation of glomerular cells.

Presentation 02

[healing] nephrotic تدريجية ← nephritic بالبداية

50% of cases → nephrotic syndrome.
It may begin as acute nephritis or as mild proteinuria

03 **MPGN type I**

80% of cases.
Immune complex activate both classical & alternative complement pathways.
↳ C3

الصفات المترسبة بـ [IgG, IgA, C3, C4]

Dense Deposit Disease 04

Formly MPGN type II. ✗ تغير اسمه
Excessive complement activation

MPGN - Pathogenesis

Type I

- The antigens Mostly are proteins derived from infectious agents e.g., hepatitis C & B viruses;

1. "planted" antigens: after first binding to or becoming trapped within glomerular structures.
2. Contained in preformed immune complexes deposited from the circulation.

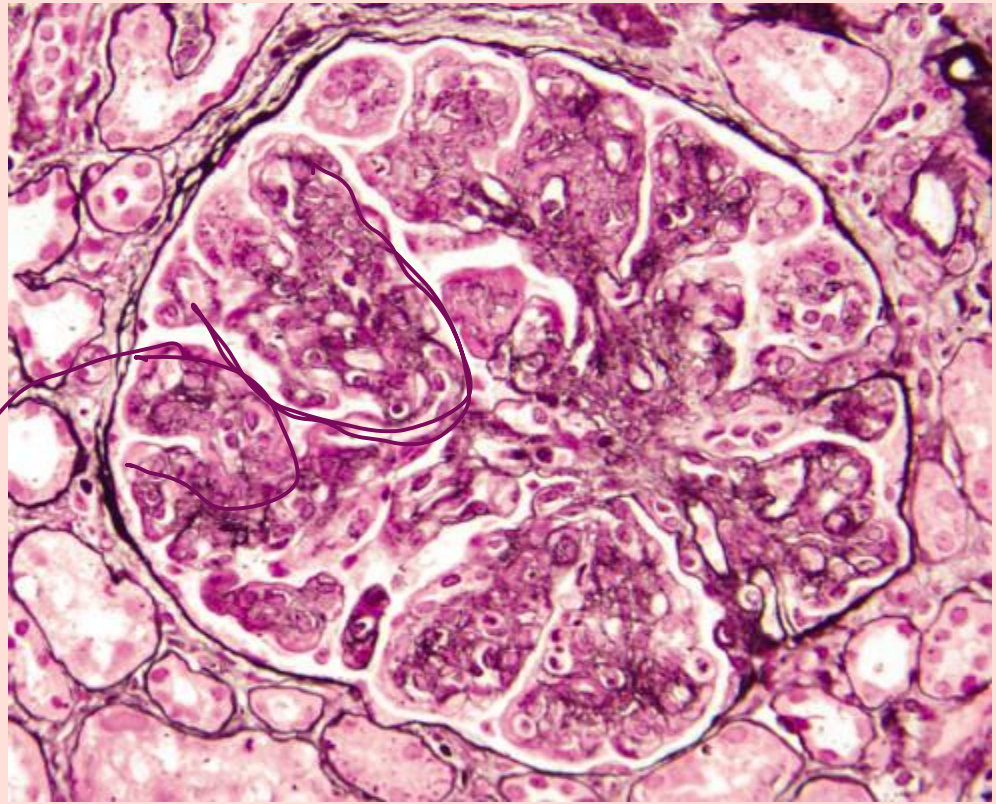
Dense Deposit Disease

- **Complement dysregulation**
- Autoantibody against C3 convertase (called C3 nephritic factor)
- Ab It stabilizes the enzyme → uncontrolled cleavage of C3 & activation of the alternative complement pathway

MPGN- Morphology -LM

proliferation Mesangial // endothelial leukocytosis

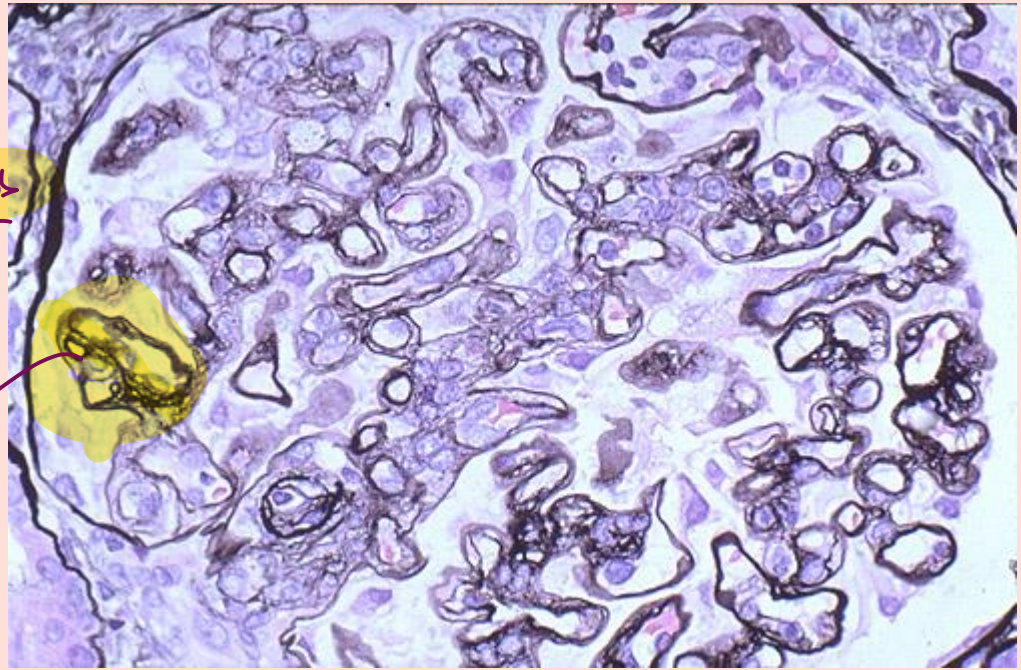
Glomeruli are large, have an accentuated **lobular** appearance; proliferation of mesangial & endothelial cells as well as infiltrating leukocytes, lymphocyte



* Very large Glomeruli
* proliferative
* lobular appearance

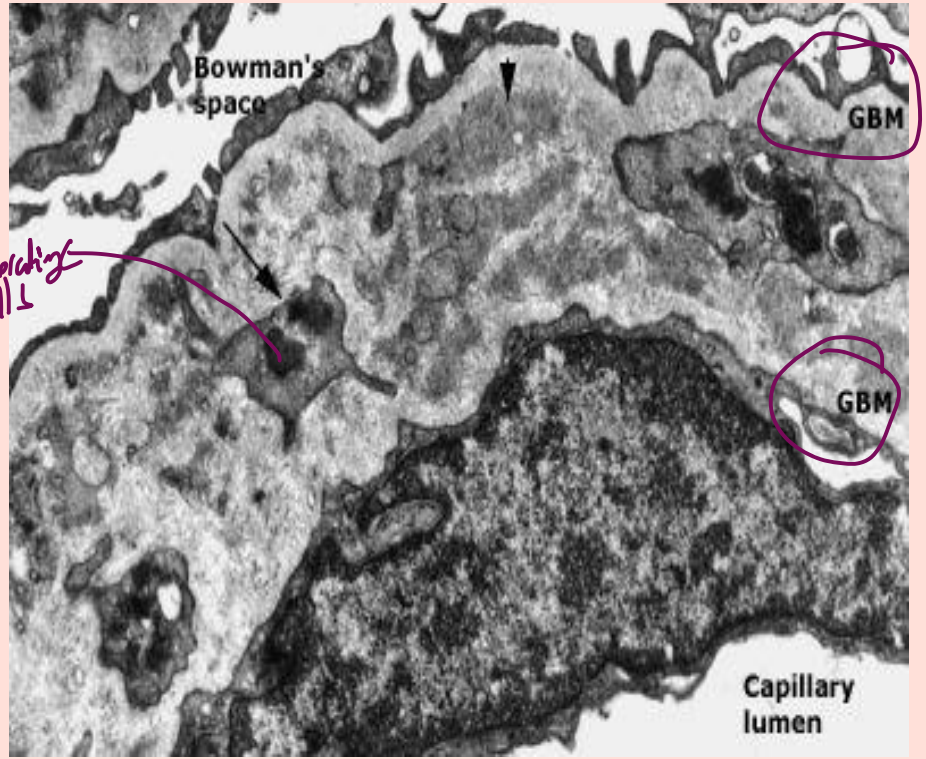
MPGN- Morphology -LM

The GBM is thickened, and the glomerular capillary wall often shows a **double contour**, or "**tram track**," appearance, especially evident with use of silver



MPGN I - Morphology -EM

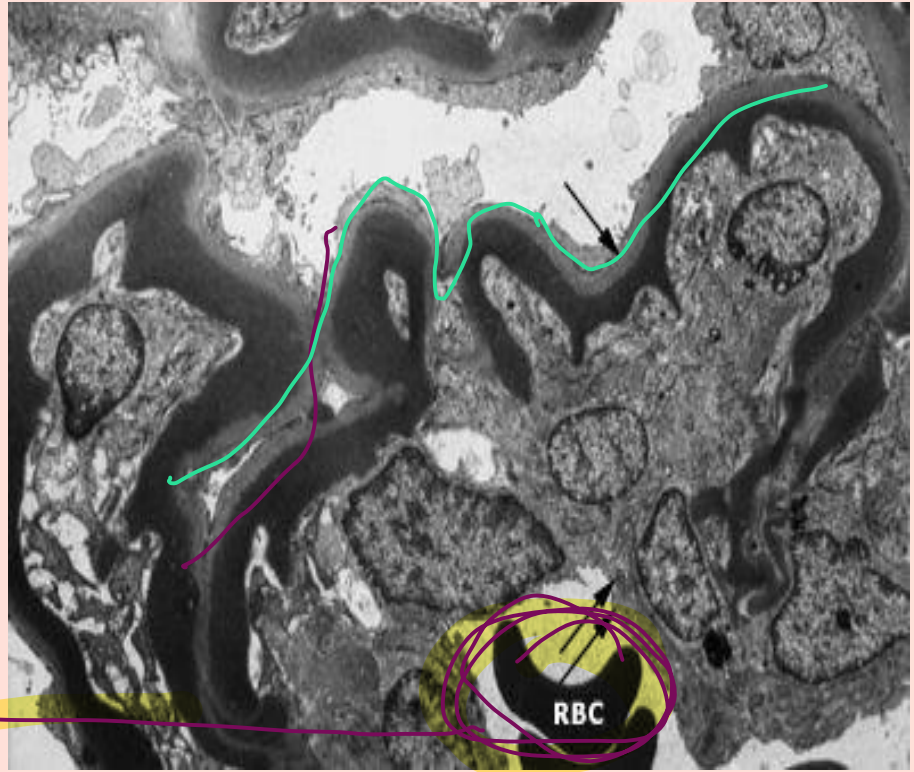
Marked thickening of the glomerular capillary wall by immune deposits (short arrow) & by interposition of mesangial cell processes (long arrow).



MPGN II/DDD - Morphology -EM

There are **dense** homogeneous deposits within the basement membrane. Ribbon-like appearance of subendothelial & intramembranous material

* Mediated By C3
* Disregulation Alternative pathway specifically C3



MPGN - IF

Type I

C3 is deposited in an irregular granular pattern, IgG and early complement components (C1q & C4)

Dense Deposit Disease

Only C3 is present in irregular foci in the GBM on either side but not within the dense deposits.

MPGN-Clinical

- The prognosis generally is poor.
- No complete remission;
- 40% progressed to renal failure End stage
- 30% had variable degrees of renal insufficiency, & the remaining 30% had persistent nephrotic syndrome without renal failure.

↑ Creatinin

Acute Postinfectious (Poststreptococcal) Glomerulonephritis

01 About the Disease

Glomerular deposition of immune complexes resulting in (1) proliferation of & damage to glomerular cells (2) infiltration of leukocytes, (esp. neutrophils)

02 Typically

develops in a child 1-4 weeks after he/she recovers from a group A streptococcal infection.

03 Association

Initial infection in pharynx or skin.

Classic pattern/most common → poststreptococcal GN. (but ass/w other organisms; viral or bacterial)

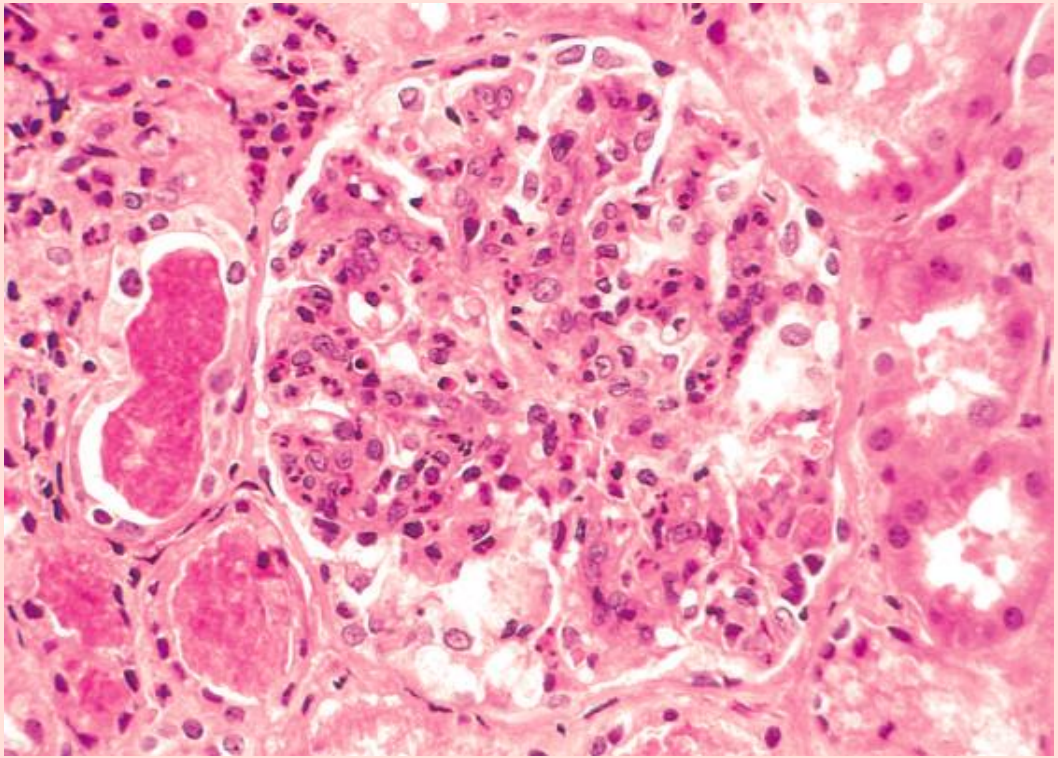
04 Pathogenesis

Immune complexes containing streptococcal antigens & specific antibodies formed in situ → activate complement system

Acute Postinfectious Glomerulonephritis

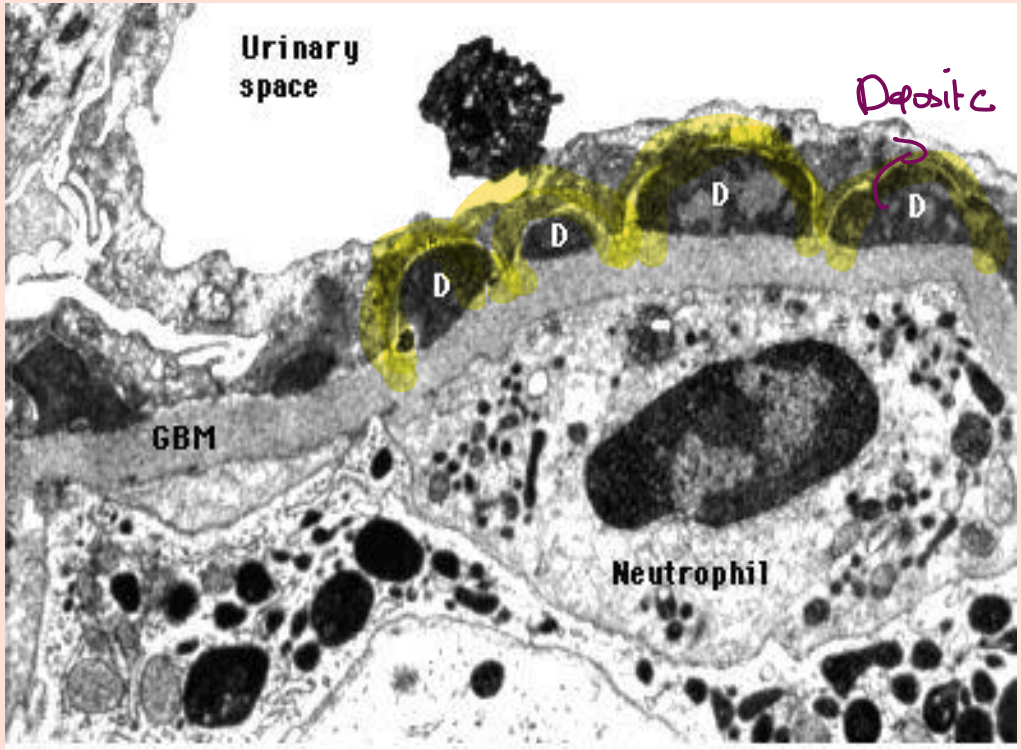
Morphology -LM

Most characteristic change → increased cellularity of all glomeruli (nearly all glomeruli) → caused by (1) proliferation & swelling of endothelial & mesangial cells (2)by infiltrating neutrophils & monocytes.



Acute Postinfectious Glomerulonephritis
Morphology — IF & EM

EM: shows deposited immune complexes as subepithelial "humps" (on the epithelial side of GBM)
IF: scattered granular deposits of IgG & complement within the capillary walls



Acute Postinfectious Glomerulonephritis

Clinical

- Most commonly present as acute nephritic syndrome
- Fever, nausea, gross hematuria, & mild proteinuria.
- Serum complement levels are low during the active phase of the disease.
- Serum anti–streptolysin O antibody titers are elevated in poststreptococcal cases.
- Recovery occurs in most children with poststreptococcal disease

IgA Nephropathy (Berger Disease)

indlont, Asymptomatic, vasculitis Glumoler

01 About the Disease

One of the most common causes of recurrent microscopic or gross hematuria. Usually affects children & young adults

02 Presentation

An episode of gross hematuria (within 1-2 days of a nonspecific URTI), hematuria lasts days & subsides, but it recurs periodically.

03 Association

Similar IgA deposits are present in a systemic disorder of children, Henoch-Schonlein purpura. Renal manifestations occur in one third of patients. (same deposition pattern as IgA nephropathy)

petechiae

04 Pathogenesis

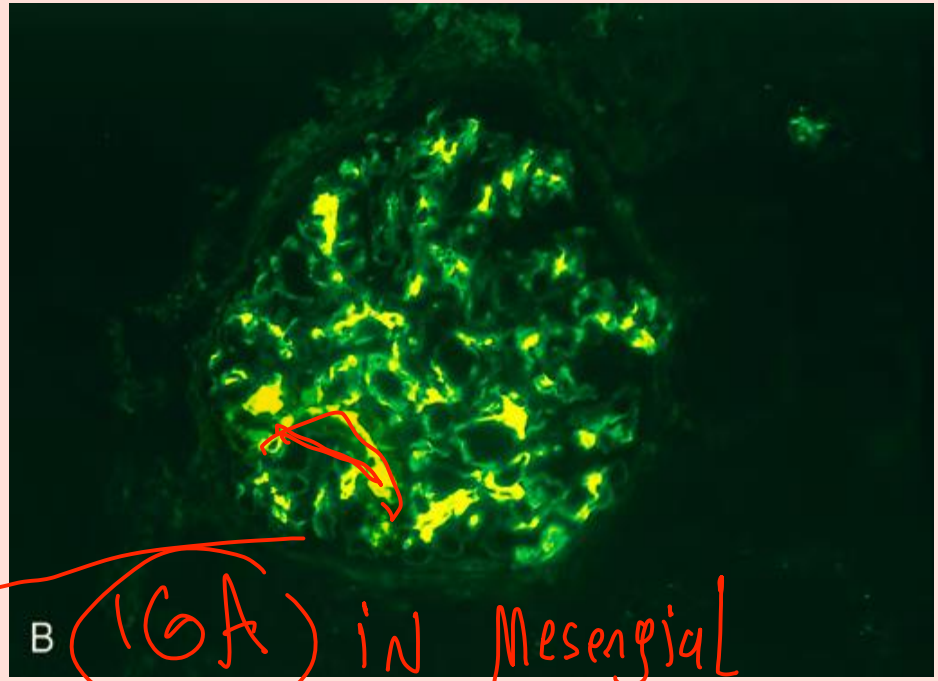
have genetic susceptibility + environment trigger

A genetically susceptible individual + URTI or GIT exposure to microbial or other antigens → ↑↑↑ IgA synthesis → deposition of IgA & immune complexes in the mesangium

skin + GI bleeding

IgA Nephropathy - Morphology

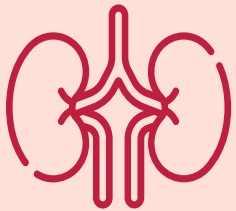
Different **LM** findings but whatever the histologic lesions, the pathognomonic feature by **IF** is the deposition of IgA and C3, in the mesangial region. (diagnostic)



Rapidly Progressive (Crescentic) Glomerulonephritis

chronic
The worst prognosis

JCD
in Microscopic Studies



01 It is a clinical syndrome & not a specific etiologic form of GN

- Rapid loss of renal function if untreated; (nephritic syndrome → oliguria→ renal failure) in weeks to months

02 Characterized by the presence of crescents (crescentic GN)

- Formed by : (1) proliferation of epithelial cells & (2) migration of monocytes/ macrophages into Bowman's space in response to injury

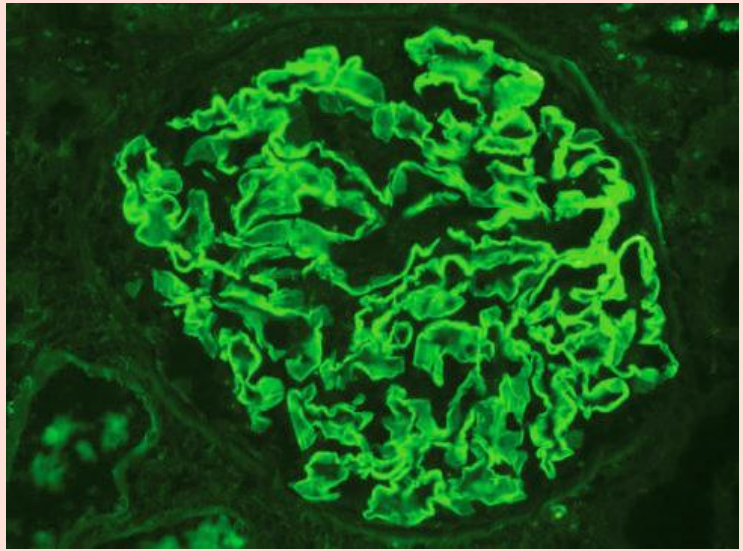
03 Associated with number of disease

- Anti-GBM antibody–mediated crescentic GN (Goodpasture disease)
- Any of the immune complex nephritides
- Pauci-immune RPGN Serum ANCA

RPGN — Goodpasture disease

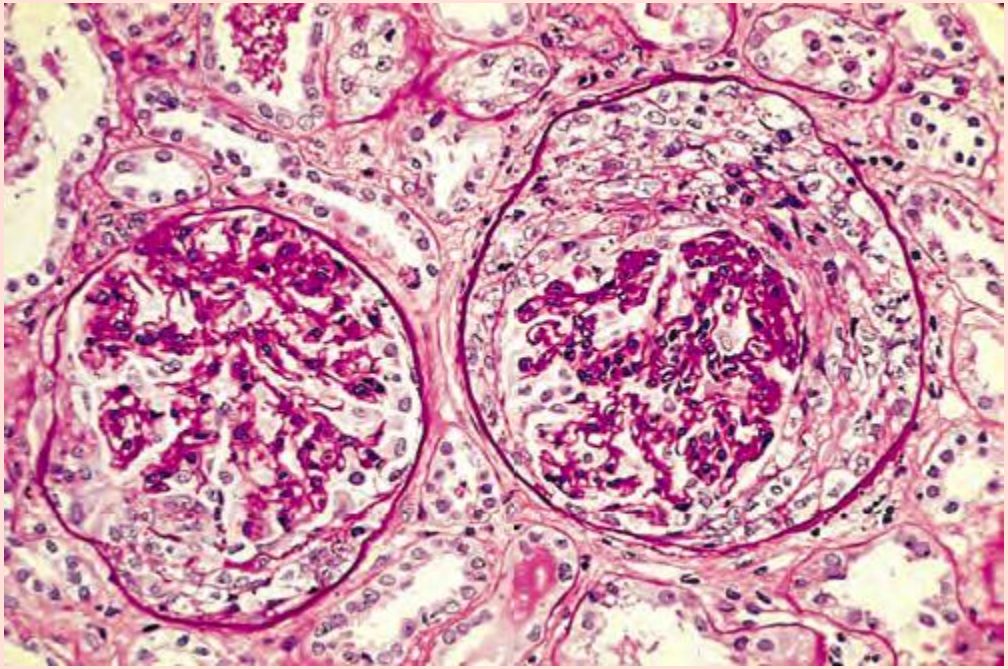
Anti-GBM antibody—mediated crescentic GN

- Characterized by linear deposits of IgG in GBM.
- In some patients, anti-GBM antibodies bind to pulmonary alveolar capillary BM to produce the clinical picture of pulmonary hemorrhages ass/w renal failure →Goodpasture syndrome.
- Anti-GBM Abs are in the serum → Diagnosis.
- It is important to recognize Goodpasture disease→ benefit from plasmapheresis
  →removes pathogenic antibodies from the circulation.



RPGN - Morphology - LM

Collapsed glomerular tufts and **crescent-shaped** mass of proliferating parietal epithelial cells & leukocytes internal to Bowman capsule

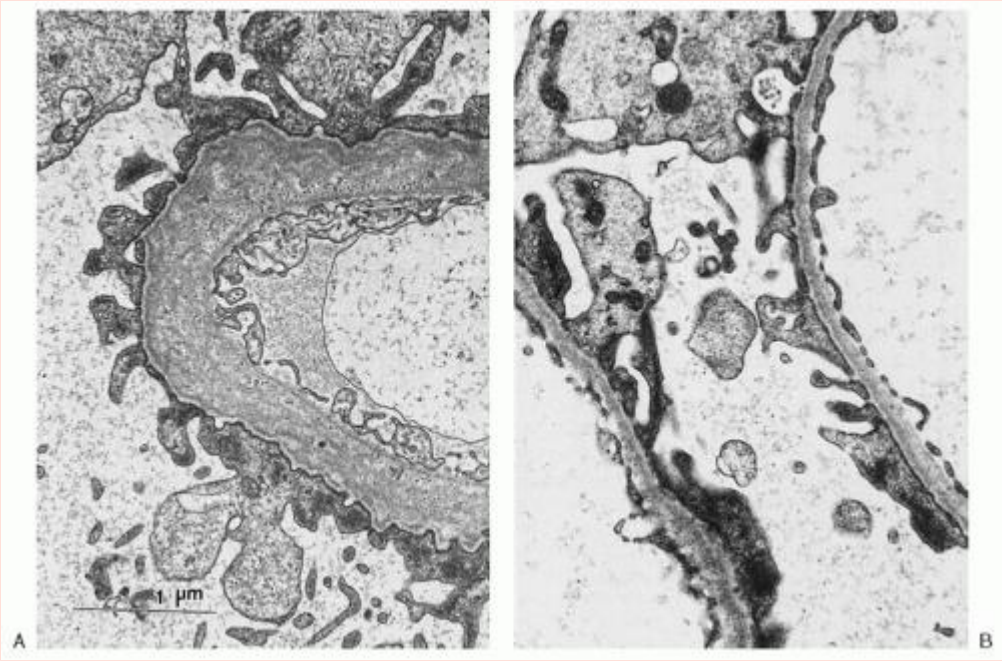


Hereditary Nephritis - Alport Syndrome

- **Hereditary nephritis:** a group of heterogeneous familial renal diseases ass/w mutations in collagen genes & manifest primarily with glomerular injury.
- **Alport syndrome** manifest by nephritis + sensorineural deafness + various eye disorders (lens dislocation, posterior cataracts, & corneal dystrophy)
- Inherited as an X-linked trait in ~ 85% of cases
- GBM is composed of type IV collagen, heterotrimers of α3, α4, & α5 type IV collagen. This form of type IV collagen is crucial for function of the lens, cochlea, & glomerulus.
- Mutation of any one of the α chains results in defective heterotrimer assembly → manifestations of Alport syndrome

Alport Syndrome — Morphology - EM

Early: GBM is thin & attenuated
Later: develops irregular foci of thickening, splitting and lamination, yielding a "**basket-weave**" appearance.



thank you!

Which of the following findings best distinguishes focal segmental glomerulosclerosis (FSGS) from minimal change disease (MCD)?

A. Selective proteinuria
B. Absence of hematuria
C. Foot process effacement on EM
D. Poor response to corticosteroids

Answer: D. Poor response to corticosteroids

---

2. The collapsing variant of FSGS is most strongly associated with which of the following conditions?

A. Hepatitis C
B. HIV infection
C. Diabetes mellitus
D. Post-streptococcal infection

Answer: B. HIV infection

---

3. In membranous nephropathy, the characteristic “spike and dome” appearance is seen on:

A. Light microscopy using H&E stain
B. Immunofluorescence microscopy
C. Electron microscopy and silver stain
D. Urine microscopy

Answer: C. Electron microscopy and silver stain

4. Which of the following is a common clinical presentation of membranous nephropathy?

A. Gross hematuria with flank pain
B. Acute nephritic syndrome with fever
C. Sudden onset of full-blown nephrotic syndrome
D. Oliguria and rising creatinine after pharyngitis

Answer: C. Sudden onset of full-blown nephrotic syndrome

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5. The presence of "tram-track" appearance on light microscopy is most characteristic of:

A. Minimal change disease
B. IgA nephropathy
C. MPGN type I
D. Post-infectious GN

Answer: C. MPGN type I

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6. A 10-year-old child presents with hematuria and edema 2 weeks after recovery from sore throat. Which of the following findings is most likely?

A. IgA deposition in mesangium
B. Anti-PLA2R antibodies in serum
C. Subepithelial "humps" on EM
D. Spike and dome pattern on silver stain

Answer: C. Subepithelial "humps" on EM

---

7. Which of the following is true about IgA nephropathy (Berger disease)?

A. It typically occurs weeks after a streptococcal infection
B. It shows granular IgG deposition on IF
C. It presents with nephrotic-range proteinuria
D. It may recur with each upper respiratory infection

Answer: D. It may recur with each upper respiratory infection

1. Which morphologic feature best correlates with nonselective proteinuria in FSGS?

A. Subepithelial immune complex deposition
B. Hyaline entrapment in sclerotic segments
C. Full-thickness GBM duplication
D. Mesangial proliferation

Answer: B. Hyaline entrapment in sclerotic segments

---

2. In membranous nephropathy, subepithelial immune complex deposits induce a reaction in the GBM resulting in which of the following patterns?

A. Double contour with mesangial interposition
B. Spike-like projections of GBM matrix
C. Linear deposition of IgG along GBM
D. Segmental sclerosis and hyaline deposition

Answer: B. Spike-like projections of GBM matrix

---

3. The failure of corticosteroid therapy in both FSGS and membranous nephropathy suggests that:

A. The disease is limited to mesangial involvement
B. The pathology is mostly immune-complex free
C. There is irreversible structural damage to glomeruli
D. There is minimal podocyte injury

Answer: C. There is irreversible structural damage to glomeruli

Which of the following best explains persistent proteinuria in MPGN type II (dense deposit disease)?

A. Formation of anti-PLA2R antibodies
B. Continuous deposition of immune complexes from circulation
C. Autoantibody stabilizing C3 convertase, leading to unregulated complement activation
D. Episodic mesangial IgA deposition

Answer: C. Autoantibody stabilizing C3 convertase, leading to unregulated complement activation

---

5. A renal biopsy in a child reveals increased glomerular cellularity, subepithelial humps on EM, and low complement levels. The most likely diagnosis is:

A. IgA nephropathy
B. Membranous nephropathy
C. Postinfectious glomerulonephritis
D. FSGS

Answer: C. Postinfectious glomerulonephritis