

Glomerular Diseases


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True case

- Mom says to Dad at dinner table that their 5 yo daughter had puffy eyes that morning
- Dad says “she’s tired” and needs to go to bed earlier
- Next evening, same conversation
- Following morning, mom calls dad at work to say their daughter has edematous ankles





What do the kidneys do?

- Excrete impurities
- Prevent loss of blood proteins and cells



What happens when proteins are lost in the urine?

Increased glomerular Permeability to proteins → Albuminuria → Hypoalbuminemia → Decreased Plasma Oncotic Pressure → Edema



True story, more


- Sees pediatrician
- Confirms edema
- Urinalysis, 4+ protein, otherwise negative
- Cholesterol, 518 mg/dl



What are the sequelae of proteinuria?

Increased glomerular Permeability to proteins → Albuminuria → Hypoalbuminemia → Decreased Plasma Oncotic Pressure → Edema

Albuminuria → Stimulation of Hepatic Albumin Synthesis → Stimulation of Hepatic Cholesterol Synthesis → Hypercholesterolemia



What are the sequelae of proteinuria?

Nephrotic Syndrome

Can be substantial > 3.5 gm/d

Hypoalbuminemia

Edema

Hypercholesterolemia

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    graph TD
      A[Can be substantial > 3.5 gm/d] --> B[Hypoalbuminemia]
      B --> C[Edema]
      B --> D[Hypercholesterolemia]
  
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What are other sequelae of proteinuria?

Increased glomerular Permeability to proteins

Albuminuria

Loss of other proteins

IgG

Increased susceptibility To Infections

Anticoagulant proteins (AT III, Protein S, Protein C)

Increased risk of Venous Thrombosis

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    graph TD
      A[Increased glomerular Permeability to proteins] --> B[Albuminuria]
      A --> C[Loss of other proteins]
      C --> D[IgG]
      C --> E[Anticoagulant proteins AT III, Protein S, Protein C]
      D --> F[Increased susceptibility To Infections]
      E --> G[Increased risk of Venous Thrombosis]
  
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What are the most common causes of proteinuria?

- Primary – disease limited to kidney
 - Children
 - Minimal change disease
 - Adults
 - Membranous glomerulonephritis – Caucasian adults
 - Focal segmental glomerulosclerosis – AA adults
 - IgA nephropathy – young adults

What are the common causes of proteinuria?

- Secondary – component of systemic disease
 - Diabetes mellitus
 - Lupus nephritis – SLE
 - Cancer - Membranous glomerulonephritis
 - Hepatitis C - Membranoproliferative GN

What do the kidneys do?

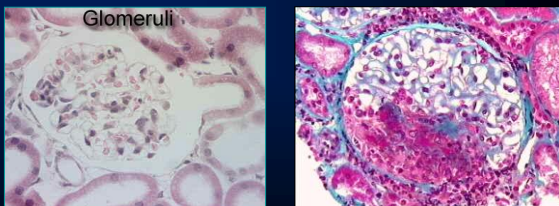
- Excrete impurities
- Prevent loss of blood proteins and cells

Glomerular RBC loss

- “Nephritic syndrome”

Dysmorphic (crenated) RBC

Crescentic glomerulonephritis



Glomerulonephritis

- May be slowly or rapidly progressive
 - Rapidly progressive glomerulonephritis (RPGN)
 - Can be irreversible if treatment delayed

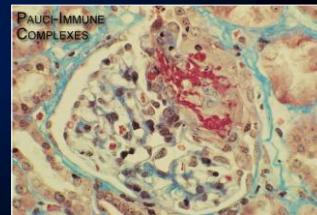
Causes of RPGN

- Antibody mediated
 - Anti-GBM disease
 - Goodpasture's disease



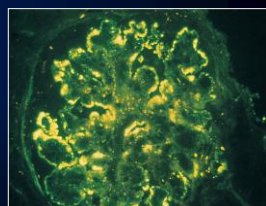
Causes of RPGN

- Pauci-immune (cell-mediated)
 - ANCA-related disease
 - PAN
 - Wegener's granulomatosis



Causes of RPGN

- Immune-complex deposition
 - SLE
 - Endocarditis
 - Post-infectious or post-streptococcal GN

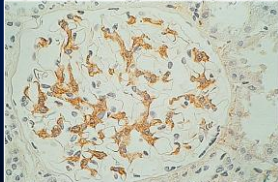


"Chronic" glomerulonephritis

- Young adults
 - IgA nephropathy
 - Can be slowly progressive
 - ESRD in 20% in 20 years
- Hepatitis C – membranoproliferative GN
- SLE and lupus nephritis

World Health Organization (WHO) Lupus nephritis classification

Class	Histology
1	Minimal changes



Normal by light microscopy

World Health Organization (WHO) Lupus nephritis classification

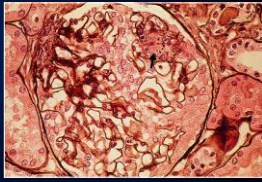
Class	Histology
1	Minimal changes
2	Mesangial disease



Mesangial expansion by light microscopy

World Health Organization (WHO) Lupus nephritis classification


Class	Histology
1	Minimal changes
2	Mesangial disease
3	Focal proliferative



Focal necrosis (arrow) and cellular proliferation on light microscopy

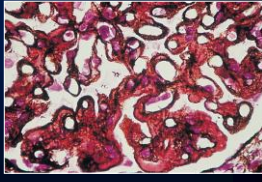
World Health Organization (WHO) Lupus nephritis classification

Class	Histology
1	Minimal changes
2	Mesangial disease
3	Focal proliferative
4	Diffuse proliferative



World Health Organization (WHO) Lupus nephritis classification

Class	Histology
1	Minimal changes
2	Mesangial disease
3	Focal proliferative
4	Diffuse proliferative
5	Membranous



Glomerular disease

- Leads to nephrotic syndrome and/or chronic kidney disease
- Treatment depends on underlying cause