Nephrotic Syndrome

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July 2024

Disclosures

- Nothing to declare

Objectives

- Know how to approach a child with edema
- Focused history
- Focused PE
- Focused labs/imaging
- Focused management

Case presentation

- A 6 year old child was brought to the clinic because of periorbital swelling of one week duration. He was treated by a relative ENT doctor with antihistamines without benefit

On PE

Normal BP

Had pitting pretibial edema

Mild scrotal swelling

Nephrotic syndrome

- With permission from family

Approach to edema

- First Question : Is it allergy or kidney problem or else

  Check urinalysis-> Abnormal-> it is not allergy

- Next Question

  Is it Acute Glomerulonephritis OR Nephrotic syndrome OR else

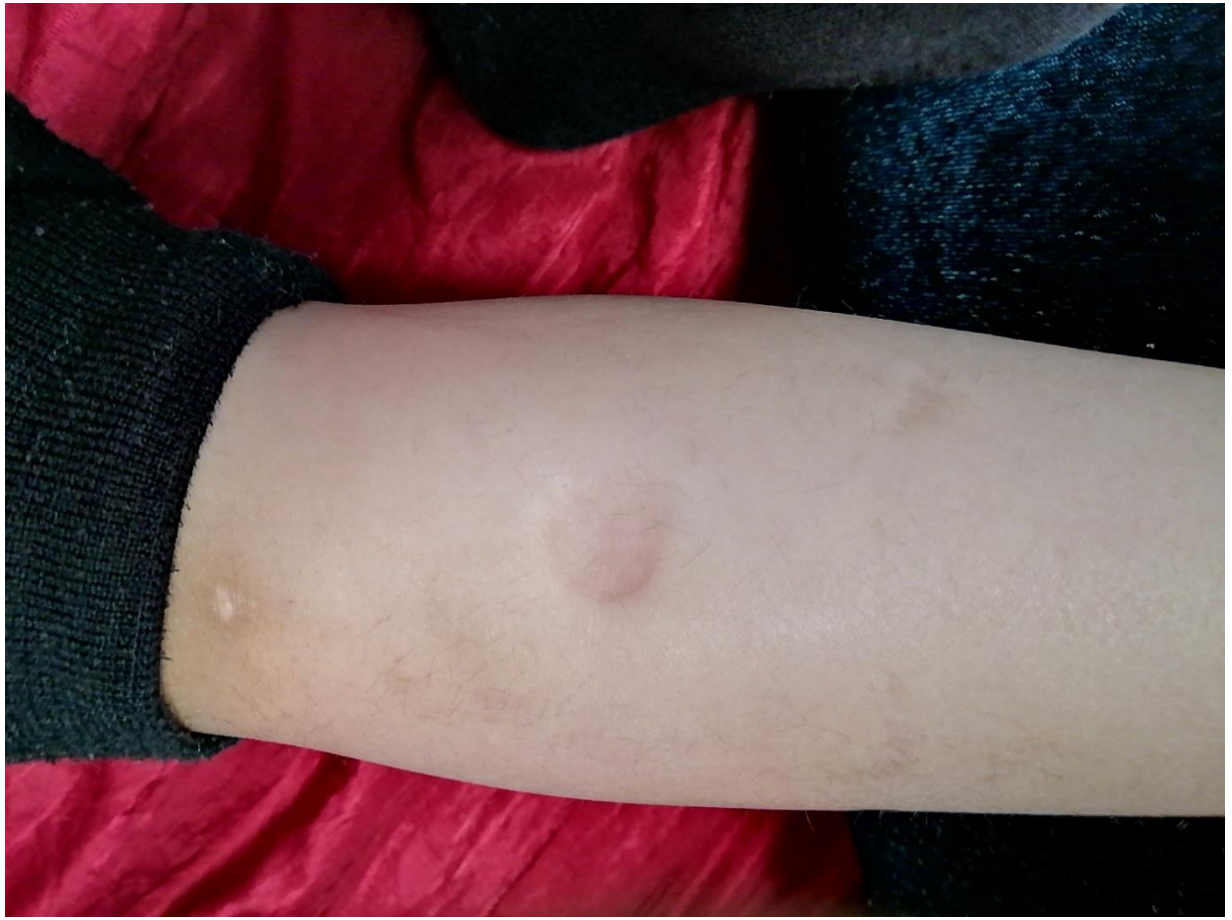
Physical exam

- **New case**
- Ht percentiles , wt percentiles, BP[high vs Orthostatic hypotension]
- Look for peripheral edema +/- ascites/ scrotal swelling
- Ears-soft with loss of protein
- Nails- horizontal hypoalbuminemic lines with each relapse
- Check for evidence of systemic disease eg rash
- **Known case in relapse**
- Look also for side effect of medication and complications of the disease

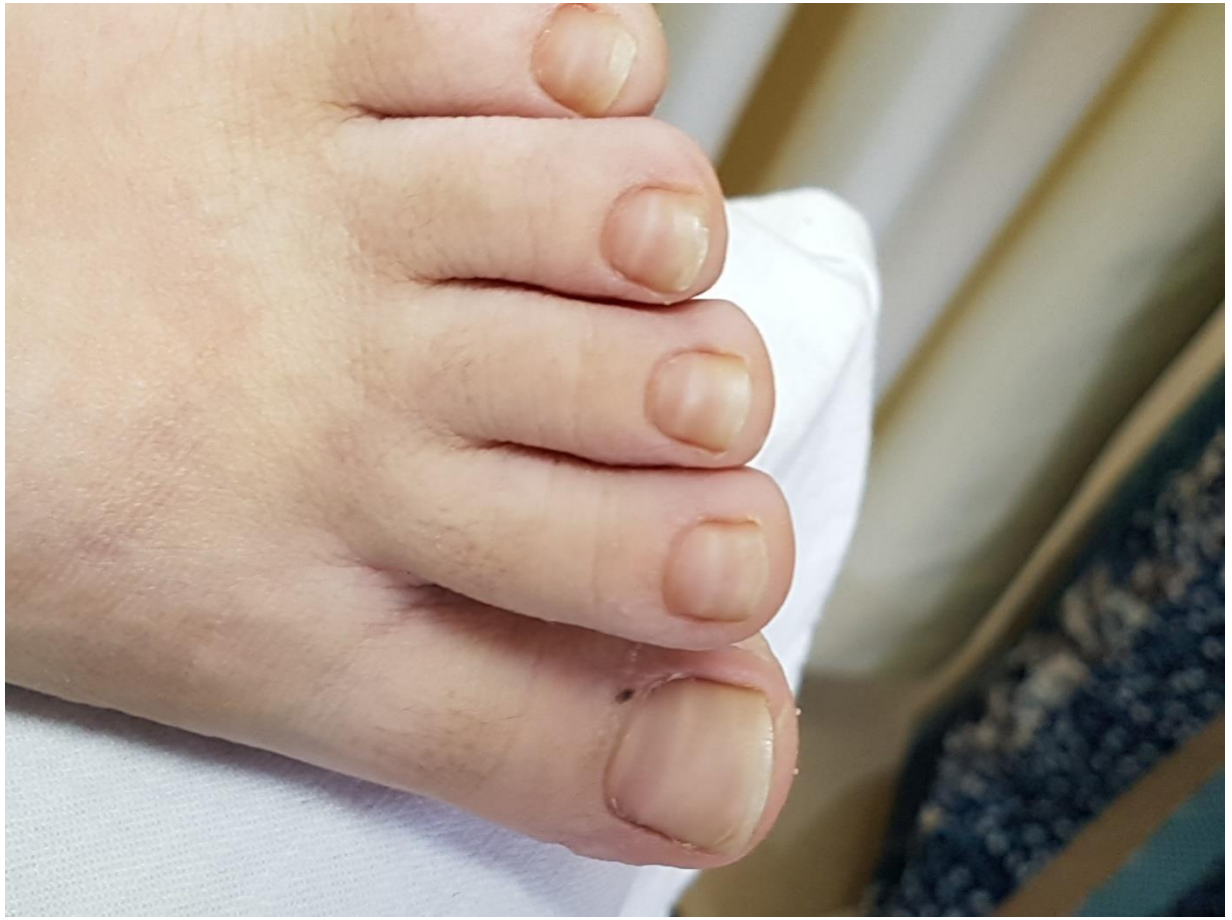
Clinical detection of edema

- One finger
- One place
- One minute

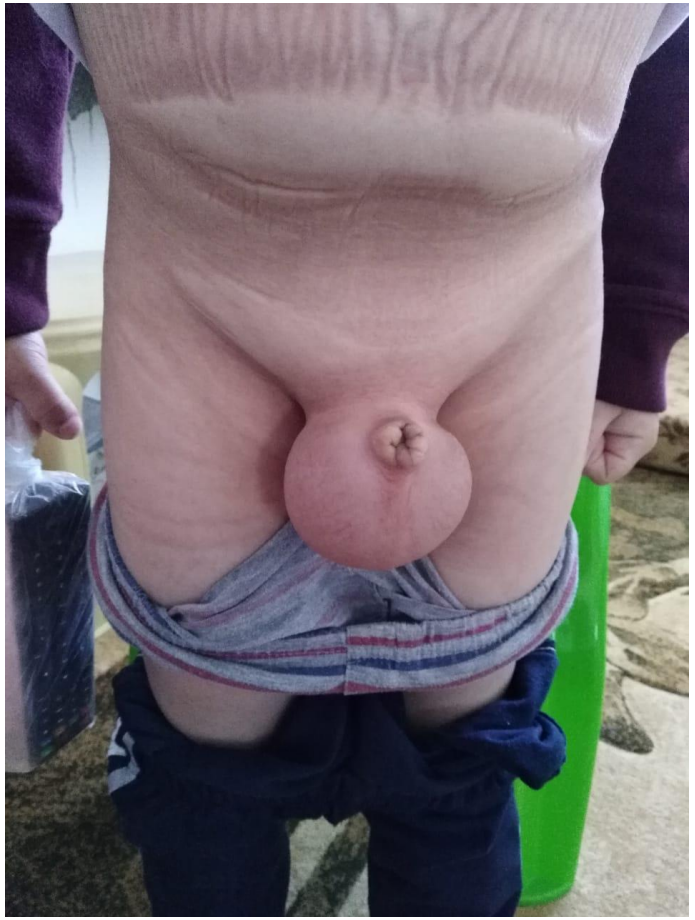
Physical exam- Pitting edema



Nails :Hypoalbuminemic lines



Scrotal edema



Labs

Urinalysis: showed +4 protein; no RBC; no WBC

C3, & ASOT normal

Differential diagnosis of edema

- Protein loss: renal, GI
- Hepatic Injury
- Protein Malnutrition
- Heart Failure
- Lymphedema
- Hypothyroidism
- Other causes: eg use of medications such as calcium channel products

Nephrotic Syndrome in Childhood

- Edema
- Heavy proteinuria(>50 mg/kgm/day OR > 40 mg/m^2/hour)
- Hypoalbuminemia(<2.5 gm%)

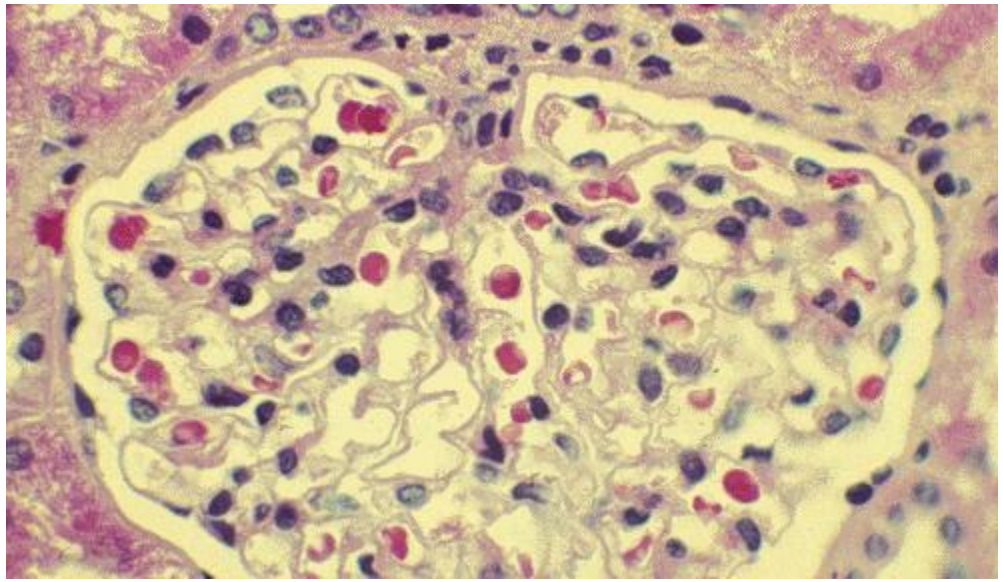
- Hyperchlesterolemia

Nephrotic Syndrome

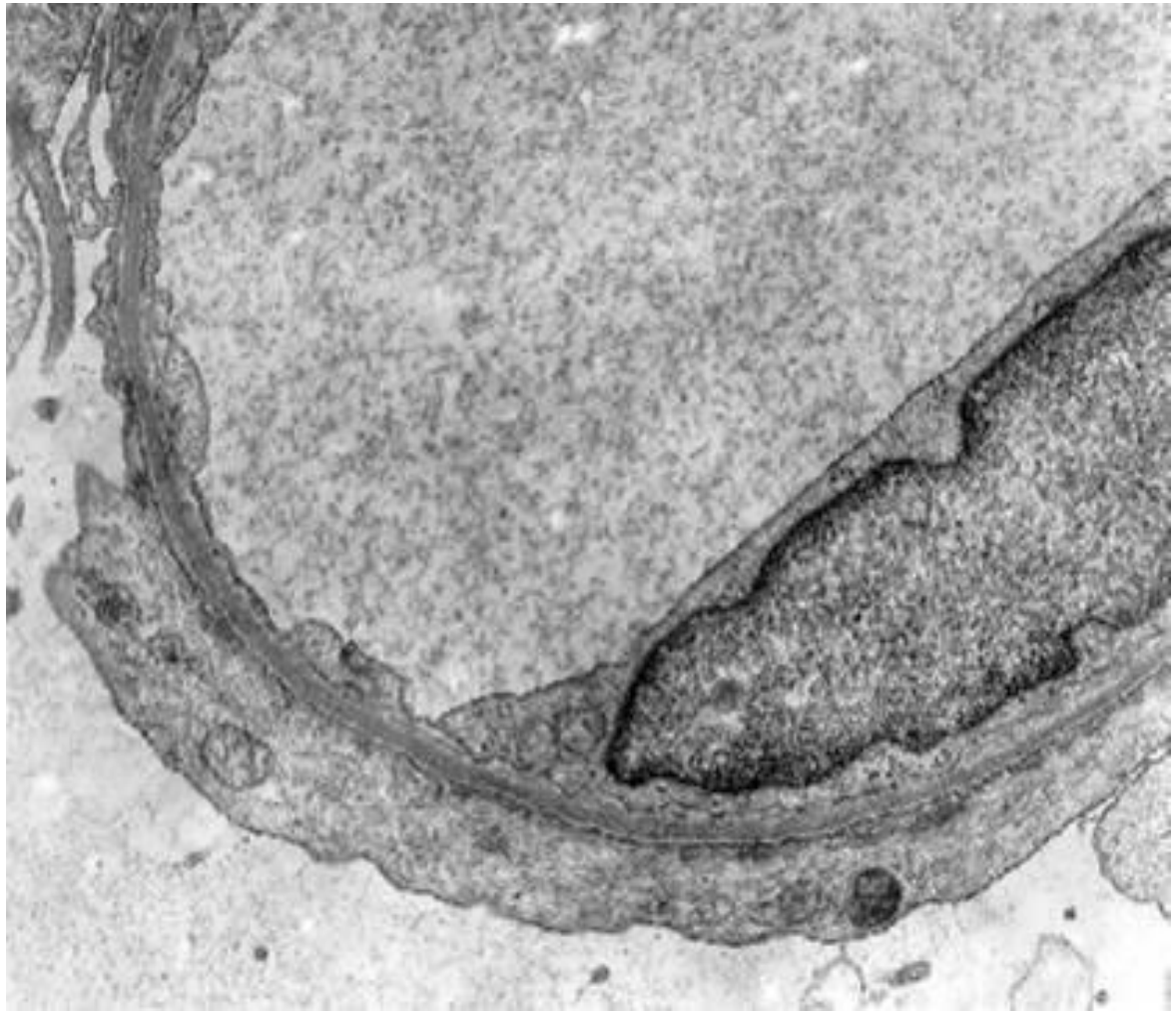
- **Primary**

- MCNS(>85% of cases) in children
- Focal Segmental Glomerulosclerosis(FSGS)
- Mesangial proliferative glomerulopathy
- Mesangiocapillary glomerulopathy
- Membranous Nephropathy

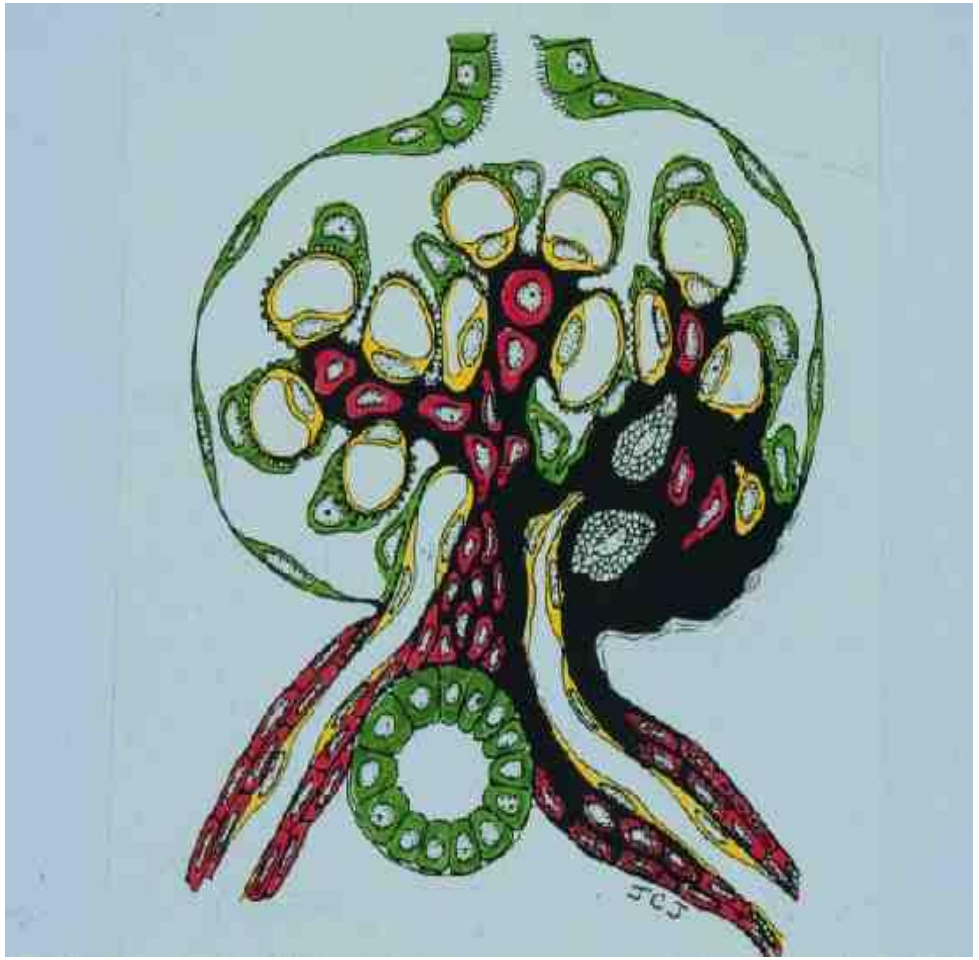
Minimal Change Glomerulopathy



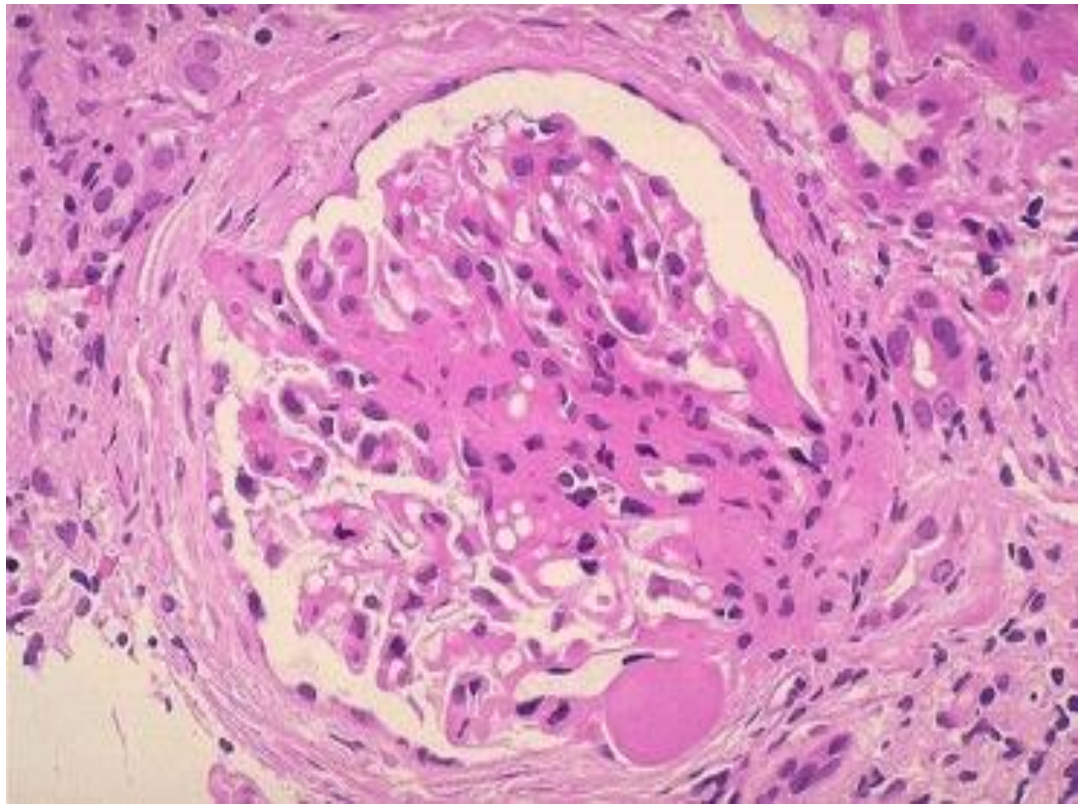
Effacement of visceral epithelial foot processes - MCD



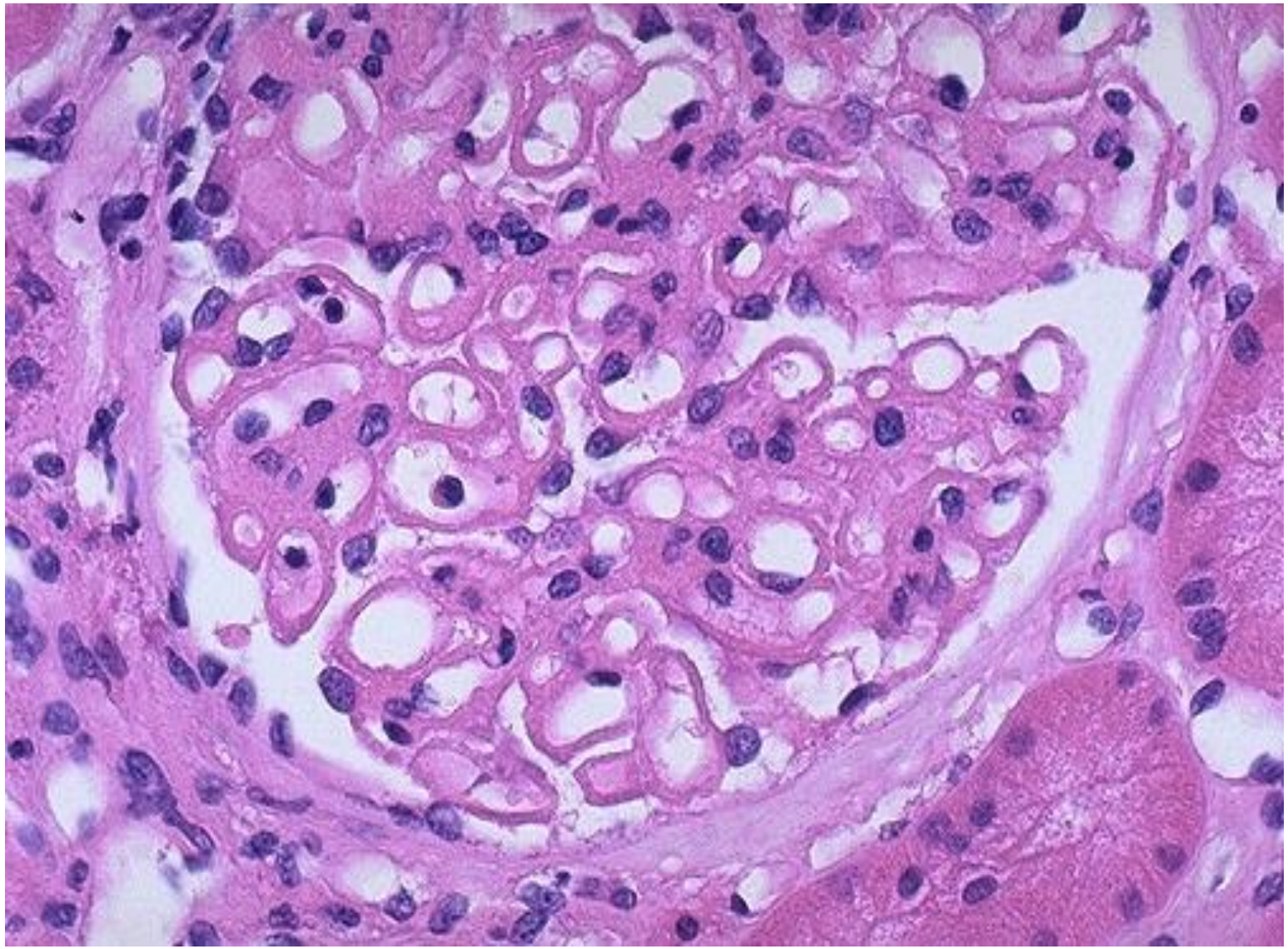
Focal Segmental Glomerulosclerosis



FSGS



Membranous Nephropathy



Nephrotic Syndrome

- **Secondary**

- Infections- Hep B, C, HIV, Malaria
- Miscellan: SLE,FMF, IgA vasculitis(HSP), Sickle cell disease
- Drug induced: NSAIDS, Penicillamine

Primary Nephrotic Syndrome

- Incidence: 1.8-16.9/100 000 children
- Hodson E et al, Ped Kidney Dis 2023

- Prevalence : 12-16/100 000

Primary NS

Boys : girls = 2 : 1

Most common between 1-12 years

Peak age = 2 ~ 6 yr

Initial episode & subsequent relapses : follow a viral URTI

Nephrotic Syndrome

- Minimal Change Disease

Spot Urine protein/creatinine ratio

- Normal: < 0.2 in child > 2 years; < 0.5 in child 6 months to 24 months)
- Microalbuminuria : 30-300 mg alb/gm creatinine
- Proteinuria: spot Urine prot/creat ratio 0.2 to 2
- Nephrotic syndrome: spot Urine prot/creat ratio> 2

Mechanism of edema in NS

- **Underfill Hypothesis**
- **Overfill Hypothesis**

Mechanism of edema in NS

- **Underfill mechanism**
- Weakness, pallor, cool extremities, tachycardia, orthostatic hypotension,abdominal pain, delayed capillary refil
- Oliguria, FENa<0.2%
- UK/UK+Na>60%
- Very low serum albumin<2 gm%
- eGFR= >75 ml/min/1.73m^2
- High circulating renin, aldosterone
- Kallash et al Ped Nephrol 2020
- Matsumoto et al 2011

Mechanism of edema in NS

- **Overfill Mechanism**
- (caused by primary sodium retention)
- Normal or increased BP without tachycardia or orthostatic hypotention
- FENa>0.2-0.5%
- UK/UK+Na<60%
- Low serum albumin but >2 gm/dL
- eGFR<75 ml/min/1.73 m^2
- Decreased circulating renin,aldosterone

Management of NS

- Non pharmacologic: low salt diet. No fluid restriction except if ARF or serum sodium < 125 mEq/L
- Pharmacologic:
- Steroids
- Others:
- Immunomodulators: Levamisole
- Steroid sparing: immunosupressives: Cyclosporin, Tacrolimus, Mycophenolate
- Also vitamin D + calcium

Non pharmacological:

Monitor : urine output, weight, BP, HR, capillary refill, electrolytes, kidney function

Fluids: restrict only if serum sodium < 125 or has ARF on top

Protein: Normal daily allowance

Sodium: restrict even when in remission

Fat : restrict fatty food

Steroids

- Prednisone :
- First episode: 2 mg/kgm/day or 60 mg/m^2/day x 4 weeks the 40 mg/m^2/day EOD in a single morning dose x 4 weeks then stop
- May use iv methylprednisolone instead of oral steroids at the begining
- <u>Response:</u>
- Steroid Sensitive
- Late Responder
- Steroid Resistant
- Frequent relapse
- Infrequent Relapser
- Steroid Dependent

Indications for albumin infusion

- Scrotal/labial edema
- Hypovolemia
- Severe anasarca /cellulitis

- Precautions : if volume status is unknown, careful with albumin
- infusion/diuretics

Indications for renal biopsy

- Atypical presenting features eg Nephrotic-Nephritic
- Age < 12 months >12 years
- Persistent hypertension or impaired renal function
- Gross Hematuria
- Low C3
- Hepatitis B or C positivity
- Steroid resistance

Major Complications from disease

- Infection
- Hypovolemia
- Hypercoagulable state

Safe doctor

- How to be a safe doctor when you assess a child with nephrotic syndrome?

- Identify Complications - Early

Infections in NS

- Peritonitis
- Cellulitis
- UTI

Hypovolemia in NS

- History: risk factors include diarrhea, vomiting, sepsis, injudicious use of diuretics or herbals
- Get generalized abdominal pain-> May present as Acute Abdomen

- PE: monitor capillary refil time, peripheral temperature, BP(orthostatic changes) pulse, wt

- Lab: increased Hgb, v low FE_{Na}

- Imaging

Hypercoagulability in NS

- Precipitants(hypovolemia, diuretics)
- Be on the lookout for it

Complications from steroids

- Growth
- Bone disease
- Posterior subcapsular cataract: need to check every 6 months-> Any suspicion-> Consult ophthalmologist

- etc

Immunizations

- For :
- Pneumococcus
- Varicella
- Influenza

Conclusions

- Cause of edema in a child resides in the history and PE

- In case of periorbital swelling, ask for a urinalysis before diagnosing allergy

Conclusions

- Thank you for listening