

# Nephrotic Syndrome

Kamal Akl MD

Professor of Pediatrics & Nephrology

Feb 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



# 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

# Nephrotic Syndrome in Childhood

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

# Nephrotic Syndrome

- **Primary**
  - MCNS(>85% of cases)
  - FSGS
    - Mesangial proliferative
    - Mesangiocapillary glomerulopathy
  - Membranous

# Nephrotic Syndrome

- **Secondary**
- Infections- Hep B, C, HIV, Malaria
- Miscellan: SLE, 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

# Nephrotic Syndrome

- Most common between 1-12 years is 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 prot/creat ratio 0.2 to 2
- Nephrotic syndrome: spot 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 refill
- Oliguria,  $\text{FENa} < 0.2\%$
- $\text{UK}/\text{UK} + \text{Na} > 60\%$
- Very low serum albumin  $< 2 \text{ gm}\%$
- $\text{eGFR} = > 75 \text{ ml}/\text{min}/1.73\text{m}^2$
- 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 hypotension
- $FENa > 0.2-0.5\%$
- $UK/UK+Na < 60\%$
- Low serum albumin but  $> 2$  gm/dL
- $eGFR < 75$  ml/min/1.73 m<sup>2</sup>
- 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: immunosuppressives: 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<sup>2</sup>/day x 4 weeks then 40 mg/m<sup>2</sup>/day EOD in a single morning dose x 4 weeks then stop
- May use iv methylprednisolone instead of oral steroids at the beginning
  
- 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
- 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?

# 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
- PE: monitor capillary refill time, peripheral temperature, BP( orthostatic changes) pulse, wt
- Lab: increased Hgb, v low FE<sub>Na</sub>
- Imaging

# Hypercoagulability in NS

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



# Complications from steroids

- Growth
- Bone disease
- Posterior subcapsular cataract
  
- 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