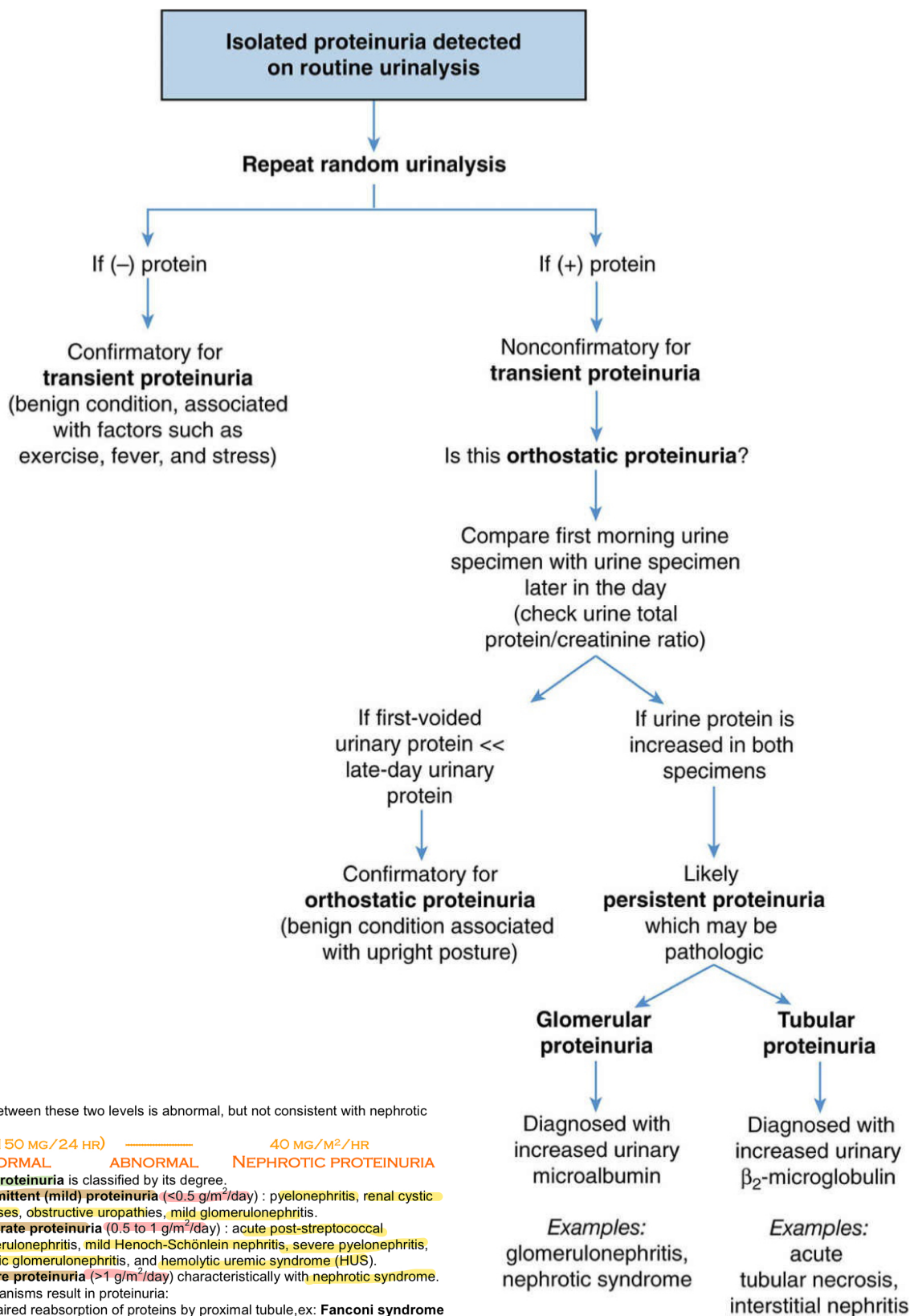


Proteinuria

III. Proteinuria

- A. While a small amount of protein is normally present in the urine, **proteinuria greater than 100 mg/m²/day** or an elevated urine total protein/creatinine ratio are considered pathologic.
- B. **Detection**
1. **Urinary dipstick** is the most frequently used method of screening for proteinuria and detects variable levels of **albuminuria**.
 - a. **False positives** may result if the urine is **very concentrated** (specific gravity > 1.025) or **alkaline** (pH ≥ 7.0), or if the patient has received **certain medications** (e.g., penicillin, aspirin, IV contrast imaging agents, oral hypoglycemic agents).
 - b. **False negatives** may result if the urine is **very dilute**.
 2. **Twenty-four-hour urinary protein collection** (normal is <100 mg/m²/day) **is the most accurate method of detecting proteinuria** but is very difficult to obtain in children. Instead, a **random spot urine total protein-to-creatinine ratio (TP/CR)** is usually performed. An early morning sample correlates well with 24-hour urinary protein excretion.
 - a. Normal urine TP/CR for infants of age 6–24 months is <0.5.
 - b. Normal urine TP/CR for children of age >2 years is <0.2.
- C. **Epidemiology.** Up to 10% of children have a single positive dipstick test for proteinuria at some point; however, <1% have persistent proteinuria on repeated dipstick evaluations.
- D. **Classification**
1. **Benign transient proteinuria.** Increased urinary protein excretion may sometimes be associated with **vigorous exercise**, **fever**, **dehydration**, and **congestive heart failure (CHF)**.
 2. **Orthostatic proteinuria**
 - a. Certain children and adults (especially athletic individuals) have increased urinary protein excretion **while upright but not while supine**.
 - b. Orthostatic proteinuria is usually a **benign condition**, and its confirmation eliminates the need for further workup.
 - c. The presence of orthostatic proteinuria is diagnosed with an **elevated** afternoon urine TP/CR and a **normal** first morning urine TP/CR.
 3. **Persistent pathologic proteinuria**
 - a. Persistent pathologic proteinuria may be associated with **significant renal disease** and is considered a marker for progression of renal disease.
 - b. Generally, **the greater the magnitude of the proteinuria, the more serious the renal disease**. The greatest amounts of proteinuria are seen in patients with **nephrotic syndrome** [see section VI].
 - c. Persistent pathologic proteinuria may have a **glomerular origin** or a **tubular origin**. Glomerular proteinuria is more common.
 1. **Glomerular proteinuria** is caused by increased permeability of the glomerular capillaries to large molecular weight proteins, as seen in **glomerulonephritis** [see section V] and in **minimal change nephrotic syndrome**.
 2. **Tubular proteinuria** results from **decreased reabsorption of low molecular weight proteins by the tubular epithelial cells**, or by the addition of **inflammatory proteins to the tubular urine**.
 - a. **Examples of tubular proteinuria** include interstitial nephritis, ischemic renal injury (acute tubular necrosis, acute kidney injury [AKI]), and tubular damage resulting from nephrotoxic drugs.
 - b. **Laboratory findings** include elevated levels of **urinary β₂-microglobulin**, a good marker for tubular proteinuria among others. This small molecule, which is freely filtered at the glomerulus, is normally almost completely reabsorbed by the tubular epithelial cells. Its presence therefore signifies tubular injury. **Glucosuria** and **aminoaciduria** may also accompany diffuse injury to the tubular epithelial cells.



- Proteinuria between these two levels is abnormal, but not consistent with nephrotic syndrome

4 MG/M²/HR (150 MG/24 HR) ————— 40 MG/M²/HR

NORMAL **ABNORMAL** **NEPHROTIC PROTEINURIA**

- Glomerular proteinuria** is classified by its degree.
 - Intermittent (mild) proteinuria** (<0.5 g/m²/day) : pyelonephritis, renal cystic diseases, obstructive uropathies, mild glomerulonephritis.
 - Moderate proteinuria** (0.5 to 1 g/m²/day) : acute post-streptococcal glomerulonephritis, mild Henoch-Schönlein nephritis, severe pyelonephritis, chronic glomerulonephritis, and hemolytic uremic syndrome (HUS).
 - Severe proteinuria** (>1 g/m²/day) characteristically with nephrotic syndrome.
- Several mechanisms result in proteinuria:
 - Impaired reabsorption of proteins by proximal tubule, ex: **Fanconi syndrome**
 - Drug or heavy metal exposure
 - Factors that increase glomerular permeability
 - physical damage
 - abnormal hemodynamics
 - hormone-mediated changes

NOTE:
Membranoproliferative GN:
A. TYPE I: Low C1, C4, C3-C9
B. TYPE II: Normal C1, C4, low C3-C9.

22



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

المحاضرة (2) مع الدكتور دباياسيه

→ nephrotic \$ → proteinuria ← hypodalbuminuria ←

Edema

History : onset : متى بدأت

course : بتخف / بتزيد / زوي ماضية

duration : كم الحما

in nephrotic \$ = puffiness of eyes [periorbital edema]

← إلا بتحليله الولد عينيه متنفخات at the morning بعد صبح

بتضاعف موجودة لكنه بتخف

و at the end of day بتزيد في gravity dependant area

pulmonary edema ← 2 cough عند

intestinal edema ← 2 diarrhea عند

other presentation of Edema

← complication تدهال edema :

→ convulsion, due to cerebral artery thrombosis

→ Fever, due to infection

→ pneumonia

→ cellulitis

→ peritonitis

→ affect renal system : oligouria

Epinephrin may cause proteinuria because he increase the intraglomerular pressure

hematuria 20%

frothy urine = proteinuria

DDx of Edema :

Bilateral

unilateral

- Congestive HR

- myxedema

- PNP. اساع. دساع

- lymphedema

- Liver dz

- Cellulitis

- Jaundice اساع. دساع

- DVT

- mal absorption chronic diarrhea wt loss

- rupture baker cyst

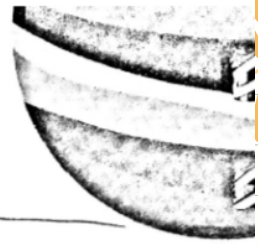
- mal nutrition (gaucher dz)

decreased of protein intake → associated with edema

* marasmus dz : decreased of protein and carbohydrate intake → Not associated with edema, associated with loss of subcutaneous tissue.



28



Burn

allergy

* From History pt with sudden onset of periorbital edema associated with gain^{wt}, There is no other systemic manifestation
∴ Nephrotic \$.

[2] physical examination:

vital : Bld pressure,

20% of Nephrotic associated with Nephritic
Fever; due to infection.

general examination :

Jaundice edema

Systemic examination :

heart : gallop rhythm

abdomin : Ascites

chest : basal lung crepitation.

* From examination pt has edema with no other manifestation

[3] Investigation :

12 Nephrotic signs to be investigated are as follows:

Nephrotic

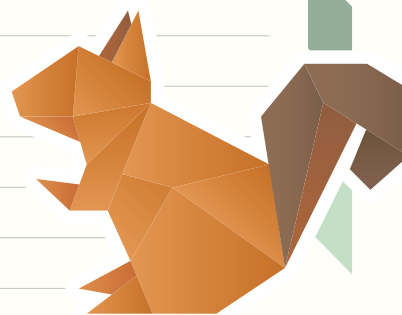
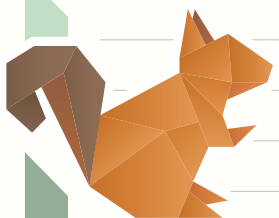
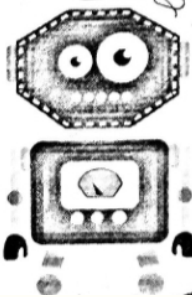
1. proteinuria

2. hypoalbuminuria

3. edema

4. hyperlipidemia

cholesterol > 250 mg/dl



24



★ Age group: 2-6 years ★



② minimal change: most common

pathophysiology = effacement of podocytes

protein in glomeruli protected by

- negative charge
- large size

proteins. بروتينات. pores. مسامير.

← hypoalbuminemia ← [proteinuria] ←

decrease in oncotic pressure → [shifting of fluid from

intravascular to extravascular] → activation of RAAS

that exacerbate the [edema].

? hyperlipidemia

① loss of lipase enzyme

② ↑ liver production of lipoprotein

? thrombosis

loss of anti-thrombin & protein C & S

? infection

loss of immunoglobulins

? thrombosis

① renal vein thrombosis

② cerebral artery

④ types of proteinuria:

Proteinuria

90% transient

Persistent 10%

due to stress event
[fever/exercise/exacerbation of CHF]

40% fixed
(في المصطفى الى ما)

orthostatic 60%
وهو واقف

يوم يوميه وبعينه

How diagnose?

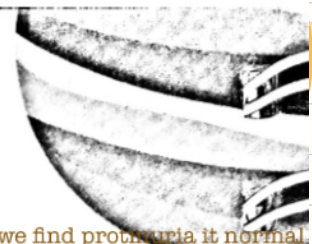
باخذ 3 عينات 1 3 1
وهو واقف اذا طلعوا
④ orthostatic proteinuria

without any clinical
manifestation

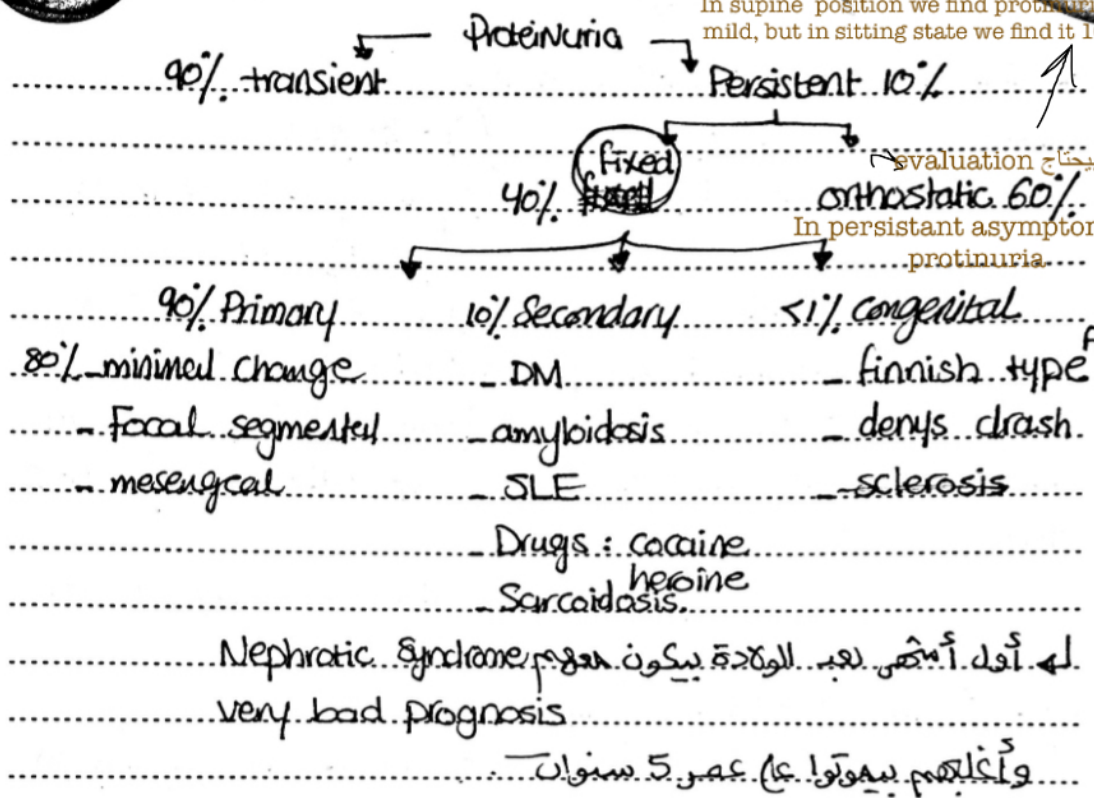
ISLAMIC

25

* mcc of proteinuria = transient.



In supine position we find proteinuria it normal mild, but in sitting state we find it 10 fold elevat



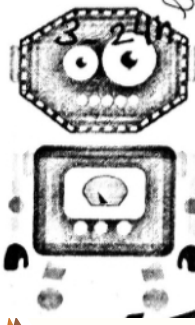
* How investigate proteinurea :

1. dipstick $\rightarrow$
 - +1 = 30 mg/dl
 - +2 = 100 mg/dl
 - +3 = 300 mg/dl
 - +4 = 1000 mg/dl

nephrotic range $\boxed{+3/+4}$

Non-nephrotic range

2- Pr/creat $\Rightarrow$ nephrotic range = > 2



collection $\rightarrow$ Surface area $\rightarrow$ $\frac{wt \times 4 + 7}{90 + wt}$

- Nephrotic range $> 40 \text{ mg } 1 \text{ m}^2 / \text{h}$

- non-nephrotic range $> 4 \text{ mg } 1 \text{ m}^2 / \text{h}$

* معادلة الـ surface area

$$\frac{wt \times 4 + 7}{90 + wt}$$

Urine analysis $> 150 \text{ mg/dL}$ = non-nephrotic range.

$> 300 \text{ mg/dL}$ = Nephrotic range.

hypoalbuminuria : شاذياً

hypoalbuminemia $< 2.5 \text{ gm/dL}$

DDx : 1. decrease intake : malnutrition

2. increase absorption : malabsorption

3. decrease synthesis : liver dz

4. increase uptake : renal dz
excretion.

[3] Investigation : نرجع ناسي لـ

1. urine analysis $\rightarrow$ proteinuria / hematuria

2. Serum $\rightarrow$ albumin / cholesterol

3. KFT $\rightarrow$ urea / creat

4. Complement = Normal [low complement $\rightarrow$ Kidney Biopsy]

5. Kidney Biopsy indications :

① minimal change at year < 1 year

② low complement > 8 year

③ picture of Nephritic $\rightarrow$ hematuria

④ steroid resistance $\rightarrow$ acute renal failure

⑤ HTN

لا نؤخر في أكثر من 95 / ٩٥ يومين

steroid : يجب الـ

[4] treatment :

$\rightarrow$ Curative $\rightarrow$ Symptomatic :

1st line steroid monitoring : wt / BP / UOP

edema $\rightarrow$ low salt

hypонатremia $\rightarrow$ low fluid

generalized edema = severe Anasarca $\rightarrow$ severe edema $\rightarrow$ albumin

pulmonary edema - HTN $\rightarrow$ CCB if acute.

ACEI if chronic.

والبحسن والأمانة والإخلاص ، والرحمة

ISLAMIC

① albumin dose = $0.5 - 1 \text{ gm/Kg}$
should followed by diuretics.

② steroid for < 2 weeks duration. No need for tapering.
induction : $60 \text{ mg/m}^2 / 24\text{h}$ 2 mg/Kg

Daily for 6 weeks.

maintenance : 40 mg/m^2 on alternative day. for 6 w

tapering : على أنشور

③ Steroid resistance =

أعطيت ستيرويد لطفلة 8 أسابيع وفتش استجابة

④ Steroid dependant =

مرجعوع الأعراض بعد أو خلال غياب العلاج

Proteinuria + symptom

مرجعوع الأعراض خلال الـ alternative day

خلال الـ 28 day بعد توقف الـ steroid

⑤ Steroid relapse = رجعت الأعراض بعد 28 يوم من التوقف

⑥ frequent relapse = أكثر من 4 مرات بالأسبوع

minimal change & mcc of primary Nephrotic &

100% Nephrotic No Nephritic

95% Steroid responsive

very good prognosis

more common in male

focal segmental : 90% Nephrotic 10% Nephritic

80% Steroid resistant

age group : 10/12 y.

⑦ Complication & infection, most commonly Streptococcal pneumonia
Pretonitis

Thrombosis

Pleural effusion

acute renal failure

end stage renal dz