

***Webpath Questions – GUS midterm – Done by: Ahmad AlHurani***

1. A 69-year-old man incurs blunt force trauma from a fall. On physical examination he has a contusion on his lower back. An abdominal CT scan shows 3 peripheral 1 to 2 cm cysts in his kidneys. The kidneys are normal in size. Laboratory studies show a serum urea nitrogen of 16 mg/dL and creatinine of 1.1 mg/dL. A urinalysis reveals no blood, ketones, protein, or glucose. Microscopic urinalysis reveals a few oxalate crystals. Which of the following is the most likely diagnosis?

- A. Polycystic kidney disease
- B. Hydronephrosis
- C. Renal atherosclerosis
- D. Simple cortical cysts
- E. Recurrent pyelonephritis infection

Ans: (D) CORRECT. Simple renal cysts typically do not interfere with renal function. A few small cysts can be found in many older persons and are inconsequential. They will appear as incidental findings in radiologic imaging studies. The trauma might cause hemorrhage into a cyst.

2. A clinical study is performed with pediatric subjects who had a diagnosis of minimal change disease. These patients were observed to have prominent periorbital edema at diagnosis. Laboratory test findings from serum and urine tests were analyzed. Which of the following urinalysis test findings is most likely to have been consistently present in these subjects?

- A. Nitrite positive
- B. Proteinuria  $>40$  mg/m<sup>2</sup>/hr
- C. Hematuria with  $>10$  RBC/hpf
- D. Calcium oxalate crystals
- E. Renal tubular epithelial cells and casts

Ans: (B) CORRECT. This is the definition of nephrotic syndrome. MCD produces a nephrotic syndrome, with significant albuminuria. A single urine specimen will not suffice for the definition of nephrotic syndrome (though it could be extrapolated, given the daunting task of 24 hour urine collection in children). The 3.5 g/24 hr value commonly used to define nephrotic syndrome is based upon a standard adult size person.

3. A 53-year-old woman has noted fever and right-sided flank pain for the past 3 days. On physical examination her temperature is 38.4°C and there is right costovertebral angle tenderness. A urinalysis reveals sp. gr. 1.010, pH 7.5, no glucose, no protein, no ketones, and 1+ blood. Many WBCs and WBC casts are seen on urine microscopic examination. An abdominal radiograph reveals a radiopaque calculus that forms a cast of a dilated right renal collecting system. A urine culture grows *Proteus vulgaris*. Which of the following crystals is most likely to be seen in large numbers on microscopic urinalysis in this woman?

- A. Calcium oxalate
- B. Cystine
- C. Calcium phosphate dihydrate
- D. Uric acid
- E. Magnesium ammonium phosphate

Ans: (E) CORRECT. She has a staghorn calculus and acute pyelonephritis. These 'infection stones' are typically the 'triple phosphate' stones whose formation is aided by infection with urea-splitting bacteria such as *Proteus*.

4. A 53-year-old man has passed darker urine for the past week. On physical examination there are no abnormal findings. A urinalysis shows pH 5.5, specific gravity 1.013, 2+ blood, no protein, and no glucose. A urine cytology is performed and there are atypical cells seen. A cystoscopy is performed, but no mucosal lesions are noted. He has a 60 pack year history of smoking cigarettes. Which of the following is the most likely diagnosis?

- A. Adenocarcinoma of prostate
- B. Urothelial carcinoma of renal pelvis
- C. Acute interstitial nephritis
- D. Nodular glomerulosclerosis
- E. Squamous cell carcinoma of penis

Ans: (B) CORRECT. The lack of findings in the bladder, but the presence of atypical cells along with hematuria

suggests that there is a malignant lesion and it is located higher in the urinary tract. His history of smoking increases the risk for urothelial carcinomas and for renal cell carcinomas.

5. A 72-year-old man has been feeling tired and lethargic for 5 months. He has noted increasing hesitancy with urination. On physical examination his prostate is diffusely enlarged. Laboratory studies show sodium 139 mmol/L, potassium 4.0 mmol/L, chloride 104 mmol/L, bicarbonate 25 mmol/L, creatinine 3.9 mg/dL, and glucose 81 mg/dL. Which of the following renal abnormalities is most likely to be present in this man?

- A. Cortical atrophy
- B. Glomerulonephritis
- C. Papillary necrosis
- D. Polycystic change
- E. Renal cell carcinoma

Ans: (A) CORRECT. The prostatic hyperplasia could lead to obstructive uropathy with bilateral hydronephrosis, renal cortical atrophy, and eventual chronic renal failure. His elevated serum creatinine is evidence for reduced renal function.

6. A 3-year-old child has become more irritable over the past two months and does not want to eat much at meals. On physical examination the pediatrician notes an enlarged abdomen and can palpate a mass on the right. An abdominal CT scan reveals a 10 cm solid mass involving the right kidney. The resected mass has a microscopic appearance with sheets of small blue cells along with primitive tubular structures. The child receives chemotherapy and radiation therapy, and there is no recurrence. Which of the following neoplasms is this child most likely to have had?

- A. Angiomyolipoma
- B. Renal cell carcinoma
- C. Urothelial carcinoma
- D. Wilms tumor
- E. Medullary fibroma

Ans: (D) CORRECT. This is the classic age, histopathology, and location for Wilms tumor. These childhood neoplasms, when treated properly, have a very good prognosis.

7. A 5-year-old boy is noted to have increased puffiness around his eyes for the past week, and he has been less active than normal. On physical examination he has periorbital edema. Vital signs include T 37°C, P 90/minute, RR 30/minute, and BP 140/90 mm Hg. A urinalysis reveals sp. gr. 1.010, pH 6.5, no glucose, 4+ protein, no blood, no casts, and no ketones. Microscopic urinalysis reveals oval fat bodies, but no WBC's or RBC's. He improves following a course of corticosteroid therapy. Which of the following renal lesions is most likely to have been present in this boy?

- A. Glomerular crescent formation
- B. Podocyte foot process effacement
- C. Patchy acute tubular necrosis
- D. Hyperplastic arteriolosclerosis
- E. Mesangial immune complex deposition

Ans: (B) CORRECT. This is minimal change disease, the most common cause for nephrotic syndrome in children, and fusion of podocyte foot processes is the only pathologic finding present (on electron microscopy). Most patients respond to corticosteroid therapy.

8. A 56-year-old man complains of dull flank pain for the past month. On physical examination he has tenderness to percussion at the right costovertebral angle. Laboratory studies show microscopic hematuria but no proteinuria or glucosuria. A urine cytology shows no atypical cells. A CBC shows WBC count 7800/microliter, Hgb 21.1 g/dL, Hct 63.5%, MCV 94 fL, and platelet count 195,000/microliter. His serum urea nitrogen is 15 mg/dL and creatinine 1 mg/dL. Which of the following radiographic findings is most likely to be present in this man?

- A. Hydronephrosis on intravenous pyelogram
- B. Renal mass on abdominal CT scan
- C. Radiopaque ureteral calculus on an abdominal plain film
- D. Enlarged, multicystic kidneys on abdominal ultrasound
- E. Pelvic abscess below the bladder on MR imaging

Ans: (B) CORRECT. The polycythemia suggests a paraneoplastic syndrome, and a renal cell carcinoma is a likely candidate for the primary lesion. The flank pain and hematuria can be explained by the mass effect from a renal cell carcinoma.

9. A 43-year-old man has had increasing malaise for the past 3 weeks. On physical examination he has a blood pressure of 150/95 mm Hg and 1+ pitting edema of the lower extremities to the knees. Dipstick urinalysis shows no glucose, blood, ketones, nitrite, or urobilinogen, and the microscopic urinalysis reveals no RBC/hpf and only 1 WBC/hpf. Additional laboratory studies show a 24 hour urine protein of 4.1 gm. His serum creatinine is 3.5 mg/dL with urea nitrogen of 38 mg/dL. His hepatitis B surface antigen is positive. Which of the following is the most likely diagnosis?

- A. Membranous nephropathy
- B. Systemic lupus erythematosus
- C. Acute tubular necrosis
- D. Diabetic nephropathy
- E. Post-streptococcal glomerulonephritis

Ans: (A) CORRECT. Membranous nephropathy is the most common cause for nephrotic syndrome in adults. Some cases are associated with underlying infections or malignancies, but in most cases the cause is unknown. There is diffuse thickening of the glomerular capillary basement membrane from immune deposits.

10. A 60-year-old woman is admitted with sudden onset of chest pain and is diagnosed with an acute myocardial infarction. There is difficulty maintaining adequate blood pressure and tissue perfusion for 3 days. Her serum lactate becomes elevated. Her serum urea nitrogen increases to 44 mg/dL and creatinine to 2.2 mg/dL. Granular and hyaline casts are present on microscopic urinalysis. Which of the following renal lesions is most likely to be present in this situation?

- A. Chronic pyelonephritis
- B. Acute tubular necrosis
- C. Nodular glomerulosclerosis
- D. Renal vein thrombosis
- E. Minimal change disease

Ans: (B) CORRECT. Ischemia, typically in hypotensive hospitalized patients, is the most frequent antecedent to acute tubular necrosis (ATN), and ischemic heart disease with coronary syndromes including MI's are common. This is a pre-renal form of azotemia, and note the BUN:Cr ratio more than 20:1.

11. A 53-year-old woman has had chronic arthritis pain for the past 3 years. She has taken 2 gm of phenacetin and acetaminophen a day for her pain over that time. She now has increasing fatigue. There are no abnormal findings on physical examination. Laboratory studies show her serum urea nitrogen is 52 mg/dL and creatinine 5.4 mg/dL. Which of the following pathologic findings is most likely to occur in her kidneys?

- A. Papillary necrosis
- B. Focal segmental glomerulosclerosis
- C. Nephrocalcinosis
- D. Acute interstitial nephritis
- E. Arteriolosclerosis

Ans: (A) CORRECT. She has analgesic abuse nephropathy which leads to papillary necrosis and chronic interstitial nephritis with tubular atrophy (though the renal columns are spared). There is also risk for development of urothelial carcinoma. The analgesics implicated may include combinations of phenacetin, acetaminophen, and aspirin.

12. A 25-year-old woman has been hospitalized for treatment of a *Staphylococcus aureus* abscess of her left thigh complicating a puncture wound. The wound is incised and drained and she receives antibiotic therapy. She is improving and discharged home a week later, but the next day she develops a fever. On physical examination her temperature is 38.1°C and there is a diffuse erythematous skin rash of her trunk and extremities. A urinalysis shows sp gr 1.020, pH 6.5, 1+ blood, 1+ protein, no glucose, and no ketones. There are 10-20 WBCs/hpf and 1-5 RBCs/hpf, and a few eosinophils are noted on urine microscopic examination. Which of the following is the most likely diagnosis?

- A. Acute tubular necrosis
- B. Septicemia with pyelonephritis
- C. Drug-induced interstitial nephritis
- D. Hemolytic-uremic syndrome
- E. Post-infectious glomerulonephritis

Ans: (C) CORRECT. This allergic response can occur following drug therapy with such antibiotic agents as methicillin, as well as some diuretics and NSAIDs. This allergic response with acute interstitial nephritis may be unrelated to the amount of drug and duration of therapy. This condition is treated by stopping the drug.

13. A 39-year-old previously healthy man has the sudden onset of severe right flank pain that comes in waves all night long. When he is seen in the emergency room, after waiting for two hours, he is exhausted. On physical examination there are no abnormal findings. Urinalysis reveals no ketones, glucose, protein, nitrite, or urobilinogen, but blood is present. Urine microscopic examination shows many RBCs but few WBCs. The specific gravity is 1.015 and the pH is 5.5. Which of the following is the most likely diagnosis?

- A. Nodular prostatic hyperplasia
- B. Membranous nephropathy
- C. Ureteral calculus
- D. Renal angiomyolipoma
- E. Urothelial carcinoma of bladder

Ans: (C) CORRECT. These acute symptoms are typical for a calculus that is being passed down the ureter, with intermittent contractions producing colicky pain. 5 to 10% of persons may pass a urinary stone at some point in their life. Non-contrast CT scanning is a good diagnostic study. Most calculi will pass spontaneously, but analgesics are needed. NSAIDs work well except when renal function is impaired; opiates may be considered. Other patients waiting in the ER would gladly let this man be seen first, and the ER staff should triage patients in acute distress first.

14. A 15-year-old girl has had increasing lethargy following a bout of the 'flu' 3 weeks ago. On physical examination there are no abnormal findings. Her condition does not improve after 3 weeks on corticosteroid therapy, so a renal biopsy is performed and microscopic examination shows segmental sclerosis of 3 of 10 glomeruli. Immunofluorescence studies and electron microscopy do not show immune deposits. Which of the following is the most likely outcome for this girl's condition?

- A. Progression to chronic renal failure
- B. Improvement with additional corticosteroid therapy
- C. Development of restrictive lung disease
- D. Discovery of an underlying malignancy
- E. Remission following dietary change

Ans: (A) CORRECT. The findings point to focal segmental glomerulosclerosis (FSGS), which leads to chronic renal failure in half of cases. The lack of resolution with corticosteroid therapy and the progression to chronic renal failure is what sets FSGS apart from minimal change disease. FSGS is idiopathic, so there is unlikely to be an underlying condition.

15. A 59-year-old man notes blood in his urine for the past week. On physical examination there are no abnormal findings. A urinalysis confirms the presence of blood, but no proteinuria or glucosuria. A urine culture is negative. A cystoscopy is performed, and a 3 cm exophytic mass is seen in the dome of the bladder. A biopsy of this mass is performed and microscopic examination reveals fibrovascular cores covered by a thick layer of urothelium (transitional cells). Which of the following risk factors is most likely to have led to development of this lesion?

- A. Diabetes mellitus
- B. Recurrent urinary tract infection
- C. Therapy with methicillin
- D. Cigarette smoking
- E. Tuberosus sclerosis
- F. Use of NSAIDS

Ans: (D) CORRECT. He has a urothelial carcinoma of the urinary bladder, and smokers are at increased risk for this cancer. These cancers can be multiple and recurrent. Additional less common risk factors include exposure to aniline dyes and to beta-naphthylamine compounds. Drugs that increase the risk include analgesic phenacetin and the chemotherapy agent cyclophosphamide.

16. A 60-year-old man was diagnosed last year with adenocarcinoma of the lung, and he underwent right lower lobectomy. For the past 3 weeks he has had increasing malaise. On physical examination he has pitting edema to his knees and presacral edema. Abdominal and chest CT scans show scattered hepatic mass lesions and hilar lymphadenopathy. A urinalysis reveals 4+ proteinuria, and his 24 hour urine protein is 2.7 gm. His serum urea nitrogen is 55 mg/dL with creatinine of 6.1 mg/dL. A renal biopsy is performed, and there is focal deposition of IgG and C3 with a granular pattern. Which of the following forms of glomerular disease is he most likely to have?

- A. Membranous nephropathy
- B. Rapidly progressive glomerulonephritis
- C. Nodular glomerulosclerosis
- D. Chronic glomerulonephritis
- E. Dense deposit disease

Ans: (A) CORRECT. Most cases of membranous nephropathy are idiopathic, but in some patients there is a history of an infection or a malignancy (usually lung) with antigenemia that drives the immune deposition in the



glomerular capillary basement membranes. Membranous nephropathy produces primarily proteinuria. Note the BUN:Cr ratio here close to 10:1 that suggests intrinsic renal disease.

17. A 49-year-old woman has been hospitalized for the past 10 days for treatment of bronchopneumonia. She has developed chills and fever over the past 2 days. On physical examination her temperature is 38.8°C and she has a diffuse erythematous skin rash. Laboratory studies show serum creatinine 2.2 mg/dL and glucose 73 mg/dL. A peripheral blood smear reveals eosinophilia. On urinalysis she has 2+ proteinuria but no blood, glucose, or ketones. Which of the following is the most likely diagnosis?

- A. Post-streptococcal glomerulonephritis
- B. Drug-induced interstitial nephritis
- C. IgA nephropathy
- D. Acute tubular necrosis
- E. Acute serum sickness

Ans: (B) CORRECT. These findings are typical for a drug-induced acute interstitial nephritis. The eosinophilia is seen with allergic phenomena (as in a drug allergy).

18. A 60-year-old woman has had increasing abdominal discomfort and flank pain for the past 5 years. Vital signs shows blood pressure 150/100 mm Hg. On physical examination there are mass-like areas in the posterior abdomen bilaterally. Laboratory studies show serum creatinine 5 mg/dL and urea nitrogen 44 mg/dL. There is a family history of similar findings. What is most likely to be found with abdominal ultrasound examination?

- A. Bilateral calyceal dilation with cortical atrophy
- B. Bilateral renal enlargement with echogenic cysts
- C. Bilateral solid mass lesions of the kidneys
- D. Bridge of tissue connecting renal lower poles
- E. Markedly dilated urinary bladder

Ans: (B) CORRECT. The findings are consistent with autosomal dominant polycystic kidney disease, explaining the family history. Though it is congenital, the cystic change occurs over decades, so the measurable decline in renal function, the pain and discomfort from the mass effect, and the hypertension have an onset in later adult life. Mutation of the PKD1 (polycystin 1) or the PKD2 (polycystin 2) gene underlies this disorder.

19. A 59-year-old man has experienced lower back pain for 4 months. On physical examination there are no abnormal findings. A urinalysis shows microscopic hematuria, but no proteinuria or glucosuria. An abdominal CT scan reveals a 6 cm solid mass in the upper pole of the right kidney. A right nephrectomy is performed, and the grossly variegated mass is seen microscopically to be composed of nests of cells with clear cytoplasm. Which of the following laboratory test findings likely to be associated with this lesion?

- A. Hypercalcemia
- B. Increased catecholamines
- C. Positive serology for hepatitis B surface antigen
- D. Hyponatremia
- E. Hyperaldosteronemia

Ans: (A) CORRECT. This paraneoplastic effect can occur with renal cell carcinomas. The hypercalcemia is most likely related to elaboration of parathormone-related peptide (PTHrP) by the neoplasm.

20. A 30-year-old man has noted puffiness around his eyes and swelling of his feet for the past 2 weeks. On physical examination his blood pressure is 155/95 mm Hg. Urine microscopic examination reveals oval fat bodies. Which of the following conditions is he most likely to have?

- A. Ascending pyelonephritis
- B. Nephritic syndrome
- C. Nephrotic syndrome
- D. Obstructive uropathy
- E. Renal infarction
- F. Papillary necrosis

Ans: (C) CORRECT. Oval fat bodies appear in association with pronounced proteinuria and lipiduria. These bodies represent degenerating, sloughed tubular cells that are filled with lipid. The tubular cells try to reabsorb the spilled protein and lipid and get overwhelmed.

21. An 11-year-old girl has increasing lethargy and has passed dark-coloured urine for the past week. She had a sore throat two weeks ago. On physical examination she is afebrile with blood pressure 140/90 mm Hg. Laboratory studies show her serum creatinine is 2.8 mg/dL and urea nitrogen 24 mg/dL. Urinalysis shows 2+ blood, 2+ protein, no glucose, and no ketones. Microscopic urinalysis shows dysmorphic RBC's. A renal biopsy is performed and on microscopic examination shows glomerular hypercellularity, with PMNs present. Electron microscopy shows subepithelial electron dense 'humps'. Which of the following laboratory test findings is most likely to be present in this girl?

- A. Elevated serum glucose
- B. Antibody to double stranded DNA
- C. Antiglomerular basement membrane antibody
- D. Positive C3 nephritogenic factor
- E. Elevated antistreptolysin O titer

Ans: (E) CORRECT. This hypercellular glomerulus has many neutrophils, characteristic for a post-infectious glomerulonephritis, for which a nephritogenic strain of group A Streptococcus is a likely etiology. Other serologic test findings could include elevated hyaluronidase and elevated anti-DNase. Use of all three increases the sensitivity of detection.

### Lab Questions!

1. A 5-year-old child has complained of pain in his abdominal region for the past 2 months. Physical examination reveals a palpable mass in the posterior abdomen. An abdominal CT scan shows a mass involving the left kidney. A nephrectomy is performed and the specimen is shown here. Which of the following is the most likely diagnosis?

- A. Wilms tumor
- B. Urothelial carcinoma
- C. Renal cell carcinoma
- D. Angiomyolipoma
- E. Rhabdomyosarcoma



-F. Neuroblastoma

Ans: A

2. A 65-year-old man has had worsening renal failure for the past 10 years. He now requires hemodialysis. An abdominal ultrasound reveals that both his kidneys are enlarged. Based upon this gross appearance of his kidneys shown here, which of the following conditions is he most likely to have?

- A. Systemic lupus erythematosus
- B. Renal cell carcinoma
- C. Urinary tract obstruction
- D. Dominant polycystic kidney disease
- E. Chronic glomerulonephritis

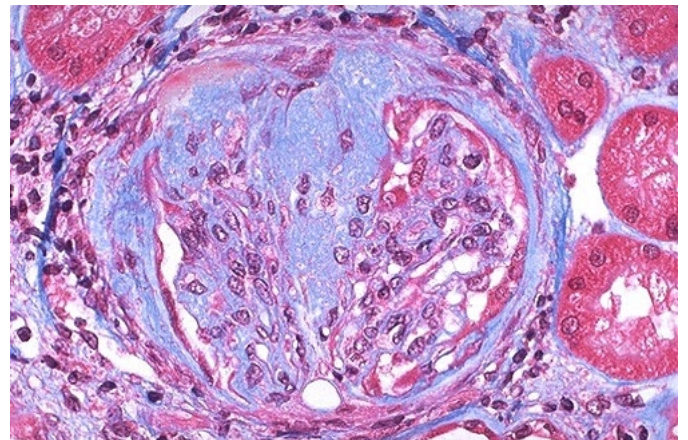
Ans: D



3. A 12-year-old boy has felt tired for the past 2 months. On physical examination he has periorbital edema. Laboratory studies show his serum urea nitrogen is 26 mg/dL and creatinine 2.4 mg/dL. He is given a course of corticosteroid therapy but does not improve. A renal biopsy is performed, and the microscopic appearance with trichrome stain is shown here. This appearance is 3 of 10 glomeruli present in the biopsy. Immunofluorescence staining is nonspecific. Which of the following renal diseases is he most likely to have?

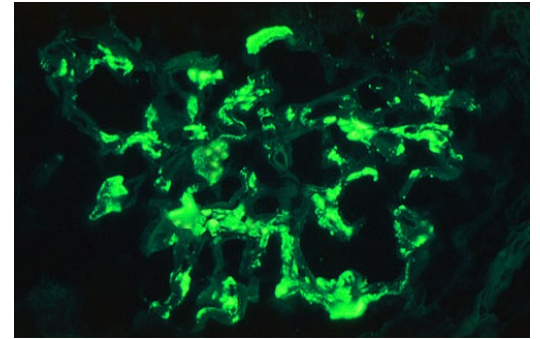
- A. Minimal change disease
- B. Nodular glomerulosclerosis
- C. Alport syndrome
- D. Post-infectious glomerulonephritis
- E. Focal segmental glomerulosclerosis

Ans: E



4. A 35-year-old man notes passing dark urine following a flu-like illness that has lasted for 10 days. On physical examination his blood pressure is 140/90 mm Hg. Urinalysis shows hematuria. A week later his serum creatinine is 2.9 mg/dL. A renal biopsy is performed and microscopic examination with immunofluorescence pattern with antibody against human IgA is shown here. Which of the following is the most likely diagnosis?

- A. Lupus nephritis
- B. Goodpasture syndrome
- C. Berger disease (*IgA Nephropathy*)
- D. Membranoproliferative glomerulonephritis
- E. Membranous nephropathy
- F. ANCA-associated granulomatous vasculitis

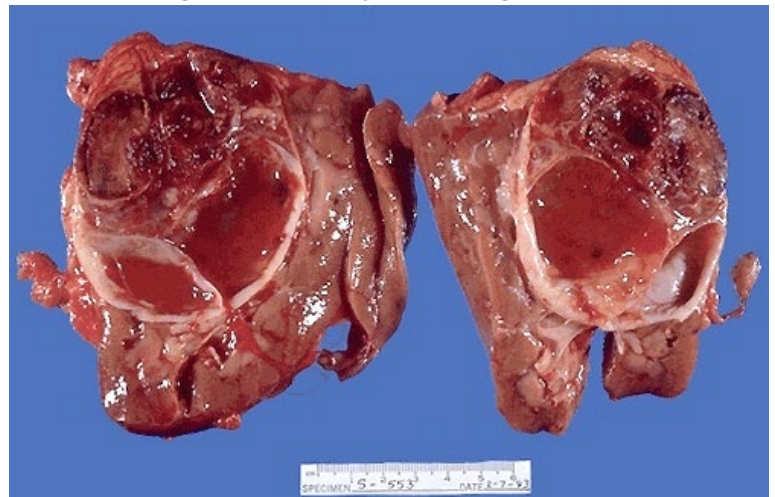


Ans: C CORRECT. This is a classic history for IgA nephropathy, which is nephritic, and thus has microscopic hematuria. The pattern of immunofluorescence staining seen here is mesangial. Some of these patients go on to develop chronic renal failure.

5. A 61-year-old man has had dull flank pain for 2 months. On physical examination he has left costovertebral angle tenderness. He has plethora of his skin. Laboratory studies with urinalysis show 4+ blood. Abdominal CT scan shows hepatic vein thrombosis and liver infarction. The excised lesion from this man is shown here. Which of the following laboratory findings is most likely to be related to this finding?

- A. Polycythemia
- B. Hyponatremia
- C. Hyperaldosteronemia
- D. Hyperglycemia
- E. Hypercholesterolemia

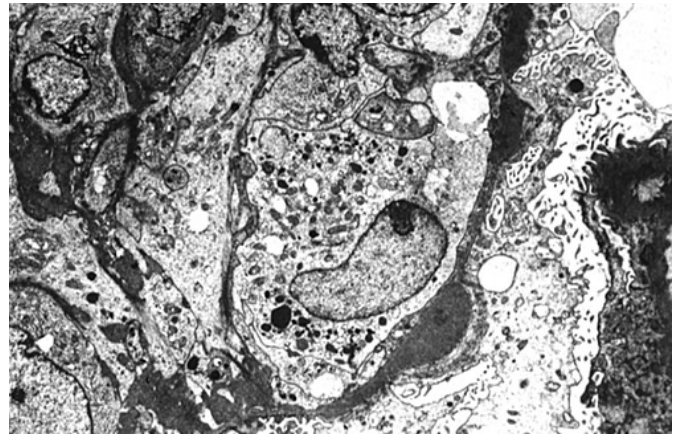
Ans: A



6. A 10-year-old girl was brought to the family physician because of increasing lethargy for 4 days. She had a sore throat 14 days prior to the office visit. On physical examination she has periorbital edema. Initial laboratory studies show a serum BUN of 25 mg/dL and creatinine 2.7 mg/dL. A microscopic urinalysis shows hematuria with dysmorphic RBC's. The light microscopic appearance of her renal biopsy shows hypercellularity, with PMN's present. The electron microscopic appearance is shown. Which of the following additional laboratory test findings is most likely to be present in this girl?

- A. Elevated serum glucose
- B. Antibody to double stranded DNA
- C. Elevated antistreptolysin O titer
- D. Antiglomerular basement membrane antibody
- E. Positive C3 nephritogenic factor

Ans: C



7. A 69-year-old man has had recurrent urinary tract infections for the past 13 years, with *Escherichia coli*, *Proteus mirabilis*, and *Staphylococcus saprophyticus* cultured on multiple occasions. He now has a serum urea nitrogen of 40 mg/dL and serum creatinine of 3.9 mg/dL. A urinalysis shows no hematuria, proteinuria, or glucosuria. An intravenous pyelogram reveals that both kidneys are involved with the condition depicted here. Which of the following underlying conditions is he most likely to have?

- A. Diabetes mellitus
- B. Prostatic hyperplasia
- C. Gouty nephropathy
- D. Chronic glomerulonephritis
- E. Analgesic-induced nephropathy

Ans: B

***Good Luck!***

