ACUTE KIDNEY INJURY

15 NOVEMBER 2021

GLMS

CASE

- 37 years old with hypertension and obesity presented with 3 days history of weakness, malaise, dry cough and diarrhoea
- PMH was otherwise completely unremarkable
- Medications:

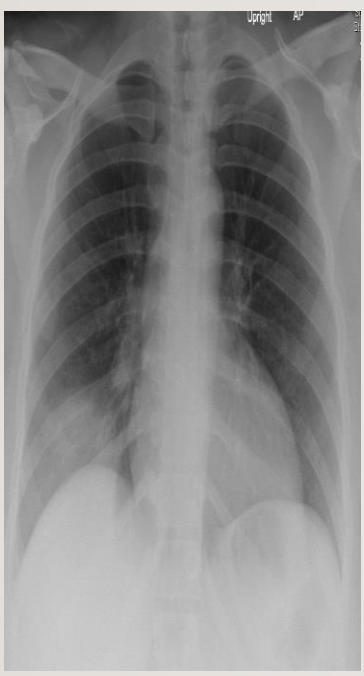
  Chlorthalidone 12.5 mg od

  Omeprazole 40 mg od
- BP 143/93 mmHg, P 112, RR 16, O2 Sat 98% on air, T 100.2 C
- Examination remarkable only for decreased breath sounds on right base

CASE

- Laboratory results
- Na 136, K 2.9, Cl 96, Urea 14, Creatinine 183 umol/L
- Hb 153, WBC 21.32, (Neutrophil 90%), Platelets 144
- Lactic acid 2.4
- Influenza A & B :negative
- Covid 19 - negative
- UA: red, turbid, pH 5, Bld 3+, Pro 3+, Nit +, Leuk 1+
- UA – rbc 5 to 10, wbc 20 to 50
- Urine toxin +cannabinoids

Imaging Studies



CXR: RLL infiltrate

Renal US: R 11.7cm, L 11.3cm, no hydronephrosis

ED COURSE

- In ED, she was given 1 G paracetamol and N/S 2 liters bolus with potassium
- Her urine out put was minimal despite fluid bolus

ACUTE KIDNEY INJURY DIAGNOSTIC STRATEGIES

ACUTE KIDNEY INJURY

- Pre-Renal
- Post-Renal

ACUTE KIDNEY INJURY

- Intrinsic Renal Injury

INTRINSIC RENAL INJURY

- Tubulointerstitial
- Vascular: Microangiopathic
- Glomerular

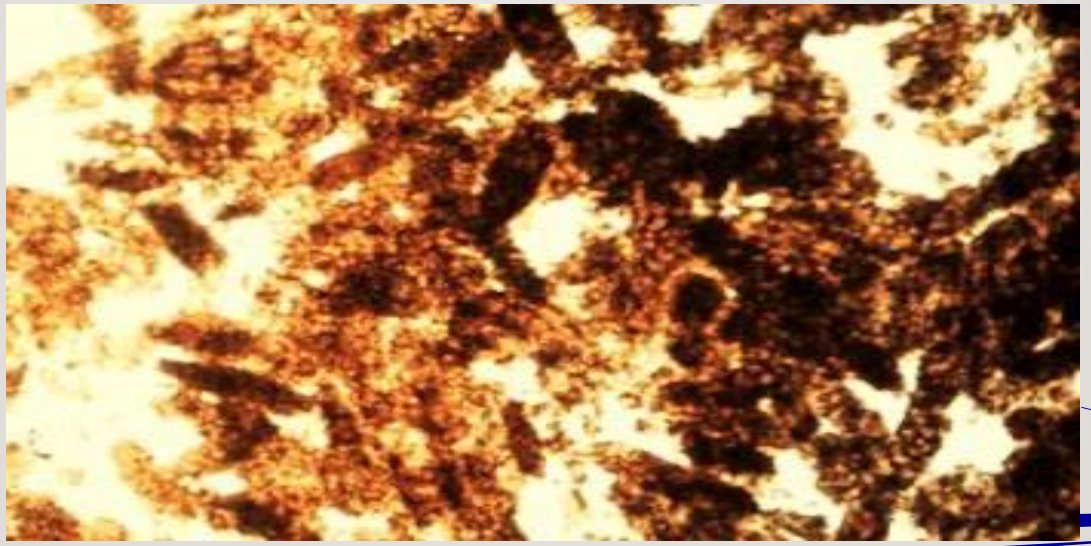
Diagnostic strategies – things that will get you an answer in next a few hours

IMMEDIATE DIAGNOSTIC CLUES

1. Urine sediment
2. Peripheral blood film/smear

IMPORTANCE OF URINALYSIS IN DIAGNOSIS OF AKI

Urine sediment

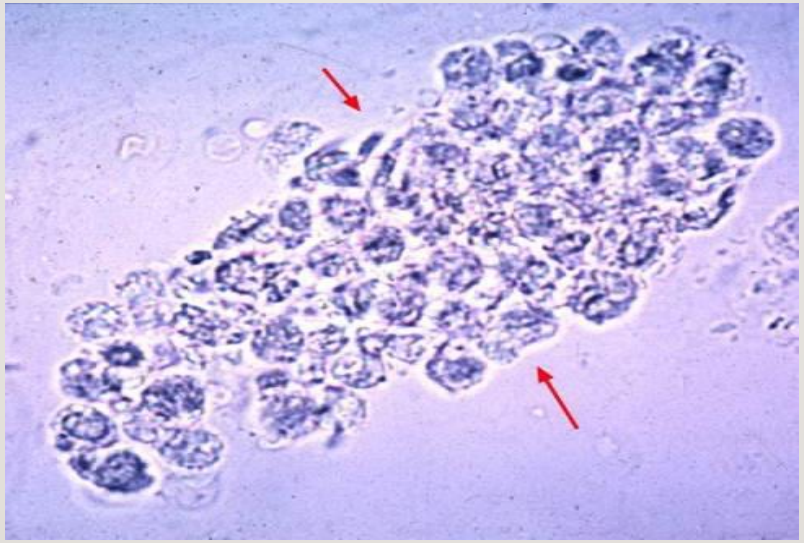


Urine sediment

INTRINSIC RENAL INJURY

- Tubulointerstitial
- Acute Tubular Necrosis (ATN)

Urine sediment



INTRINSIC RENAL INJURY

- Tubulointerstitial
- ATN
- AIN (Acute Interstitial Nephritis)

Our patient – No Urine for Microscopy

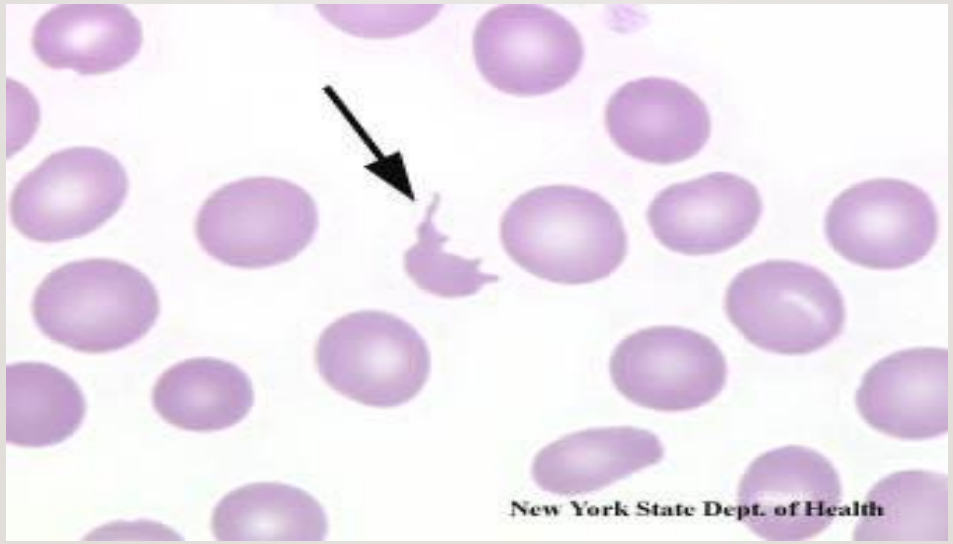
CASE RECAP

- 37 years old with hypertension and obesity
- 3 days history of weakness, malaise, dry cough and diarrhoea
- Low grade fever and hypertensive
- Leucocytosis, platelet count 144,000
- Creatinine 186 umol/L (base line 70 umol/L)
- Abnormal LFT
- High LDH
- Active urinary sediment RBC 3+, Protein3+
- RLL infiltrate
- Unremarkable ultrasound renal tract

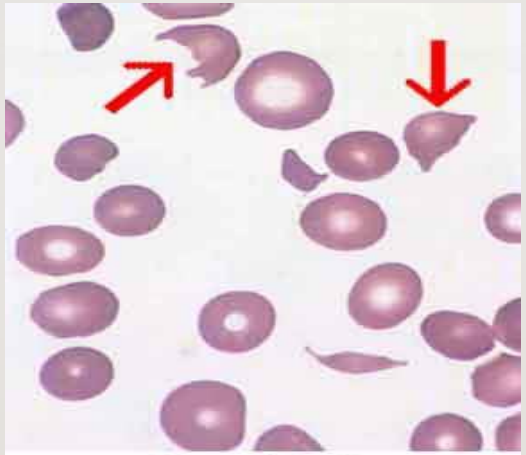
IMMEDIATE DIAGNOSTIC CLUES

1. Urine sediment
2. *Peripheral Blood film*

Peripheral Smear



Peripheral Smear



Schistocytes / Helmet Cells

Robbins Pathologic Basis Of Disease: 6th Edition. 1999. Fig. 14-17 p. 621.

INTRINSIC RENAL INJURY

- Tubulointerstitial – ATN, AIN

- *Vascular : Microangiopathic*

  Thrombotic microangiopathy (HUS, aHUS, TTP)

  Anti-Phospholipid

THROMBOTIC MICROANGIOPATHY

- *Hemolytic Uremic syndrome*
- Atypical Hemolytic Uremic Syndrome
- Thrombotic Thrombocytopenic Purpura

HEMOLYTIC UREMIC SYNDROME

- Clinical Triad

Hemolysis

Acute Kidney Injury

Thrombocytopenia

HEMOLYTIC UREMIC SYNDROME

- HUS (STEC)
- Secondary HUS (non-STEC)

HEMOLYTIC UREMIC SYNDROME (STEC)

- Causes: often occurs after gastrointestinal infection with E coli

  Shiga-like toxin producing E coli (STEC-HUS)

  70% E coli 017:H7

  Shigella

  Campylobacter

- Diagnosis: Stool culture and Shiga-toxin testing
- Treatment: Supportive

SECONDARY HUS (NON-STEC)

- Non-enteric infection
- Viruses
- Drugs
- Malignancies
- Transplantation
- pregnancy

ATYPICAL HEMOLYTIC UREMIC SYNDROME

- Causses: Gene mutations that cause chronic, uncontrolled and excessive activation of complement
- Diagnosis: Decrease in Complement factor B and CH50
- Treatment: eculizumab (terminal complement inhibitor) + plasma exchange

THROMBOTIC MICROANGIOPATHY

- Hemolytic Uremic syndrome
- Atypical Hemolytic Uremic Syndrome
- *Thrombotic Thrombocytopenic Purpura*

THROMBOTIC THROMBOCYTOPENIC PURPURA

- Clinical Pentad

Microangiopathic hemolytic anemia

Acute kidney Injury

Thrombocytopenia

Neurologic symptoms

Fever

THROMBOTIC THROMBOCYTOPENIC PURPURA

- Causes: Autoantibody mediated inhibition of the enzyme ADAMTS 13 which cleaves large multimers of von Willebrand factor into smaller units
- ULVWF causes thrombocytopathy

THROMBOTIC THROMBOCYTOPENIC PURPURA

- Diagnosis

  Clinical Pentad

  ADAMTS 13 activity

- Acute or Chronic TTP

TREATMENT

Plasma Exchange

Steroids

Rituximab — for acute TTP

Caplacizulab (anti-VWF)

Vincristine

Cyclophosphamide — for chronic TTP

Splenectomy

INTRINSIC RENAL INJURY

- Tubulointerstitial – ATN, AIN
- *Vascular : Microangiopathic*

  Thrombotic microangiopathy (HUS, aHUS, TTP)

  Anti-Phospholipid antibody

ANTI-PHOSPHOLIPID ANTIBODY SYNDROME

- Auto-immune antibodies causing

  Thrombotic events

  Thrombocytopenia

  Microangiopathy

- Treatment: aggressive anticoagulation (INR 2.5 to 3.5)

CASE RECAP - OUR PATIENT -NO EVIDENCE OF MICROANGIOPATHY

- 37 years old with hypertension and obesity
- 3 days history of weakness, malaise, dry cough and diarrhoea
- Low grade fever and hypertensive
- Leucocytosis, Platelet count 144,000
- Creatinine 186 umol/L (base line 70 umol/L)
- High LDH
- Active urinary sediment RBC 3+, Protein3+
- RLL infiltrate
- Unremarkable ultrasound renal tract

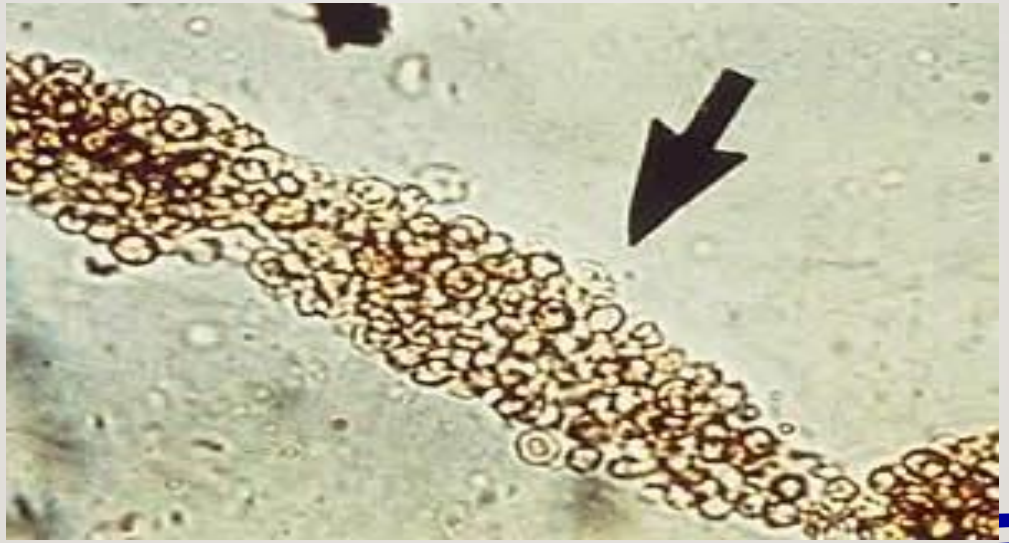
INTRINSIC RENAL INJURY

- Tubulointerstitial – ATN, AIN
- *Vascular : Microangiopathic*

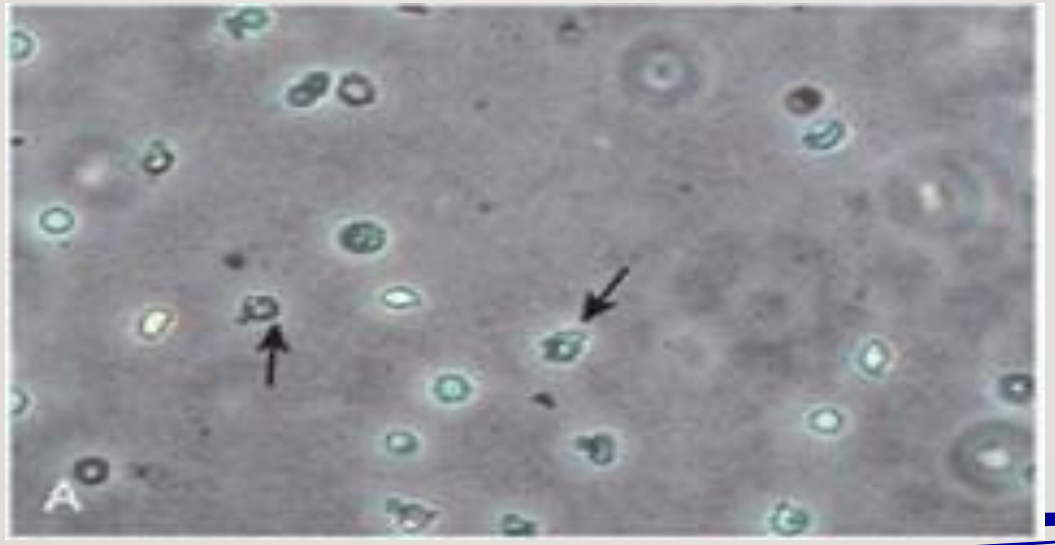
  Thrombotic microangiopathy (HUS, aHUS, TTP)

  Anti-Phospholipid antibody
- *Glomerular*

Urine sediment



Urine sediment



INTRINSIC RENAL INJURY

- Tubulointerstitial – ATN, AIN
- *Vascular : Microangiopathic*

  Thrombotic microangiopathy (HUS, aHUS, TTP)

  Anti-Phospholipid antibody
- *Glomerular: RPGN*

DIFFERENTIAL DIAGNOSIS OF RPGN

1. Anti-GBM: 3%

   a. Goodpasture (Pulmonary Renal Syndrome)

   b. Anti-GBM disease

      (10 – 40% ANCA positive)

DIFFERENTIAL DIAGNOSIS OF RPGN

2. Immune Complex 45%
    a. Post-infectious
    b. Lupus
    c. Henoch Schonlein Purpura
    d. IgA Nephropathy
    e. Mixed Cryoglobulin
    f. MPGN

DIFFERENTIAL DIAGNOSIS OF RPGN

3. Pauci-Immune 50%
    a. Wegner's Granulomatosis (cANCA)
    b. Microscopic Polyangiitis (either p or c ANCA)
    c. Necroltizing Cresentic GN (pANCA)
    d. Churg Strauss (pANCA)

Our patient – no urine for microscopy

NEXT DAY…….

- Na 133, K 3.4, Urea 37, Creatinine 548 umol/L
- Hb 13, Wbc 13.3, Platelet 161
- Lactic acid 1.6, Ca 2.3, ALT 263, AST 1543, ALP 89, Bilirubin 0.8

NEXT DAY…….

- Na 133, K 3.4, Urea 37, Creatinine 548 umol/L
- Hb 13, Wbc 13.3, Platelet 161
- Lactic acid 1.6, Ca 2.3, ALT263, AST 1543, ALP 89, Bilirubin 0.8
- CK 428,000, LDH 855

THE NEXT DAY……

- Creatinine 928 umo/L

  CK 593,000

  Urine myoglobin >5000

  Urine legionella antigen positive

DIAGNOSIS

Legionella pneumonia

Rhabdomyolysis

Acute Kidney Injury

LEGENELLA'S DISEASE

- First identified as causative agent in massive outbreak in Philadelphia, USA
- Named after 1976 American legion Convention in Philadelphia

LEGIONELLA DISEASE AND AKI

- 123 patients hospitalized during out break, 14 developed frank AKI and 3 required dialysis (*Clinical infectious disease 1992:14:204- 7)*
- Review of 45 cases of legionella disease with AKI
- 7 associated with rhabdomolysis

Table 1. Summary of 45 Reported Cases of Legionnaire's Disease and Acute Renal Failure

No. of patients	Dialysis	Outcome (Death)	Renal Pathology	Rhabdomyolysis
45	25	23	ATN 6 ATIN 5 RPGN 1 MGN 1 APN 2 NA 29	7

ATN: acute tubular necrosis, ATIN: acute tubulointerstitial nephritis, RPGN: rapidly progressive glomerulonephritis, MGN: mesangioglomerulonephritis, APN: acute pyelonephritis, NA: not available.

PROGRESS

- Hemodialysis started on Day 4
- CK normalized by Day 8
- Creatinine improved and started passing urine by Day 10
- Dialysis ceased by Day 12
- 4 weeks from admission Serum creatinine 106 umol/L

QUESTIONS & DISCUSSION