

Renal Case Studies - Cologne January 2011

Case 1.

Mr NT is a 40-year old man, diagnosed with testicular teratoma.

Weight 82kg
Height 183cm

Routine blood tests show:-

Urea	3.2 mmol/L	(2.1 – 7.1 mmol/L)
Creatinine	86 μ mol/L	(49 – 92 μ mol/L)
Sodium	142 mmol/L	(135 – 145 mmol/L)
Potassium	4.1 mmol/L	(3.5 – 5.1 mmol/L)
Magnesium	0.81 mmol/L	(0.7 - 1.0 mmol/L)
Corrected Calcium	2.32 mmol/L	(2.2- 2.65 mmol/L)

Before commencing treatment, a Cr-EDTA scan shows he has a GFR of 107 ml/min

He is subsequently treated with:

Prednisolone, Vincristine, Methotrexate, Bleomycin, Adriamycin, Cisplatin

One week later, a routine set of blood tests shows

Urea	15.1 mmol/L
Creatinine	200 μ mol/L
Sodium	137 mmol/L
Potassium	2.8 mmol/L
Magnesium	0.2 mmol/L
Corrected Calcium	1.87 mmol/L

On his next admission, Mr. N.T. was given his chemotherapy as per protocol.

Two days later, he was pyrexial with a temperature of 39.8°C.

His full blood count revealed that he was neutropenic,

WBC count = 1.3×10^9 (normal range $3.7 - 11.0 \times 10^9$),

Neutrophil count = 0.1×10^9 (normal range $1.5 - 7.5 \times 10^9$).

He was prescribed empirically the following drugs:-

Gentamicin	IV	560mg OD
Vancomycin	IV	1g BD
Ceftazidime	IV	2g TDS
Metronidazole	IV	500mg TDS

His biochemistry over the following days was as follows:-

	Day 2	Day 3	Day 4	(Normal Range)
Na ⁺	143	141	144	(135 – 145 mmol/L)
K ⁺	5.3	5.5	6.2	(3.5 – 5.1 mmol/L)
Ca ⁺⁺	2.01	2.00	1.97	(2.2 – 2.65 mmol/L)
Mg ⁺⁺	0.97	0.86	0.73	(0.7 – 1.0 mmol/L)
PO ₄ ⁻	1.29	1.57	2.01	(0.70 – 1.25mmol/L)
Urea	7.3	10.6	15.4	(2.1 – 7.1 mmol/L)
Creat.	155	235	481	(49 – 92 μmol/L)

Q1. What has happened now?

Q2. Comment on the antibiotic therapy he has been prescribed. Do you need to intervene??

Q3. What would you recommend?

Case 2

Mr. D.K. is a 76 year-old man admitted to general surgical ward for repair of abdominal aortic aneurysm.

HPC One week history of intermittent abdominal pain, backache and breathlessness. Pulsating mass in abdomen.
Referred as an emergency by General Practitioner.
Angiogram shows dissecting aortic aneurysm - needs urgent repair.

PMH Hypertensive for the last 20 years.
Partial seizure epilepsy since childhood.
Declining renal function secondary to hypertension.

SOCIAL HISTORY

Retired company director
Married with 2 children - lives with wife
Smoked 30 cigarettes/day for 40 years.
Drinks alcohol socially

ON EXAMINATION

Hypertensive - BP 155/90
Height - 5'7"
Weight - 87kg
Serum Creatinine 140 $\mu\text{mol/L}$ (49 - 92 $\mu\text{mol/L}$)
Serum Urea - 5.3 mmol/L
WBC count - $6.7 \times 10^9/\text{L}$

DRUGS ON ADMISSION

Furosemide 80mg BD
Enalapril 10mg BD
Nifedipine MR 20mg BD
Phenytoin 300mg OD

DAY 1

At operation Mr.D.K. experiences a major haemorrhage and collapses in theatre. He is resuscitated and taken to ITU where he is commenced on inotropes and cefotaxime IV 2g TDS.

DAY 2

Serum Creatinine 285 $\mu\text{mol/L}$
Urea 15 mmol/L
Serum Potassium 5.7 mmol/L

DAY 3

Serum Creatinine 482 $\mu\text{mol/L}$
Urea 22 mmol/L
Urine output has dropped to about 10 ml/hour
Weight - 91kg Height 178cm
Diagnosis of acute renal failure
Commenced on CAVHD

Also on Day 3:-

Temp 38°C , BP 130 / 75, WBC count 15.8 x 10⁹/L

Q1. Describe the factors which influence drug removal during haemodialysis and haemofiltration.

Mr.D.K.'s prescription is changed to:-

Ranitidine 50mg TDS IV
Amikacin 750mg OD IV
Teicoplanin 400mg OD IV
Phenytoin 100mg TDS IV

Diclofenac IM 75mg BD
Morphine IV Infusion @ 2mg/hr
Dopamine IV 2.5mcg/kg/min

Q2. Comment on the patient's prescription above. What changes you would recommend for the prescription?

DAY 7

Mr. D.K. is well enough to be discharged from ITU. He has not recovered any renal function so is transferred to a renal ward to receive intermittent haemodialysis.

Q3. Do you need to amend his drug doses again?

Case 3

Mrs BH is a 43 year old woman, admitted with a 3 day history of fever, rigors, night sweats, and general malaise. On examination she was noted to have splinter haemorrhages under her fingernails and she had developed a new heart murmur. She had recently had a tooth extracted.

Previous Medical History

Diagnosed with lupus nephritis at age 31.

Reached end stage renal failure 3 years ago.

She now has haemodialysis, for 4½ hours, 3 times a week.

Temperature 38.2°C BP = 135/90 mmHg Pulse = 66/min

Serum biochemistry	Value	Normal range
WCC	11.6 x 10 ⁹ /L	(3.5 – 11.0 X 10 ⁹ /L)
C Reactive Protein	65 mg/L	(0 – 5 mg/L)

An echocardiogram revealed vegetation on the mitral valve.

Blood cultures were taken, which subsequently grew *Streptococcus viridans*.

A diagnosis of infective endocarditis was made, and Mrs BH was admitted to the medical ward for intravenous antibiotics.

She was empirically prescribed:-

Benzylpenicillin IV 1.2g every 4 hours +

Gentamicin IV 80mg every 12 hours.

When the results of the blood cultures were known, amoxicillin 2g every 8 hours was added to her antibiotic regimen.

Q1. Do you want to make any dosage adjustments for this patient?

Sensitivities showed Mrs. BH had acquired a resistant strain of *Strep. viridans*, and the microbiologists advise that a new antimicrobial agent, "Streptoban", be added to her current drug therapy.

There is no immediate data on appropriate dosing in haemodialysis but the following information about Streptoban is available:-

- The molecular weight is 370 daltons,
- 85% of the oral dose is excreted unchanged in the urine,
- Plasma protein binding is about 15%,
- The normal intravenous dose for a healthy adult is 1g BD.

Q2. What is the likely clearance of Streptoban by intermittent haemodialysis?
Can you suggest a dose for Mrs. BH?

Haemodialysis gives an effective GFR of approximately 10 ml/min

Dosing in Renal Failure = Daily Dose x [(1 - Feu) + (Rf x Feu)]

Feu - Fraction excreted unchanged in the urine.

Rf - Extent of renal impairment as a fraction of renal function.

Case 4

Mrs. N.R. is a 43-year old woman, admitted for treatment of a severe case of shingles (herpes zoster).

PMH

Diagnosed as having adult polycystic kidney disease at age of 39.

Reached end stage renal failure 4 years ago.

Has been on automated peritoneal dialysis, 10 hours overnight, 5x / week, ever since.

BP = 135/84 Pulse = 66/min Dry weight = 72kg
Daily fluid allowance = 500ml

Her initial serum biochemical and haematological profile is:-

Sodium	138 mmol/L
Potassium	5.0 mmol/L
Urea	16.0 mmol/L
Creatinine	624 mmol/L
Phosphate	1.8 mmol/L
Bicarbonate	22 mmol/L
Haemoglobin	9.2 g/dL
WCC	6.6×10^9 /L

It is decided she requires intravenous aciclovir.

Q1. What dose would you recommend, and how would you administer it?

Q2. If Mrs. NR was on intermittent haemodialysis, what dose of aciclovir would you recommend?

Q3. If Mrs. NR was on CRRT, what dose of aciclovir would you recommend?