Common Haematological problems in ICU – Recent cases seen in QMH

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Case 1: KM

- F/42, Thailand immigrant since 1998
- Married
- Works as a masseuse

Case 1: KM

- Past medical history:
  - Left Bartholin cyst 1999
  - Grave's disease since 2001
  - Dermatitis herpetiformis since 4/2006
    - Dapsone 50mg daily

Case 1: KM

- Admitted 29/10/2008 at 5:00am for drug overdose ~15 tablets of dapsone (~750mg) 1 hour before admission
- Dizziness, vomiting, confusion
- Oxygen saturation
  - Room air: 87% → Rebreathing mask: 92%
- RR 28/min, Chest clear
- Marked cyanosis

Laboratory reports

Collect Date :	29/10/08
Collect Time :	04:20
Request No. :	CA290660
Na	135 L
K	3.6
Chloride	104
Urea	4.8
Creatinine	63
R Glucose	6.8
Calcium	2.10 L
Adjusted Calcium	2.14
Phosphate	0.91
Total Protein	70
Albumin	40
Globulin	30
Total Bili	8
ALP	39
ALT	9
AST	17
Amylase	100

Collect Date :	29/10/08
Collect Time :	05:12
Request No. :	CA290541
Remark :	Drug overdose. Mask Type
Comment	
Mask Type	Mask
Flow Rate	15.0
% inspired O2	100
pH	7.49 H
pO2	16.6 H
pCO2	4.1 L
HCO3-	23
Base excess	0

Laboratory reports

- WCC normal, Hb 11.2 (MCV 70.6), Plt 241
- Clotting profile normal

What is the next investigation?

A. Blood Film
B. Echocardiogram
C. CT thorax
D. Urine toxicology
E. Mathemoglobin
F. Carboxyhemoglobin
G. Direct anti-globulin test
H. Reticulocyte count
I. G6PD level
J. LDH
K. HIV status

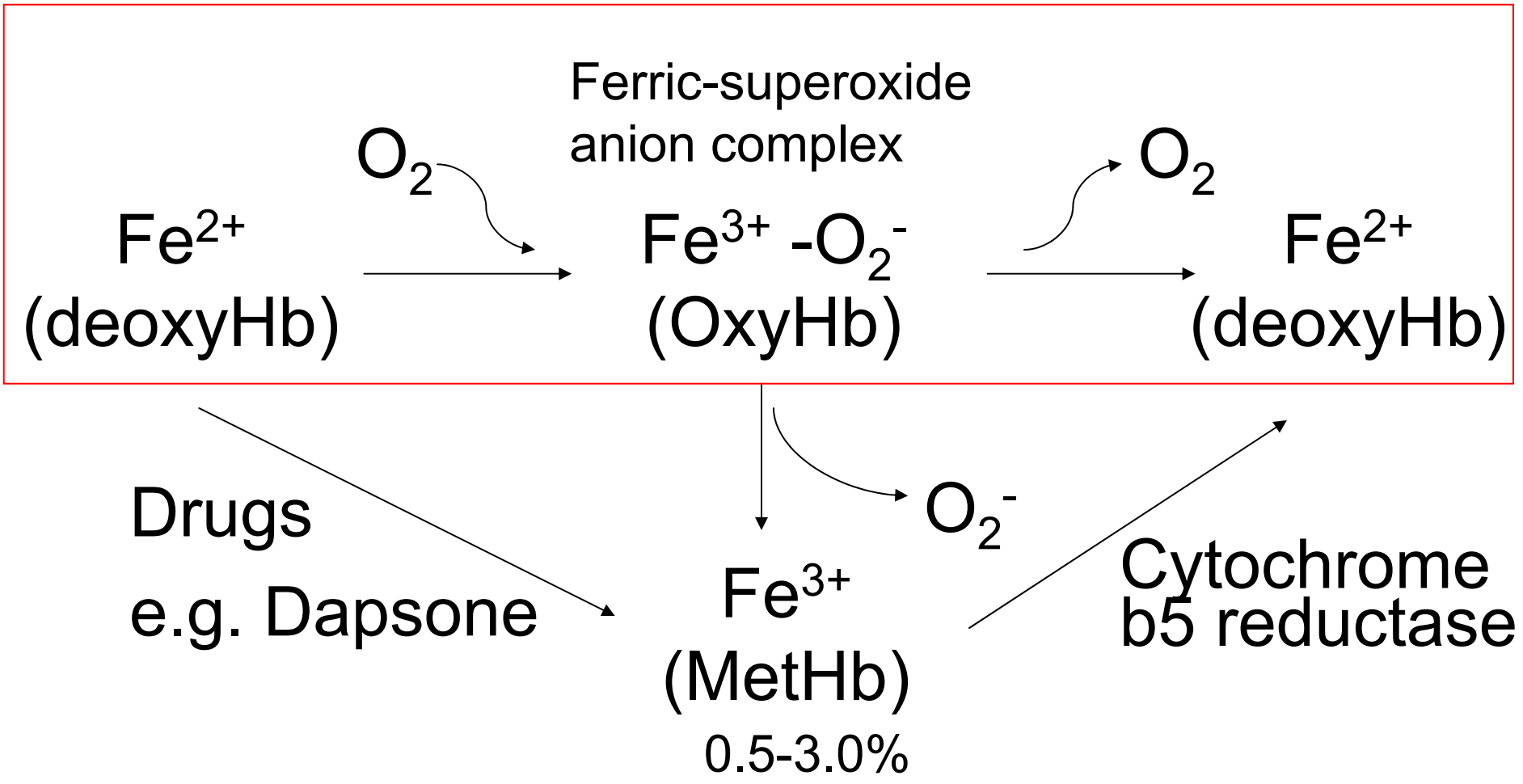
Laboratory tests:

Methemoglobin 52.1% (N: 0-0.5%)
Carboxyhaemoglobin 1.3% (N: 0-3%)
Urine toxicology: Dapsone present

Diagnosis

Acquired methaemoglobinaemia

Pathogenesis



Methaemoglobinaemia Causes

1. Hereditary (Rare)
   - Asymptomatic, normal life-expentency

   Sub-types
   - Cytochrome b5 reductase deficiency
   - Cytochrome b5 deficiency (rare)
   - Haemoglobin M disease

2. Acquired
   - Drugs

Drugs associated with methaemoglobinaemia

Acetanilid	Menadione	Paraquat
p-Amino salicylic acid	Metoclopramide	Phenacetin
Aniline dyes	Methylene blue*	Phenazopyridine
Benzene derivatives	Naphthoquinone	Primaquine
Clofazimine	Naphthalene	Resorcinol
Chlorates	Nitrites	Sulfonamides
Chloroquine	Amyl nitrite	
Dapsone	Farryl nitrite	
Local anesthetic agents	Sodium nitrite	
Benzocaine	Nitroglycerin	
Lidocaine	Nitric oxide	
Prilocaine	Nitrobenzene	

Acquired methemoglobinemia

- Topical anesthetic agents, esp benzocaine
  - Mayo Clinic: 28 478 TEEs, 19 cases of methemoglobinemia

Kane et al. Arch Intern Med 2007; 167:1977.

- Dapsone:
  - Causing 42% of cases in 138 patients suffered from methemoglobinemia
  - Can cause prolonged MetHb due to its extensive enterohepatic circulation

Ash-Bernal et al. Medicine (Baltimore) 2004; 83:265.

Methaemoglobinaemia: Clinical suspicion

Central cyanosis disproportion to systemic oxygen saturation

SaO_2 from pulse oximetry << ABG (Saturation gap)

Methaemoglobinaemia presentation

Met-Hb level	**Clinical features**
<1%	Normal
3-15%	Possibly none except low SpO2
15-20%	Mild cyanosis, asymptomatic otherwise
20-50%	Anxiety, headache, dizziness, weakness, tachypnea, sinus tachycardia
50-70%	Myocardial ischaemia, dysrhythmia, seizures, coma, lactic acidosis
>70%	Generally incompatible with life

KM was admitted to the ICU, what is your management?

A. Close monitoring, no specific management
B. Activated charcoal orally
C. Oral methylene blue
D. Intravenous methylene blue
E. Hyperbaric oxygen
F. Ascorbic acid
G. N-acetylcysteine
H. Exchange transfusion

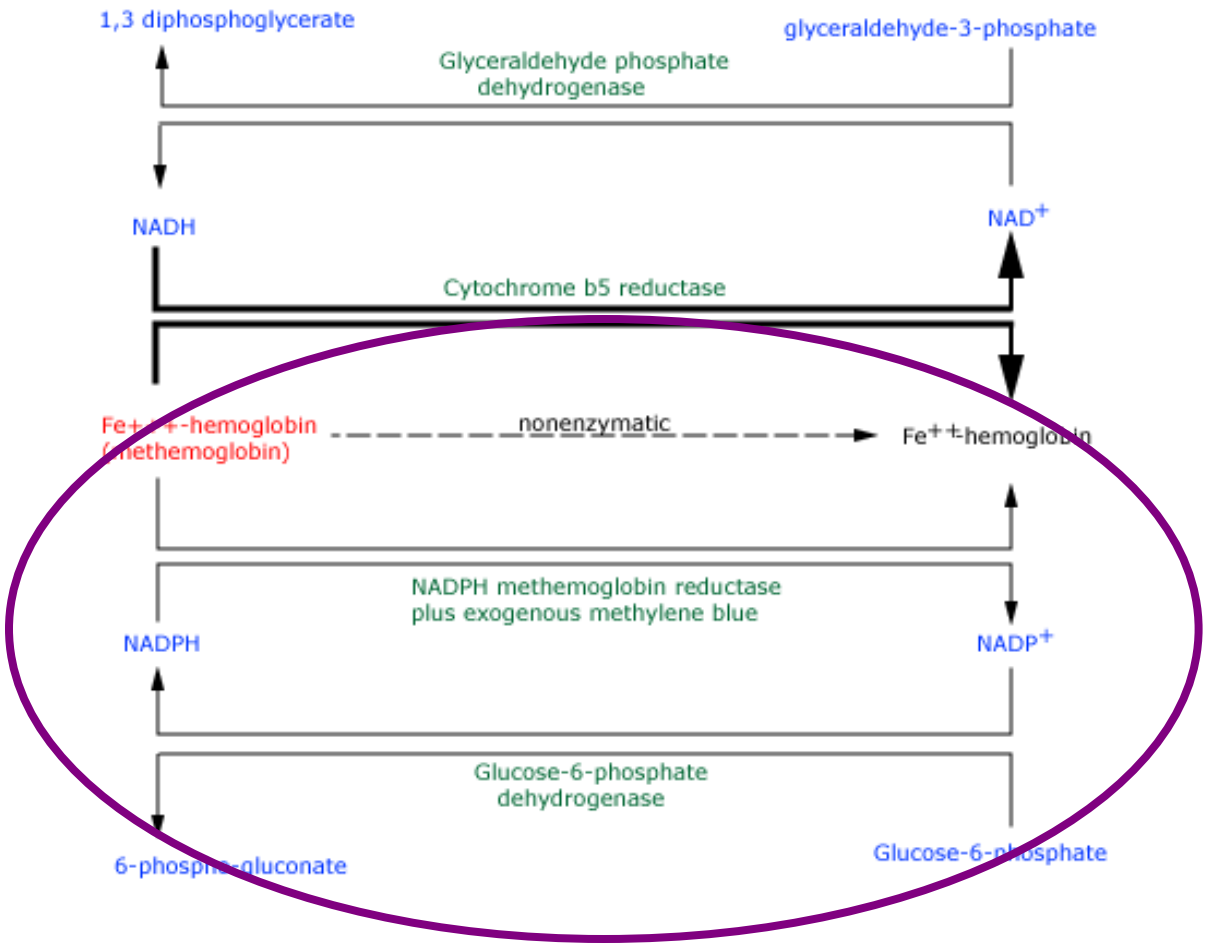
Treatment

- Hereditary:
  - Avoid exposure
  - Cytochrome b5 reductase deficiency: methylene blue, ascorbic acid, riboflavin
  - HbM disease: no treatment

Treatment

- Acquired:
  - Stop offending agent
  - Elimination: Gastric lavage, activated charcoal, hemodialysis, charcoal hemoperfusion
  - Methylene blue IVI 1-2mg/kg (repeated doses if necessary, max 7mg/kg)
  - G6PD deficiency: ascorbic acid PO 300-1000mg/day
  - Hyperbaric oxygen, exchange transfusion

Treatment


1,3 diphosphoglycerate
glyceraldehyde-3-phosphate
Glyceraldehyde phosphate dehydrogenase
NADH
NAD+
Cytochrome b5 reductase
nonenzymatic
NADPH methemoglobin reductase plus exogenous methylene blue
NADPH
NADP+
Glucose-6-phosphate dehydrogenase
Glucose-6-phosphate

Clinical Progress of KM

In ICU, activated charcoal was given

Methylene blue i.v. 50 mg was administered.

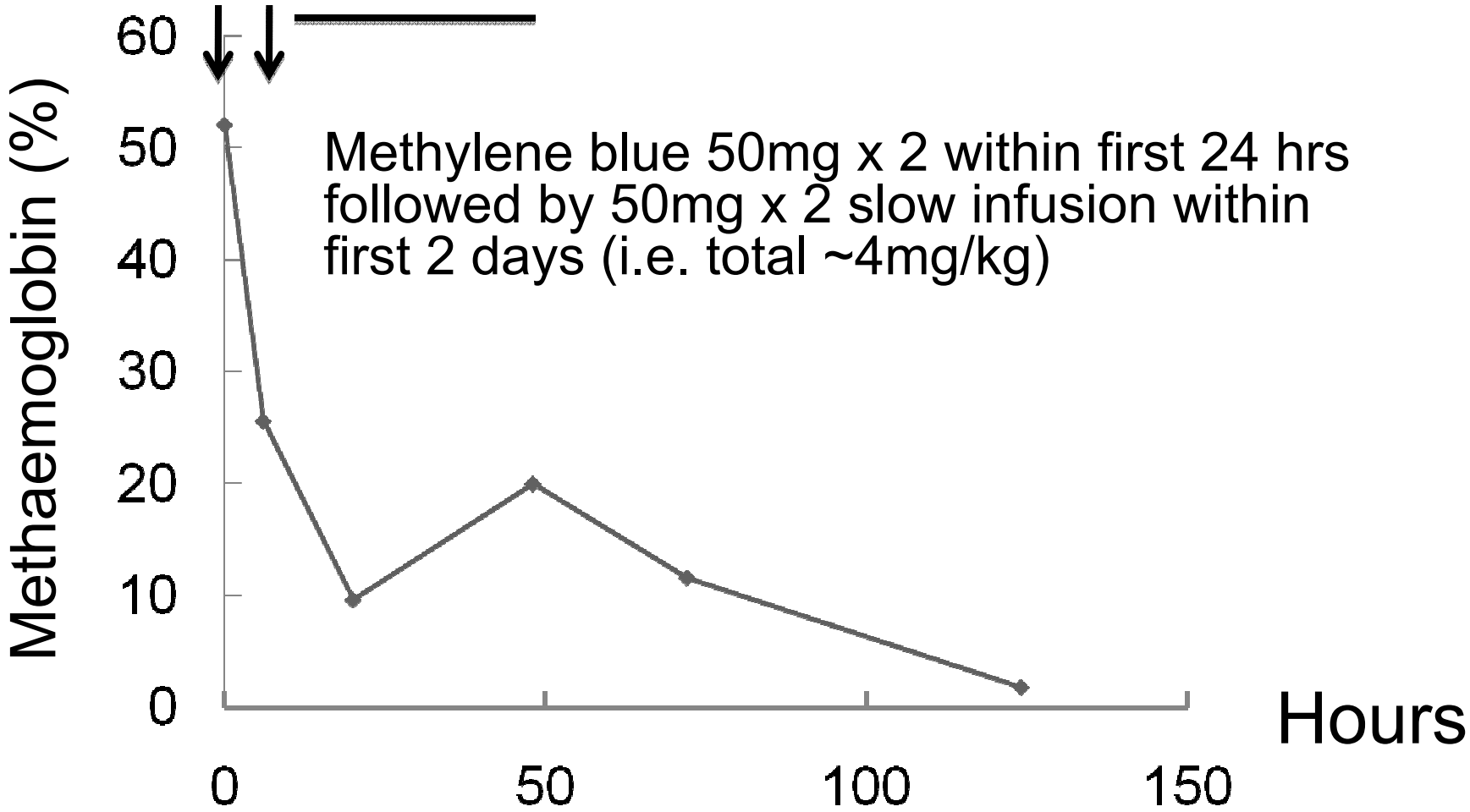
Six hours, patient was still cyanotic and confused.

Methaemoglobin level:
5 a.m. 52.1% $\rightarrow$ 11 a.m. 25.6%

What is your plan of management?

A. Close monitoring, no specific management
B. Repeat activated charcoal
C. Repeat intravenous methylene blue
D. Hyperbaric oxygen
E. Ascorbic acid
F. N-acetylcysteine
G. Exchange transfusion

Clinical Progress



Hong Kong Poison Information Centre

- Dapsone is well reported cause of delayed onset but prolonged methemoglobinaemia due to its metabolite that had extensive enterohepatic circulation.
- Multiple dose activated charcoal: first dose 50gm mixed with laxative, followed by subsequent dose of 25-50gm (no laxative mixed) Q4-Q6H for a total of 36 to 48hr titrating with clinical response and GI motility.
- Other enhanced elimination methods reported useful are haemodialysis and charcoal hemoperfusion.
- Another dose of methylene blue slow IV over 5 min (1mg/kg)
- Methylene blue infusion (mixing with normal saline) starting at 0.1mg/kg/hr up to 0.2mg/kg/hr titrating with met-Hb drop.
- The total max dose of methylene blue is usually recommended as 7mg/kg.
- We adopted 20% Met-Hb as the action level for methylene blue, however other clinical parameters should be considered as well e.g. lactic acidosis, end-organ dysfunction
- Please also monitor for intravascular hemolysis
- Other treatment that had reported useful when methylene blue was contraindicated included red cell exchange transfusion, plasma exchange, hyperbaric oxygen. N-acetylcysteine has been postulated useful based on in-vitro evidence.

Learning objectives

Methaemoglobinaemia

1. Clinical and laboratory diagnosis
2. Common causes
3. Management

Case 2: NLM

- F/49, married.
- Past medical history
  - Breast carcinoma in 2000 treated with breast conservation surgery followed by adjuvant chemo-radiotherapy
  - Therapy related (11q23) AML in 2004, received induction chemotherapy followed by sibling BMT in 2004.
  - Multiple relapses afterwards treated by chemotherapy with stem cell support from the sibling.
  - BMT with reduced intensity conditioning from MUD (matched unrelated donor) in 2008

Case 2: NLM

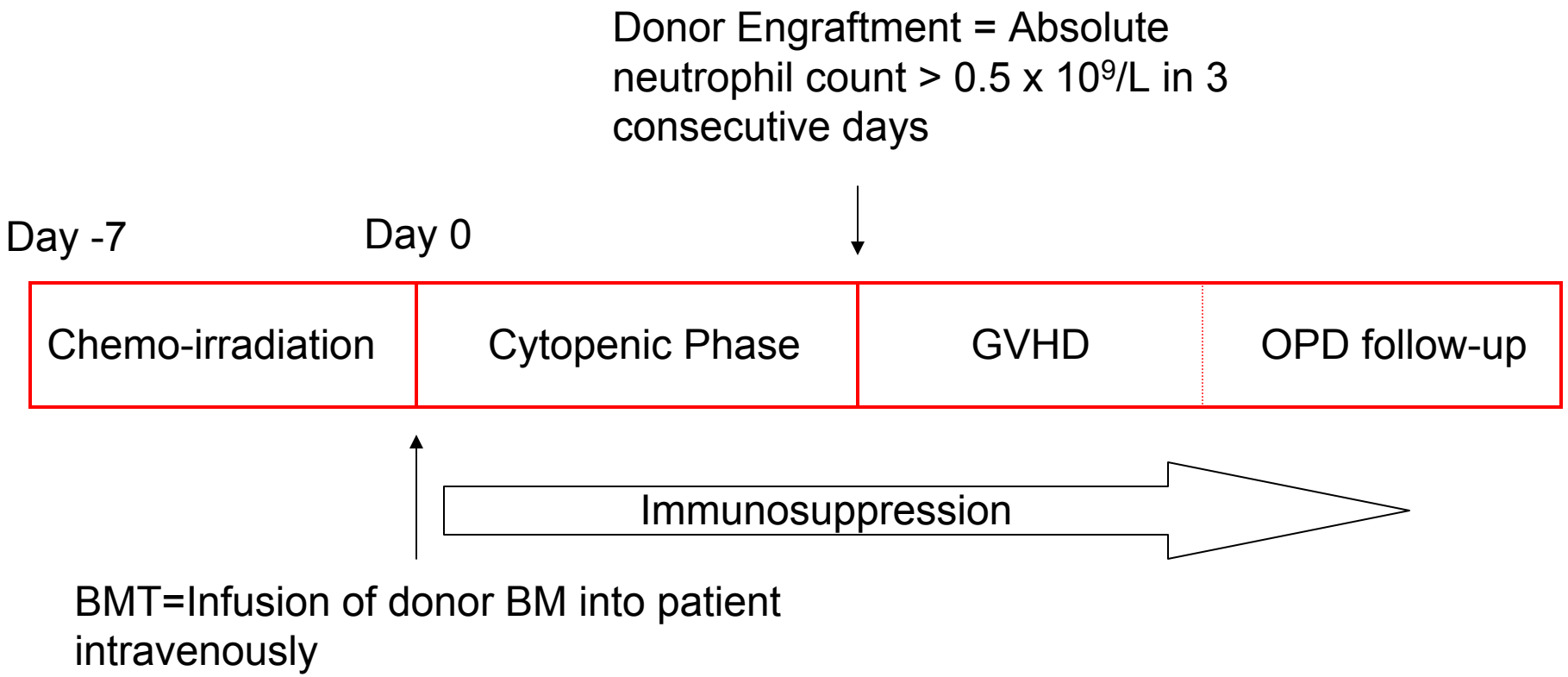
- Post BMT course:
  - Neutropenic fever on Day 6 post BMT, responded to broad-spectrum antibiotics
  - Developed spike of temperature on Day 9

    ANC 0.29

    Hb 9.3 → 6.5 (rechecked 5.8)

    Platelet 23

Bone Marrow Transplantation



Case 2: NLM Physical Examination

- Tired
- Sinus tachycardia with high fever
- No obvious source of infection
- Yellowish stool

Case 2: NLM Investigation Results

Collect Date :	18/04/08	19/04/08	20/04/08
Collect Time :	08:03	08:04	07:58
Request No. :	H1090377	H1100349	H1110335
CBC			
WBC	0.79 L	0.61 L	1.32 L
RBC	3.06 L	2.60 L	Cancelled
HGB	10.6 L	9.3 L	6.5 L
HCT	0.284 L	0.238 L	Cancelled
MCV	92.8	91.8	Cancelled
MCH	34.7 H	35.7 H	Cancelled
MCHC	37.5 H	38.9 H	Cancelled
RDW	14.4 H	18.6 H	Cancelled
PLT	19 L	23 L	32 L
WBC DIFFERENTIAL			
DC Type	MACHINE	MACHINE	MANUAL
#Myelocyte	--	--	--
#Neutrophil	0.28 L	0.16 L	0.29 L
#Lymphocyte	0.40 L	0.32 L	0.42 L
#Monocyte	0.02 L	0.04 L	0.53
#Eosinophil	0.00	0.01	--
#Basophil	0.00	0.00	--
#Atypical lym.	--	--	0.08
Total Cell Count	--	--	50
Film Review	N	N	Y
RBC MORPHOLOGY			
Anisocytosis	--	++	+
Macrocytosis	--	+	--
Hypochromasia	--	--	--
Poikilocytosis	--	--	--
Spherocytosis	--	--	+
PLT MORPHOLOGY			
PLT. Count Est.	--	--	Low
Giant platelets	--	--	Present

PT/APTT normal

Case 2: NLM Investigation Results

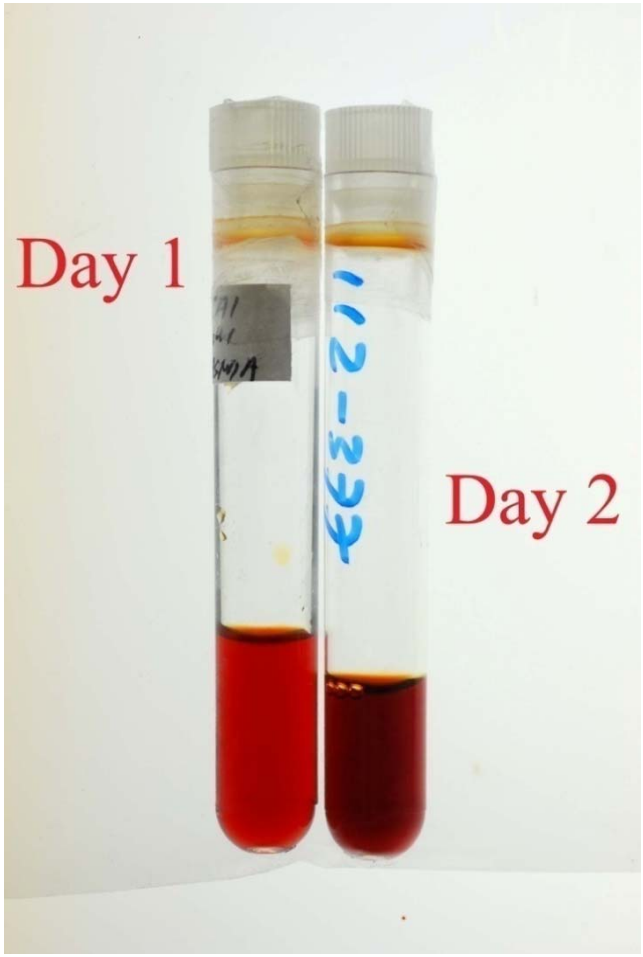
Collect Date :	18/04/08	19/04/08	20/04/08	20/04/08
Collect Time :	08:03	08:04	07:58	10:45
Request No. :	C4181526	C4191511	C4201482	C4201014
Remark :	AML	AML	AML	?HEMOLYSIS
Comment	Below		Below	
Na	144	142	141	141
K	4.2	3.9	4.0	3.7
Chloride	107	106	105	106
Urea	5.1	5.9	6.6	7.5 H
Creatinine	79	70	64	63
R Glucose	5.5	6.1	6.6	8.5 H
Calcium	2.18	2.16	2.24	2.19
Adjusted Calcium	2.30	2.30	2.46	2.43
Phosphate	1.44	1.16	1.06	0.89
Total Protein	65 L	60 L	56 L	54 L
Albumin	36 L	35 L	31 L	30 L
Globulin	29	25 L	25 L	24 L
Total Bili	44 H	85 H	149 H	159 H
Direct Bili	14 H	23 H	20 H	18 H
ALP	66	60	52	47
ALT	42 H	32	26	23
AST	28	27	53 H	61 H
GGT	115 H	100 H	85 H	79 H
LDH	--	--	--	968 H
CK	--	--	--	43

What could be the problem?

A. Massive internal bleeding
B. Thrombotic thrombocytopenic purpura
C. Disseminated intravascular coagulopathy
D. Cytomegalovirus infection
E. Acute graft-versus-host disease (GVHD) liver
F. Transfusion associated GVHD
G. Massive haemolysis

A spot urine sample

Serum sample



What could be the problem?

A. Microangiopathic haemolytic anaemia
B. Severe intravascular haemolysis
C. Severe extravascular haemolysis
D. Haemolytic uraemic syndrome
E. Drug-induced haemolytic anaemia

Comment:

Peripheral blood smear

Grossly haemolysed specimen.

Hb 6.5 (red cell agglutination. Prominent spherocytosis.
No significant polychromasia. Occ HJ bodies).
WCC 1.32 (Marked neutropenia, no blast seen)
Plt 32 (no clumps)

What would be the next investigation?

A. G6PD level
B. Reticulocyte count
C. Cold-agglutinin titre
D. Osmotic fragility test
E. Repeat donor's blood grouping
F. Direct anti-globulin test
G. Indirect anti-globulin test

Case 2: NLM Investigation Results

Date Collected: 20/04/08
Date Arrived: 20/04/08 15:47

Immunohaematology :-

Direct Antiglobulin Test	Positive
Anti-Human Globulin (Polyspecific)	Positive
Anti-IgG	Positive
Anti-Complement (Anti-C3d)	Positive

More Information

- No history of blood transfusion during post transplant period
- G6PD normal (Both patient and her previous sibling donor)
- Blood Group
  - Patient Herself O+
  - Patient's Sibling Donor B+
  - MUD Donor O+

Further Workup

1. Cell grouping showed mixed field reaction with the presence of O cells & B cells.
2. Serum grouping showed the presence of strong anti-A and strong anti-B.
3. Eluate of the patient' s red cells showed only the presence of anti-B

Diagnosis

Donor-Derived Red Blood Cell Antibodies and Immune Hemolysis After Allogeneic Bone Marrow Tranplantation

Donor Lymphocyte Syndrome

- Mechanism
  - Immunocompetent donor memory B lymphocytes produce antibodies in a secondary immune response against the recipient's RBCs
  - Can be regarded as a type of graft versus host reaction
  - Most common in ABO systems with minor mismatch

Donor Lymphocyte Syndrome

- Natural History
  - Antibodies typically become evident at 5-17days post BMT
  - Usually undetectable by 3 months
  - Not all patients who develop antibodies experience RBC destruction
  - Haemolysis usually has an abrupt onset
  - Most cases are self-limiting but occasionally can be fatal

Retrospective analysis of 97 consecutive BMT patients

- 21 patients received minor ABO or D mismatched marrow
- 16 ABO mismatch

6 developed DAT +ve → only 2 showed clinical evidence of hemolysis

- 7 Gp D mismatch

3 developed DAT +ve → only 1 showed clinical evidence of hemolysis

Hows et al., Blood 67(1): 177-181

Back to our patient

Collect Date :	20/04/08
Collect Time :	07:58
Request No. :	H1110335

CBC	
WBC	1.32 L
RBC	Cancelled
HGB	6.5 L
HCT	Cancelled
MCV	Cancelled
MCH	Cancelled
MCHC	Cancelled
RDW	Cancelled
PLT	32 L
WBC DIFFERENTIAL	
DC Type	MANUAL
#Myelocyte	--
#Neutrophil	0.29 L
#Lymphocyte	0.42 L
#Monocyte	0.53
#Eosinophil	--
#Basophil	--
#Atypical lym.	0.08
Total Cell Count	50
Film Review	Y
RBC MORPHOLOGY	
Anisocytosis	+
Macrocytosis	--
Hypochromasia	--
Poikilocytosis	--
Spherocytosis	+
PLT MORPHOLOGY	
PLT. Count Est.	Low
Giant platelets	Present

Collect Date :	22/04/08	22/04/08
Collect Time :	07:32	15:41
Request No. :	C4221525	C4222487
Remark :	AML.Pleas e indicate if this	AML

Comment		Below
Na	--	137
K	--	3.2 L
Chloride	--	101
Urea	--	20.6 H
Creatinine	--	139 H
R Glucose	--	11.3 H
Magnesium	0.41 L	--
Calcium	--	2.14
Adjusted Calcium	--	2.42
Phosphate	--	1.33
Total Protein	--	53 L
Albumin	--	28 L
Globulin	--	25 L
Total Bili	--	105 H
Direct Bili	--	43 H
ALP	--	52
ALT	--	26
AST	--	66 H
GGT	--	62 H
LDH	--	2063 H
Urate	--	242

Comment:
08C4231504 Test result(s) analytical
08C4222487 Test result(s) analytical

This laboratory is accredi
Report Destination: QMH/--/J8N - J8N,

How would you manage the patient?

A. High dose corticosteroids
B. Exchange transfusion
C. Increased dose of cyclosporine A
D. Close monitoring, no specific treatment
E. Only red cell transfusion

Donor Lymphocyte Syndrome

- Treatment
  - Transfusion with suitable blood group
  - Maintain adequate urine output and monitor RFT
  - +/- Steroid
  - +/- Exchange transfusion

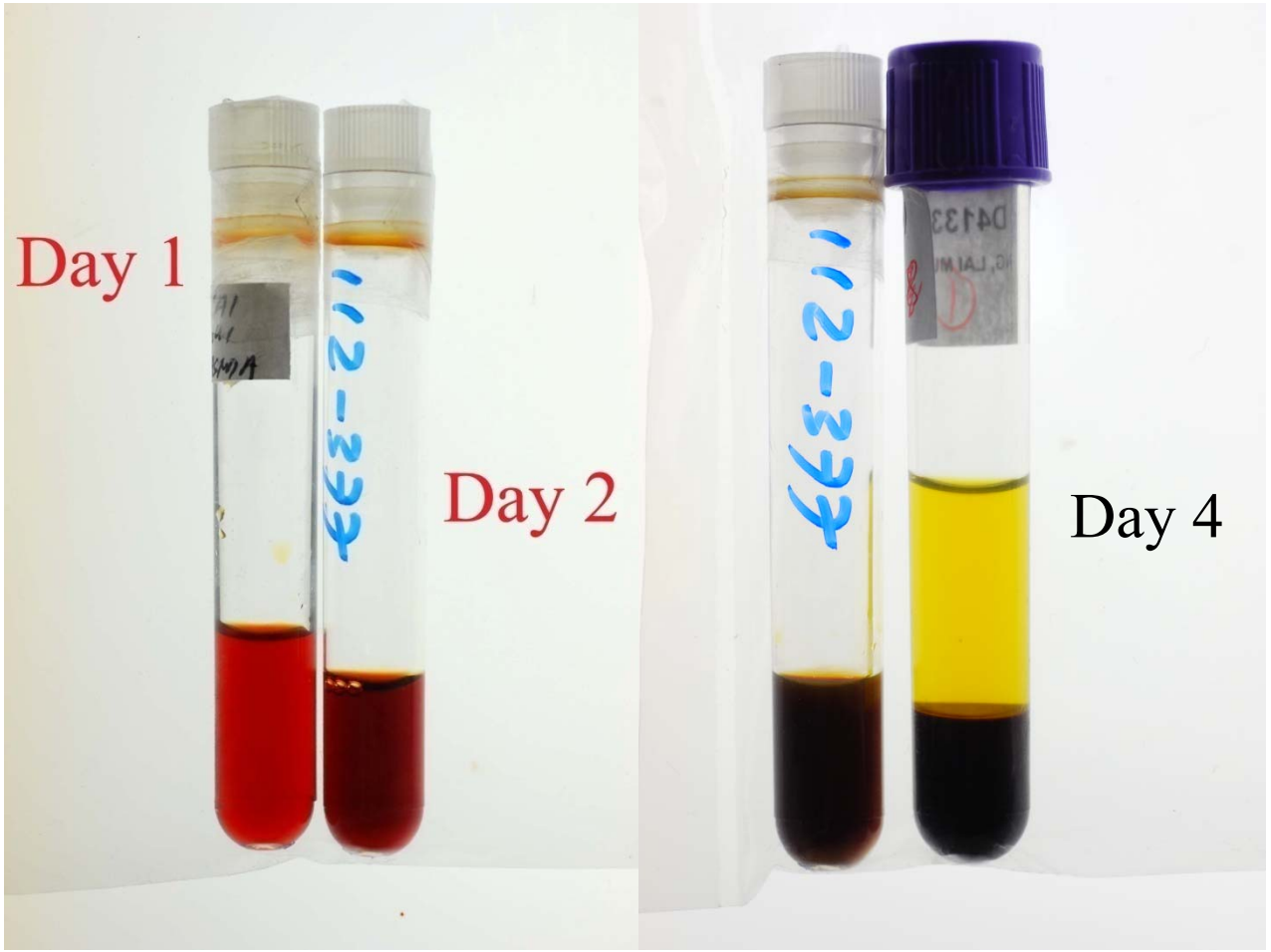
Progress of NLM

- Initially transfused 3 units of packed RBC
- Steroid 3mg/kg
- Exchange Transfusion 3 units of packed RBC
- Hb static ~10g/dL
- Low grade hemolysis persisted for few days more
- Steroid quickly tailed down
- Transient deteriorated renal function with peak Cr 143 → subsequently back to baseline
- Marked improvement in haemoglobinuria and haemoglobinaemia

Progress

Day 1 Day 2 Day 3 Day 4 Control

Progress



Repeat Workup after two week

Date Collected: 03/05/08
Date Arrived: 03/05/08 12:49

Immunohaematology :-
Post Bone Marrow Transplant

Direct Antiglobulin Test	Negative
Anti-Human Globulin (Polyspecific)	Negative

Comment:
"O" cells present.
Anti-A and Anti-B antibodies present by saline agglutination technique.
Titre of IgM anti-B is 1024 against B cells by saline agglutination technique.
Titre of IgG anti-B is 512 against B cells by indirect agglutination technique.

This laboratory is accredited by the College of American Pathologists,
CAP Accreditation Number 71755-25
********** End of Report **********
Report Destination: QMH/--/J8N - J8N, ICU / HDU, QMH

Learning Objectives

Donor lymphocyte syndrome

1. Recognize the clinical context in which it occurs
2. Clinical presentation
3. Treatment

Case 3: CKK

- M/50
- Primary school teacher
- Past medical history:
  - Enteropathic T-cell lymphoma since March 2008 presented with abdominal distension
  - Treated by private oncologist with 3 courses of chemotherapy with persistent lymphoma and ileus
  - Transferred to QMH on 4th June 2008 for further management

Case 3: CKK

- PET/CT scan: Persistent lymphoma
- Decided for further intensive chemotherapy
- Pre-chemotherapy: Intravenous hydration and allopurinol, septrin for PCP prophylaxis
- G6PD by fluorescent spot test: Normal

Laboratory tests

Chemotherapy

Collect Date :	09/06/08	10/06/08	11/06/08
Collect Time :	07:07	11:33	11:29
Request No. :	C6091537	C6102213	C6112154
Remark :	lymphoma	lymphoma	lymphoma
Comment			
Na	138	139	139
K	3.6	3.8	4.3
Chloride	102	106	103
Urea	5.3	7.8	9.1 H
Creatinine	60 L	71	78
R Glucose	5.9	6.9	7.0
Calcium	2.21	2.27	2.29
Adjusted Calcium	2.31	2.37	2.39
Phosphate	0.94	0.66 L	0.70 L
Total Protein	68	70	73
Albumin	37 L	37 L	37 L
Globulin	31	33	36
Total Bili	18	15	16
ALP	171 H	142 H	128 H
ALT	21	24	23
AST	20	23	22
LDH	151	191	252 H
Urate	240 L	284	314

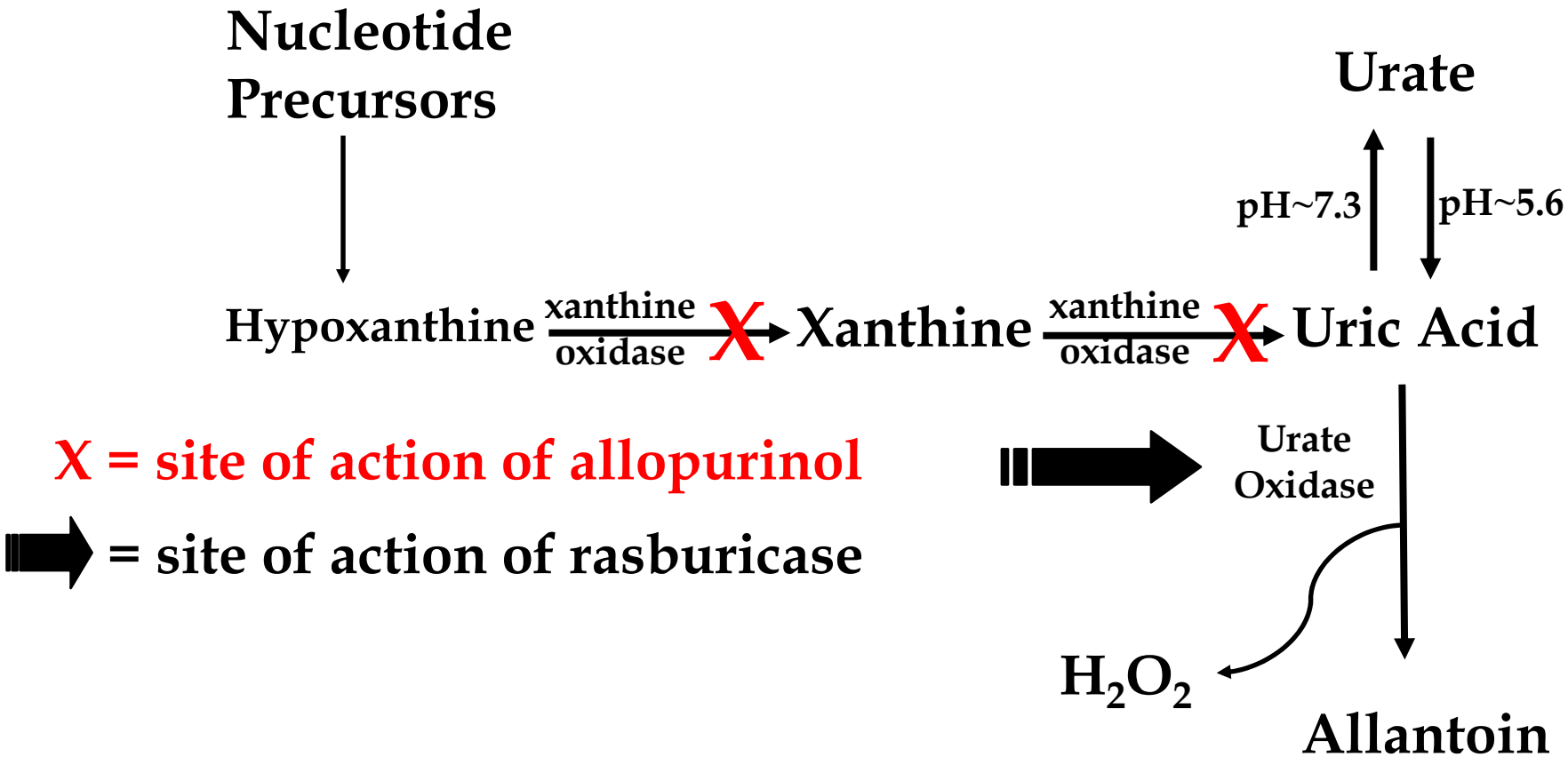
What is your management?

A. Judicious hydration, closely observed
B. In addition to A), step up allopurinol
C. In addition to A), give rasburicase
D. Haemodialysis
E. Further increase the chemotherapy dose

Progress

- Patient was given hydration, alkaline diuresis and one dose of rasburicase for possible tumor lysis syndrome

Oxidation of nucleotide precursors into uric acid



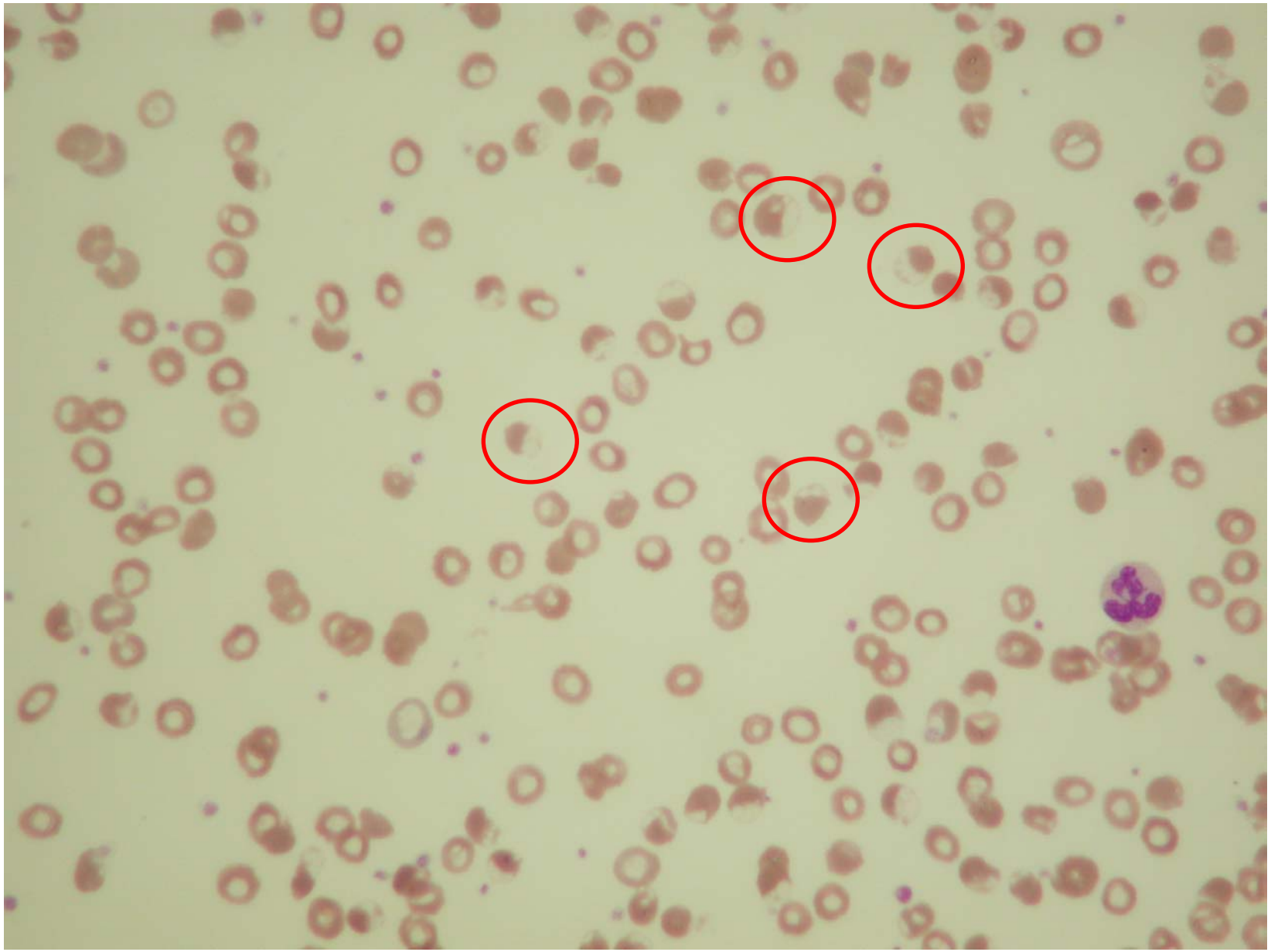
Collect Date :	14/06/08	14/06/08	14/06/08	15/06/08	15/06/08
Collect Time :	01:23	05:27	15:22	05:33	16:49
Request No. :	H1660288	H1660345	H1660837	H1670322	H1670672
CBC					
WBC	55.70 H	49.10 H	42.01 H	36.40 H	33.90 H
RBC	3.02 L	2.71 L	2.61 L	1.92 L	2.49 L
HGB	9.1 L	8.3 L	7.8 L	5.9 L	7.1 L
HCT	0.269 L	0.242 L	0.224 L	0.166 L	0.201 L
MCV	89.0	89.2	85.9	86.2	80.5 L
MCH	30.2	30.7	29.9	30.6	28.6
MCHC	33.9	34.4	34.8	35.5	35.5
RDW	16.2 H	16.3 H	17.0 H	15.9 H	22.4 H
PLT	513 H	472 H	435 H	361	342
WBC DIFFERENTIAL					
DC Type	MACHINE	MACHINE	MACHINE	MANUAL	MACHINE
#Neutrophil	55.40 H	48.70 H	41.36 H	36.40 H	33.80 H
#Lymphocyte	0.10 L	0.20 L	0.30 L	--	0.10 L
#Monocyte	0.00 L	0.10 L	0.24	--	0.00 L
#Eosinophil	0.10	0.10	0.04	--	0.00
#Basophil	0.00	0.00	0.01	--	0.00
Total Cell Count	--	--	--	100	--
Film Review	N	N	N	Y	N
RBC MORPHOLOGY					
Anisocytosis	+	+	+	+	+++
Hypochromasia	--	--	--	+	--
Poikilocytosis	--	--	--	+	--
PLT MORPHOLOGY					
PLT. Count Est.	--	--	--	Normal	--

Laboratory Tests

Collect Date :	15/06/08
Collect Time :	05:33
Request No. :	C6150602
pH	7.48 H
pO2	11.6
pCO2	4.5 L
HCO3-	24
Base excess	0
Met-Hb	4.2 H
Na	141
K	4.0
Chloride	99 L
Urea	31.1 H
Creatinine	286 H
R Glucose	9.1 H
Calcium	2.09 L
Adjusted Calcium	2.39
Phosphate	2.61 H
Total Protein	51 L
Albumin	27 L
Globulin	24
Total Bili	127 H
Direct Bili	--
ALP	76
ALT	32
AST	107 H
LDH	798 H
Urate	55 L

Collect Date :	05/06/08	16/06/08
Collect Time :	10:39	11:54
Request No. :	H1570041	H1680004
Fluorescent Spot	Normal	--
G6PD Assay	--	--
Methaemalbumin	--	1.43 H

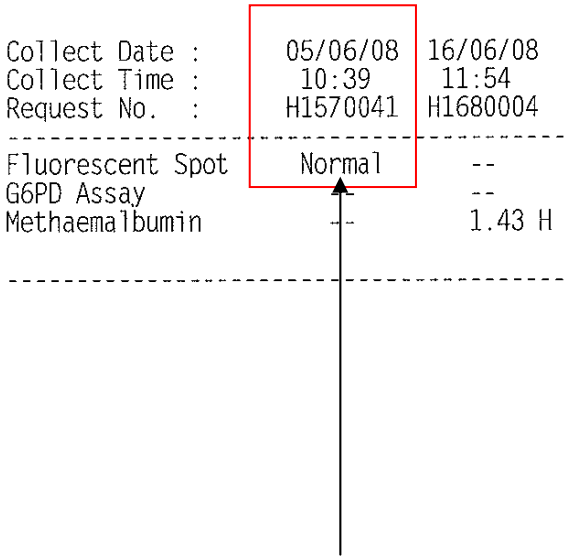
Peripheral blood smear (15/6/2008)



What is the problem?

A. Anaemia due to renal failure
B. Anaemia due to marrow failure
C. Intravascular haemolytic anaemia
D. Autoimmune haemolytic anaemia
E. Acute gastrointestinal tract bleeding

Patient was mildly deficient in G6PD enzyme level



Collect Date :	05/06/08	16/06/08
Collect Time :	10:39	11:54
Request No. :	H1570041	H1680004
Fluorescent Spot	Normal	--
G6PD Assay	--	--
Methaemalbumin	--	1.43 H

G6PD Assay: 5.55 (Ref: 6.35 – 10.33 IU/g Hb)

Table 1 Drugs that may cause hemolysis in G6PD deficient patients with polymorphic variants.

Drugs to be avoided		*Variants Involved*
Antidiabetic agents	Glibenclamide	Mediterranean[a], Asian[a]
Antimalarials	Pentaquine	All[a]
	Pamaquina	All
	Primaquine	All
	Quinacrine	Mediterranean, Asian
Chemotherapeutic agents	Chloramphenicol	Mediterranean, Asian
	Ciprofloxacin	Mediterranean, Asian
	Doxorubicin	Mediterranean, Asian
	Nalidixic acid	Mediterranean, Asian
	Nitrofurantoin	All
	Stibophen	All
Gout Treatment agents	Recombinant Urate oxidase	All
Sulfonamides	Sulfasalazine (5-amino salicylic acid)	All
	Sulfapyridine	All
	Sulfadimidine	All
Sulphones	Dapsone(diaphenylsulphon)	All

[a] "Mediterranean/Asian" means the drug is likely to have an adverse effect on people with the more severe Mediterranean or Asian variants but the drugs may be safely taken by people with the milder African A^- variant. "All" means that all G6PD deficient individuals should avoid the drugs.

Learning Objectives

- Recognition of tumor lysis syndrome and its management
- Acute intravascular haemolysis secondary to oxidative RBC damage in patients with borderline G6PD

Case 4: HSW

- A 28 year woman with good past health complained of malaise, dizziness and blurring of vision in recent three months.
- Seen by ophthalmologists – retinal hemorrhages

Collect Date : 03/11/06
Collect Time : 09:47
Request No. : CB031859
Remark :

Comment	Below	
Na	141	
K	3.8	
Chloride	101	
Urea	3.9	
Creatinine	72	
R Glucose	7.4	
Calcium	2.49	
Adjusted Calcium	2.53	
Phosphate	INT	
Total Protein	121	H
Albumin	40	
Globulin	81	H
Total Bili	4	L
Direct Bili	<2	
ALP	43	
ALT	12	
AST	19	
GGT	7	L
LDH	262	
Urate	346	

- What are the abnormalities?
- What further tests?

Collect Date	:	03/11/06
Collect Time	:	09:47
Arrive Date	:	03/11/06
Arrive Time	:	11:38
Request No.	:	I0082077
Urgency	:	--

IgG	490 L
IgA	41 L
IgM	8340 H
SPE	MD
Serum IFX	See Below
Total protein	75.0
% Paraprotein	See Below

Two IgM/Kappa bands and one weak IgG/Kappa band.
Strong IgM/Kappa band: 25.73 g/L (34.3%)
Weak IgM/Kappa band: Too weak to quantitate
Weak IgG/Kappa band: Too weak to quantitate

- What are the treatments of choice?

Collect Date :	03/11/06	06/11/06	08/11/06	10/11/06
Collect Time :	09:47	10:21	10:44	10:13
Request No. :	CB031859	CB061884	CB081877	CB101813
Remark :				

Plasmapheresis →

Comment	Below	Below	Below	Below
Na	141	143	144	144
K	3.8	3.7	3.8	3.8
Chloride	101	108	109	110
Urea	3.9	2.8	2.5	2.9
Creatinine	72	50	49	46
R Glucose	7.4	--	--	--
Calcium	2.49	2.01 L	1.99 L	1.96 L
Adjusted Calcium	2.53	1.93 L	1.89 L	1.82 L
Phosphate	INT	1.05	1.01	1.00
Total Protein	121 H	82 H	78	75
Albumin	40	46	47	49 H
Globulin	81 H	36 H	31	26
Total Bili	4 L	3 L	4 L	4 L
Direct Bili	<2	<2	<2	<2
ALP	43	20 L	22 L	21 L
ALT	12	5	4 L	6
AST	19	10 L	11 L	12
GGT	7 L	<5 L	<5 L	<5 L
LDH	262	140 L	149 L	133 L
Urate	346	284	300	272