



# Haematological Emergencies

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# Contents

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- 5 real life case scenarios
  - Key elements of history & examination
  - Recognise signs & symptoms
  - Investigations
  - Basic pathology
  - Management
- You can always call haem for help and advice!

# Case 1

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- You are the ED F1
  - ‘A haematology patient has spiked a temperature at home’
- What do you want to know?

# History

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- 70 year old man, known to have DLBCL
- Last had chemo 7 days ago
- Now comes in very lethargic
- Triage obs
  - T = 38.4
  - BP 91/52
  - P 144
  - Sats 98% o/a
  - RR 20

# What are you worried about?

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## Neutropenic sepsis

# What are you going to give?

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# When are you giving it?

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# Now!

# Definition

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- Neutrophils  $<0.5$ , or  $<1$  if recent chemo
- Sepsis – may not necessarily have a fever
  - Temp  $>38$
  - Feeling 'unwell'
  - Possible focal symptoms of infection

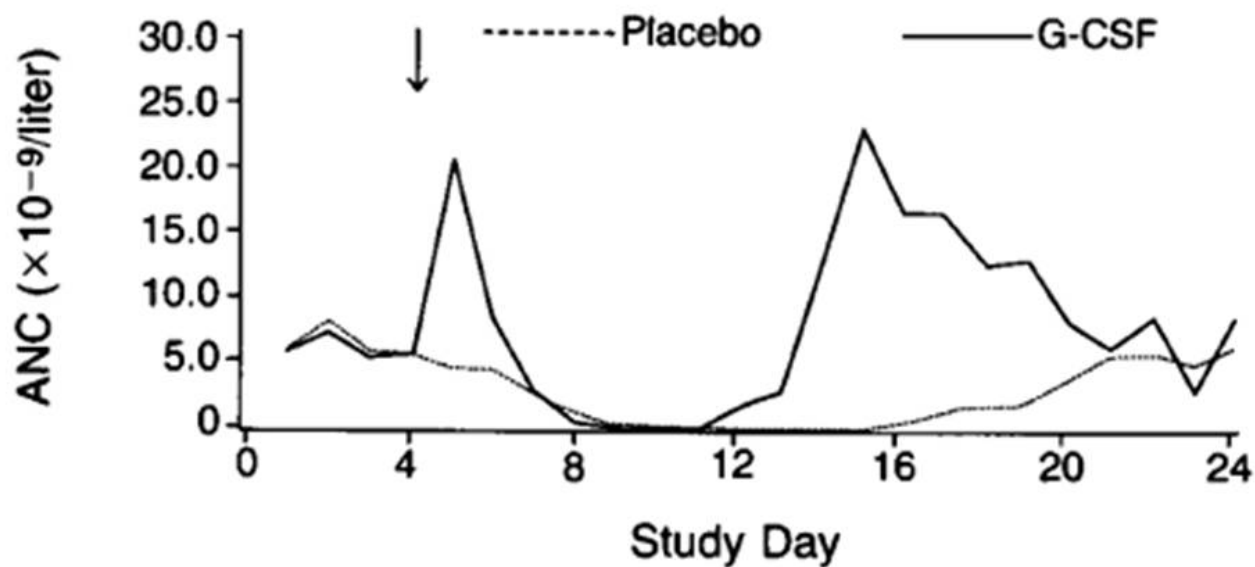


# Management

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- Common – always treat as an emergency
- Never wait for blood results before giving antibiotics – give within 1 hour of presentation
- Follow your local trust protocol
  - Broad spec abx + gram negative cover
- Resuscitate patient, look for source of infection
  - PICC line, mouth/teeth, perianal area
  - DON'T do a PR

# Effects of G-CSF



# Case 2

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- You are the medical SHO on take
- A&E refer a patient - 59 year old man presents with back pain, feeling unwell
- Blood results:

# Blood results

Results	17/08/2017 7:07
<b>Routine Chemistry</b>	
<input checked="" type="checkbox"/> Sodium	136 mmol/L
<input type="checkbox"/> Potassium	3.6 mmol/L
<input type="checkbox"/> Chloride	
<input type="checkbox"/> Urea	8.5 mmol/L
<input type="checkbox"/> Creatinine	H 167 umol/L
<b>AKI Flag</b>	
<input type="checkbox"/> Estimated Glomerular Filtration Rate	* L 37 mL/min
<input type="checkbox"/> Corrected eGFR	
<input type="checkbox"/> Bilirubin (Total)	3 umol/L
<input type="checkbox"/> Alkaline Phosphatase	144 iu/L, 144 iu/L
<input type="checkbox"/> Alanine Aminotransferase	15 iu/L
<input type="checkbox"/> Gamma-Glutamyl Transferase	
<input type="checkbox"/> Protein (Total)	
<input type="checkbox"/> Albumin	L 30 g/L, L 30 g/L
<input type="checkbox"/> Calcium	C 3.13 mmol/L
<input type="checkbox"/> Calcium (Corrected)	* C 3.19 mmol/L
<input type="checkbox"/> Magnesium	
<input type="checkbox"/> Phosphate (Inorganic)	1.07 mmol/L
<input type="checkbox"/> Amylase	
<input type="checkbox"/> C-Reactive Protein	5 mg/L
<input type="checkbox"/> Creatine Kinase	
<input type="checkbox"/> Troponin I (High Sensitivity)	* 23.2 ng/L

<input type="checkbox"/> Haemoglobin	L 94 g/L
<input type="checkbox"/> White Blood Cell Count	5.4 x 10 <sup>9</sup> /L
<input type="checkbox"/> Platelet Count	187 x 10 <sup>9</sup> /L
<input type="checkbox"/> Mean Corpuscular Volume	96.1 fL
<input type="checkbox"/> Red Blood Cell Count	L 2.81 x 10 <sup>12</sup> /L
<input type="checkbox"/> Haematocrit	L 0.270 l/l
<input type="checkbox"/> Mean Corpuscular Haemoglobin	H 33.5 pg
<input type="checkbox"/> Mean Corpuscular Haemoglobin Conc	348 g/L
<input type="checkbox"/> Red Cell Distribution Width	12.8 %
<input type="checkbox"/> Neutrophils	2.5 x 10 <sup>9</sup> /L
<input type="checkbox"/> Lymphocytes	2.6 x 10 <sup>9</sup> /L
<input type="checkbox"/> Monocytes	0.3 x 10 <sup>9</sup> /L
<input type="checkbox"/> Eosinophils	0.1 x 10 <sup>9</sup> /L
<input type="checkbox"/> Basophils	0.0 x 10 <sup>9</sup> /L
<input type="checkbox"/> Reticulocytes	
<input type="checkbox"/> Ret. abs.	
<input type="checkbox"/> Nuc.RBC count	<0.2 x 10 <sup>9</sup> /L

# What would you do next?

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- History
- Examination
  
- Further bloods
- Imaging
- Special tests for the haematologists

<input type="checkbox"/> <b>β2-Microglobulin</b>	
<b>Free light chains</b>	* Free light chain:
<input type="checkbox"/> <b>Immunoglobulin A</b>	* L 0.32 g/L
<input type="checkbox"/> <b>Immunoglobulin G</b>	* H 39.23 g/L
<input type="checkbox"/> <b>Immunoglobulin M</b>	* L 0.17 g/L
<b>Serum Electrophoresis Interpretation</b>	* Serum Electrop
<b>Immunofixation Result</b>	* Immunofixation
<input type="checkbox"/> <b>Paraprotein</b>	* 30 g/l.



# Spinal cord compression in Multiple Myeloma

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- Needs urgent oncology +/- neurosurgical input
- Myeloma diagnosis
  - CRAB
    - Calcium
    - Renal impairment
    - Anaemia
    - Bone involvement
  - Paraprotein/light chains
  - Plasma cells (on bone marrow biopsy)



# Case 3

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- You are the ward cover F1 - called in the evening by biochemistry lab:
  - ‘AKI’

	26/09/2019 04:12	26/09/2019 06:41	
Sodium		130	▼
Potassium		4.7	
Urea		15.6	▲
Creatinine		207	▲
Estimated GFR		29 *	
Calcium		3.46	▲
Calcium (albumin-a...		3.70	▲
Phosphate		1.14	
Total Protein	56		▼
Urate		1,100	▲



# What further information would you like?

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- 48 year old man with probable high grade lymphoma
- Admitted to hospital yesterday
- Hasn't started any chemo yet
  
- Baseline creatinine = 90
  
- Suspected diagnosis?

Tumour lysis syndrome

# TLS definition

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## Laboratory tumour lysis syndrome

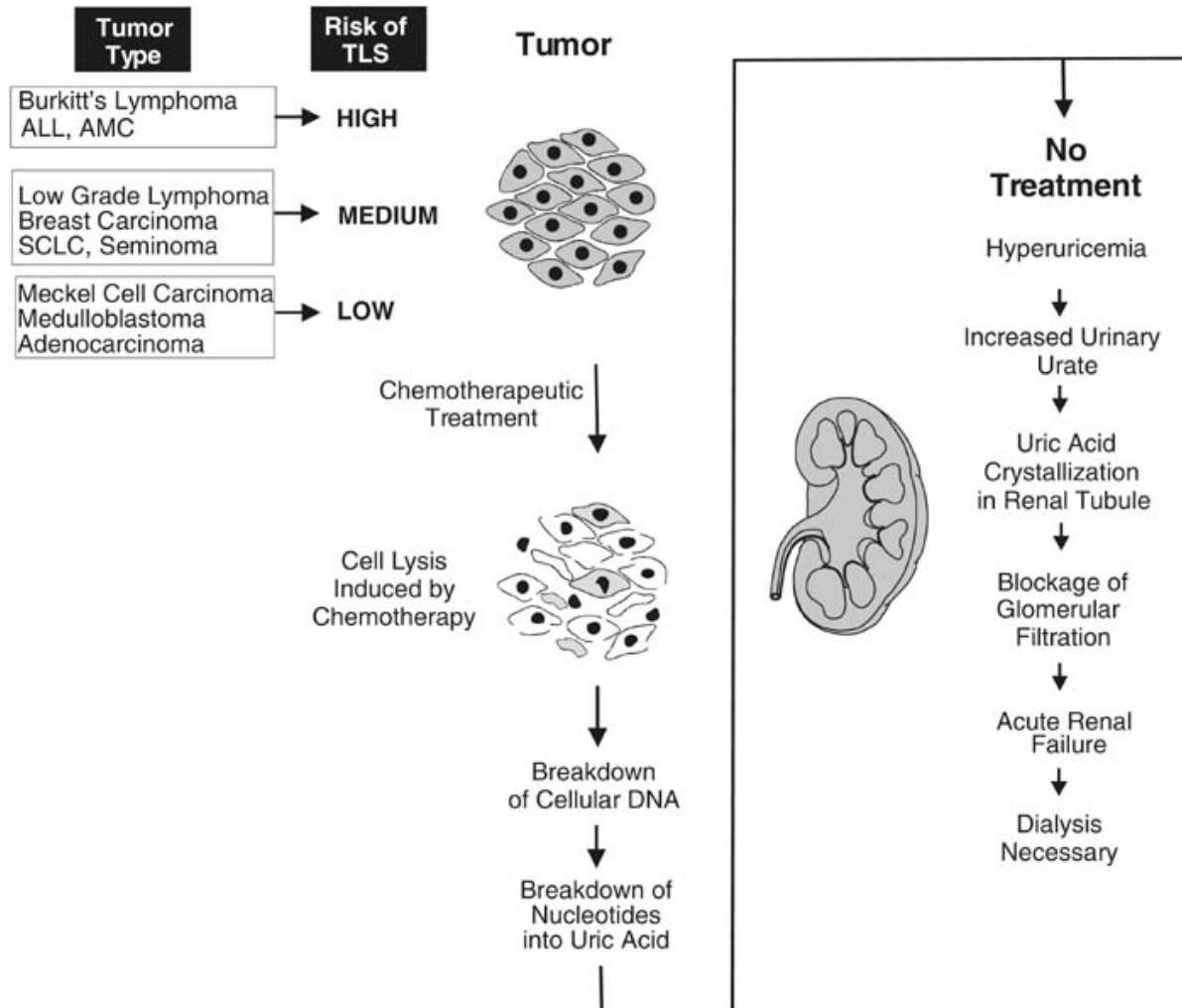
- The presence of  $\geq 2$  of the following abnormalities in a patient with cancer or undergoing treatment for cancer,  $< 3$  or  $> 7$  days of starting treatment
  - Urate  $\uparrow$
  - Potassium  $\uparrow$
  - Phosphate  $\uparrow$
  - Calcium  $\downarrow$

## Clinical tumour lysis syndrome

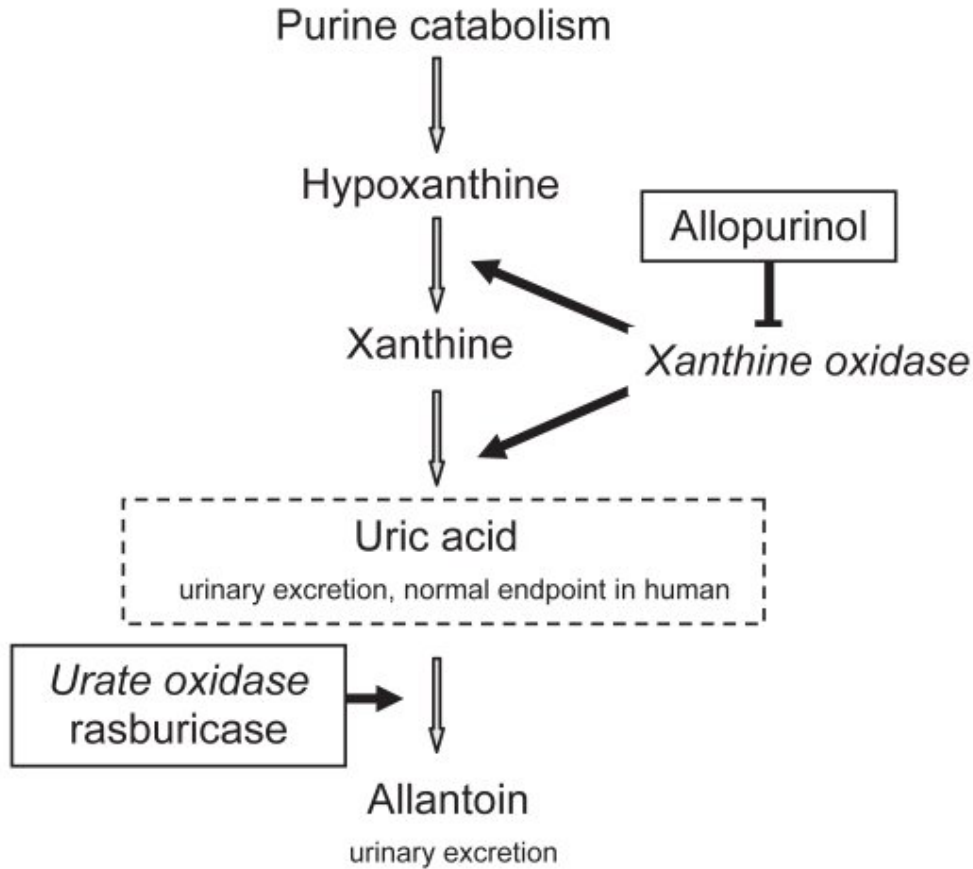
- Laboratory TLS +  $\geq 1$  of
  - Creatinine  $\geq 1.5 \times$  ULN
  - Cardiac arrhythmia
  - Sudden death
  - Seizure

# Pathology of TLS

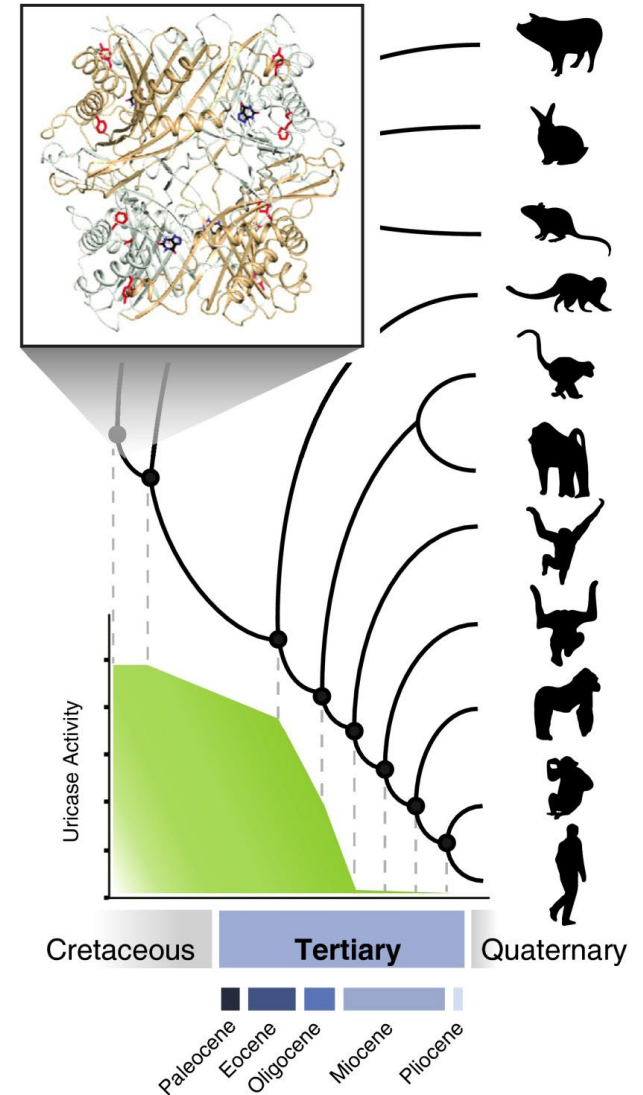
## Tumor Lysis Syndrome and Kidney Dysfunction



# Mechanism of rasburicase



Barred lines=inhibition. Arrows=activation or consequences



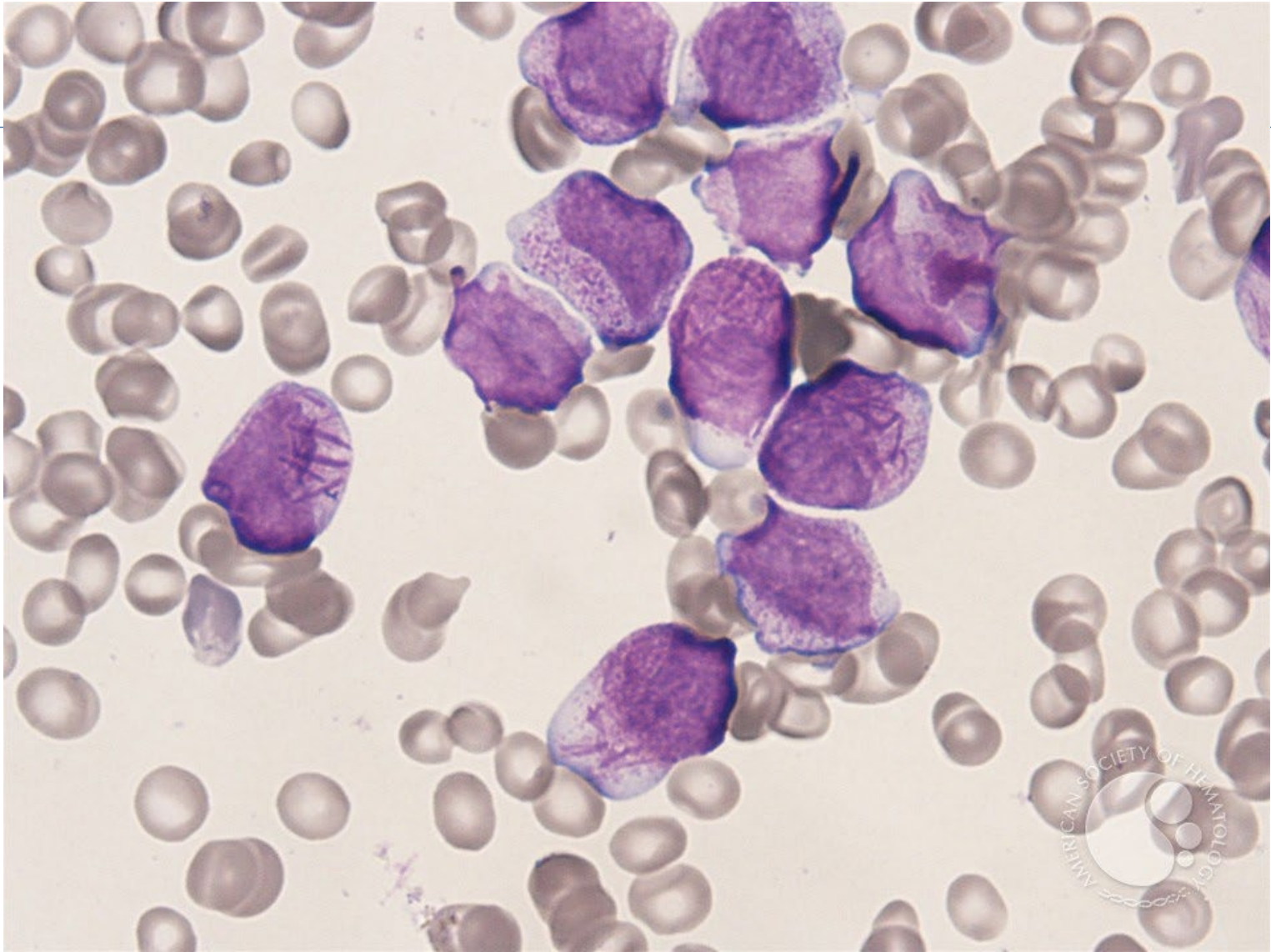
# Rasburicase outcome

	26/09/2019 04:12	26/09/2019 06:41	26/09/2019 11:32	26/09/2019 20:24	27/09/2019 05:02	28/09/2019 03:58	29/09/2019 06:49	30/09/2019 07:15
Sodium		130 ▼	129 ▼	125 ▼	127 ▼	129 ▼	133 ▼	136
Potassium		4.7	4.5	4.8	4.8	5.2 ▲	4.5	3.9
Urea		15.6 ▲	15.6 ▲	17.9 ▲	19.3 ▲	24.4 ▲	13.0 ▲	12.2 ▲
Creatinine		207 ▲	212 ▲	240 ▲	244 ▲	261 ▲	134 ▲	111
Estimated GFR		29 *	28 *	24 *	24 *	22 *	48 *	60 *
Calcium		3.46 ▲	3.52 ▲	3.45 ▲	3.17 ▲	2.74 ▲	2.42	2.17 ▼
Calcium (albumin-a...		3.70 ▲	3.72 ▲	3.69 ▲	3.45 ▲	3.04 ▲	2.75 ▲	2.54
Phosphate		1.14	1.20	1.88 ▲	1.79 ▲	2.13 ▲	1.32	1.29
Total Protein	56 ▼							
Urate		1,100 ▲			<12 ▼	<12 ▼		28 ▼

# Case 4

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- You're the medical SHO on take
- ED refer a 24 year old female with bruising and fevers
  - Hb 89
  - WCC 27.5
  - Neuts 0.84
  - Plts 33
- What is the single most important blood test??
- Who will you call?



# Acute promyelocytic leukaemia

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- For anyone with suspected acute leukaemia, must send a clotting screen, including fibrinogen!
- Needs urgent haem r/v and treatment
- Manage DIC
  - Keep Fibrinogen >1.5
  - Platelets >50
  - Monitor closely for bleeding!
- Specific treatment?
  - ATRA

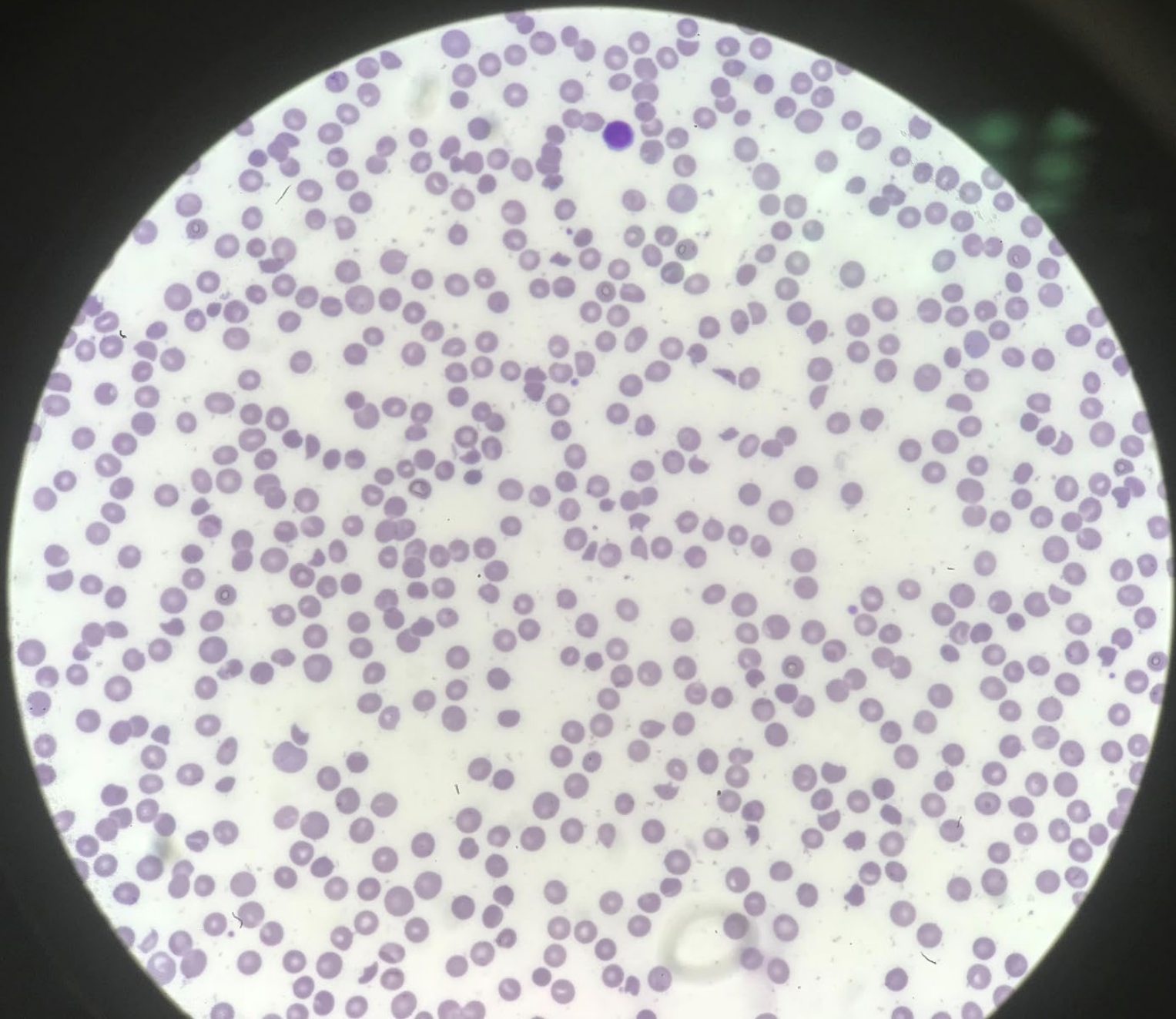


# Case 5

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- 17 year old male in A&E
- Expressive dysphasia - can't say anything other than 'I don't know' and febrile
- Neuro advised to do an LP to r/o encephalitis, but...

Results	06/11/2017 19:03	06/11/2017 16:49	06/11/2017 14:39	06/11/2017 12:48	25/06/2015 9:24
<b>Routine Chemistry</b>					
<input type="checkbox"/> Sodium				142 mmol/L	
<input type="checkbox"/> Potassium				4.2 mmol/L	
<input type="checkbox"/> Urea				6.6 mmol/L	
<input type="checkbox"/> Creatinine				97 umol/L	
<input type="checkbox"/> Bilirubin (Total)				H 46 umol/L	
<input type="checkbox"/> Alkaline Phosphatase				L 64 iu/L	
<input type="checkbox"/> Alanine Aminotransferase				H 56 iu/L	
<input type="checkbox"/> Albumin				42 g/L	
<input type="checkbox"/> C-Reactive Protein				H 6 mg/L	
<input type="checkbox"/> Ferritin	C 1,317 ug/L				
Ferritin Interpretation	* See Note				
<b>Non-Routine Chemistry</b>					
<input type="checkbox"/> Iron	18.4 umol/L, 18.4				
<input type="checkbox"/> Iron Binding Capacity (Total)	63 umol/L				
<input type="checkbox"/> Transferrin	2.44 g/l.				
<input type="checkbox"/> Transferrin Saturation	29 %				
<input type="checkbox"/> Lactate Dehydrogenase (Total)	H 1,323 iu/L				
<b>FBC and Differential</b>					
<input type="checkbox"/> Haemoglobin	L 88 g/L			L 100 g/L	
<input type="checkbox"/> White Blood Cell Count	H $12.1 \times 10^9/L$			$10.2 \times 10^9/L$	
<input type="checkbox"/> Platelet Count	C $11 \times 10^9/L$			* C $15 \times 10^9/L$	
<input type="checkbox"/> Mean Corpuscular Volume	87.6 fL			86.9 fL	
<input type="checkbox"/> Red Blood Cell Count	L $2.83 \times 10^{12}/L$			L $3.27 \times 10^{12}/L$	
<input type="checkbox"/> Haematocrit	L 0.248 l/l			L 0.284 l/l	
<input type="checkbox"/> Mean Corpuscular Haemoglobin	31.1 pg			30.6 pg	
<input type="checkbox"/> Mean Corpuscular Haemoglobin Conc	355 g/L			352 g/L	
<input type="checkbox"/> Red Cell Distribution Width	H 15.2 %			14.7 %	
<input type="checkbox"/> Neutrophils	H $9.3 \times 10^9/L$			$7.7 \times 10^9/L$	
<input type="checkbox"/> Lymphocytes	$2.3 \times 10^9/L$			$1.9 \times 10^9/L$	
<input type="checkbox"/> Monocytes	$0.4 \times 10^9/L$			$0.4 \times 10^9/L$	
<input type="checkbox"/> Eosinophils	$0.1 \times 10^9/L$			$0.2 \times 10^9/L$	
<input type="checkbox"/> Basophils	$0.0 \times 10^9/L$			$0.1 \times 10^9/L$	
<input type="checkbox"/> Nuc.RBC count	$<0.2 \times 10^9/L$			$<0.2 \times 10^9/L$	
Film Comment				Film Comment	



# Signs & symptoms

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- **If you see:**
  - 1) Anaemia (specifically MAHA - microangiopathic haemolytic anaemia)
  - 2) Thrombocytopenia
  - 3) AKI
  - 4) Confusion
  - 5) Fever
- Think TTP and call haem urgently!

# Thrombotic Thrombocytopenic Purpura

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- A true haematological emergency! Needs blue light transfer to nearest TTP centre – 90% die <10 days if untreated!
  - Clotting should be normal
  - Never transfuse platelets!
- Usually autoimmune in nature – inhibits ADAMTS13
- Management:
  - Plasma exchange
  - Immunosuppress – steroids, rituximab esp if cardiac or neuro involvement
  - Caplacizumab – anti vWF Ab

# Summary

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- Covered:
  - Neutropenic sepsis – don't wait for blood results!
  - Spinal cord compression
  - Tumour lysis syndrome
  - Acute promyelocytic leukaemia
  - TTP
- The 2 things haem must get out of bed for are:
  - APML
  - TTP
- Clotting is vital to distinguish



Many thanks  
Any questions?