

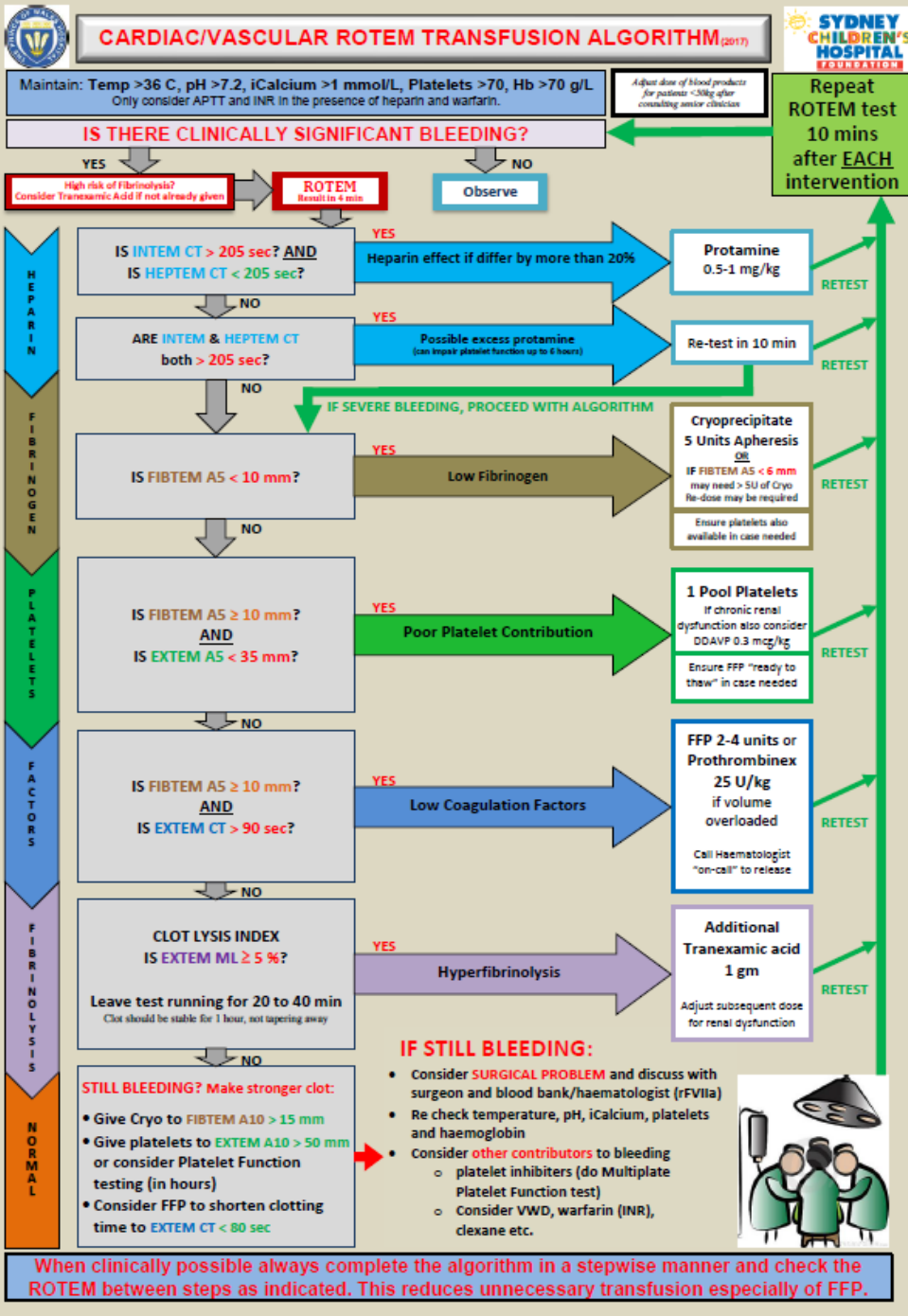
# Upper GI Bleed

December 2019

Thanks to Dr Gary Devine at Fiona Stanley Hospital for sharing this educational case.

# Disclaimer / Pre-amble

- These cases have been de-identified to protect the identity of the patient and the treating teams.
- These are all real cases and real ROTEMs. The individuals involved in these difficult cases have agreed to anonymously share these with us – thank you for your generosity.
- Successful management of the bleeding patient involves much more than just administration of blood products.
- The primary aim of these cases is to teach the use ROTEM guided blood product therapy. We have deliberately not included a lot of detail about some of the other aspects of management which might detract from this focus.



# ROTEM ANALYSIS AND TREATMENT PLAN

\*\*Nurse or JMO to circle algorithm used then insert results from ROTEM  
Next circle range (action red range) and use algorithm to create a plan.\*\*

Date: / /

Time:

ALGORITHM USED (circle one):

CARDIAC/VASCULAR or GENERAL/OBSTETRIC

- For CARDIAC/VASCULAR start here and do all:

INTM CT = ..... Below 205 / 205 & Above

HEPTM CT = ..... Below 205 / 205 & Above

- For GENERAL/OBSTETRIC start here (this section only):

EXTEM A5 = ..... Below 35 / 35-40 / Above 40

FIBTEM A5 = ..... Below 10 / 10-15 / Above 15

EXTEM CT = ..... Below 80 / 80-90 / Above 90

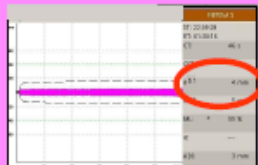
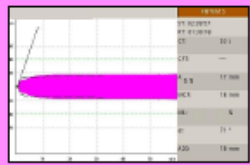
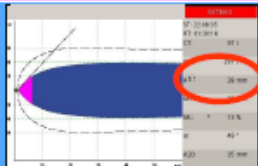
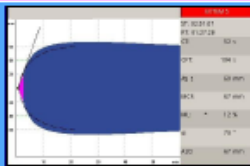

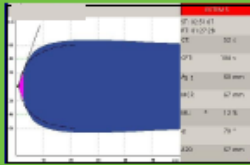
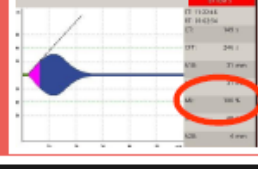
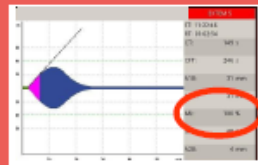
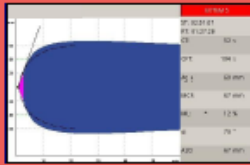
EXTEM ML = ..... Below 5 / 5 & Above

Management Plan: .....

Please stick this label in the patients progress notes

# KEMH ROTEM Algorithm for Critical Bleeding

**Key Points:** This algorithm should be used in conjunction with the KEMH Blood Product Guidelines for Major Obstetric Haemorrhage. Only treat abnormal values if active bleeding or at high risk of bleeding. Repeat ROTEM analysis 10 mins after intervention to assess response.

	ABNORMAL ROTEM	CRITERIA	DIAGNOSIS	INTERVENTION	CORRECTED ROTEM
<b>FIBRINOGEN</b>		<b>FIBTEM A5 ≤ 10mm</b>	<b>Low fibrinogen</b>	<b>Cryoprecipitate OR Fibrinogen concentrate</b> (see dosing guide) <b>AND Tranexamic acid 1 g</b>	
<b>PLATELETS</b>		<b>EXTEM A5 ≤ 35mm</b> and <b>FIBTEM A5 ≥ 10mm</b>	<b>Low platelets</b>	<b>Platelets: 1 adult dose</b> (correlate with platelet count)	
		<b>EXTEM A5 ≤ 25mm</b> and <b>FIBTEM A5 ≤ 10mm</b>	<b>Low platelets</b> and <b>Low fibrinogen</b>	<b>Platelets and fibrinogen</b> (correlate with platelet count)	
<b>FACTORS</b>		<b>EXTEM CT 80-140s</b> and <b>FIBTEM A5 ≤ 10mm</b>	<b>Low fibrinogen</b>	Correct <b>fibrinogen</b> and reassess	
		<b>EXTEM CT &gt; 140s</b> and <b>FIBTEM A5 ≤ 10mm</b>	<b>Low fibrinogen and</b> <b>Low coagulation factors</b>	<b>FFP 1-2U + Fibrinogen as Indicated</b> (Consider Prothrombinex-see below)	
<b>FIBRINOLYSIS</b>		Early Diagnosis <b>EXTEM A5 ≤ 35mm</b> or <b>FIBTEM CT &gt; 600s</b>	<b>High likelihood of</b> <b>excess fibrinolysis</b>	<b>Tranexamic acid 1g</b> Consider repeat dose if has lost over 1 blood volume since initial dose	
		Late Diagnosis <b>EXTEM or FIBTEM ML ≥ 5%</b>	<b>Excess fibrinolysis</b>		

## Fibrinogen Dosing Guide

**FIBTEM A5 Target: ≥ 12mm**

FIBTEM A5	Increase required	Cryoprecipitate	Fibrinogen Concentrate
9-10mm	2-3 mm	1-2 doses	2g*
7-8mm	4-5 mm	1-2 doses	3g*
4-6mm	6-8 mm	2 doses	4g
<4mm	≥9mm	2 doses	5g

\*Outside of currently approved guidelines, must be discussed with haematologist

## Fibrinogen Concentrate

### Guidelines For Use

- Consultant anaesthetist or haematologist approval required.
- Patients must be experiencing life threatening haemorrhage.
- Fibrinogen concentrate may be indicated instead of, or in addition to, cryoprecipitate if the FIBTEM A5 is 6mm or below, OR there is a high suspicion of coagulopathy in a life threatening haemorrhage.
- Use at higher FIBTEM values may be appropriate in patients refusing cryoprecipitate.

### Administration

- Reconstitute 1g in 50ml warm sterile water (use prepared kit in fluid warmer).
- Swirl gently and do not shake (to avoid foaming).
- Administer each 1g via syringe driver over 2-4 mins if life-threatening haemorrhage or over 10 mins if not.

## Cryoprecipitate

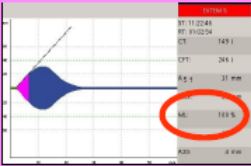
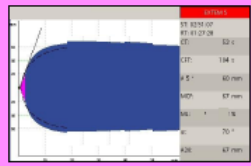
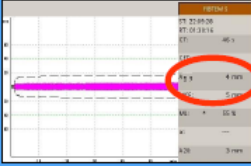
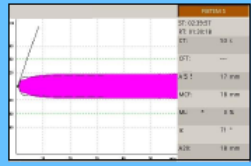
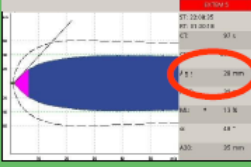
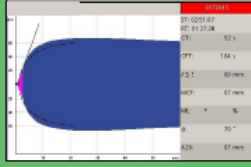
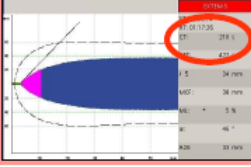
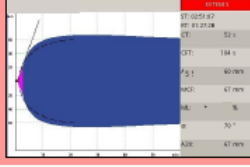
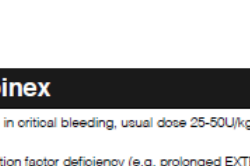
1. 1 dose is equivalent to 10 whole blood units or 5 apheresis units.
2. May be supplied as whole blood units or as apheresis units (or a combination) 1 apheresis unit = 2 whole blood units.
3. Availability time: generally available within 10 minutes of request being made

## Prothrombinex

1. Haematologist approval required
2. Consider as an alternative to FFP for patients with coagulation factor deficiency (e.g. prolonged EXTEM CT see above) in the following circumstances:
  - Circulatory overload
  - Rapid correction in extreme coagulopathy

# SCGH ROTEM Algorithm for Critical Bleeding

**Key Points:** This algorithm should be used in conjunction with the SCGH Critical Bleeding Protocol. Only treat abnormal values if active bleeding or at high risk of bleeding. Repeat ROTEM analysis 10 mins after intervention to assess response.

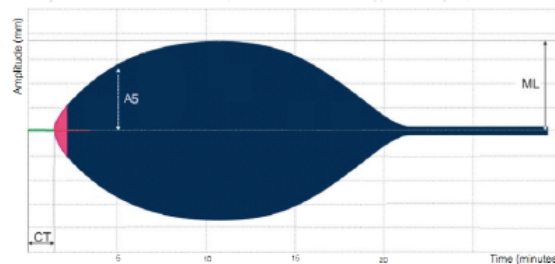
	ABNORMAL ROTEM	CRITERIA	DIAGNOSIS	INTERVENTION	CORRECTED ROTEM
FIBRINOLYSIS		Early Diagnosis <b>EXTEM A5 ≤ 35mm</b> or <b>FIBTEM CT &gt; 600s</b>	High likelihood of <b>excess fibrinolysis</b>	<b>Tranexamic acid 1g</b> Consider repeat dose if has lost over 1 blood volume since initial dose	
		Late Diagnosis <b>EXTEM or FIBTEM ML ≥ 5%</b>	<b>Excess fibrinolysis</b>		
FIBRINOGEN		<b>FIBTEM A5 ≤ 10mm</b>	<b>Low fibrinogen</b>	<b>Cryoprecipitate</b> (see dosing guide)	
PLATELETS		<b>EXTEM A5 ≤ 35mm</b> and <b>FIBTEM A5 &gt; 10mm</b>	<b>Low platelets</b>	<b>Platelets: 1 adult dose</b> (correlate with platelet count)	
		<b>EXTEM A5 ≤ 25mm</b> and <b>FIBTEM A5 ≤ 10mm</b>	<b>Low platelets</b> and <b>Low fibrinogen</b>	<b>Platelets and fibrinogen</b> (correlate with platelet count)	
FACTORS		<b>EXTEM CT 80-140s</b> and <b>FIBTEM A5 ≤ 10mm</b>	<b>Low fibrinogen</b>	Correct <b>fibrinogen</b> and reassess	
		<b>EXTEM CT &gt; 80s</b> but <b>FIBTEM A5 &gt; 10mm</b>	<b>Low coagulation factors</b>	<b>FFP 1-4U</b> or <b>Prothrombinex 10 U/kg</b> (+ fibrinogen if indicated)	
		<b>EXTEM CT &gt; 140s</b> and <b>FIBTEM A5 ≤ 10mm</b>	<b>Low fibrinogen</b> and <b>Low coagulation factors</b>		

## Fibrinogen Dosing Guide

**FIBTEM A5 Target: ≥ 12mm**

FIBTEM A5	Increase required	Cryoprecipitate*
9-10mm	2-3 mm	10 Units
7-8mm	4-5 mm	15 Units
4-6mm	6-8 mm	20 Units
<4mm	≥9mm	20-25 Units

\*Cryoprecipitate dosing is for standard adult units  
(Cryo 5 units = Fibrinogen A5 increase of approx 2mm)



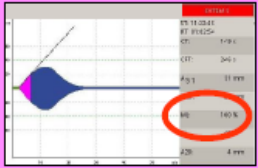
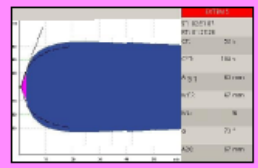
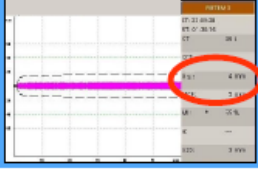
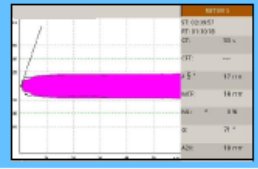
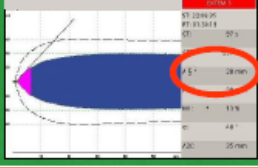
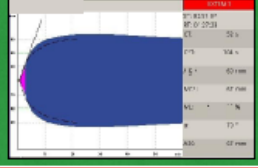
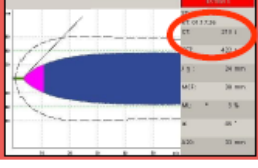
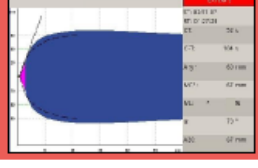
## Prothrombinex

1. Warfarin Reversal: Indicated for urgent reversal of warfarin in critical bleeding, usual dose 25-50U/kg (+/- FFP) discuss with haematologist.
2. Consider as an alternative to FFP for patients with coagulation factor deficiency (e.g. prolonged EXTEM CT see above) in the following circumstances:
  - Circulatory overload
  - Rapid correction in extreme coagulopathy
  - Consider lower dose 10U/kg (round to nearest 500U).



# FSH ROTEM Algorithm for Critical Bleeding

This algorithm should be used in conjunction with the FSH Major Haemorrhage Protocol  
Treat abnormal values only if there is active bleeding or the patients is at high risk of bleeding.  
Repeat ROTEM analysis 10 mins after any intervention to assess response.

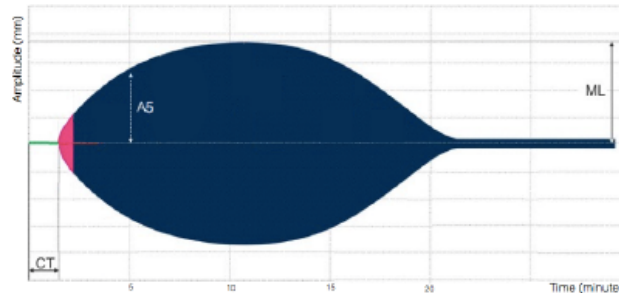
	ABNORMAL ROTEM	CRITERIA	DIAGNOSIS	INTERVENTION	CORRECTED ROTEM
<b>FIBRINOLYSIS</b>		Trauma (within 3hrs) OR Post partum haemorrhage  Flat trace OR Maximal lysis >5%	→ Hyperfibrinolysis	Tranexamic acid 1g	
<b>FIBRINOGEN</b>		FIBTEM A5 ≤10mm	Hypofibrinogenaemia	Cryoprecipitate	
<b>PLATELETS</b>		EXTEM A5 ≤35mm with normal fibrinogen*	Thrombocytopaenia	Platelets	
<b>FACTORS</b>		EXTEM CT 90-140sec with normal fibrinogen** OR EXTEM CT >140sec	Low coagulation factors	Fresh Frozen Plasma 2-4u OR Prothrombinex 25IU/kg	

## Cryoprecipitate Dosing Guide

FIBTEM A5	Non-obstetric	Obstetric
7-10	1 dose	2 doses
<6	2 doses	3 doses

One dose = five apheresis units = Fibrinogen A5 increase of approximately 4mm

\*If EXTEM ≤25 and FIBTEM A5 ≤10 consider replacing both factors  
\*\*Fibrinogen replacement in the context of hypofibrinogenaemia may overcome a minor prolongation of clotting time





## Key components

EXTEM CT Clotting Time	Thrombin generation
EXTEM A5 Amplitude at 5 minutes	Fibrinogen and platelet concentration and function
FIBTEM A5 Amplitude at 5 minutes	Fibrinogen concentration and function
ML % Maximal lysis	Degree of fibrinolysis over temogram

Do you think the algorithms are too complicated to use in the middle of a crisis?

- Consider using the traffic light system published by this group from Argentina shown on the next slide.

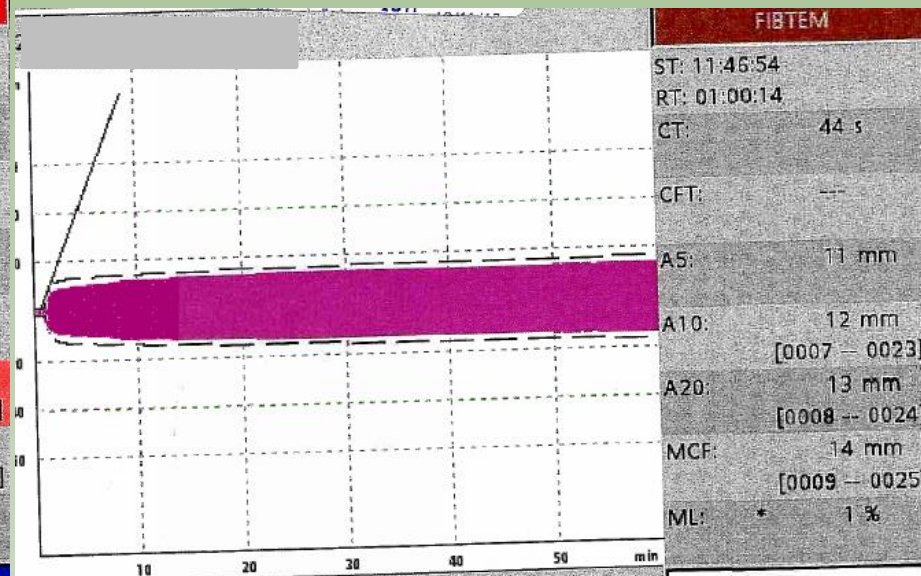
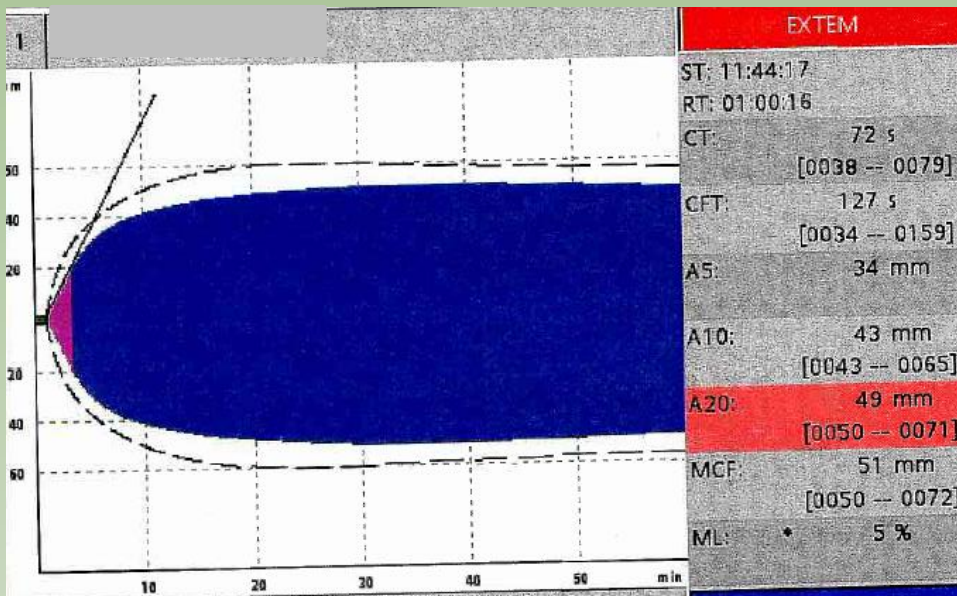
ASSESSMENT	CODE	PRIORITIES	STRATEGY	ALTERNATIVES
 <b>PERICARDIAC/CARDIAC ARREST</b> <ul style="list-style-type: none"> <li>- Exsanguinating bleeding.</li> <li>- Need for epinephrine boluses.</li> <li>- Fluid non responder.</li> </ul>		<ol style="list-style-type: none"> <li>1. Clot lysis</li> <li>2. Clot strength</li> <li>3. Thrombin generation</li> </ol>	<b>A. RED PACK</b> <ol style="list-style-type: none"> <li>1. TXA 2 g (25 mg.kg<sup>-1</sup>)</li> <li>2. FC 4 g (50 mg.kg<sup>-1</sup>)</li> <li>3. 4-PCC 1000 U (10–15 U.kg<sup>-1</sup>)</li> <li>4. Give O (–) pRBCs (max. 2 U)</li> </ol> <b>B.</b> Take blood sample for VET, typing and crossmatching <b>C.</b> Go into POC guided	<b>A. RED PACK</b> <ol style="list-style-type: none"> <li>1. TXA 2 g</li> <li>2. Cryo 1 U.5 kg<sup>-1</sup></li> <li>3. Plasma 15 - 30 ml.kg<sup>-1</sup></li> <li>4. Give O (–) pRBCs (max. 2 U)</li> </ol> <b>+ B and C</b>
<b>UNSTABLE PATIENT</b> <ul style="list-style-type: none"> <li>- Bleeding difficult to control.</li> <li>- Will persist over time.</li> <li>- Increasing need of vasopressors.</li> <li>- Fluid transitory responder.</li> </ul>		<ol style="list-style-type: none"> <li>1. Clot lysis</li> <li>2. Clot strength</li> </ol>	<b>A. YELLOW PACK</b> <ol style="list-style-type: none"> <li>1. TXA 1 g (15 mg.kg<sup>-1</sup>)</li> <li>2. FC 2 g (25 mg.kg<sup>-1</sup>)</li> </ol> <b>B.</b> Take blood sample for VET, typing and crossmatching. <b>C.</b> Go into POC guided	<b>A. YELLOW PACK</b> <ol style="list-style-type: none"> <li>1. TXA 1 g</li> <li>2. Cryo 1 U.10 kg<sup>-1</sup></li> </ol> <b>+ B and C</b>
<b>STABLE PATIENT</b> <ul style="list-style-type: none"> <li>- Controlled bleeding.</li> <li>- Limited in time.</li> <li>- Able to monitor blood loss.</li> <li>- Fluid sustain responder.</li> </ul>		<b>A.</b> Take blood sample for VET and typing - crossmatching if needed. <b>B.</b> Complete POC guided		
<ul style="list-style-type: none"> <li>• Consider medications (platelet inhibitors and anticoagulants)</li> <li>• Consider patient past medical history (bleeding disorders)</li> </ul>	Switch and Reassess	<ul style="list-style-type: none"> <li>• Always keep Hb &gt; 70 g.l<sup>-1</sup> – Control BD – T &gt; 36°C – Cai &gt; 1 mmol.l<sup>-1</sup> – pH &gt; 7.20</li> <li>• Minimise fluids to keep perfusion avoiding dilutional coagulopathy.</li> <li>• Consider early administration of vasopressors (i.e. norepinephrine).</li> </ul>		

## The haemostasis traffic light: a pragmatic tool for bleeding management



# History - Morning

- Male drinker with alcoholic cirrhosis
  - Admitted for hematochezia (fresh pr bleeding)
  - In the am booked for upper GI endoscopy
- 
- Initial bloods were FBC, COAG & ROTEM



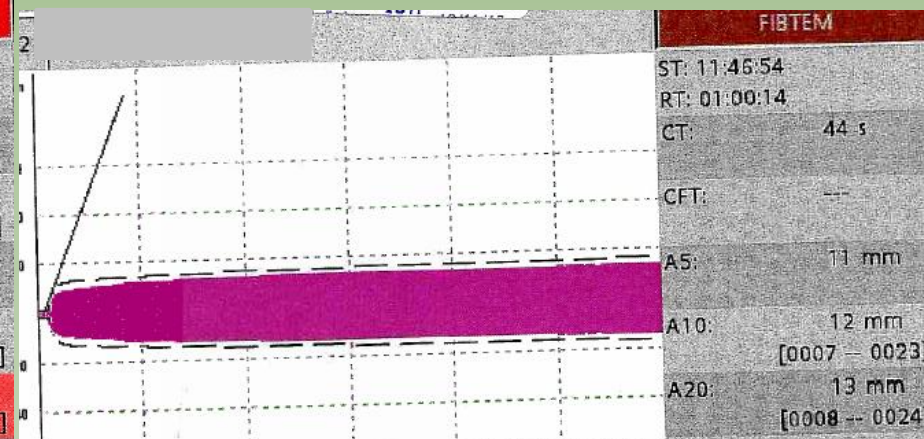
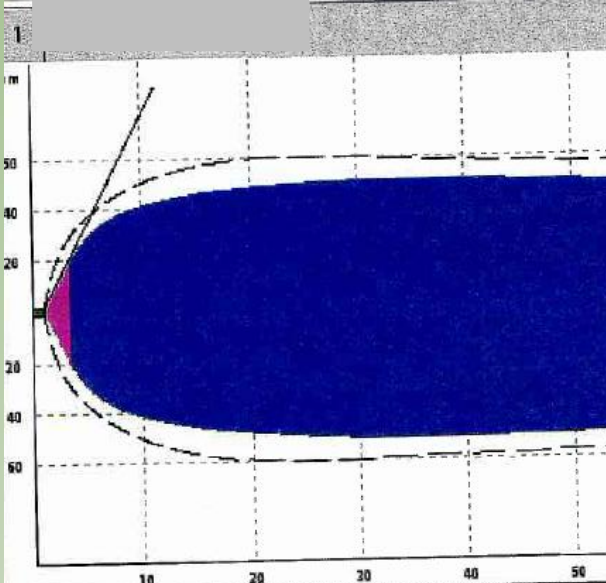
## COAG

- HB 62
- INR 1.6
- Fibrinogen 1.6g
- Platelets 93

## ROTEM Results

- Fibtem A5 = 11m
- Extem CT = 72s
- Extem A5 = 34mm

This patient is about to go for an endoscopy and is possibly still bleeding – try and interpret this yourself.



## Interpretation

This patient seems relatively stable from the history and so assuming we don't know what the future holds I would:

- 1) Consider TXA 1g
- 2) Fibrinogen – Fibtem A5 11mm is borderline if they seem to be still bleeding consider giving a dose of cryo to prevent it becoming too low (Clauss fibrinogen of 1.6g/L is low) so actually I would probably treat this.
- 3) Platelets – Extem A5 34mm and plt count 93 – both are borderline levels – this is a great example that it's not just the lab results which matter – patient status and examination is paramount – most stable patients who aren't bleeding won't need this corrected but if strong concerns of ongoing bleeding consider a dose of platelets.
- 4) Thrombin - Extem CT = 72s no need to treat this at present.

### COAG

- HB 62
- INR 1.6
- Fibrinogen 1.6g
- Platelets 93

### ROTEM Results

- Fibtem A5 = 11m
- Extem CT = 72s
- Extem A5 = 34mm

- Transfused 2 units red cells
- Upper GI endoscopy completely normal

# History - Afternoon

- Cardiovascular collapse and MET call
- Arterial & venous lines, fluid and blood products empirically administered
- 5 units red cells
- 3 units FFP
- 1g TXA
- 1 adult dose platelets
- Taken for urgent CT angiogram

- Initial bloods sent FBC, COAG & ROTEM results but not available initially.

## Comments

- This is an emergency situation and the team did an awesome job – they recognised the need to resuscitate with volume / red cells but also to attempt to correct haemostasis in a patient who was almost certainly coagulopathic even without having any laboratory results to guide them.
- They recognised that the patient is likely to need platelets – based on the results from the morning.
- Some empiric fibrinogen would have also been extremely useful – e.g. Fibrinogen concentrate or cryoprecipitate depending upon your hospital resources.

- You could consider using empiric therapy using the traffic light system presented earlier:



### PERICARDIAC/CARDIAC ARREST

- Exsanguinating bleeding.
- Need for epinephrine boluses.
- Fluid non responder.



1. Clot lysis
2. Clot strength
3. Thrombin generation

#### A. RED PACK

1. TXA 2 g ( $25 \text{ mg.kg}^{-1}$ )
2. FC 4 g ( $50 \text{ mg.kg}^{-1}$ )
3. 4-PCC 1000 U ( $10\text{--}15 \text{ U.kg}^{-1}$ )
4. Give O (–) pRBCs (max. 2 U)

**B.** Take blood sample for VET, typing and crossmatching

**C.** Go into POC guided

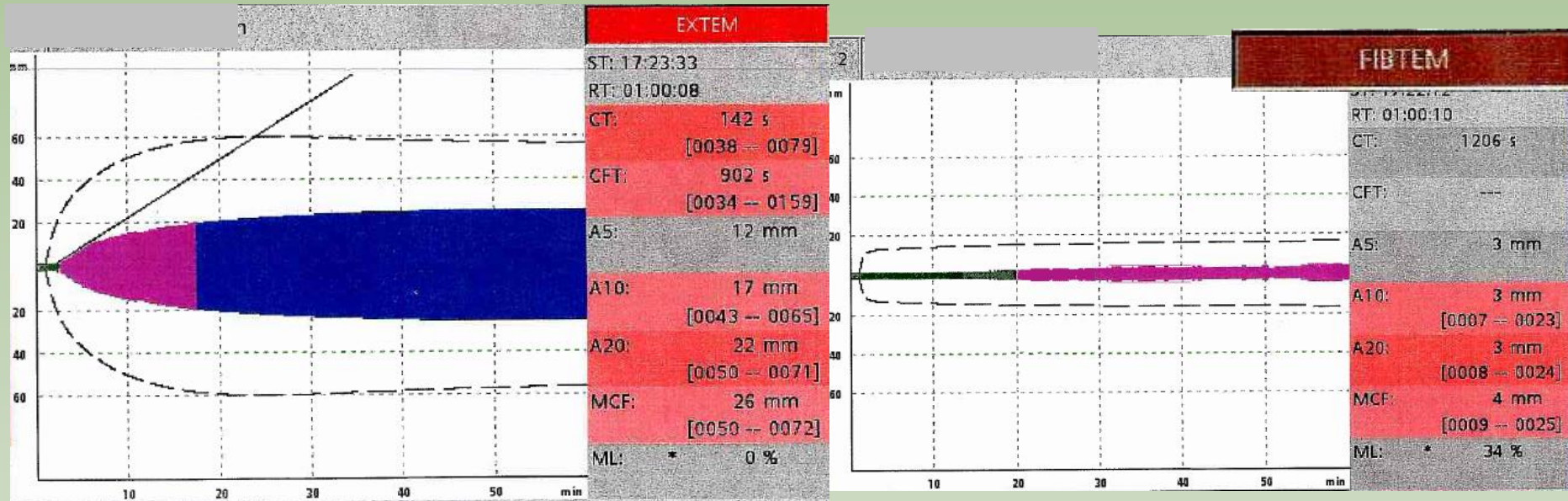
#### A. RED PACK

1. TXA 2 g
2. Cryo 1 U.5  $\text{kg}^{-1}$
3. Plasma 15 - 30  $\text{ml.kg}^{-1}$
4. Give O (–) pRBCs (max. 2 U)

+ B and C



- This ROTEM becomes available in radiology

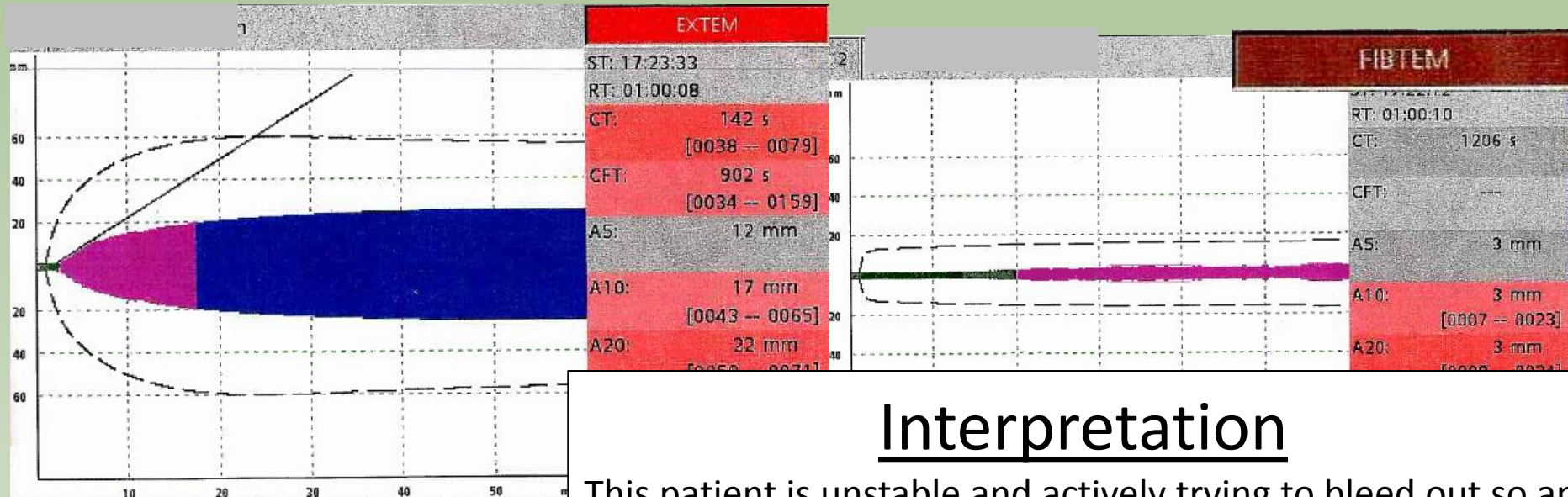


## ROTEM Results

- Fibtem A5 = 3m
- Extem CT = 142s
- Extem A5 = 12mm

Try and interpret this yourself. What else would you give? Remember they have already had TXA 1g, FFP 3 units and 1 dose platelets after this was taken.

- This ROTEM becomes available in radiology



## ROTEM Results

- Fibtcm A5 = 3m
- Extem CT = 142s
- Extem A5 = 12mm

## Interpretation

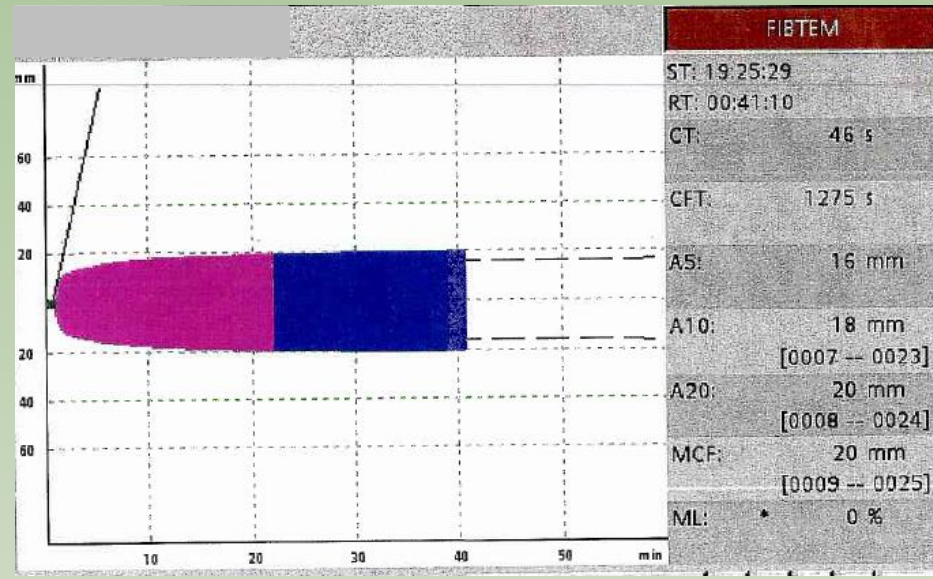
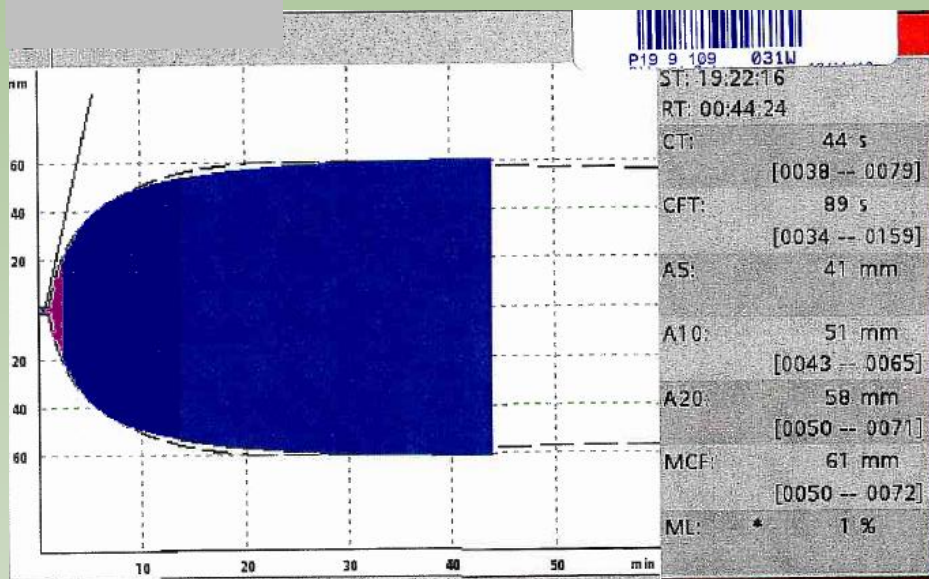
This patient is unstable and actively trying to bleed out so an aggressive approach is warranted:

- 1) Consider TXA 1-2g (already given)
- 2) Fibrinogen – Fibtcm A5 3mm is extremely low, give a very large dose of fibrinogen! 2-3 adult doses of cryo or 6g Fib concentrate.
- 3) Platelets – Extem A5 12mm This patient needs platelets too (already given)
- 4) Thrombin - Extem CT = 142s Mild prolongation – will sometimes correct with fibrinogen alone but in this context of CVS collapse you should treat (already given 3 units FFP)- alternative would be PCC (eg 1000u).

- Based on ROTEM patient was given
- 3 adult doses of cryoprecipitate = 15 units of apheresis cryoprecipitate
- More platelets
- More FFP (?dose)

- Transferred emergently to theatre for emergency hemicolectomy.
- Intubated – some CVS instability initially.
- More red cells and repeat ROTEM sent.

# Next ROTEM in OT



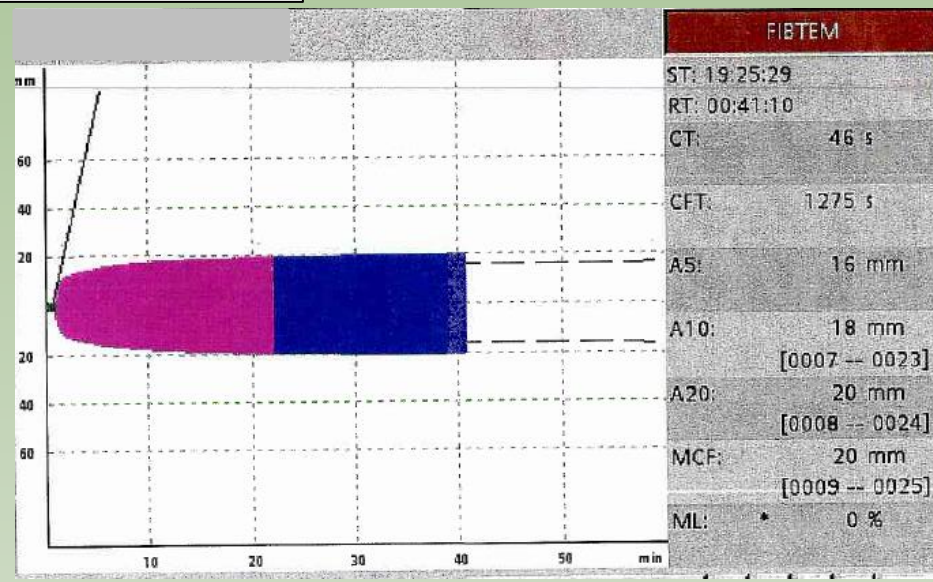
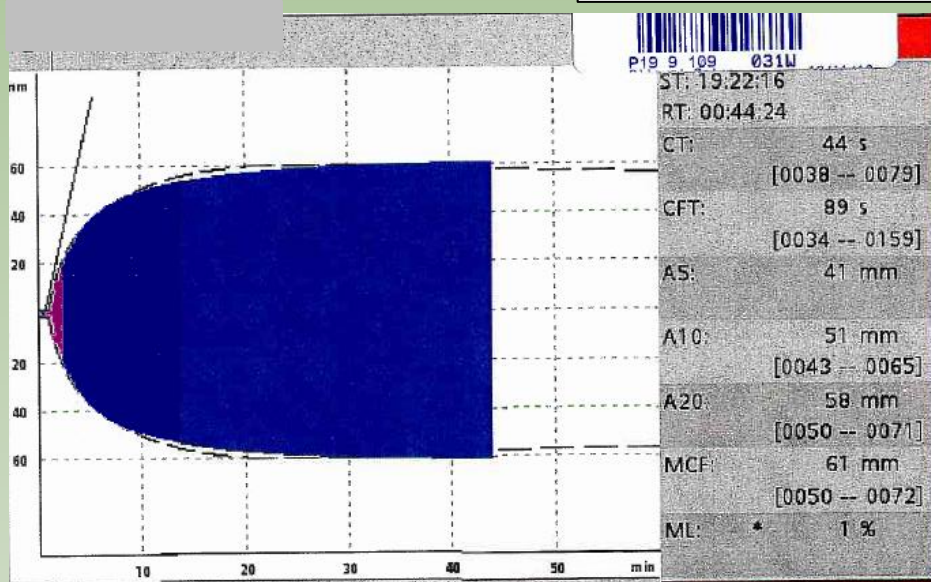
## ROTEM Results

- Fibtem A5 = 16m
- Extem CT = 44s
- Extem A5 = 41mm

Try and interpretate this yourself.



# Next ROTEM in OT



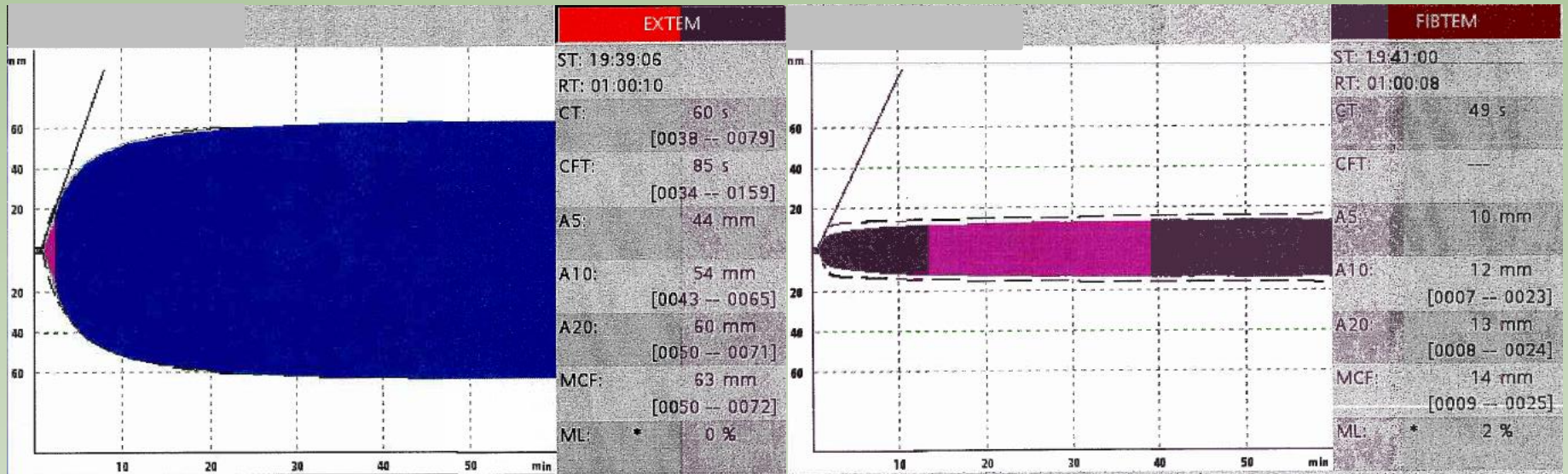
## ROTEM Results

- Fibtem A5 = 16m
- Extem CT = 44s
- Extem A5 = 41mm

## Interpretation

- 1) TXA already given
  - 2) Fibrinogen – Fibtem A5 16mm Great result! No action needed.
  - 3) Platelets – Extem A5 41mm Also back to normal!
  - 4) Thrombin - Extem CT = 44s Normal !
- All great at the moment – check again if more bleeding occurs.

# Next ROTEM in OT



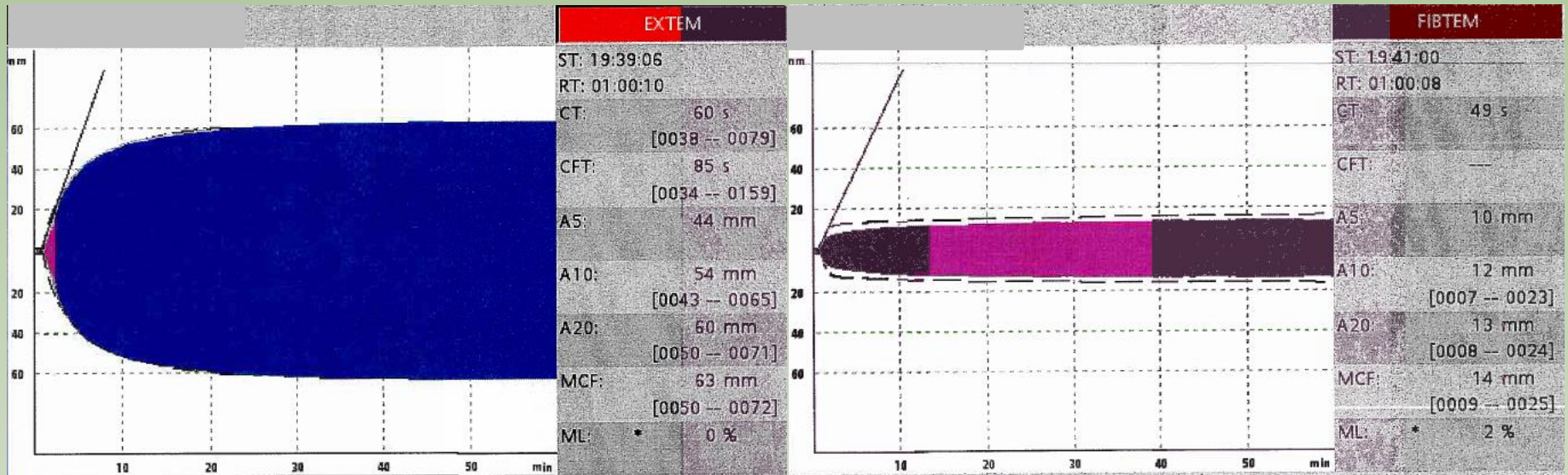
## ROTEM Results

- Fibtem A5 = 10mm
- Extem CT = 60s
- Extem A5 = 44mm

Try and interpret this yourself.



# Next ROTEM in OT



## ROTEM Results

- Fibtem A5 = 10mm
- Extem CT = 60s
- Extem A5 = 44mm

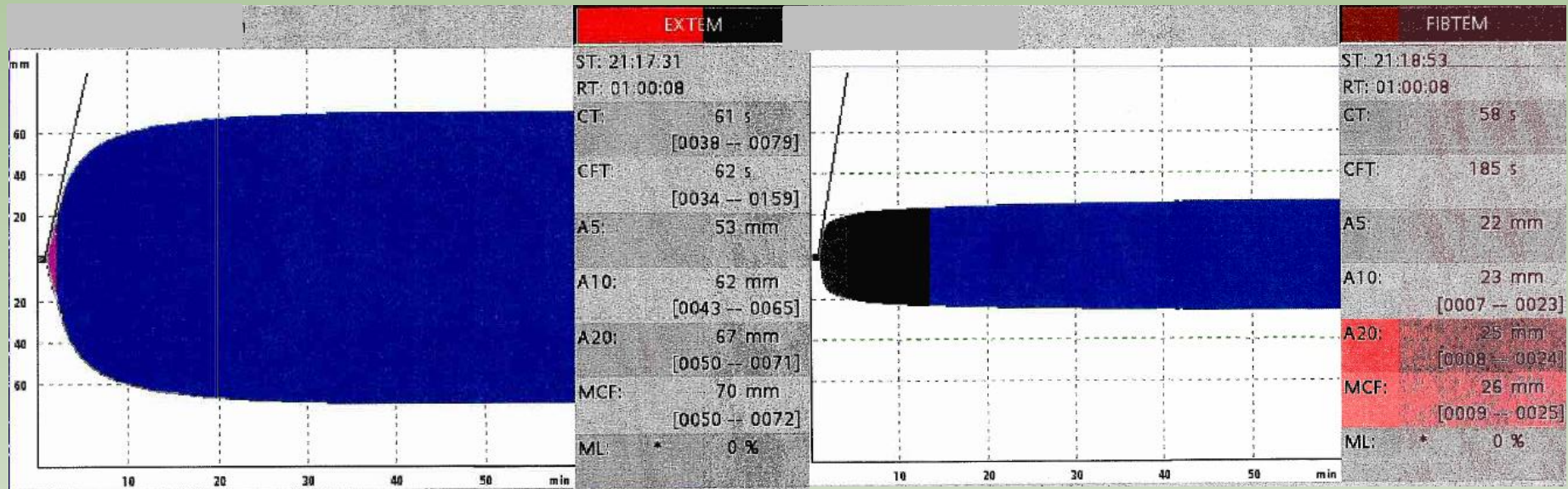
## Interpretation

- 1) TXA already given
- 2) Fibrinogen – Fibtem A5 10mm Now low / borderline – consider treating again with either cryo or Fib Conc
- 3) Platelets – Extem A5 44mm Not needed at present
- 4) Thrombin - Extem CT = 60s Normal No treatment needed

- The patient was given
- 2 adult doses of cryoprecipitate = 10 units of apheresis cryoprecipitate
- Another Adult dose platelets

- ROTEM taken after these products

# Final ROTEM



## ROTEM Results

- Fibtem A5 = 22mm
- Extem CT = 61s
- Extem A5 = 53mm

## Interpretation

- 1) TXA already given
- 2) Fibrinogen – Fibtem A5 22mm Now high normal
- 3) Platelets – Extem A5 53mm Normal
- 4) Thrombin - Extem CT = 61s Normal

- Transferred to ICU
- Normothermic, no vasopressors, no bleeding!
- Bair hugger x 2 and all fluids / blood products warmed with level 1 fluid infuser
- This is an important point – giving cold products rapidly induce hypothermia and hypothermic patients have abnormal haemostasis.....
- Great resuscitation / management!

#### Total Products Given

- Red cells 13 units
- Cryoprecipitate 5 adult doses = 25units apheresis cryoprecipitate (equivalent to 50 units whole blood cryo)
- FFP 5 units
- Platelets 4 adult doses
- TXA 2g
- Ca Chloride 10% 15ml

# Take Home Points

- Large doses of fibrinogen are required when it is really low.
- Empiric correction of haemostasis even before viscoelastic test results is important when patients are in extremis – TXA and fibrinogen.
- Consider the traffic light system recently published.

Thanks again to Dr Gary Devine from the Dept of Anaesthesia  
Fiona Stanley Hospital WA for sharing this case.