Uterine atony and severe unexpected coagulopathy

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.

Case 1 PPH – 2016

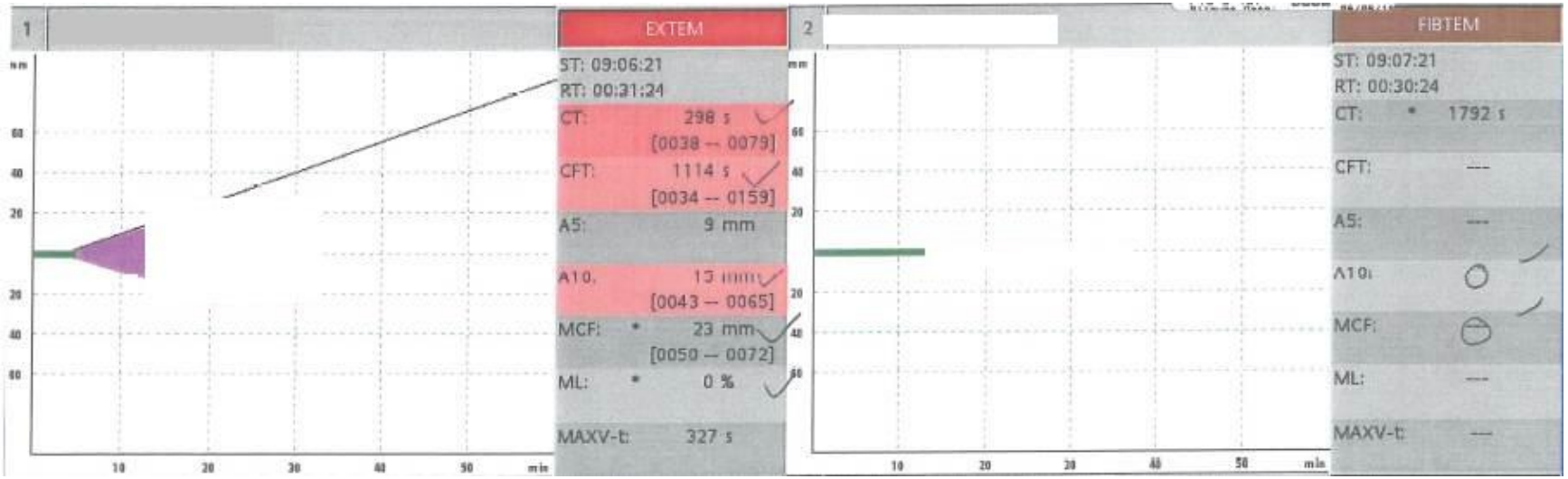
HISTORY

- Nulliparous women – induction / augmentation with oxytocin
- Developed obstructed labour & haematuria.
- Episiotomy and Spontaneus Vaginal Delivery at 0700.
- Ongoing bleed 500ml, nil obvious trauma to birth canal / cervix.
- Transferred to Theatre for Examination under Epidural top up.

In theatre:

- BP 80/40, P 120.
- Uterus contracted but bleeding continued. Pads weighed, Estimated Blood Loss now 2.3 Litres
- 0800: Massive transfusion protocol activated by midwives and Obs RMO.
- 0850: GA / ETT + arterial line.
- 2units red cells + crystalloid
- Surgeons happy with Tone but ongoing bleeding.
- Ooze from IV line insertion sites.

ROTEM 1 @ 0907



- What treatments / blood products would you give if using the ROTEM algorithm.
- Are there any discrepancies between the traditional coags and the ROTEM – how do you explain these?

<u>COAGs @0900</u>

Hb 46

Plt 135

INR 4.4

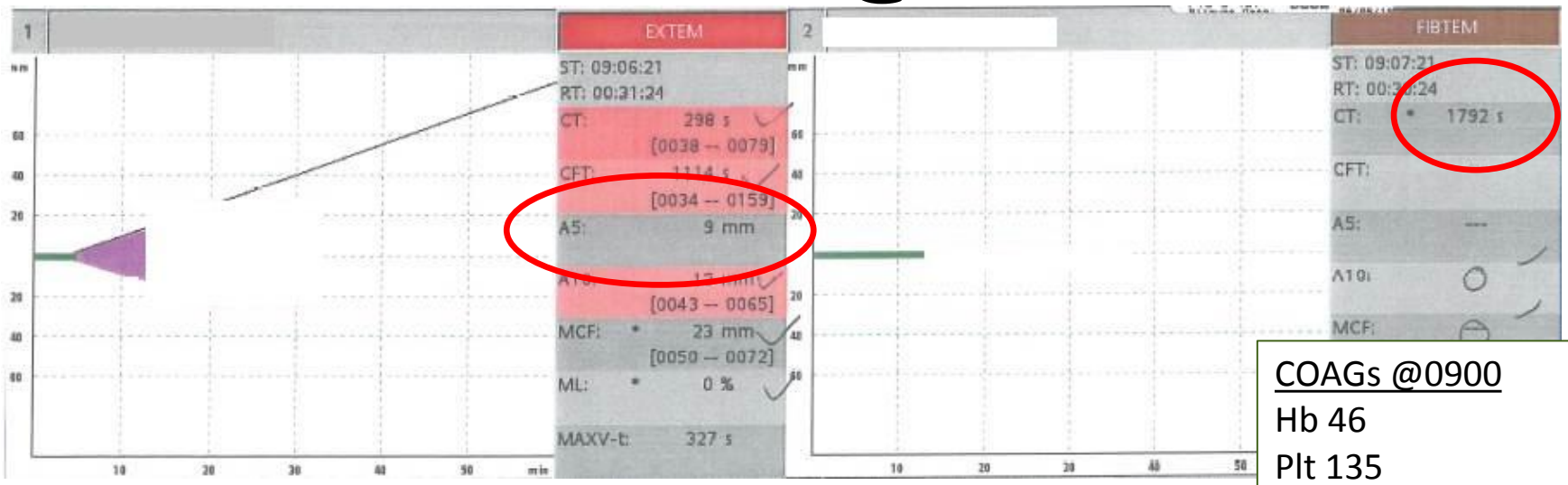
APTT 93.9

Fib <0.2

D-dimers > 20 (<0.4)

*might have been available at about 0945-1000

ROTEM 1 @ 0907



- She has become **profoundly coagulopathic** and this appears to have happened very rapidly. Why? Treatment is probably the same anyway.

- Hyperfibrinolysis? – This is very likely I think (very high D-dimers – No Aptem trace available unfortunately)
- Amniotic fluid embolism? – Not classical (usually dictinct cardiorespiratory collapse first)
- With a well contracted uterus this bleeding appears to be almost all due to the coagulopathic state.

COAGs @0900
Hb 46
Plt 135
INR 4.4
APTT 93.9
Fib <0.2
D-dimers > 20 (<0.4)
*might have been available at about 0945-1000

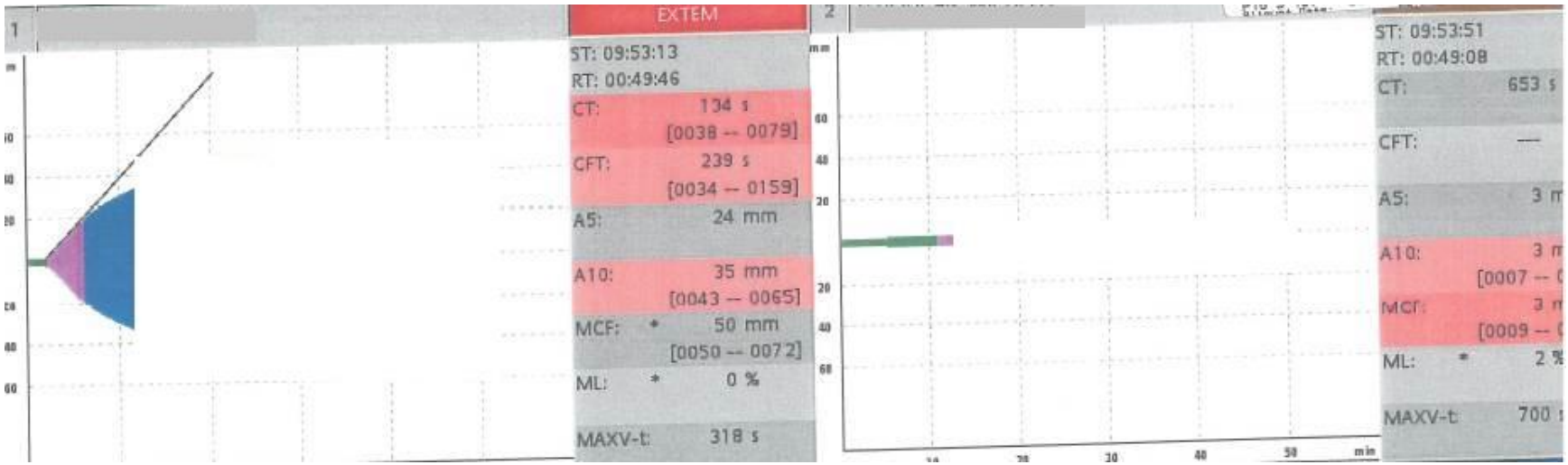
Applying the algorithm:

- 1 – Fibtem A5 is 0mm, note this will not display at all and you will just see a very long CT (1792s) as the CT does not finish until the amplitude reaches 2mm – in this case never. The target is 14mm, you need to increase it by 14mm. She is 90kg so the best treatment would be 7-8g of fibrinogen concentrate (quickest) or alternatively use 35-40 units of cryoprecipitate.
- 2 – Fibrinolysis – no lysis on the trace but both the fibtem and extem are very low – this could well be due to hyperfibrinolysis give her Tranexamic acid 1g (consider 2g as this is a severe coagulopathy and she is 90kg)
- 3 – Platelets – Her Extem A5 is 9mm she appears to have a combined fibrinogen AND platelet deficiency. Give 1(or 2) adult doses of platelets. ** Note her platelet count 135 appears to be falsely reassuring….possibly the low extem amplitude is due to fibrinolysis or does she have poor platelet function?
- 4 – Extem CT 298s – this is severely prolonged and needs correction. Give 2 units FFP or consider prothrombinex 1000-1500units

ROTEM 2 @0953

She is given: TXA 1g, 16u cryo, 2 FFP, 4 u PRBC 1 u Platelets.

Another ROTEM is performed at 0953 – you would see this at about 1015



- What treatments / blood products would you now give if using the ROTEM algorithm.
- Are there any discrepancies between the traditional coags and the ROTEM – how do you explain these?

<u>COAGs @0955</u>

Hb 71

Plt 121

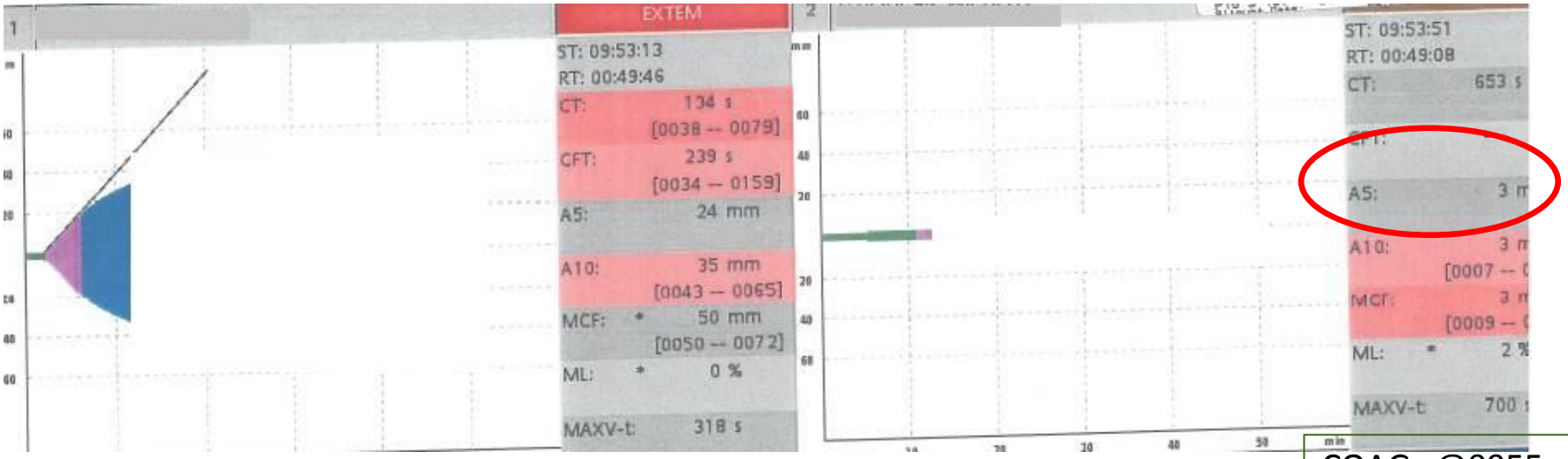
INR 1.8

APTT 53.5

Fib 1.3

*might have been available at about 1045

ROTEM 2 @0953



- She is much better but she is still very coagulopathic.

COAG vs ROTEM :

- Her traditional fibrinogen is 1.3g/L – low but not disastrous– whereas the Fibtem shows a much more alarming picture A5 of 3mm – almost no visible clot at all…..

Applying the algorithm:

- 1 – Fibtem A5 is 3mm, the target is 14mm, you need to increase it by 11mm. She is 90kg so the best treatment would be 5-6g of fibrinogen concentrate (quickest) or alternatively use 25-30 units of cryoprecipitate.
- 2 – Fibrinolysis – she has already had Tranexamic acid 1g (consider giving another 1g)
- 3 – Platelets – Her Extem A5 is 24 mm which is borderline low but probably mainly due to the low fibrinogen. ** Note her platelet count 121 has gone down despite the platelets she was given
- 4 – Extem CT 134s – this is mildly prolonged and may correct with fibrinogen alone but you could consider another 1 unit FFP (or consider prothrombinex 500units if concerned about volume overload)

<u>COAGs @0955</u>

Hb 71

Plt 121

INR 1.8

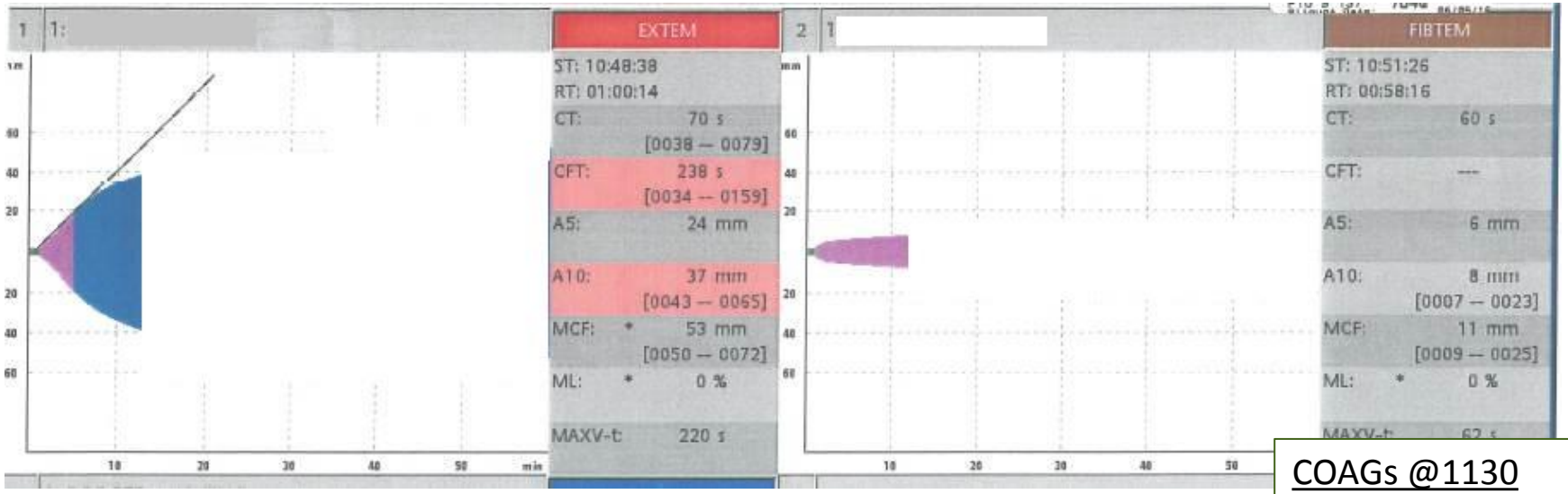
APTT 53.5

Fib 1.3

*might have been available at about 1045

ROTEM 3 @ 1050

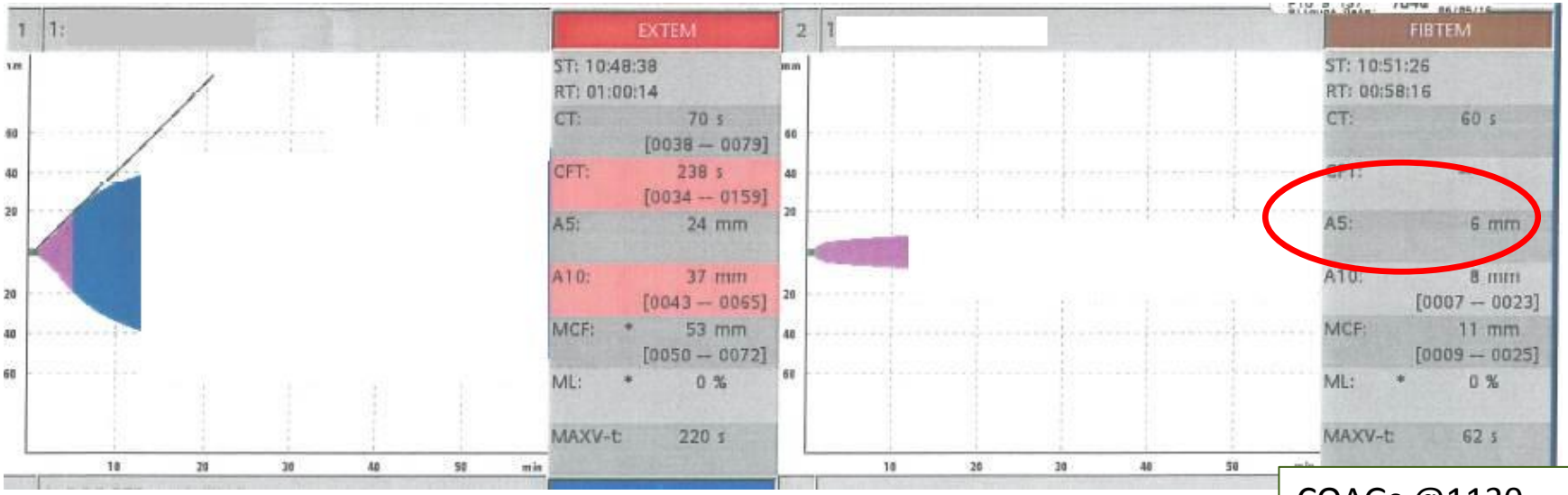
- Ongoing bleeding despite intrauterine Bakri balloon, decision to move to Interventional Theatre for Uterine artery embolization.
- 10:00-1100: further 2u FFP, Further 16u Cryo, further 1u PRBC, further 1g TXA
- Another ROTEM is performed at 1050 – you would see this at about 1110



- What treatments / blood products would you now give if using the ROTEM algorithm.
- Are there any discrepancies between the traditional coags and the ROTEM – how do you explain these?

<u>COAGs @1130</u>
Hb 75
Plt 75
INR 1.3
APTT 36.8
Fib 3.4
*might have been available at about 1215

ROTEM 3 @ 1050



- Once again despite all the treatments she is still very coagulopathic.

COAG vs ROTEM :

- Her traditional fibrinogen is 3.4g/L – taken 40 minutes later so maybe after some more cryo? But still well & truly normal looking – whereas the Fibtem shows a much more alarming picture A5 of 6mm – this is critically low still & needs correction.

Applying the algorithm:

- 1 – Fibtem A5 is 6mm, the target is 14mm, you need to increase it by 8mm. She is 90kg so the best treatment would be 4g of fibrinogen concentrate (quickest) or alternatively use 20 units of cryoprecipitate.
- 2 – Fibrinolysis – she has already had Tranexamic acid 2g
- 3 – Platelets – Her Extem A5 is 24 mm which is borderline low but still probably mainly due to the low fibrinogen. ** Note her platelet count 40min later is 75 which has gone down despite the platelets she was given
- 4 – Extem CT 70s – this is normal. No FFP or Prothrombinex needed.

<u>COAGs @1130</u>

Hb 75

Plt 75

INR 1.3

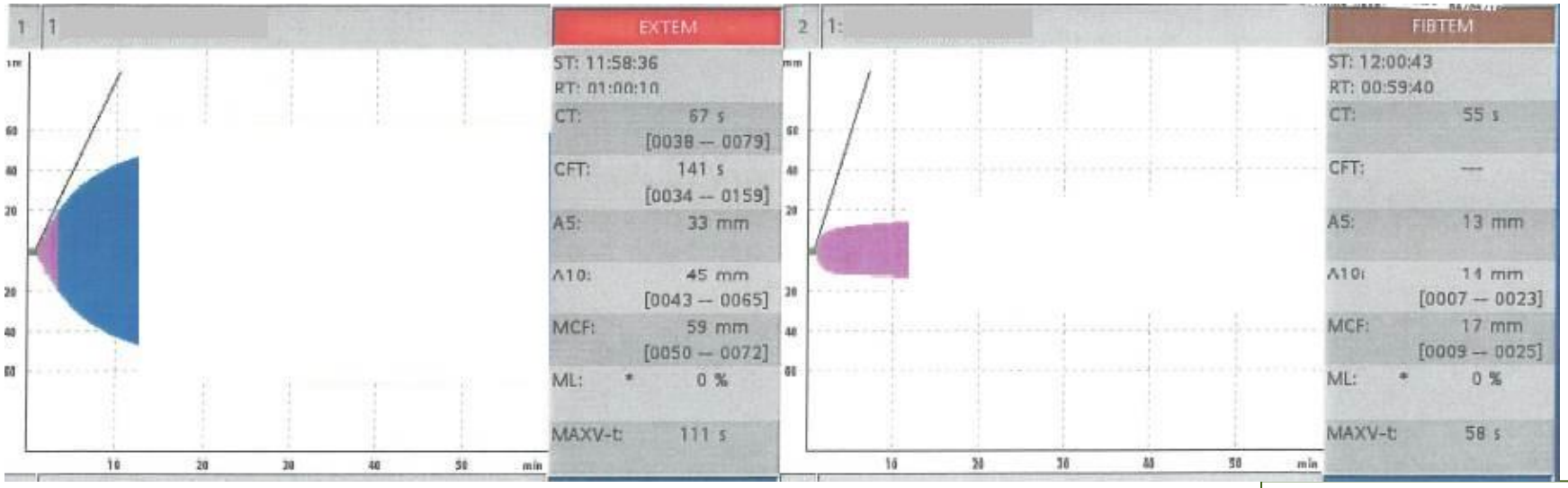
APTT 36.8

Fib 3.4

*might have been available at about 1215

ROTEM 4 @ 1200

- 1100: Uterine arteries Embolised. Bleeding controlled.
- 1100-1130 further 8u cryo
- 11:30: 4th ROTEM.
- 1130-1200, Hypertension noted, Norad off, GTN started to maintain BP <140/90.



COAGs @1245
Hb 83
Plt 76
INR 1.4
APTT 34
Fib 3.4

Further Progress

Final Estimated Blood Loss 4.5 litres.

- Cryo 40u, FFP 4u, Plt 1u, RBC 7u
- Extubated that evening at 18:00. No respiratory complications.
- Ongoing hypertension and worsening renal function (Crn >250)

- ATN + HELLP / Pre-eclampsia / Complement related.

- Embolisation of aberrant renal artery also thought to have contributed to renal dysfunction.

Clauss fibrinogen versus ROTEM

- This case demonstrates that sometimes the traditional laboratory measurement of fibrinogen can in some patients be misleadingly reassuring. It is indirect and does not directly assess the functional ability of fibrinogen in respect of its contribution to clot strength – whereas Fibtem (and Functional Fibrinogen for those who have TEG) do.

Discussion Points

Point One

- This was a relatively low risk healthy woman delivering at term.
- This sort of case could happen at any location where obstetric patients deliver…
- The bleeding appeared to be primarily due to coagulopathy – the means to treat this effectively should be available at any location providing obstetric care.

Point Two

- In patients with very low fibrinogen 8-10 (or even 16-20units) of cryoprecipitate may often not be enough if we are aiming to get back above a fibtem A5 of 12-14mm (approx 2-2.5g/L).
- Consider making a dose calculation and an appropriate fibrinogen dose based on the first fibtem results.

Point Three

- Most obstetric patients usually have robust coagulation at term and don't develop coagulopathy until significant blood loss has occurred and giving "early empiric" therapy with haemostatic blood products is arguably not justifiable (see case2). However some patients become coagulopathic very rapidly and it is hard to predict (beware abruption, HELLP). Performing a rapid "point of care" test with viscoelastic devices in all bleeding patients will identify those who need treatment and prevent treatment of women who don't.