Obstetric Haemorrhage

Jan 2019

Thanks to Dr Natalie Akl & Dr David Hoppe from Dept of Anaesthesia Fiona Stanley Hospital for sharing this.
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.
# 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
---|---|---|---|---
**FIBRINOGEN**<br>[Image](#)<br>FIBTEM A5 ≤10 mm | Low fibrinogen | Cryoprecipitate OR Fibrinogen concentrate (see dosing guide) AND Tranexamic acid 1 g | [Image](#) | [Image](#)
**PLATELETS**<br>[Image](#)<br>EXTEM A5 ≤35 mm and FIBTEM A5 ≥10 mm | Low platelets | Platelets: 1 adult dose (correlate with platelet count) | [Image](#) | [Image](#)
| EXTEM A5 ≤25 mm and FIBTEM A5 ≤10 mm | Low platelets and Low fibrinogen | Platelets and fibrinogen (correlate with platelet count) | [Image](#) | [Image](#)
**FACTORS**<br>[Image](#)<br>EXTEM CT 80-140 s and FIBTEM A5 ≤10 mm | Low fibrinogen | Correct fibrinogen and reassess | [Image](#) | [Image](#)
| EXTEM CT >140 s and FIBTEM A5 ≤10 mm | Low fibrinogen and Low coagulation factors | FFP 1-2U + Fibrinogen as indicated (Consider: Prothrombinex-see below) | [Image](#) | [Image](#)
**FIBRINOLYSIS**<br>[Image](#)<br>Early Diagnosis EXTEM A5 ≤35 mm or FIBTEM CT >600 s | High likelihood of excess fibrinolysis | Tranexamic acid 1 g Consider repeat dose if it has lost over 1 blood volume since initial dose | [Image](#) | [Image](#)
| Late Diagnosis EXTEM or FIBTEM ML ≤5% | Excess fibrinolysis | | [Image](#) | [Image](#)

### Fibrinogen Dosing Guide

<table>
<thead>
<tr>
<th>FIBTEM A5 Target: ≤12 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIBTEM A5</strong></td>
</tr>
<tr>
<td>9-10 mm</td>
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<tr>
<td>7-8 mm</td>
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<tr>
<td>4-6 mm</td>
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<tr>
<td>&lt;4 mm</td>
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</tbody>
</table>

*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 6 mm or below. Or if 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 60ml warm sterile water (use prepared kit in fluid warmer).
- Swirl gently and do not shake (to avoid foaming).
- Administer within 24 hrs of syringe driver over 2-4 mins if life-threatening haemorrhage or over 10 mins if not.

### Cryoprecipitate

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

### Prothrombinex

**1. Prothrombinex approval required**
- Concentrate as an alternative to FFP for patients with coagulation factor deficiency (e.g. prolonged EXTEM CT as above) 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.

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<th>DIAGNOSIS</th>
<th>INTERVENTION</th>
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<td>FIBRINOLOGY</td>
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<td></td>
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</tr>
<tr>
<td>Early Diagnosis</td>
<td>EXTEM A5 ≤35mm or FIBTEM CT &gt;800s</td>
<td>High likelihood of excess fibrinolysis</td>
<td>Tranexamic acid 1g (consider repeat dose if has lost over 1 blood volume since initial dose)</td>
<td></td>
</tr>
<tr>
<td>Late Diagnosis</td>
<td>FIBTEM or FIBTEM ML ≥5%</td>
<td>Excess fibrinolysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIBRINOGEN</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>FIBTEM A5 ≤10mm</td>
<td></td>
<td>Low fibrinogen</td>
<td>Cryoprecipitate (see dosing guide)</td>
<td></td>
</tr>
<tr>
<td>PLATELETS</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>EXTEM A5 ≤35mm and FIBTEM A5 &gt;10mm</td>
<td>Low platelets</td>
<td>Platelets: 1 adult dose (correlate with platelet count)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTEM A5 ≤25mm and FIBTEM A5 ≤10mm</td>
<td>Low platelets and Low fibrinogen</td>
<td>Platelets and fibrinogen (correlate with platelet count)</td>
<td></td>
<td></td>
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<td>Low fibrinogen</td>
<td>Correct fibrinogen and reassess</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTEM CT &gt;80s but FIBTEM A5 &gt;10mm</td>
<td>Low coagulation factors</td>
<td>FFP 1-4U or Prothrombinex 10 U/kg (+ fibrinogen if indicated)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXTEM CT &gt;140s and FIBTEM A5 ≤10mm</td>
<td>Low fibrinogen and Low coagulation factors</td>
<td></td>
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</tr>
</tbody>
</table>

**Fibrinogen Dosing Guide**

- **FIBTEM A5 Target:** ≥12mm
- **FIBTEM A5 Target:** Increase required: Cryoprecipitate
  - 0-10mm: 2-3mm, 10 Units
  - 7-8mm: 4-5mm, 15 Units
  - 4-6mm: 6-8mm, 20 Units
  - =-4mm: 10mm, 50-65 Units
- Cryoprecipitate dosing is for standard adult units (Cryo 5 units = FIBTEM A5 increase of approx 5mm)

**Prothrombinex**

1. Warfarin Reversal: Indicated for urgent reversal of warfarin in critical bleeding; usual dose 55-60 U/kg (~40 FFP) discusses with haematologist.
2. Consider as an alternative to FFP for patients with coagulation factor deficiency (e.g., prolonged EXTEM CT) in the following circumstances:
   - Circulatory overload
   - Rapid correction in extreme coagulopathy
   - Consider lower dose 10 U/kg (rounded to nearest 500 U).

Endorsed by the Department of Anaesthesia and Pain Medicine and the Haematology department January 2017 Adapted from KEMH hospital algorithm with permission
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 patient is at high risk of bleeding. Repeat ROTEM analysis 10 mins after any intervention to assess response.

<table>
<thead>
<tr>
<th>ABNORMAL ROTEM</th>
<th>CRITERIA</th>
<th>DIAGNOSIS</th>
<th>INTERVENTION</th>
<th>CORRECTED ROTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIBRINOLOGY</td>
<td>Trauma (within 3hrs) OR Post partum haemorrhage</td>
<td>Flat trace OR Maximal lysis &gt;5%</td>
<td>Hyperfibrinolysis</td>
<td>Tranexamic acid 1g</td>
</tr>
<tr>
<td>FIBTEM A5 ≤10mm</td>
<td>Hypofibrinogenemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLATELETS</td>
<td>EXTEM A5 ≤35mm with normal fibrinogen*</td>
<td>Thrombocytopenia</td>
<td></td>
<td>Platelets</td>
</tr>
<tr>
<td>FACTORS</td>
<td>EXTEM CT 90-140 sec with normal fibrinogen** OR EXTEM CT &gt;140 sec</td>
<td>Low coagulation factors</td>
<td></td>
<td>Fresh Frozen Plasma 2-4u OR Prothrombinex 25IU/kg</td>
</tr>
</tbody>
</table>

Cryoprecipitate Dosing Guide

<table>
<thead>
<tr>
<th>FIBTEM A5</th>
<th>Non-obstetric</th>
<th>Obstetric</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-10</td>
<td>1 dose</td>
<td>2 doses</td>
</tr>
<tr>
<td>&lt;8</td>
<td>2 doses</td>
<td>3 doses</td>
</tr>
</tbody>
</table>

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

Key components

- EXTEM CT: Clotting Time
- EXTEM A5: Amplitude at 5 minutes
- FIBTEM A5: Fibrinogen concentration and function

Version 1.2. Endorsed by the Department of Anaesthesia and Pain Medicine and the FSH Transfusion Services Committee on 10/11/18. Adapted from the King Edward Memorial Hospital ROTEM algorithm.
Please stick this label in the patients progress notes

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:
  INTEM CT = ............ Below 205 / 205 & Above
  HEPTEM 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
History

- Stillbirth and possible fetal death in utero
- Ongoing PPH – estimated blood loss 1.5L
- Bloods sent on arrival.
ROTEM 1

EXTEM

FIBTEM

FIBTEM A5 = 0mm!, EXTEM CT = 560s, EXTEM A5 = 5mm

What treatments would you give?
Use the FSH algorithm or better your hospital’s if it has one.

FBC/COAGS

- Hb 131
- Plt 73
- INR 3.2
- APTT 47.3
- Fib 0.2

* These would usually not be available in the first 30 min
Treatment if following FSH algorithm:

FIBRINOLYSIS: Severe coagulopathy just give TXA 1-2g!

FIBRINOGEN: Fibtem A5 = 0mm – very low give a large dose of fibrinogen – e.g. 2-3 adult doses of cryoprecipitate (20-30 units of whole blood cryo OR 10-15 units of apheresis cryo) OR fibrinogen concentrate 4-6g

PLATELETS: Extem A5 = 5mm – indicative of fibrinogen and platelet deficiency. Also give platelets.

FACTORS: Extem CT = 560s – very long might correct with fibrinogen / platelets but consider FFP or prothrombinex.

* These would usually not be available in the first 30 min

FBC/COAGS

- Hb 131
- Plt 73
- INR 3.2
- Fib 0.2
- APTT 47.3
**ROTEM 1**

**INTERPRETATION**

**FIBTEM A5 = 0mm!, EXTEM CT = 560s, EXTEM A5 = 5mm**

**PLATELET COUNT vs ROTEM**

Note the discrepancy between the platelet count of 73 – this is over 50 and in many centres would not trigger treatment with platelets. Whereas the EXTEM which is directly assessing clot strength indicates a severe deficit (an A5 of 5mm cannot be due to fibrinogen deficiency alone) and correctly alerts the clinician to the need for a platelet transfusion.

**FBC/COAGS**

- Hb 131
- Plt 73
- INR 3.2
- Fib 0.2
- APTT 47.3

* These would usually not be available in the first 30 min
History

She was given:
- TXA 1g
- 2 adult doses of cryoprecipitate (20 units)
- 1 adult dose of platelets

She also had:
- Oxytocin / ergometrine
- Bakri balloon
- Bleeding settled estimated total blood loss 2.2 Litres
- Her blood tests were repeated.
FIBTEM A5 = 4mm!, EXTEM CT = 94s, EXTEM A5 = 20mm

What treatments would you give? Use the FSH ROTEM algorithm or better your hospital’s if it has one.

What treatments would you give if you only had traditional coags and how would this differ?

FBC/COAGS
- Hb 90
- INR 1.4
- APTT 37
- Fib 1.7
* These would usually not be available in the first 30 min
FIBTEM A5 = 4mm!, EXTEM CT = 94s, EXTEM A5 = 20mm

**TREATMENT if following FSH algorithm:**
- **FIBRINOLYSIS:** TXA already given.
- **FIBRINOGEN:** Fibtem A5 = 4mm – despite the very large dose already given still very low give another large dose of fibrinogen – e.g. 2-3 adult doses of cryoprecipitate (20-30 units of whole blood cryo OR 10-15 units of apheresis cryo) OR fibrinogen concentrate 4-6g
- **PLATELETS:** Extem A5 = 20mm – less than 25mm indicative of some ongoing platelet deficiency. Consider more platelets.
- **FACTORS:** Extem CT = 94s – note almost normal without any FFP or PTX.

**INTERPRETATION**

**FBC/COAGS**
- Hb 90
- INR 1.4
- APTT 37
- Fib 1.7
* These would usually not be available in the first 30 min
**ROTEM 2**

**EXTEM**
- ST: 11:42:59
- RT: 01:00:10
- CT: 94 s
- CFT: 296 s
- A5: 20 mm
- A10: 33 mm
- A20: 43 mm
- MCF: 46 mm
- ML: * 1%

**FIBTEM**
- ST: 11:43:49
- RT: 01:00:10
- CT: 112 s
- CFT: ---
- A5: 4 mm
- A10: 5 mm
- A20: 5 mm
- MCF: 6 mm
- ML: * 8%

**FIBTEM A5 = 4mm!**, **EXTEM CT = 94s**, **EXTEM A5 = 20mm**

**INTERPRETATION**

**COAG versus ROTEM**

Note the discrepancy between the COAG results which could almost be considered normal (usually targets are fib > 2g/L and normal INR / APTT). Whereas the ROTEM (which is assessing actual clot strength), demonstrates there is still a severe functional coagulopathy present.

**FBC/COAGS**
- Hb 90
- INR 1.4
- APTT 37
- Fib 1.7

* These would usually not be available in the first 30 min
History

Patient now no longer bleeding and in PACU.

She was given another:
• 2 adult doses of cryoprecipitate (20units)
• 1 adult dose of platelets
Bloods repeated about 2 hours later in HDU
ROTEM 3

EXTEM

FIBTEM

FIBTEM A5 = 17mm, EXTEM CT = 71s, EXTEM A5 = 39mm

FBC/COAGS

- Hb 76
- Plt 83
- INR 1.2
- APTT 30.8
- Fib 3.7
History

Stable overnight in HDU.

Transfused 2 units red cells.
SUMMARY

Total Blood Loss – 2.2 litres
Severe Coagulopathy

TXA 1g
Red cells x 2 units
Cryoprecipitate 4 adult doses (40 units)
Platelets 2 adult doses
## TAKE HOME POINTS

1. **Patients with a very low fibrinogen will need a very large dose.**
   
   Traditional doses of cryoprecipitate (8-10 units for example) are not adequate. Use of a dosing table and much larger initial doses of cryoprecipitate or fibrinogen concentrate is a sensible strategy.

2. **Traditional tests including PLT count and COAG profile can often be misleading and are not as useful as viscoelastic tests which directly assess functional clot strength.**
Thanks again to Dr Natalie Akl & Dr David Hoppe from Dept of Anaesthesia, Fiona Stanley Hospital WA.