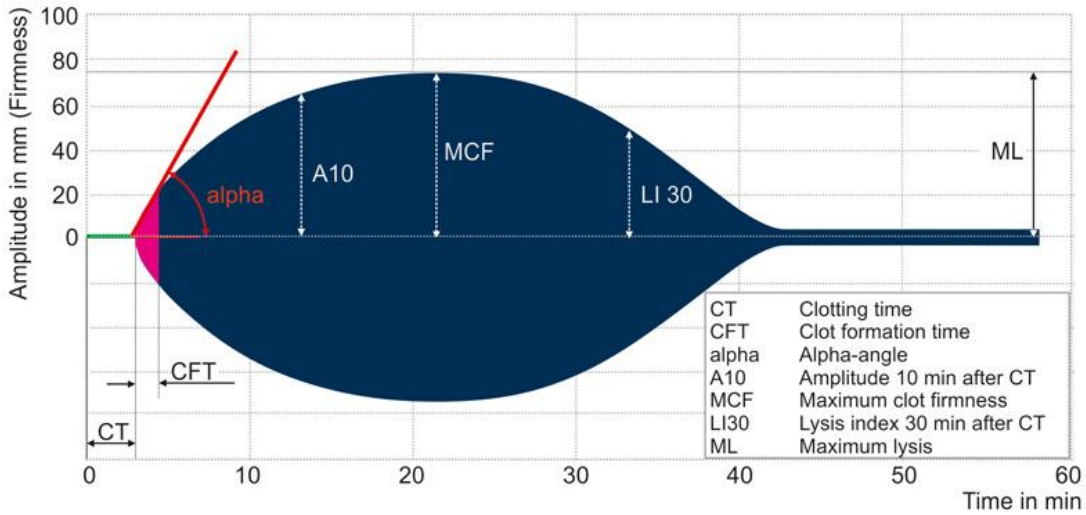
ROTEM® Interpretation

ROTEM is a form of thromboelestometry – which is a real time measure of coagulation properties in citrated whole blood (light blue blood bottle). It takes into account the action of platelets, clotting factors and cellular components of coagulation and gives a visual representation of clot formation and subsequent lysis over time.

The image is produced by immersing a pin in a sample of whole blood. The pin then oscillates in the blood. Whilst the blood is still liquid it oscillates freely but when it begins to clot the rotation of the pin is increasingly restricted with rising clot firmness. The increased resistance to movement is detected mechanically and displayed graphically on the screen.

Explanation of values:

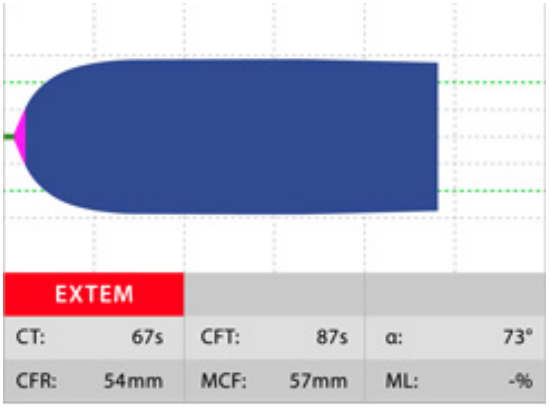


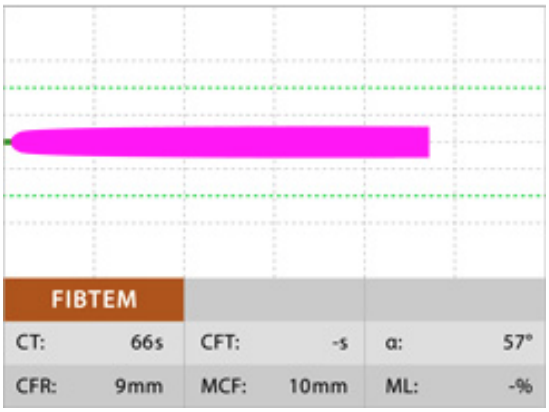
CT – Time for clot to begin forming – measure of initiation of clotting, thrombin formation and start of clot polymerisation
CFT – Time from initiation of clotting until a clot firmness of 20mm – measure of fibrin polymerisation, thrombocyte clot stabilisation and factor XIII
Alpha angle – measure of speed of increase in clot firmness
A10 – strength of clot at 10 minutes
MCF – Clot strength at maximum – measure of stability of polymerised fibrin, thrombocytes and factor XIII function – clot quality
Maximum lysis – reduction in clot firmness after the MCF and in relation to the MCF – fibrinolysis if >15% within 1 hour

There are several different reagents used – the two channels used here at called EXTEM (extrinsic pathway) and FIBTEM (platelet contribution blocked).
Note that ROTEM does not reliably detect the use of warfarin, LMWH, Direct anti-coagulants or anti platelet against using these two channels. An INTEM and HEPTEM channel can be used to study the effect of heparin.

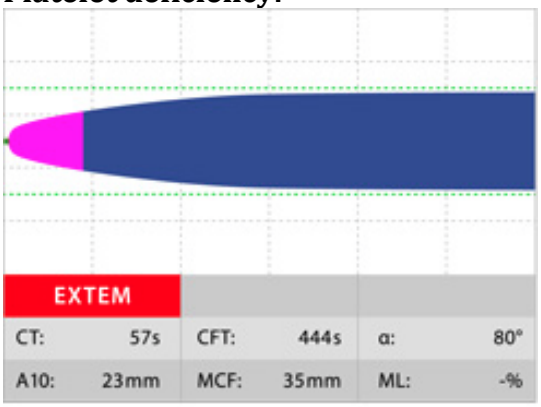
If the trace seen is not smooth in nature – i.e. is jagged then this indicates a cup/pin loading error on the machine and the analysis should be restarted from the beginning.

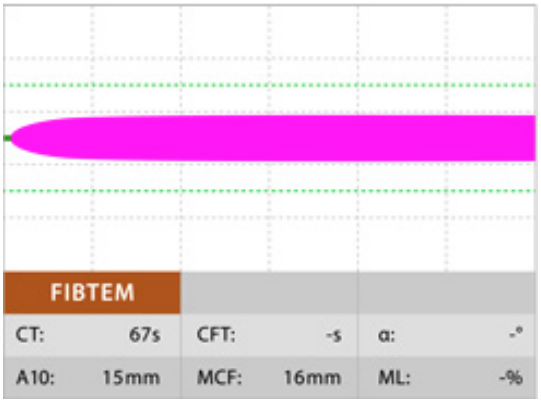
Normal Trace:





Platelet deficiency:





EXTEM:

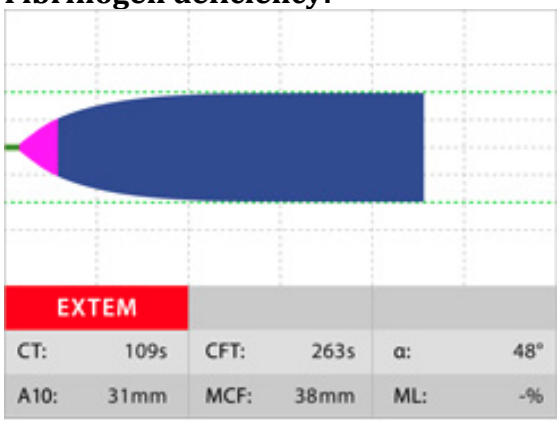
- Prolonged CFT
- Reduced alpha angle – slower clot formation
- Reduced A10 – weaker clot
- Reduced MCF – weaker clot

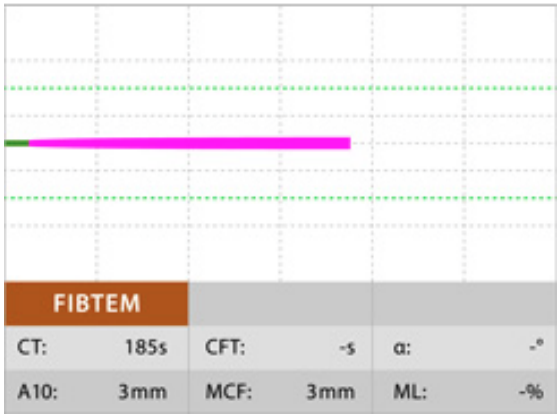
FIBTEM:

- Reduced A10 – weaker clot
- Reduced MCF – weaker clot

Solution – Give platelets

Fibrinogen deficiency:





EXTEM:

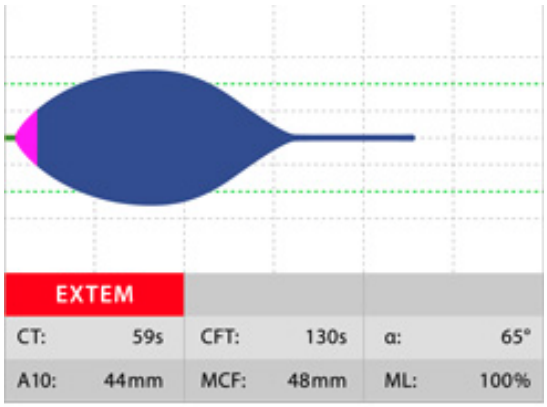
- Prolonged CT – slower initiation of clotting
- Prolonged CFT – slower clot formation
- Reduced alpha angle – slower clot formation
- Reduced MCF – weak clot

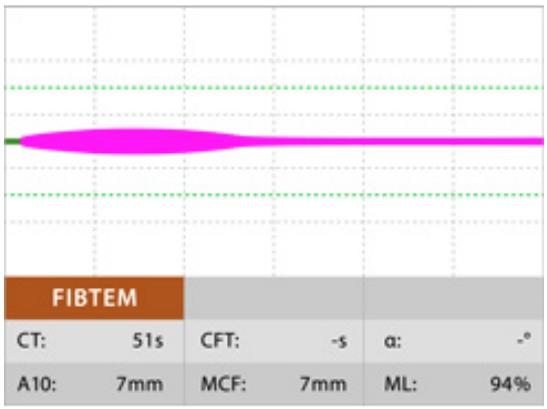
FIBTEM:

- Prolonged CT – slower initiation of clotting
- Significantly reduced A10 – very weak clot
- Significantly reduced MCF – very weak clot

Solution – replace fibrinogen – FFP and/or cryoprecipitate

Hyperfibrinolyosis:





EXTEM:

- Prolonged CFT – slower clot formation (clot broken down as formed)
- Reduced alpha angle – slower clot formation
- Reduced MCF – weaker clot
- Increased LY30 – clot break down
- Significantly increased ML – clot fully broken down

FIBTEM:

- Reduced A10 – weak clot
- Recued MCF – weak clot
- Significantly increased ML – clot broken down.

Solution – antifibrinolytic – tranexamic acid

Management of abnormalities:

The RVI has a ROTEM treatment algorithm flowchart to follow when dealing with major haemorrhage. It should be noted that this is not in place of the MH packs of blood products but additional products as guided by the ROTEM results.

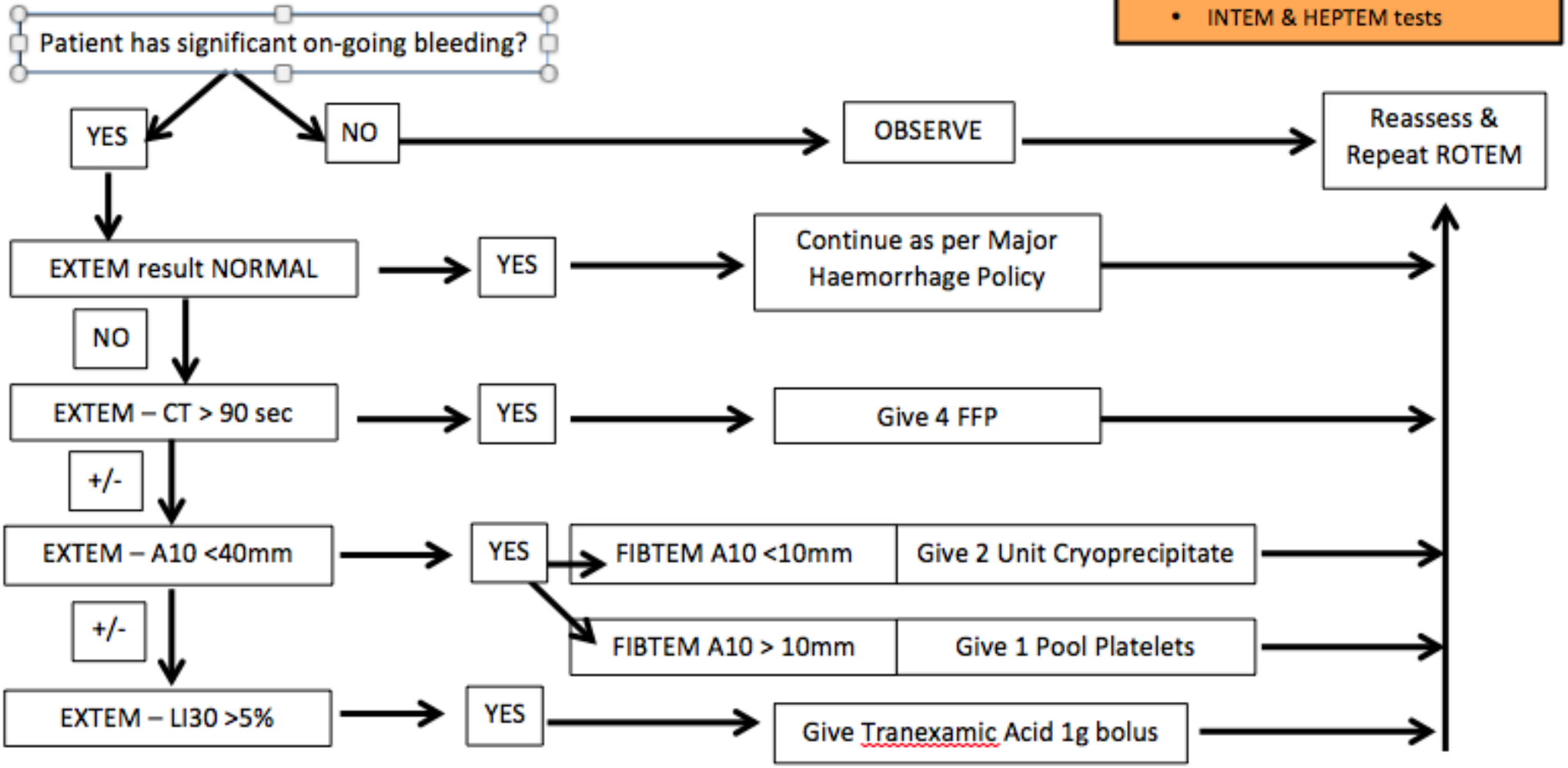
RVI ROTEM Treatment Algorithm

Physiological Targets:
- Temp>36°C
- pH>7.2, Base Excess <-6
- iCa >1.0, K+ <5.5
- Hb >80, Plt > 100, Fib >1.5

There may be > 1 clotting defect.
Treat all defects simultaneously

NOTE – ROTEM does not reliably detect effects of,
- Warfarin
- Aspirin, Clopidogrel
- Direct Oral Anticoagulants
- LMWH

Effect of heparin should be assessed using,
- INTEM & HEPTEM tests



Use these Products to supplement NOT replace the Major Haemorrhage Packs

Replace ongoing losses + correct specific deficit = Give contents of MHP + additional products as directed by ROTEM