TEG AUDIT – MATERNITY USAGE

YORK AND SCARBOROUGH TEACHING HOSPITALS NHS FOUNDATION TRUST

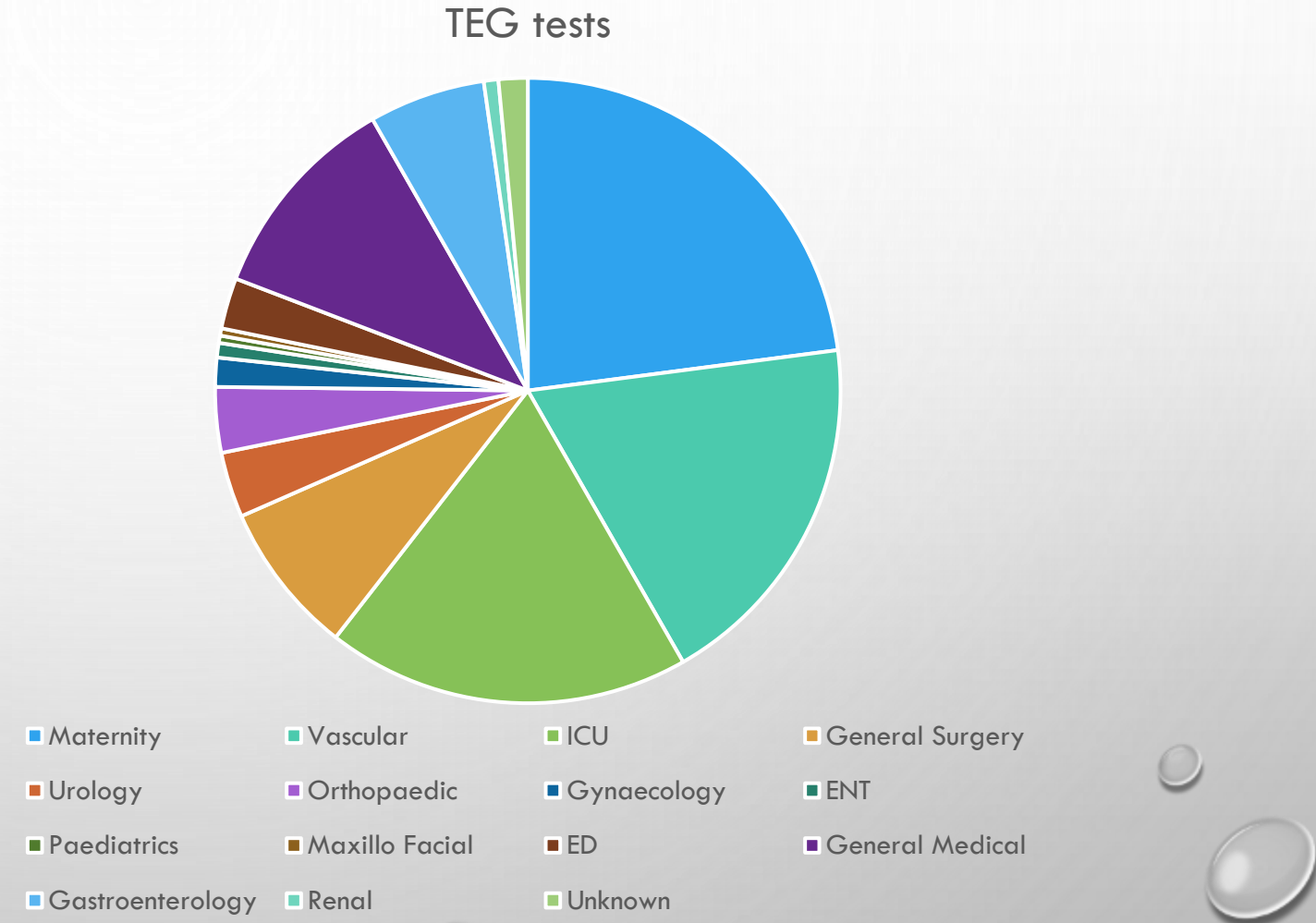
DR NATASHA ROBERTSON

DR EMILY CHRISTIE

POINT OF CARE TESTING

TEG USAGE

- Audited 1year usage from end Feb 2022 to end of Feb 2023.
- Looked at both hospital sites.
- 350 TEG samples total, including duplicate/repeat tests on patients.



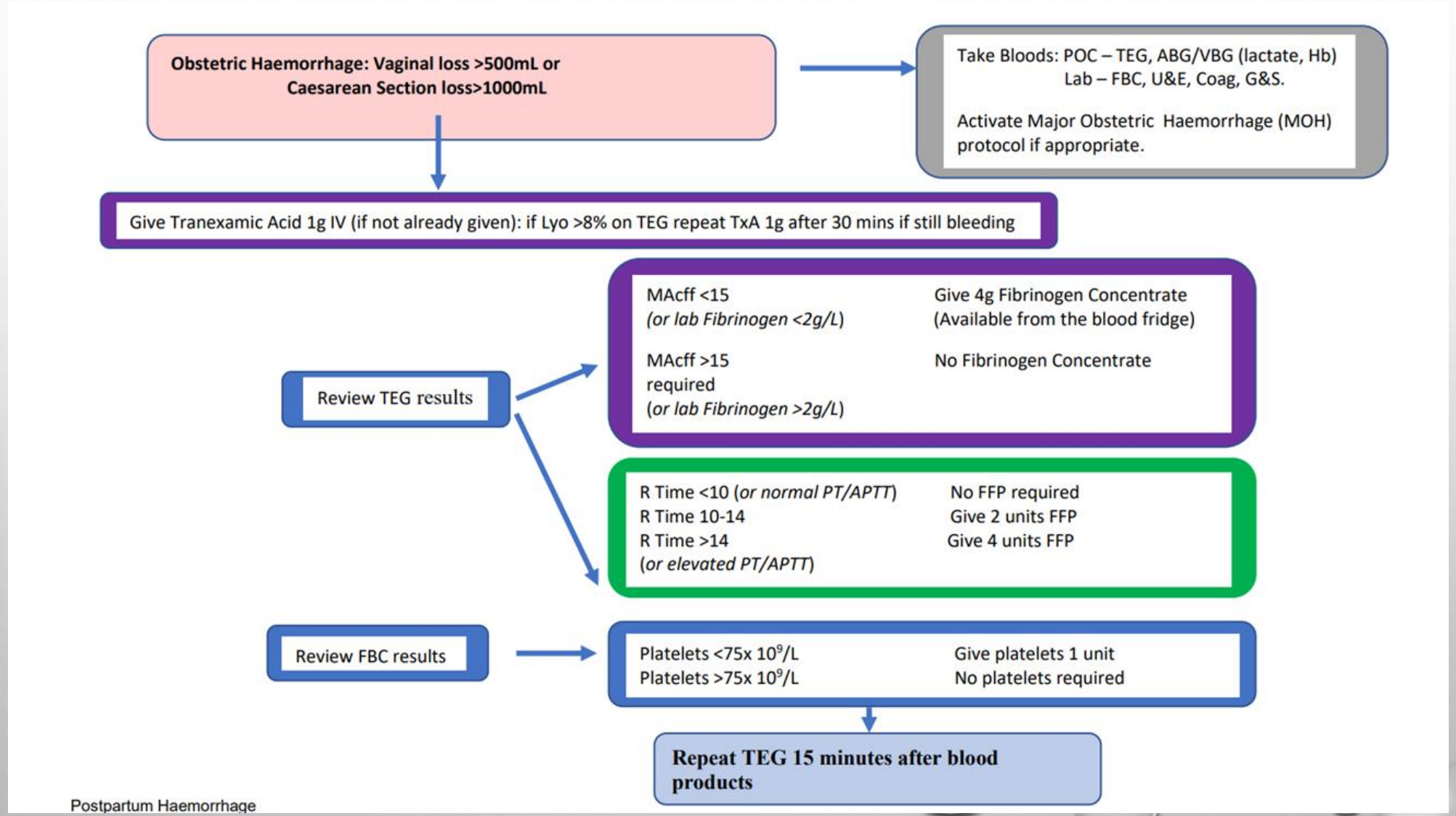
POINT OF CARE TESTING ON MATERNITY

- 61 maternity patients had 82 TEG tests done.
- Protocol for major obstetric haemorrhage is do a TEG at >1500mls blood loss.
- Out of the 61 patients tested, 6 patients had abnormal TEG.
- 6 patients with abnormal TEG, 5 received RBC and FFP, 1 RBC and Fibringoen conc.
- 3 out of 6 patients received cryoprecipitate.
- 4 patients received fibrinogen concentrate.
- 2 patient received platelet transfusion.

USE OF PROTOCOL

- 21 patients with MOH required blood transfusion, normal TEG, no coagulation products.
- 6 patients with MOH received blood transfusion and transfusion of coagulation products despite normal TEG.

TEG PROTOCOL



PT'S WITH NORMAL TEG BUT TRANSFUSED CLOTTING PRODUCTS

1 pt – pre pregnancy T2DM, nephrotic syndrome, worsening CKD, anaemia in pregnancy, admitted with pre-eclampsia and worsening renal fx. 2 RBC transfused pre LSCS, LSCS under regional 700ml EBL, admitted to ITU post op with worsening renal decline. TEG normal pre and post but given platelet tx.

1 pt – NVD Twin, 2000ml PPH, 1st TEG error, so as HB 67g/L 4 RBC and 4g Fib conc given while awaiting formal coag/repeat TEG.

1 pt – NBF, ?abruption APH and PPH 3000ml, TEG post PPH normal. Given 4 RBC and 4 FFP.

1 pt – Elective LSCS of Twins, 998ml blood loss at LSCS, but PPH, total EBL 3500 ml. TEG x 3 normal, Coag screen normal, but platelet count low, pt developed ATN, renal involved. 7 RBC transfused 1unit plts.

1 pt – NVD with epidural, PPH 2000ml GA and EUA in theatre, poor tone, vaginal pack in theatre. Normal TEG but given 4 RBC and 2 FFP pre TEG.

1 pt unknown data.

Major Obstetric Haemorrhage Pt's with Abnormal TEG

Pt number	TEG Result	Products Requested	Products Given	Products Wasted/not used	Repeat TEG performed
Patient 1	Reduced CRT MA Reduced CFF MA	2 RBC 31/12, 7 RBC, 4 FFP , 2 cryo	2 RBC 31/12, 7 RBC, 2 FFP , 2 cryo	2 FFP	Yes
Patient 2 (*)	Reduced CRT MA Reduced CFF MA	4 RBC, 8 FFP , 4 cryo	2RBC, 4 FFP, 4 Cryo, 12g Fib conc	4 FFP	Yes
Patient 3	Reduced CRT MA Reduced CFF MA	12 RBC (1 wasted), 4 FFP, 1 platelet, 2 cryo	5 RBC, 4 FFP, 2 cryo	1 RBC	Yes
Patient 4	Reduced CRT MA Reduced CFF MA	20 RBC, 12 FFP, 6 platelets, 12g Fib conc	13 RBC, 12 FFP, 4 platelets, 8g Fib conc	7 RBC, 2 Plt	Yes
Patient 5	Reduced CRT MA and reduced CFF MA	4 RBC and 4g Fib conc	2 RBC and 4g Fib conc	2 RBC	Yes
Patient 6	No R-time Reduced CRT MA and reduced CFF MA	18 RBC 4 FFP and 1 plt	8 RBC, 4 FFP 1 plt and 4g Fib conc.	10 RBC	Yes

RECOMMENDATIONS

- Increase anaesthetists trained in interpreting TEG results.
- Embed new protocol in clinical practice.
- Case discussions for anaesthetists at clinical governance sessions.
- Highlight MOH guidelines for anaesthetists specifically teaching about fibrinogen concentrate.
- Education regarding contents of MOH transfusion packs, 1st pack only contains 4 units of RBC. We have removed FFP as per evidence from Obs Cymru, importance of fibrinogen concentrate.
- If need other clotting products due to APH (such as abruption/DIC) or severe ongoing bleeding then need to discuss with lab asap.
- PPH bundle for anaesthetists with laminated quick reference guide.

CASE PRESENTATION

- Grandmultip (para 7, NVD 2003, PET emergency LSCS under spinal 2004, NVD 2008, NVD with epidural 2011, NVD with epidural in 2015 baby died 5months of age SIDs, emergency LSCS under spinal 2019, emergency LSCS under spinal in 2021).
- BMI 40, history of anxiety and depression.
- USS (anomaly scan at 20 weeks), noted to have placenta praevia (placenta covering the os by 3.4cm and placental vessels noted close to cervix), referred to Leeds for scan in 1/52 to assess for placenta accreta spectrum disorder. Very anxious.
- At 21 weeks confirmed by Leeds placenta accreta spectrum disorder, anterior placenta with bulging vessels onto the bladder.

ANTE PARTUM HAEMORRHAGE

- Admitted 05/01/2023 at 21.15pm, 21+6 weeks with APH ~150ml. Unprovoked, mildly painful (back pain).
- HR 94/min, BP 140/78.
- 2 large bore cannula sited, bloods for FBC, Coag screen, LFT's, U&E's and G&S and 4 units crossmatched.
- Anaesthetist alerted and present.

TIMELINE

Admitted with APH 05/01/2023 21.15pm

Known placenta accreta, APH ~150ml.

Consultant obstetrician

Consultant anaesthetist

Bloods taken and crossmatched 4 units

USS – Fetal Heart present

Blood results 22.23pm

HB 111 g/L

WCC 16.8

LFT's normal

U&E's normal

Fibrinogen 0.6!!!

APTT prolonged

PT prolonged!!!

? Concealed Bleeding

PV bleeding settled at this point.

Decision made to correct clotting whilst APH settled and pt stable.

Vit K 10mg

FFP 5 units

Haematologist involved

Plan Reviewed again at 03.00pm

Anaesthetic consultant on labour ward.

If pt bleeds again plan to do c-section/hysterectomy in main theatres.

Cell salvage present

Arterial line

Rapid infusor

No indication for imminent delivery as bleeding settled.

Communication

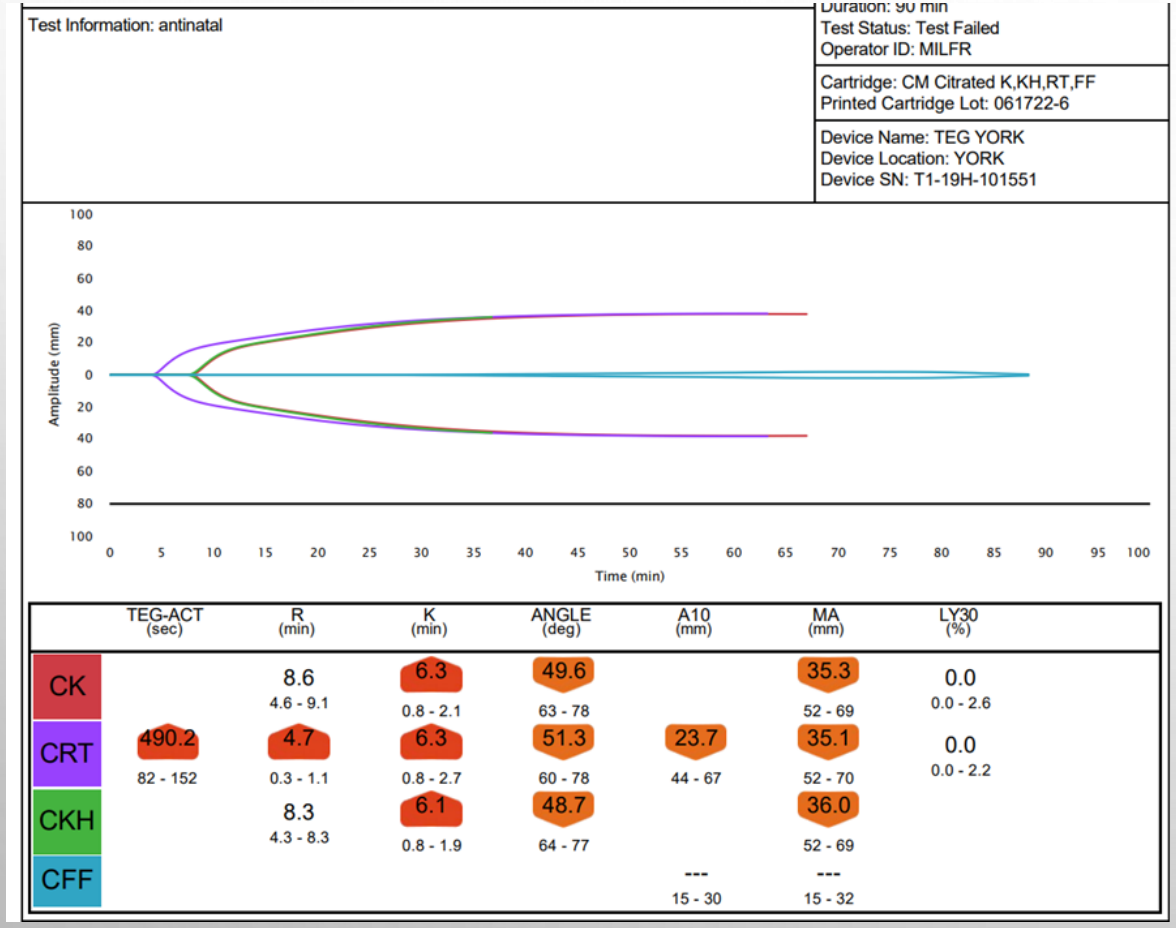
Patient aware if bleeds again will need caesarean hysterectomy.

Fetal viability discussed with pt and likelihood of fetal demise due to gestation.

Pt met paediatric team, baby for comfort care.

Interventional radiology also aware.

1ST TEG RESULT 05/01/2023 22.23PM



- Lab Blood Results from 05/01/2023 22.23pm

Test	
Hb	111 g/L
Plt	171
WCC	16.8
Hct	0.320
PT	16.0
APTT	38.3
Fibrinogen	0.6
INR	1.3

2nd TEG after 5 units FFP, 10mg Vit K, 2 units Cryo 06/01/2023 04.53am

Generated : 08/05/2023 20:23
Generated By : CHRIE

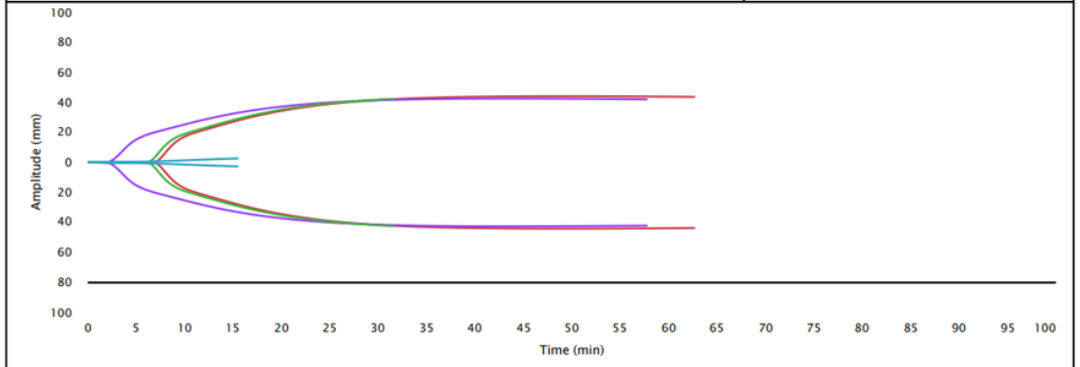
Segment: - Process: -

Test Information: antenatal

Test Start Time: 06/01/2023 04:53
Duration: 64 min
Test Status: Test Completed
Operator ID: MILFR

Cartridge: CM Citrated K,KH,RT,FF
Printed Cartridge Lot: 120321-2

Device Name: TEG YORK
Device Location: YORK
Device SN: T1-19H-101551



	TEG-ACT (sec)	R (min)	K (min)	ANGLE (deg)	A10 (mm)	MA (mm)	LY30 (%)
CK		7.4	3.8	57.6		42.6	0.0
		4.6 - 9.1	0.8 - 2.1	63 - 78		52 - 69	0.0 - 2.6
CRT	303.1	2.7	4.2	52.4	29.6	41.0	0.0
	82 - 152	0.3 - 1.1	0.8 - 2.7	60 - 78	44 - 67	52 - 70	0.0 - 2.2
CKH		6.7	3.8	58.0		42.5	
		4.3 - 8.3	0.8 - 1.9	64 - 77		52 - 69	
CFF					*	2.7	
					15 - 30	15 - 32	

3rd TEG after 4 grams of Fibrinogen concentrate and 2 units of blood and 1 gram of TXA 06/01 08.42am

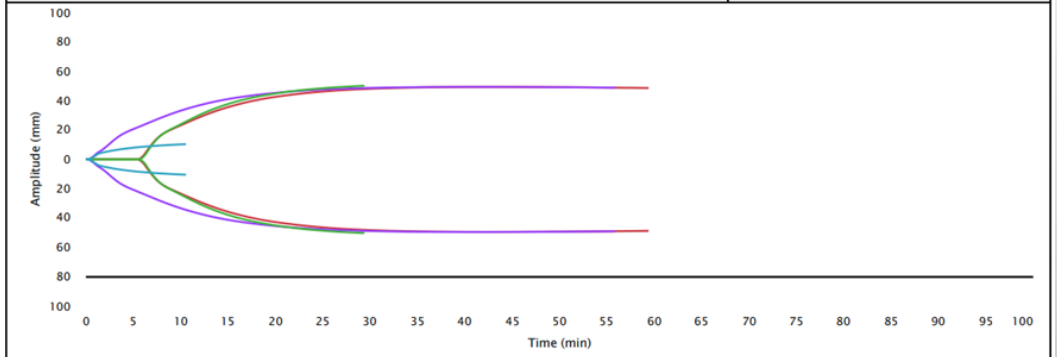
Segment: - Process: -

Test Information: Maternity RA D96286

Test Start Time: 06/01/2023 08:42
Duration: 61 min
Test Status: Test Completed
Operator ID: NORMN

Cartridge: CM Citrated K,KH,RT,FF
Printed Cartridge Lot: 120321-2

Device Name: TEG YORK
Device Location: YORK
Device SN: T1-19H-101551



	TEG-ACT (sec)	R (min)	K (min)	ANGLE (deg)	A10 (mm)	MA (mm)	LY30 (%)
CK		6.0	2.9	61.8		48.1	0.0
		4.6 - 9.1	0.8 - 2.1	63 - 78		52 - 69	0.0 - 2.6
CRT	125.3	0.8	4.0	54.1	34.9	47.9	0.0
	82 - 152	0.3 - 1.1	0.8 - 2.7	60 - 78	44 - 67	52 - 70	0.0 - 2.2
CKH		6.2	2.7	62.2		50.2	
		4.3 - 8.3	0.8 - 1.9	64 - 77		52 - 69	
CFF					*	10.4	
					15 - 30	15 - 32	

TIMELINE

06.30am

1st TEG v abnormal

Rpt TEG after 5 FFP, 10mg Vit K & cryoprecipitate, slowly improving.

Pt continues to lose small volumes of PV blood.

Hb 8.3

Fibrinogen 1.1

D/W IR ballooning possible if needed ?TH 10

4 g of fibrinogen concentrate

Actively getting MDT ready

Intermittent gushes of 150ml of fresh blood.

Vascular IR aware of situation and likely to need to need internal iliac embolization.

2 units of RBC given

Paediatric input.

Rpt TEG after fibrinogen concentrate

08.00am

Obs anaesthetist day team and acute anaesthetists aware and handed over.

Discussion with obstetricians and radiologists.

Plan for IR asap

Another 4 grams of fibrinogen concentrate.

08.55am

685ml EBL in total

Cons anaesthetist d/w lab to discuss blood products

Plt count falling 200 – 176 – 120

10 units of RBC ordered from Barnsley

More platelets ordered from Barnsley

5 units of FFP defrosting

1 unit of platelets ready

1 gram of TXA given

10.40am

Into VIU (not theatre 10 due to vascular case on table)

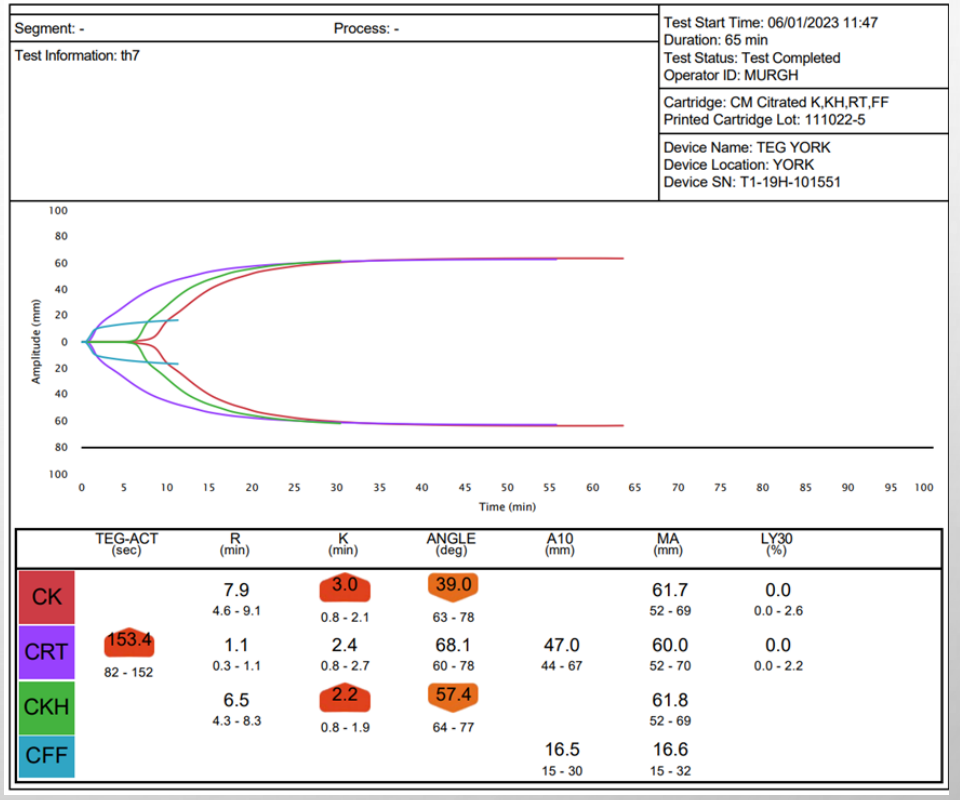
Senior midwife and Dr Christie stay with patient in VIU.

IR consultant sited balloons placed on Bentson wires over the bifurcation into the contralateral internal iliac arteries.

MAIN THEATRE – 11.25AM

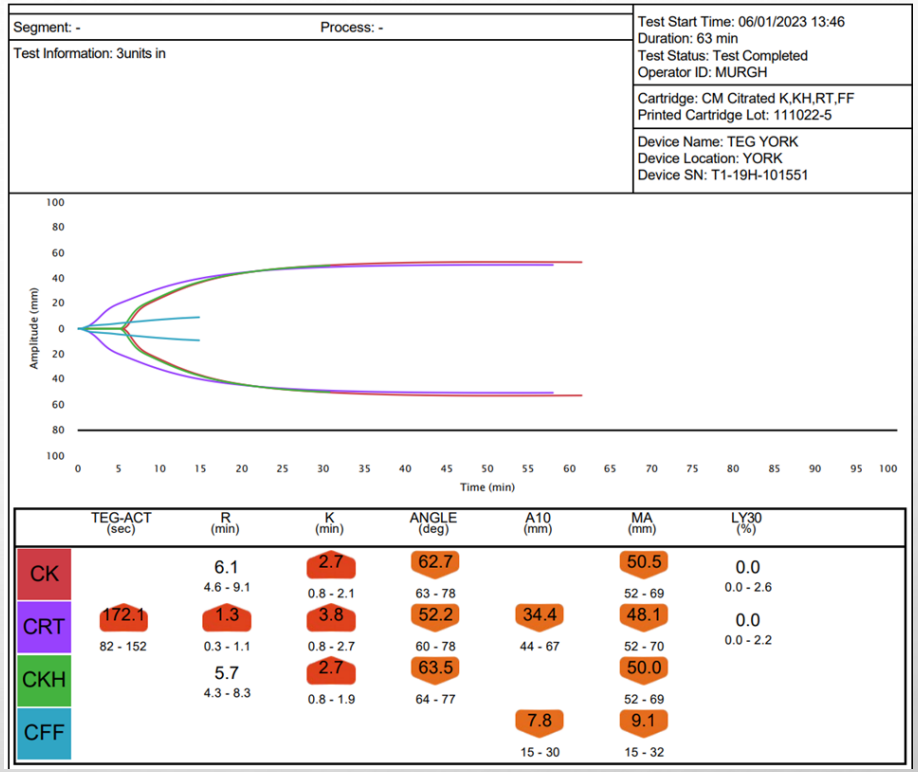
- EBL 735ml
- Transferred from VIU to theatre 7 (main)
- Arterial line sited awake, TEG sent (after 2nd dose of Fib conc) and now normal clotting! Hb 100 g/L.
- Iliac balloons in situ
- Anaesthetised in theatre, rapid 1 infusor primed and ready to go.
- 2 members of team allocated to transfusion products (checking and prescribing etc.)
- RSI as >20 weeks, CMAC used.
- 150mcg fentanyl, 200mg +30mg propofol and 80mg rocuronium
- Metaraminol running 4ml/hr

4th TEG prior to induction after another 4 grams of Fibrinogen concentrate



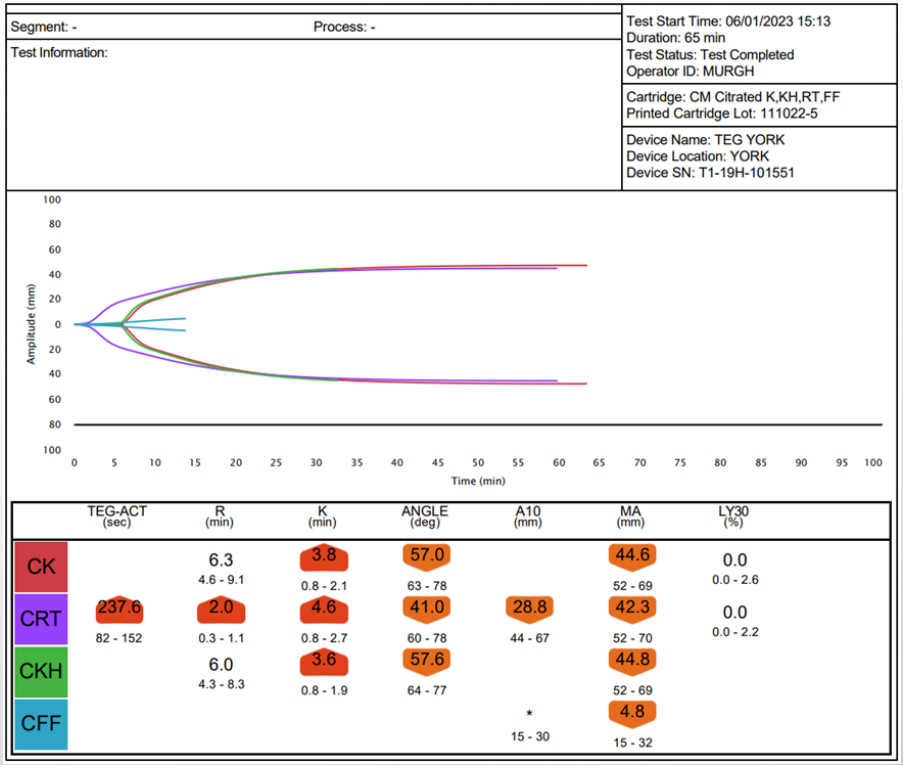
INTRA-OP TEG (5TH TEG)

- 2hrs since the last TEG the patient had received a further 3 units of blood, cell salvaged blood and 1.5 Litres of plasmolyte. IV Fluids given as per flow trac/ABG's.
- Discussion with lab only 1 more dose of fibrinogen concentrate in York Hospital.
- 2 units of cryoprecipitate available and had been ready for a while, only 1 hr left to use them.
- Pt given the 2 units of cryoprecipitate while awaiting the fibrinogen concentrate.



6TH TEG

- Repeat TEG done after cryoprecipitate – No effect in fact CFF worse now.
- Used last dose of Fibrinogen concentrate and another dose transported across from SGH.
- Calcium gluconate 10ml 10% given over 10mins.



Segment: -
Process: -
Test Information:

Test Start Time: 06/01/2023 15:13
Duration: 65 min
Test Status: Test Completed
Operator ID: MURGH

Cartridge: CM Citrated K,KH,RT,FF
Printed Cartridge Lot: 111022-5

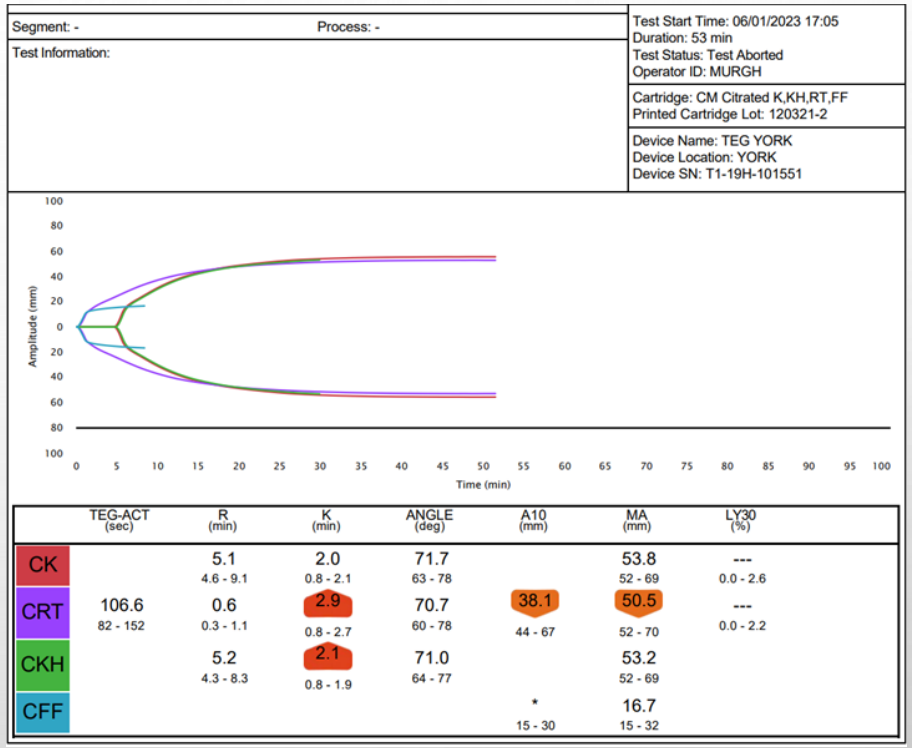
Device Name: TEG YORK
Device Location: YORK
Device SN: T1-19H-101551

Amplitude (mm)
Time (min)

	TEG-ACT (sec)	R (min)	K (min)	ANGLE (deg)	A10 (mm)	MA (mm)	LY30 (%)
CK		6.3 (4.6 - 9.1)	3.8 (0.8 - 2.1)	57.0 (63 - 78)		44.6 (52 - 69)	0.0 (0.0 - 2.6)
CRT	237.6 (82 - 152)	2.0 (0.3 - 1.1)	4.6 (0.8 - 2.7)	41.0 (60 - 78)	28.8 (44 - 67)	42.3 (52 - 70)	0.0 (0.0 - 2.2)
CKH		6.0 (4.3 - 8.3)	3.6 (0.8 - 1.9)	57.6 (64 - 77)		44.8 (52 - 69)	
CFF					* (15 - 30)	4.8 (15 - 32)	

END OF PROCEDURE

- At 17.00hrs procedure finished.
- 3rd dose of Fibrinogen concentrate given and TEG again almost normal.
- Total EBL 7.1 Litres (including APH of 800ml)
- ABG done, decision made to extubate and for critical care level 2.



Segment: -
Process: -
Test Information:

Test Start Time: 06/01/2023 17:05
Duration: 53 min
Test Status: Test Aborted
Operator ID: MURGH

Cartridge: CM Citrated K,KH,RT,FF
Printed Cartridge Lot: 120321-2

Device Name: TEG YORK
Device Location: YORK
Device SN: T1-19H-101551

Amplitude (mm)
Time (min)

	TEG-ACT (sec)	R (min)	K (min)	ANGLE (deg)	A10 (mm)	MA (mm)	LY30 (%)
CK		5.1 4.6 - 9.1	2.0 0.8 - 2.1	71.7 63 - 78		53.8 52 - 69	--- 0.0 - 2.6
CRT	106.6 82 - 152	0.6 0.3 - 1.1	2.9 0.8 - 2.7	70.7 60 - 78	38.1 44 - 67	50.5 52 - 70	--- 0.0 - 2.2
CKH		5.2 4.3 - 8.3	2.1 0.8 - 1.9	71.0 64 - 77		53.2 52 - 69	
CFF					* 15 - 30	16.7 15 - 32	

SUMMARY OF BLOOD LOSS, TRANSFUSION OF BLOOD PRODUCTS.

TOTAL BLOOD LOSS 7.1LITRES (APH AND INTRA-OP)

- APH 800ML
- SUCTION 1300ML
- SWABS 625MLS
- CELL SALVAGE 4300ML

BLOOD PRODUCTS PRIOR TO THEATRE

- 10MG VIT K
- 5 UNITS OF FFP
- 2 UNITS OF RBC
- 2 X 4 GRAMS FIBRINOGEN CONCENTRATE
- 1 GRAM TXA

IN THEATRE

- 2ND 1 GRAM TXA
- UTEROTONICS (5 UNITS OF OXYTOCIN, OXYTOCIN INFUSION, 2 X 250MCG HAEMOBATE IM)
- 1526ML CELL SALVAGED BLOOD.
- 3 UNITS OF RBC
- 2 UNITS OF CRYOPRECIPITATE
- 4 GRAMS OF FIBRINOGEN CONCENTRATE
- 4500ML PLASMOLYTE

POST OPERATIVE COURSE

06/01/2023	19.21pm
Hb	104 g/L
Plt	76
Wcc	12.1
07/01/2023	
PT	11.4
APTT	25.9
Fibrinogen	2.6
INR	1.0
eGFR	114
Na+	137
K+	4.1
Urea	2.5
Creatinine	61

- SADLY baby girl passed away before patient woke up. Baby girl had a heart beat for 90mins, no respiratory effort, resuscitation not attempted.
- Ongoing support from perinatal mental health team.
- Pt required an iron transfusion a couple of days later.
- Discharged home 11/01/2023
- Readmitted March due to ongoing pedal oedema, DVT ruled out, USS scan of veins normal.
- 2nd Iron transfusion March.
- Debrief at 6 weeks with obstetric team and again once histopathology and postmortem results back (July 2023).
- Histopathology findings consistent with placenta accreta spectrum disorder (at least FIGO IIId) with evidence of abruption and retroplacental haemorrhage.

LEARNING POINTS

- MDT support invaluable, obstetric team, IR/VIU, anaes, paeds, haematology.
- Point of care testing and use of protocol, patient specific transfusion.
- Using the TEG in theatre, its portable!!
- More fibrinogen concentrate needed in the hospital. It has a good shelf life. We now have 4 doses on site and 3 doses at Scarborough.
- Develop a MOH/PPH bundle for anaesthetists.