Obstetrisk blödning!

Koagulation och monitorering!

Ove Karlsson, MD, PhD
NU-sjukvården

Koagulation och monitorering vid (stor) obstetrisk blödning

- Fall
- Statistik
- PPH omhändertagande
- Initialt omhändertagande
- Hemostas
- Anestesiaspekter
- Ett fall till

En vanlig natt på förlossningen

Dag 0, kl 23.38

- Telefonsamtal
- Frisk
- 3 para
- Gravid v35+1
- MVC, blodtryck 110/65, ingen proteinuri dock illamående
- Ont epigastriet sedan 1 timme
- Hälsas välkommen

Dag 1, kl 00.28

- Klinik
  - Ont epigastriet
  - Illamående
  - Smärtpåverkad, kan ej ligga still
  - Mjuk buk
- Ultraljud: HF ua, FR ua, placenta ua
- Inj Ketogan iv

En vanlig natt på förlossningen?

Dag 1, kl 01.22

- CTG
  - Inskränkt variabilitet
  - Komplexa variabla decelerationer
  - Frekvens initialt 120
  - Bradykardi, frekvens 60
- Larm, urakut kejsarsnitt

Dag 1, kl 01.45

- Födelse pojke
- Oxytocin 5 E + 5 E
- Methergin
- Blödning 200 ml initialt
- Uterus väl kontraherad
- Lever svullen?

En vanlig natt på operationssalen

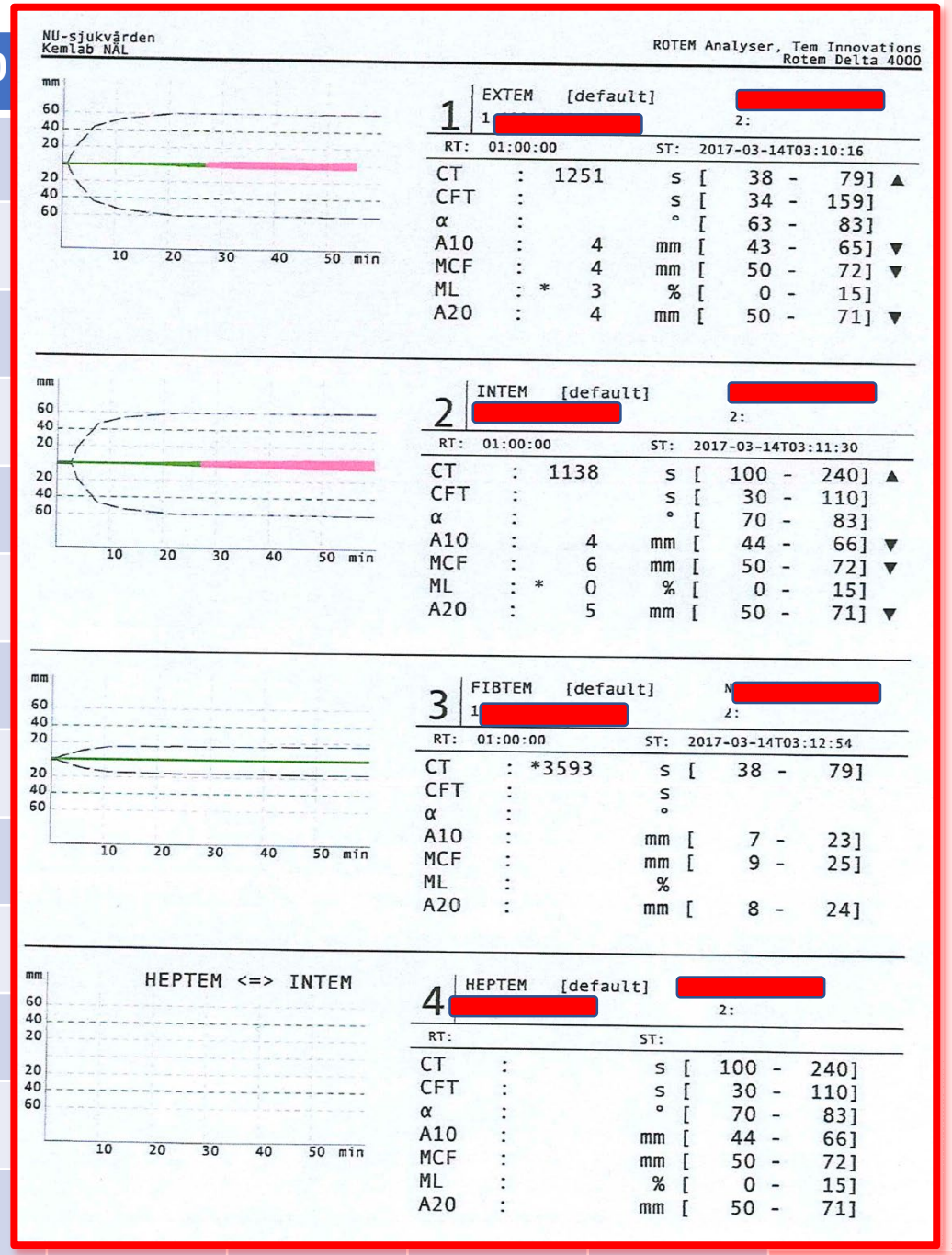
Dag 1, kl 03.12

- Blödning vaginalt, 1100 ml
- Tranexamsyra 2 g
- Oxytocin infusion
- Karboprost (Prostinfenem)
- Desmopressin (Octostim)
- Blodprover hemolys
- Transfusion, 4 blod + 2 plasma
- Rotem
- Diagnos?

Diagnos?

1. HELLP
2. Hemostasrubbning
3. Hepatit
4. Autoimmun hepatit
5. Akut fettlever

Dag 1-3	01:00	04:00	06:00	11:30	14:30	20:30
Hb	121					
LPK	17.5					
TPK	156					
CRP	6					
Asat	Hem					
Alat	Hem					
Bilirubin	Hem					
Kreat	Hem					
PK	Hem					
APTT	Hem					
Fib	Hem					
AT	0.48					
Rotem	03:10					


NU-sjukvården
Kemlab NÄL

ROTEM Analyser, Tem Innovations
Rotem Delta 4000

1 EXTEM [default]

RT: 01:00:00 ST: 2017-03-14T03:10:16

CT	1251	s	[38 - 79]	▲
CFT		s	[34 - 159]	
α		°	[63 - 83]	
A10	4	mm	[43 - 65]	▼
MCF	4	mm	[50 - 72]	▼
ML	* 3	%	[0 - 15]	
A20	4	mm	[50 - 71]	▼

2 INTEM [default]

RT: 01:00:00 ST: 2017-03-14T03:11:30

CT	1138	s	[100 - 240]	▲
CFT		s	[30 - 110]	
α		°	[70 - 83]	
A10	4	mm	[44 - 66]	▼
MCF	6	mm	[50 - 72]	▼
ML	* 0	%	[0 - 15]	
A20	5	mm	[50 - 71]	▼

3 FIBTEM [default]

RT: 01:00:00 ST: 2017-03-14T03:12:54

CT	*3593	s	[38 - 79]
CFT		s	
α		°	
A10		mm	[7 - 23]
MCF		mm	[9 - 25]
ML		%	
A20		mm	[8 - 24]

HEPTEM <=> INTEM

4 HEPTEM [default]

RT: ST:

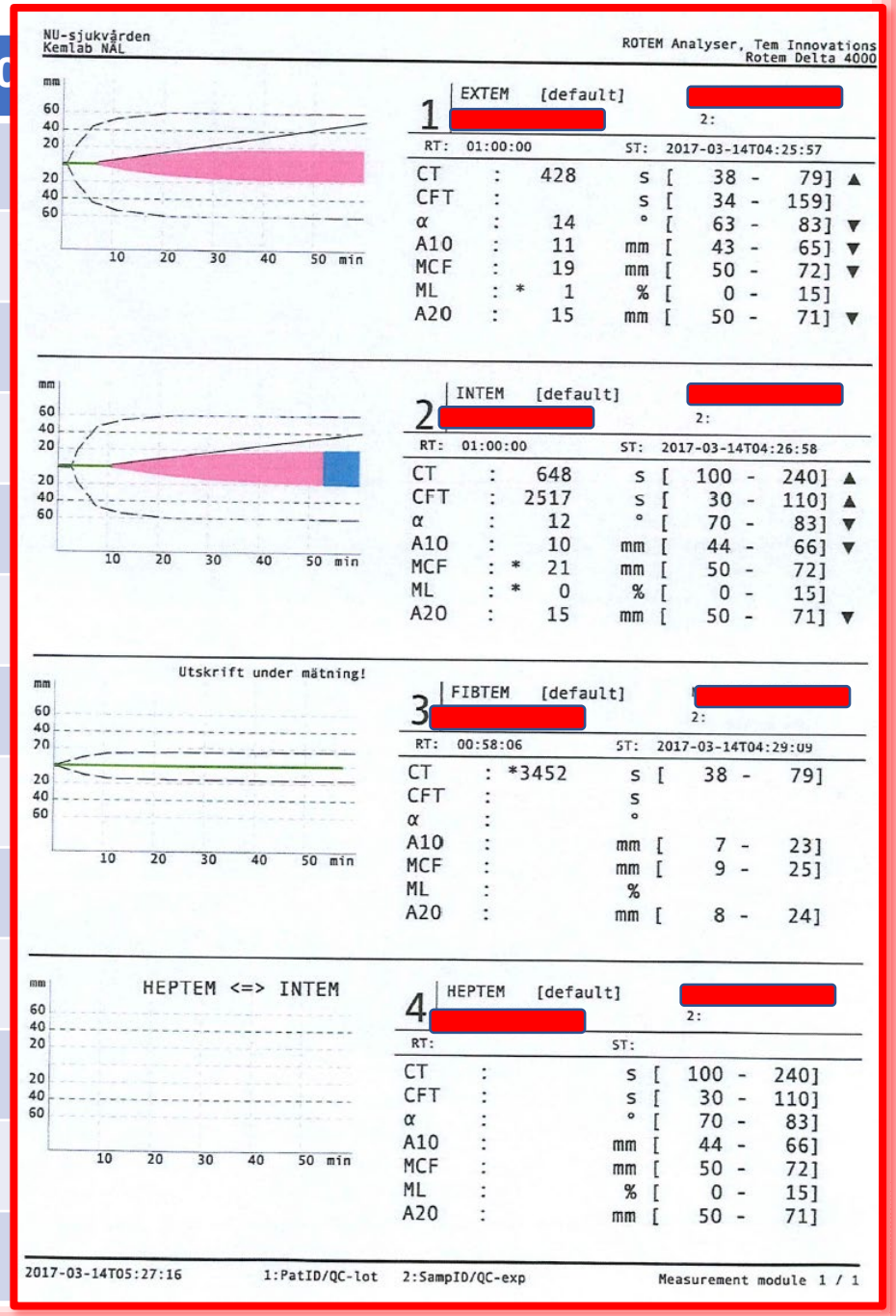
CT		s	[100 - 240]
CFT		s	[30 - 110]
α		°	[70 - 83]
A10		mm	[44 - 66]
MCF		mm	[50 - 72]
ML		%	[0 - 15]
A20		mm	[50 - 71]

En vanlig natt på IVA

Dag 1, kl 03.12

- Blödning vaginalt, 1100 ml
- Tranexamsyra 2 g
- Oxytocin infusion
- Prostinfenem
- Octostim
- Blodprover hemolys
- Transfusion, 4 blod + 2 plasma
- Rotem
- Fibrinogen 4 g

Dag 1-3	01:00	04:00	06:00	11:30	14:30	20:30	03:0
Hb	121	131					
LPK	17.5	21.8					
TPK	156	83					
CRP	6	4					
Asat	Hem	Hem					
Alat	Hem	29					
Bilirubin	Hem	Hem					
Kreat	Hem	Hem					
PK	Hem	1.2					
APTT	Hem	Hem					
Fib	Hem	-					
AT	0.48	-					
Rotem	03:10	04:30					


NU-sjukvården
Kemlab NÄL

ROTEM Analyser, Tem Innovations
Rotem Delta 4000

1 EXTEM [default] [redacted] 2:

RT: 01:00:00 ST: 2017-03-14T04:25:57

CT	:	428	s [	38 -	79] ▲
CFT	:		s [	34 -	159]
α	:	14	° [	63 -	83] ▼
A10	:	11	mm [	43 -	65] ▼
MCF	:	19	mm [	50 -	72] ▼
ML	: *	1	% [	0 -	15]
A20	:	15	mm [	50 -	71] ▼

2 INTEM [default] [redacted] 2:

RT: 01:00:00 ST: 2017-03-14T04:26:58

CT	:	648	s [	100 -	240] ▲
CFT	:	2517	s [	30 -	110] ▲
α	:	12	° [	70 -	83] ▼
A10	:	10	mm [	44 -	66] ▼
MCF	: *	21	mm [	50 -	72]
ML	: *	0	% [	0 -	15]
A20	:	15	mm [	50 -	71] ▼

Utskrift under mätning!

3 FIBTEM [default] [redacted] 2:

RT: 00:58:06 ST: 2017-03-14T04:29:09

CT	: *3452	s [	38 -	79]
CFT	:	s		
α	:	°		
A10	:	mm [	7 -	23]
MCF	:	mm [	9 -	25]
ML	:	%		
A20	:	mm [	8 -	24]

HEPTEM <=> INTEM

4 HEPTEM [default] [redacted] 2:

RT: ST:

CT	:	s [	100 -	240]
CFT	:	s [	30 -	110]
α	:	° [	70 -	83]
A10	:	mm [	44 -	66]
MCF	:	mm [	50 -	72]
ML	:	% [	0 -	15]
A20	:	mm [	50 -	71]

2017-03-14T05:27:16 1:PatID/QC-lot 2:SampID/QC-exp Measurement module 1 / 1

En vanlig natt på IVA

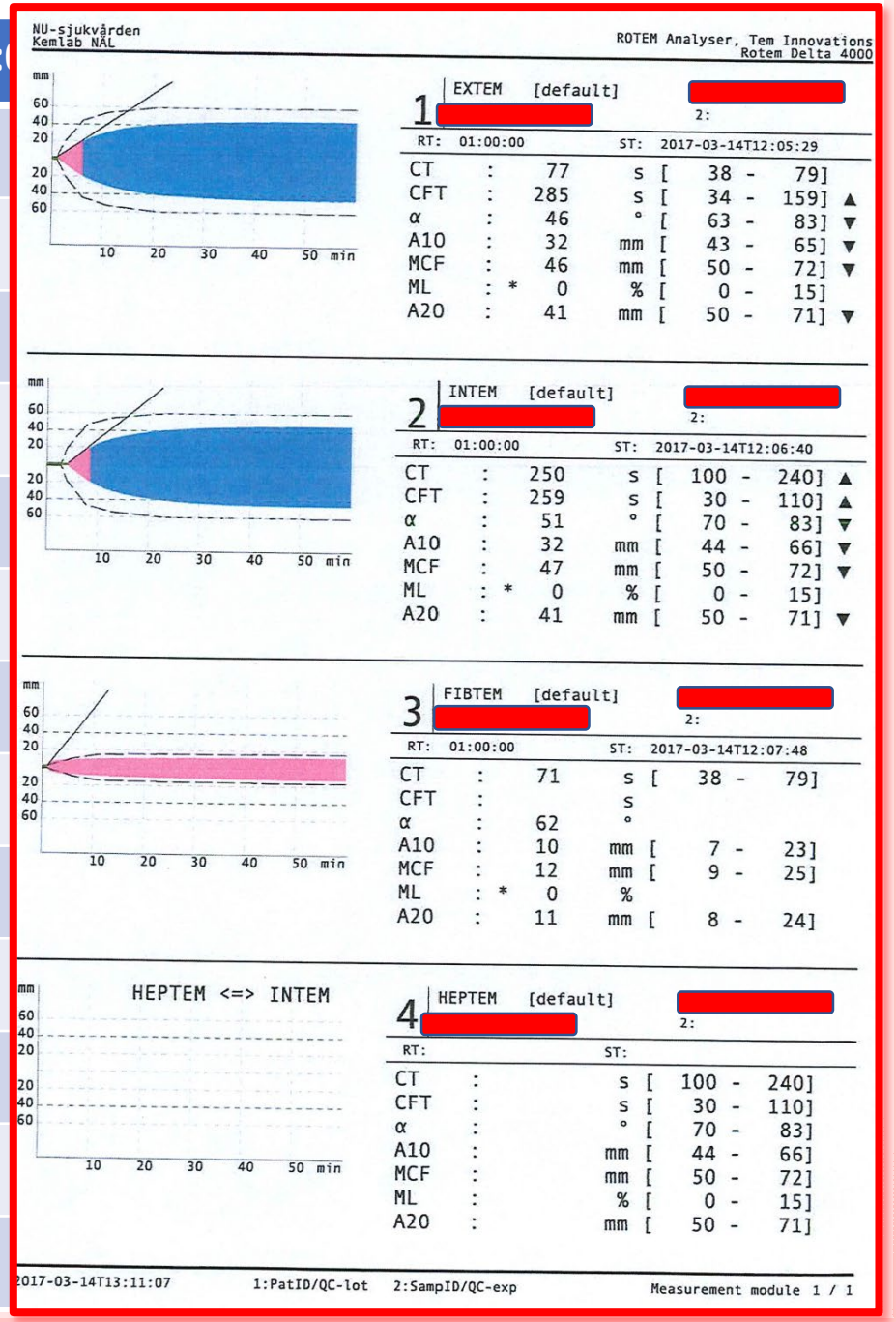
Dag 1, kl 03.12

- Blödning vaginalt, 1100 ml
- Tranexamsyra 2 g
- Oxytocin infusion
- Prostinfenem
- Octostim
- Blodprover hemolys
- Transfusion, 4 blod + 2 plasma
- Rotem
- Fibrinogen 4 g

Dag 1, kl 05.00

- Fortsätter siva från uterus
- Intuberad respirator
- Blodprover hemolys
- Bakri ballong
- Tamponad vagina
- Uterus väl kontraherad
- Diagnos?
- Mer blod, FFP, trombocyter och fibrinogen

Dag 1-3	01:00	04:00	06:00	11:30	14:30	20:30	03:
Hb	121	131	117	91			
LPK	17.5	21.8	21.7	13.2			
TPK	156	83	85	45			
CRP	6	4	5				
Asat	Hem	Hen	Hem	72			
Alat	Hem	29	22	19			
Bilirubin	Hem	Hem	78	135			
Kreat	Hem	Hem	Hem	147			
PK	Hem	1.2	1.2	1.2			
APTT	Hem	Hem	Hem	50			
Fib	Hem	-	Hem	1.6			
D-dimer	-	-	-	>10			
Rotem	03:10	04:30	08:00	12:00			



Under några vanliga dygn på IVA

Dag 1 kl

- Blodprover
- Rotem
- Blod 2 st
- FFP 7 st
- Trombocyter 3 st
- Fibrinogen 3 + 3 g
- Tranexamsyra 2 g

Dag 1 - 8

- Blod 3 st (tot 9 blod)
- FFP 3 st (tot 12 FFP)
- Trombocyter 5 st (tot 8 st)
- Fibrinogen (tot 10 g)
- Respirator dag 1-4
- Dialys CRRT dag 3-8
- Sjukhusvård 3 veckor

Diagnos?

1. HELLP
2. Hemostasrubbning
3. Hepatit
4. Autoimmun hepatit
5. Akut fettlever

Akut fettlever, behandling

- Avsluta graviditet
- Om tid finns
  - Stabilisera patient
  - Optimera hemostas
- Undvik ytterligare leverskada
  - Intensivvård
  - Optimera cirkulation, hjärtminutvolym och blodtryck
  - Undvik vissa LM
  - Acetylcystein?
- Farmakokinetik och farmakodynamik ändrad
- Samarbete och kommunikation
- Levertransplantation vb

SGF Nationella Riktlinjer
2014

På uppdrag av Svensk Gastroenterologisk Förenings styrelse

Nationella riktlinjer
för utredning samt handläggning av

Leversjukdom under graviditet – graviditet vid leversjukdom

2013-10-25
Kontaktperson: Hanns-Ulrich Marschall, Medicinkliniken, Sahlgrenska Universitetssjukhuset, 413 45 Göteborg, 070-8774073, hanns-ulrich.marschall@gu.se

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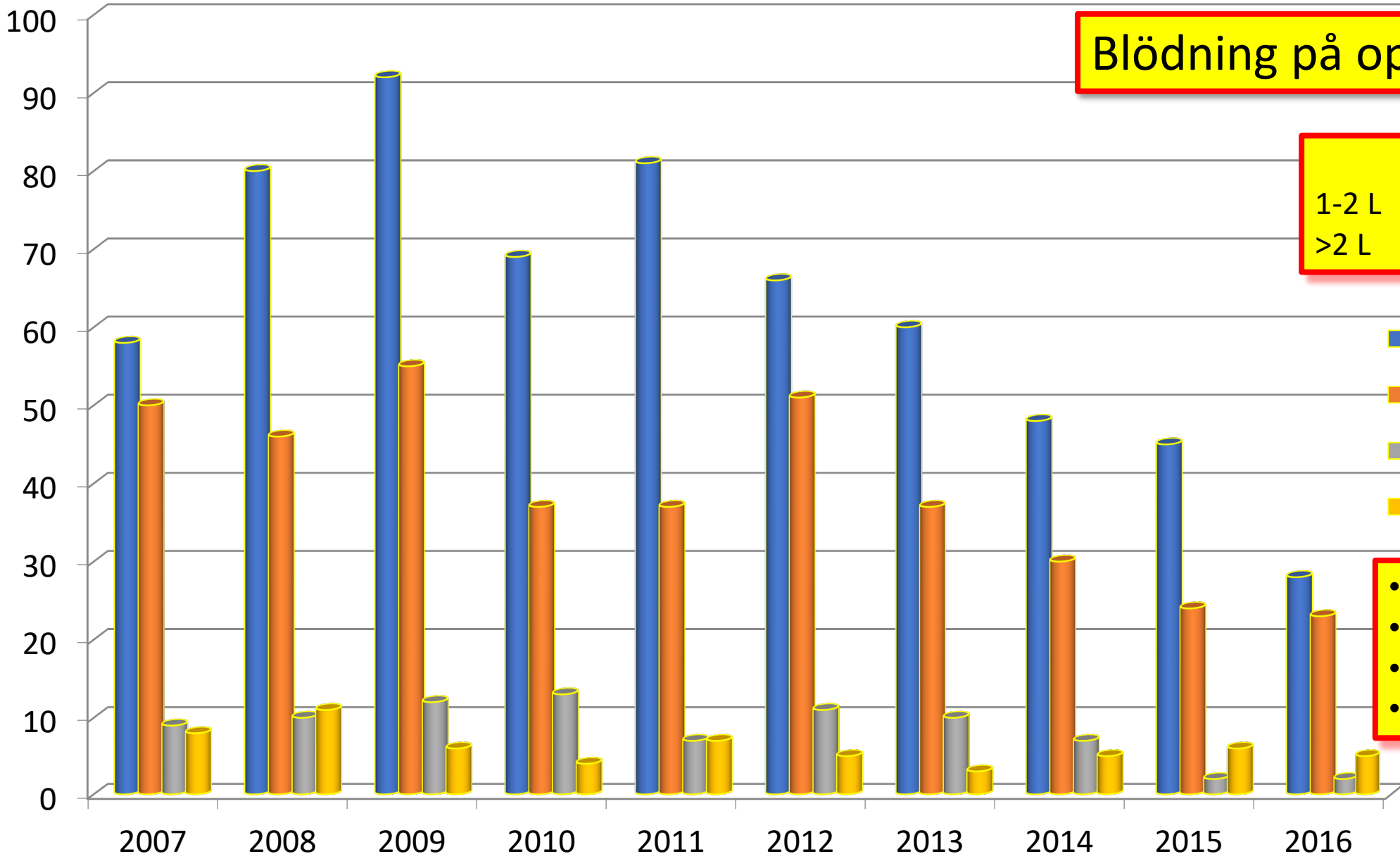
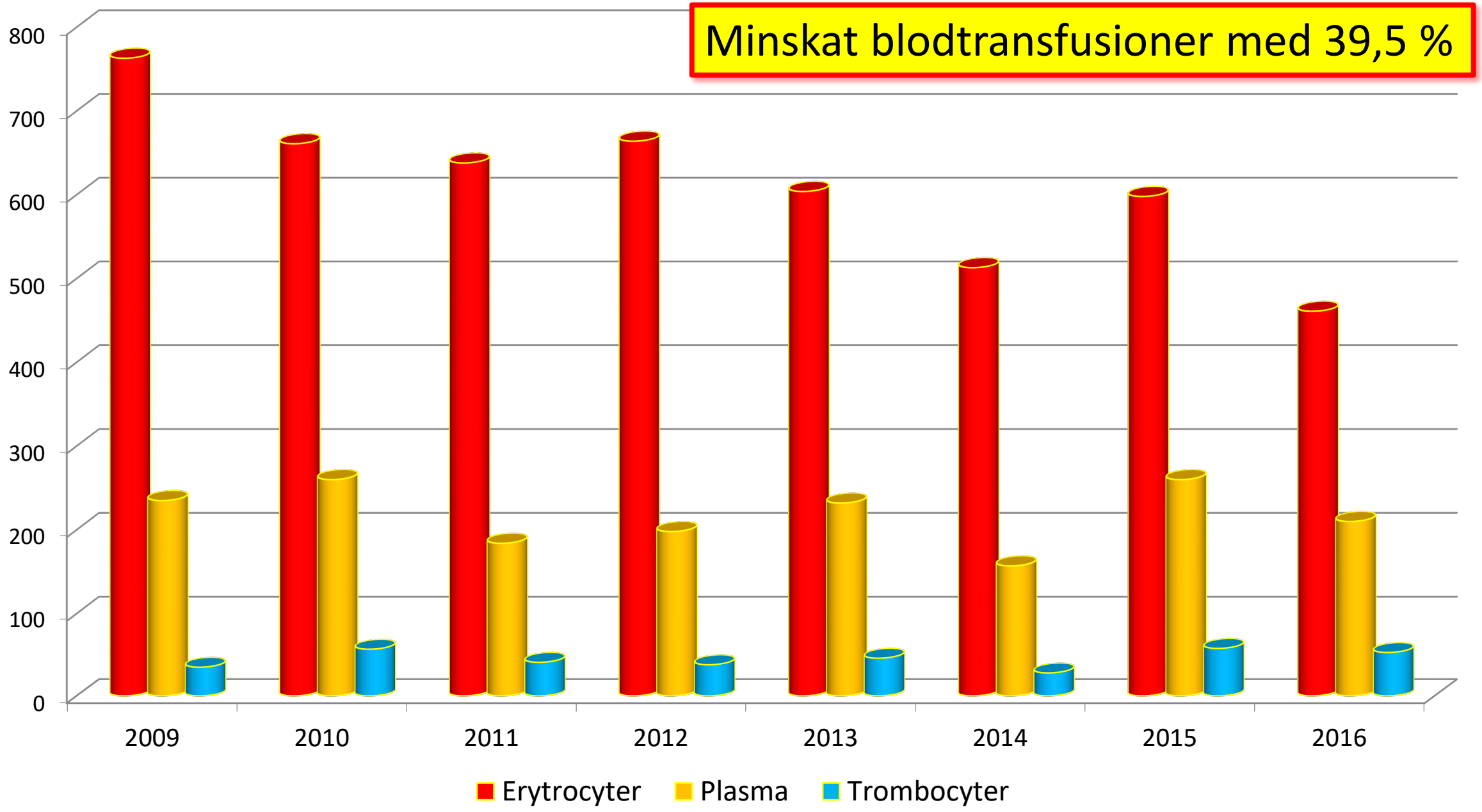
Blödning på operation



	09/10	2016
1-2 L	7.9%	4.2%
>2 L	1.5%	0.76%

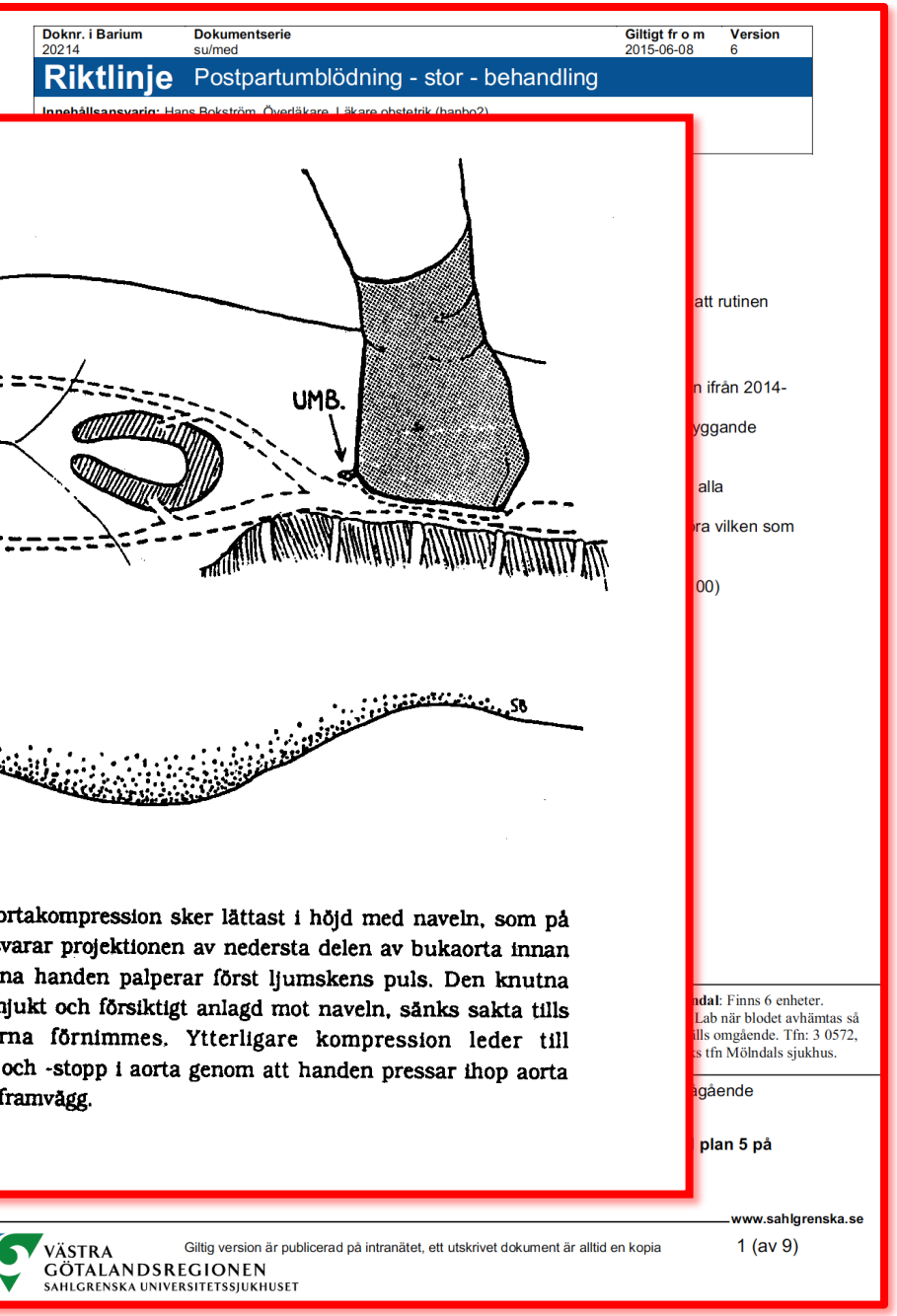
- Bättre rutiner
- Aorta kompression
- Teamarbete
- Hemostas

Minskat blodtransfusioner med 39,5 %



Behandling av stor postpartum blödning:

1. Profylax mot stor blödning
2. Initial behandling
3. Farmakologisk behandling
4. Kirurgisk behandling
5. Hemostas
6. Anestesi
7. Övrigt



Doknr. i Barium 20214 | Dokumentserie su/med | Giltigt fr o m 2015-06-08 | Version 6

Riktlinje Postpartumblödning - stor - behandling

Innehållsansvarig: Hans Bokström, Överläkare, Läkare obstetrik (hanbo2)

FIGUR 39 - Aortakompression sker lättast i höjd med naveln, som på bukens yta motsvarar projektionen av nedersta delen av bukaorta innan bifurkationen. Ena handen palperar först ljumskens puls. Den knutna andra handen, mjukt och försiktigt anlagd mot naveln, sänks sakta tills aortapulsationerna förnimmes. Ytterligare kompression leder till flödesminskning och -stopp i aorta genom att handen pressar ihop aorta mot kotpelarens framvägg.

att rutinen

n ifrån 2014-

yggande

alla

ra vilken som

00)

ndal: Finns 6 enheter.
Lab när blodet avhämtas så
lls omgående. Tfn: 3 0572,
s tfn Mölndals sjukhus.

agående

plan 5 på

Hemostas

Prospective Longitudinal Study of Thromboelastography and Standard Hemostatic Laboratory Tests in Healthy Women During Normal Pregnancy

Ove Karlsson, MD,* Tommy Sporrong, MD, PhD,† Andreas Hillarp, PhD,‡ Anders Jeppsson, MD, PhD,‖¶ and Margareta Hellgren, MD, PhD†#

BACKGROUND: Hemostatic disorders are common in obstetric complications. Thromboelastography (TEG®) simultaneously measures coagulation and fibrinolysis within 10 to 20 minutes. Our primary aim in this prospective longitudinal study was to obtain knowledge about physiological

Haemostasis during pregnancy

- Factors ↗
  - Fibrinogen
  - Factors VII, VIII, X, XII
  - vWF
- Factors ➔
  - Protein C
  - Antitrombin ev ↘
- Factors ↘
  - Factor XI
  - Factor XIII
  - Protein S
- Fibrinolysis ↘
  - Plasminogen ↗
  - PAI-1 ↗↗
  - PAI-2 ↗↗

Experience of Point-of-Care Devices in Obstetrical Care

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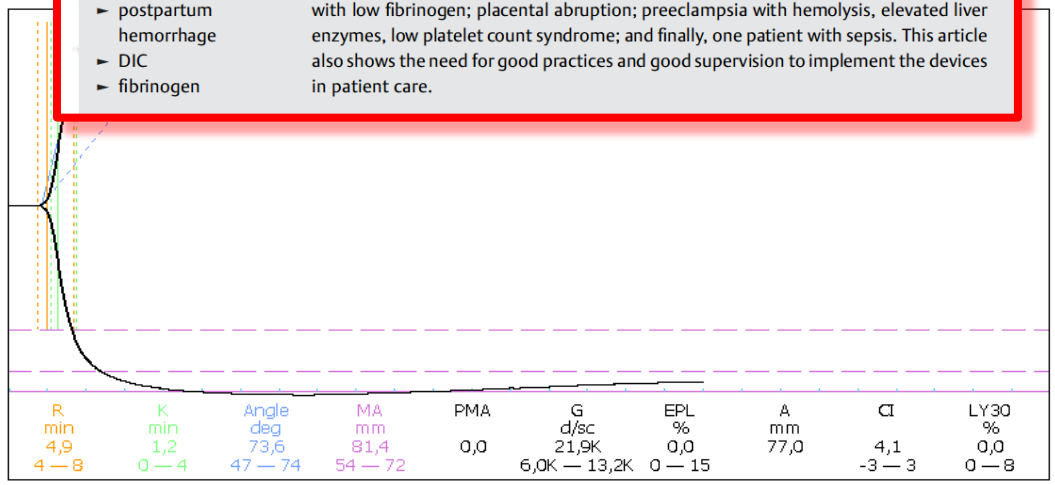
Semin Thromb Hemost 2017;43:397–406.

Abstract

During pregnancy and puerperium, there are pronounced hemostatic changes characterized by increased coagulability and decreased fibrinolysis. In addition, hemostasis can change dramatically during obstetric complications. Several reports have described substandard management of hemostatic defects in this setting and state the need for guidelines and better care. Point-of-care devices can assess hemostatic status and are especially suitable in perioperative settings. Using point-of-care devices, no time is required for transportation, allowing faster availability of results and providing potential for better care of the patient. This article will demonstrate the use of a viscoelastic method in six different patients; five with impaired hemostasis, and where the use of viscoelastic method contributes or should have contributed to better care. The cases represent patients with normal delivery; postpartum hemorrhage (PPH); PPH with low fibrinogen; placental abruption; preeclampsia with hemolysis, elevated liver enzymes, low platelet count syndrome; and finally, one patient with sepsis. This article also shows the need for good practices and good supervision to implement the devices in patient care.

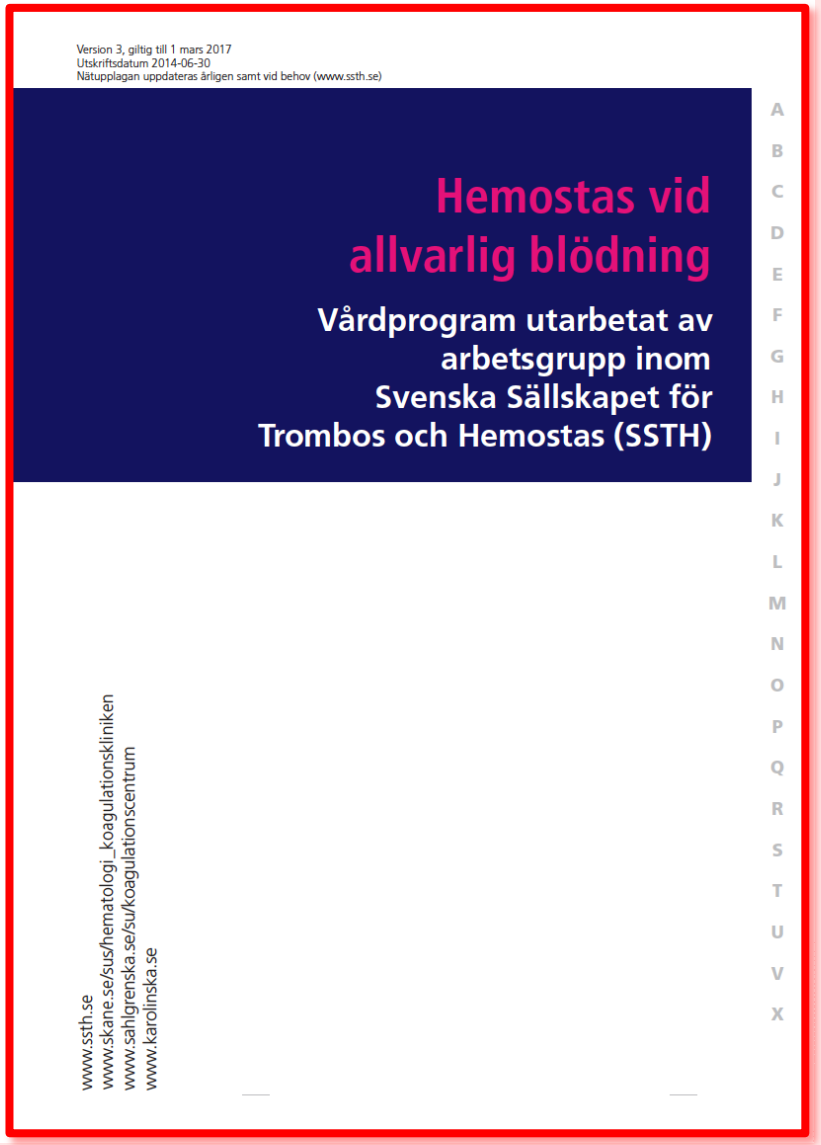
Keywords

- obstetric
- point-of-care
- viscoelastic method
- thromboelastography
- thromboelastometry
- hemostatic complication
- postpartum hemorrhage
- DIC
- fibrinogen



Mål under pågående ***stor*** blödning:

- Hb > 90 g/l
- TPK > 100 x 10^9/l
- PK < 1,5
- APTT normal
- Fibrinogen > 2,0-2,5 g/l
- Temp > 36,5 ° C
- pH > 7,2
- Jonicerat Ca >1,0
- **Patient nära analysinstrument**
- **Upprepa provtagning!**



Tranexamsyra

- 20.000 patienter, 21 länder, 193 sjukhus
- Randomiserad, dubbel-blind, placebo kontrollerad
- Inj Tranexamsyra 1g, en andra dos möjlig
- Minskad mortalitet pga minskad blödning

British Journal of Anaesthesia Page 1 of 12
doi:10.1093/bja/aeu448

BJA

Tranexamic acid for the prevention and treatment of postpartum haemorrhage

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and C. Deneux-Tharaux[8]

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[2] Department of Anesthesiology, Angers University Ho
[3] Department of Anesthesiology, Jeanne de Flandre U
[4] Department of Obstetrics and Gynecology, Jeanne d
[5] Department of Obstetrics and Gynecology, Caen Uni
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[8] INSERM, Obstetrical, Perinatal and Pediatric Epidemio
University, Paris, France

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E-mail: loicsentilhes@hotmail.com

- Minskad blödningsmängd
- Indikation PPH
- Inj Tranexamsyra 1-2 g iv
- Ges långsamt 1 ml/minut
- Kan upprepas efter 4-6 timmar

Editor's key points

- The authors considered the evidence regarding the effect of tranexamic acid in preventing and treating postpartum haemorrhage.
- They found promising effects, but concluded that there is, as yet, inadequate evidence (of efficacy and of safety) to support widespread uptake.

Postpartum haemorrhage (PPH) is a major cause of maternal mortality, accounting for one-quarter of all maternal deaths worldwide. Uterotonics after birth are the only intervention that has been shown to be effective for PPH prevention. Tranexamic acid (TXA), an antifibrinolytic agent, has therefore been investigated as a potentially useful complement to this for both prevention and treatment because its hypothesized mechanism of action in PPH supplements that of uterotonics and because it has been proved to reduce blood loss in elective surgery, bleeding in trauma patients, and menstrual blood loss. This review covers evidence from randomized controlled trials (RCTs) for PPH prevention after caesarean (n=10) and vaginal (n=2) deliveries and for PPH treatment after vaginal delivery (n=1). It discusses its efficacy and side effects overall and in relation to the various doses studied for both indications. TXA appears to be a promising drug for the prevention and treatment of PPH after both vaginal and caesarean delivery. Nevertheless, the current level of evidence supporting its efficacy is insufficient, as are the data about its benefit:harm ratio. Large, adequately powered multicentre RCTs are required before its widespread use for preventing and treating PPH can be recommended.

Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial

*WOMAN Trial Collaborators**

Summary

Background Post-partum haemorrhage is the leading cause of maternal death worldwide. Early administration of tranexamic acid reduces deaths due to bleeding in trauma patients. We aimed to assess the effects of early administration of tranexamic acid on death, hysterectomy, and other relevant outcomes in women with post-partum haemorrhage.

Methods In this randomised, double-blind, placebo-controlled trial, we recruited women aged 16 years and older with a clinical diagnosis of post-partum haemorrhage after a vaginal birth or caesarean section from 193 hospitals in 21 countries. We randomly assigned women to receive either 1 g intravenous tranexamic acid or matching placebo in addition to usual care. If bleeding continued after 30 min, or stopped and restarted within 24 h of the first dose, a second dose of 1 g of tranexamic acid or placebo could be given. Patients were assigned by selection of a numbered treatment pack from a box containing eight numbered packs that were identical apart from the pack number. Participants, care givers, and those assessing outcomes were masked to allocation. We originally planned to enrol 15 000 women with a composite primary endpoint of death from all-causes or hysterectomy within 42 days of giving birth. However, during the trial it became apparent that the decision to conduct a hysterectomy was often made at the same time as randomisation. Although tranexamic acid could influence the risk of death in these cases, it could not affect the risk of hysterectomy. We therefore increased the sample size from 15 000 to 20 000 women in order to estimate the effect of tranexamic acid on the risk of death from post-partum haemorrhage. All analyses were done on an intention-to-treat basis. This trial is registered with ISRCTN76912190 (Dec 8, 2008); ClinicalTrials.gov, number NCT00872469; and PACTR201007000192283.

Findings Between March, 2010, and April, 2016, 20 060 women were enrolled and randomly assigned to receive tranexamic acid (n=10 051) or placebo (n=10 009), of whom 10 036 and 9985, respectively, were included in the analysis. Death due to bleeding was significantly reduced in women given tranexamic acid (155 [1·5%] of 10 036 patients *vs* 191 [1·9%] of 9985 in the placebo group, risk ratio [RR] 0·81, 95% CI 0·65–1·00; p=0·045), especially in women given treatment within 3 h of giving birth (89 [1·2%] in the tranexamic acid group *vs* 127 [1·7%] in the placebo group, RR 0·69, 95% CI 0·52–0·91; p=0·008). All other causes of death did not differ significantly by group. Hysterectomy was not reduced with tranexamic acid (358 [3·6%] patients in the tranexamic acid group *vs* 351 [3·5%] in the placebo group, RR 1·02, 95% CI 0·88–1·07; p=0·84). The composite primary endpoint of death from all causes or hysterectomy was not reduced with tranexamic acid (534 [5·3%] deaths or hysterectomies in the tranexamic acid group *vs* 546 [5·5%] in the placebo group, RR 0·97, 95% CI 0·87-1·09; p=0·65). Adverse events (including thromboembolic events) did not differ significantly in the tranexamic acid versus placebo group.

Interpretation Tranexamic acid reduces death due to bleeding in women with post-partum haemorrhage with no adverse effects. When used as a treatment for postpartum haemorrhage, tranexamic acid should be given as soon as possible after bleeding onset.

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See Editorial page 2081
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Blodtransfusion

Bedöm om blödning kommer att:

Blödning < ½ blodvolym och blödning avstannar

- Transfundera
  - Så lite som möjligt
  - Målriktad terapi
  - Kristalloid

Blödning > ½ blodvolym och blödning pågår

- Transfundera
  - Blod/plasma/trombocyter
  - 4:4:1

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ORIGINAL ARTICLE

ELSEVIER
www.obstetanesthesia.com

Major obstetric haemorrhage: monitoring with thromboelastography, laboratory analyses or both?

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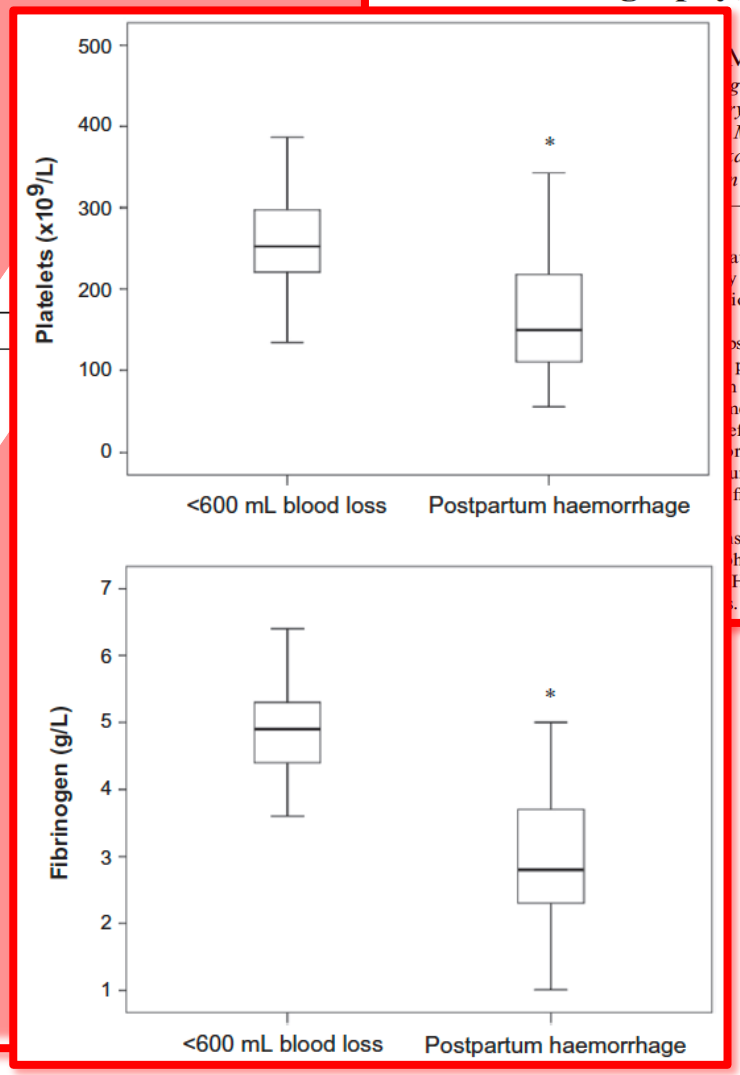
Medicine, University of Gothenburg, Gothenburg, Sweden
a University Hospital, Gothenburg and Department of Prenatal Care,

use of morbidity and mortality in the obstetric population. The aim of this study was
y and laboratory analyses to evaluate haemostasis during major obstetric haemorrhage.
ions between the results of thromboelastography, laboratory analyses and estimated

stetric haemorrhage and 49 women with blood loss <600 mL were included. The fol-
performed: time to start of clotting (TEG-R), time to 20 mm of clot firmness (TEG-K),
amplitude of clot (TEG-MA) and lysis after 30 min (TEG-LY30). In addition, platelet
e, prothrombin time, fibrinogen, antithrombin and D-dimer were measured.
flecting clot stability and fibrinolysis were decreased in women with massive obstetric
rmal bleeding, while clot initiation was accelerated. Laboratory analyses also showed
nced differences in platelet count, fibrinogen concentration and antithrombin activity.
fibrinogen and TEG-MA and between estimated blood loss and TEG-MA, fibrinogen

strated by thromboelastography and laboratory analyses, was found after an estimated
hy provides faster results than standard laboratory testing which is advantageous in the
However, laboratory analyses found greater differences in coagulation variables, which



- Snabbare initiering
- Minska koagelstyrka
- TEG, snabbare resultat
- Starkaste korrelationer
  - Fibrinogen - TEG-MA
  - EBL - Fibrinogen
  - EBL – TEG-MA

BJA

British Journal of Anaesthesia 115 (1): 99–104 (2015)

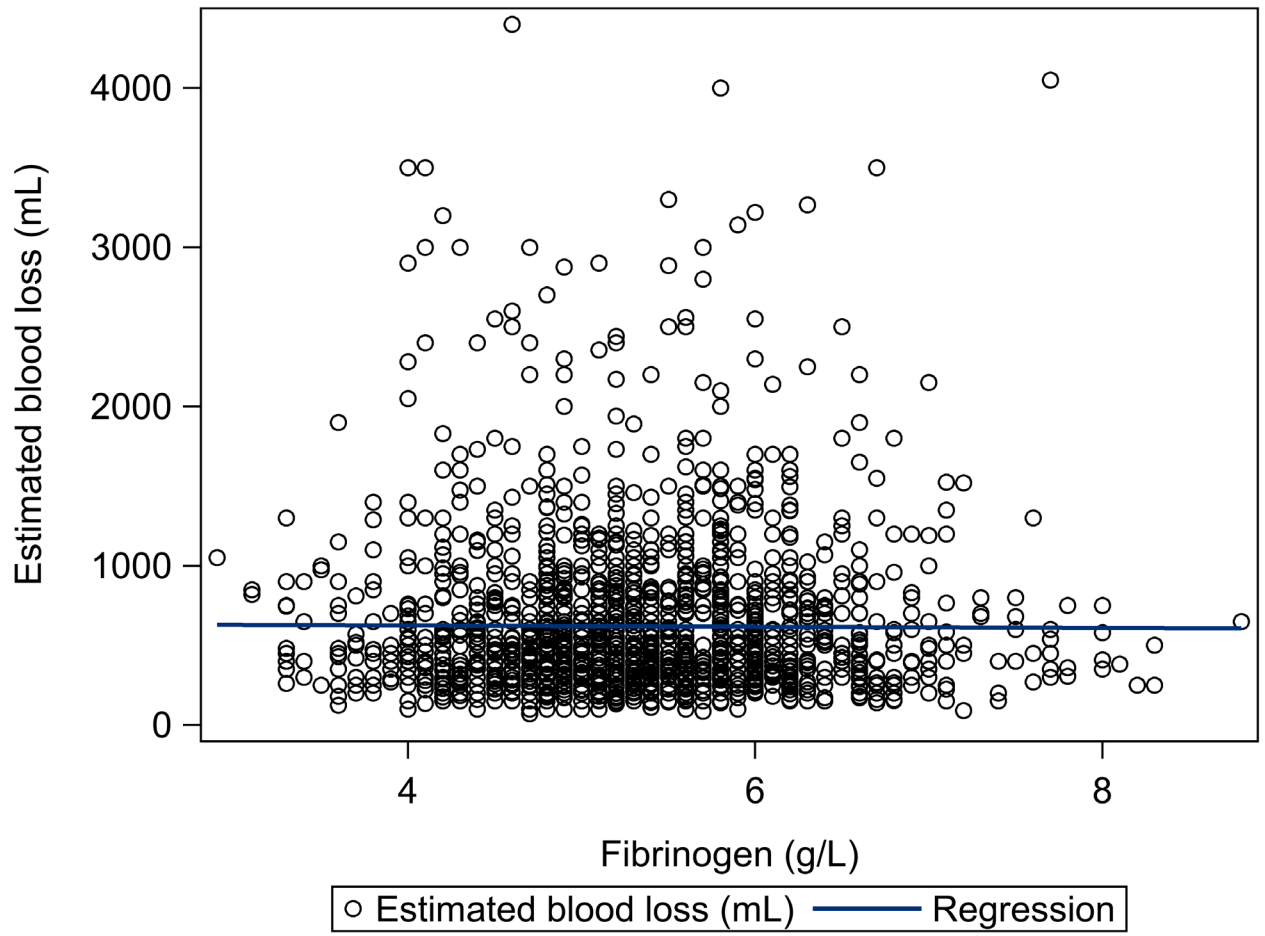
doi: 10.1093/bja/aev039
Advance Access Publication Date 18 March 2015
Obstetrics

OBSTETRICS

Fibrinogen plasma concentration before d
is not associated with postpartum haemo
a prospective observational study

O. Karlsson[1,*], A. Jeppsson[2,3], M. Thornemo[4], H. Lafrenz[5], M
and M. Hellgren[7,8,9]

r = 0.003
p = 0.9



- Fibrinogen sjunker ej under partus
- Fibrinogen predikterar ej PPH
- PPH prediktorer:
  - Exploration postpartum
  - Kejsarsnitt
  - Instrumentell förlossning
  - Oxytocin stimulering

BJA

British Journal of Anaesthesia, 119 (3): 411–21 (

doi: 10.1093/bja/aex181
Advance Access Publication Date: 19 July 2017
Obstetrics

OBSTETRICS

Viscoelastometric-guided early fibrinogen conce replacement during postpartum haemorrhage: a double-blind randomized controlled trial

P. W. Collins[1,*], R. Cannings-John[2], D. Bruynseels[3], S. Mallaiah[4], J. D C. Elton[6], A. D. Weeks[7], J. Sanders[8], N. Aawar[2], J. Townson[2], K. Hood J. E. Hall[9] and R. E. Collis[3] on behalf the OBS2 study team[†]

[1]Institute of Infection and Immunity, School of Medicine Cardiff University, UK, [2]Centre for Trials College of Biomedical and Life Sciences, Cardiff University, UK, [3]Department of Anaesthetics and Cardiff and Vale University Health Board, UK, [4]Tom Byson Department of Anaesthesia, Liverpool Hospital, Liverpool, UK, [5]Department of Anaesthetics, University College Hospital London, UK, [6]D Anaesthetics, Leicester R ...'s H Institute of Translationa ...are S Cardiff University, Cardi ...Medi University, Heath Park, U

*Corresponding author. E-mail: pe
[†]The OBS2 study team is listed in t

- Randomiserad studie
- Inkluderade blödning > 1l
- Fibrinogen/placebo
- FibTEM < 15 mm
- Ingen skillnad

Abstract

Background: Postpartum ha ...d tha gen replacement, guided by
Methods: Women with PPH 1000–1500 ml were enrolled. If Fibtem A5 was ≤15 mm and bleeding continued, su randomized to fibrinogen concentrate or placebo. The primary outcome compared the number of units of red plasma, cryoprecipitate and platelets transfused.
Results: Of 663 women enrolled 55 were randomized. The adjusted incidence rate ratio (IRR) (95% CI) for the nu neic units transfused in the fibrinogen group compared with placebo was 0.72 (0.3–1.7), P=0.45. In pre-specified s ses, subjects who had a Fibtem A5 ≤12 mm at the time of randomization and who received fibrinogen concentra median (25th–75th centile) of 1 (0–4.5) unit of allogeneic blood products and had an additional 300 (100–350) ml blood loss whereas those who received placebo also received 3 (0–6) units of allogeneic blood products and had 700 (200–1550) ml addi- tional blood loss; these differences were not statistically significantly different. There was one thrombotic event in each grou
Conclusions: Infusion of fibrinogen concentrate triggered by Fibtem A5 ≤15 mm did not improve outcomes in PPH. Pre-specified subgroup analyses suggest that fibrinogen replacement is not required if the Fibtem A5 is > 12 mm or Clauss fibrinogen >2 g litre^{-1}, but an effect below these levels cannot be excluded. The raised fibrinogen at term appears to be a physiological buffer rather than required for haemostasis.

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https://doi.org/10.1016/j.ijoa.2018.08.008

ELSEVIER
www.obstetanesthesia.com

REVIEW ARTICLE

Management of postpartum haemorrhage: from research into practice, a narrative review of the literature and the Cardiff experience

P.W. Collins,[a] S.F. Bell,[b] L. de Lloyd,[b] R.E. Collis[b]
[a]*Institute of Infection and Immunity, School of Medicine, Cardiff Univeristy, Cardiff, UK*
[b]*Department of Anaesthetics, Intensive Care and Pain Medicine, Cardiff and Vale University Health Board, Cardiff, UK*

ABSTRACT
Postpartum haemorrhage (PPH) is caused by obstetric complications but may be exacerbated by haemostatic impairment. In a 10-year programme of research we have established that haemostatic impairment is uncommon in moderate PPH and that fibrinogen falls earlier than other coagulation factors. Laboratory Clauss fibrinogen and the point-of-care surrogate measure of fibrinogen (FIBTEM A5 measured on the ROTEM® machine) are predictive biomarkers for progression from early to severe PPH, the need for blood transfusion and invasive procedures to control haemorrhage. Fibrinogen replacement is not required in PPH unless the plasma level falls below 2 g/L or the FIBTEM A5 is below 12 mm. Deficiencies of coagulation factors other than fibrinogen are uncommon even during severe PPH, and ROTEM® monitoring can inform withholding FFP safely in most women. In the absence of placental abruption, clinically significant thrombocytopenia is uncommon unless the platelet count is low before the bleed started, or very large bleeds (>5000 mL) occur. Measuring blood loss is feasible in routine practice during PPH and is more accurate than estimation. These research findings have been collated to design an ongoing quality improvement programme for all maternity units in Wales called OBS Cymru (Wales) (The Obstetric Bleeding Strategy for Wales).
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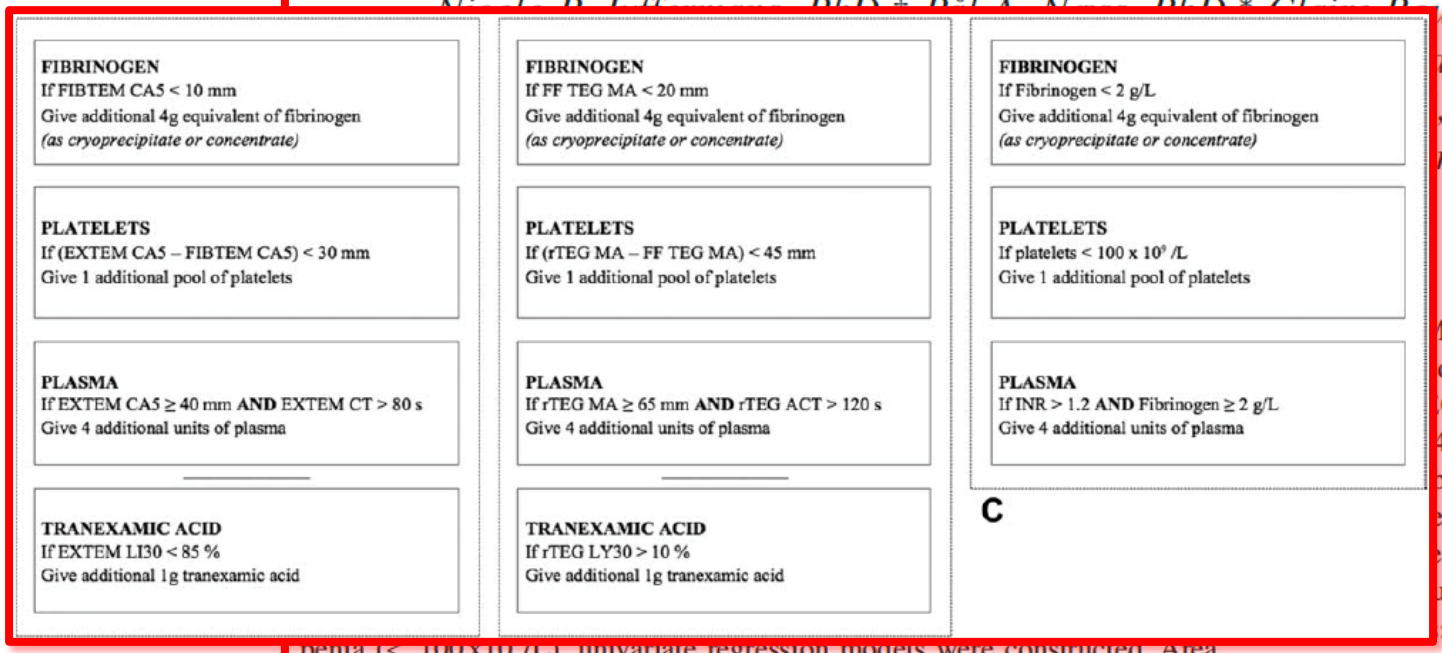
Annan studie visar:
- Vid obstetrisk blödning höjer 1 g ca 0,36 g/l

- Fibrinogen om:
  - FIBTEM A5 < 12 mm
  - Fibrinogen < 2 g/l

Data-driven Development of ROTEM and TEG Algorithms for the Management of Trauma Hemorrhage

A Prospective Observational Multicenter Study

Kjersti Baksaas-Aasen, MD, Susan Van Dieren, PhD,† Kirsten Balvers, PhD,†*
…urke, BSc,§ Simon Eaglestone, PhD,§
*…unworth, PhD,** Marc Maegele, PhD,††*
…, MD,§ and Christine Gaarder, PhD§§,
…rators



FIBRINOGEN
If FIBTEM CA5 < 10 mm
Give additional 4g equivalent of fibrinogen
(as cryoprecipitate or concentrate)

PLATELETS
If (EXTEM CA5 – FIBTEM CA5) < 30 mm
Give 1 additional pool of platelets

PLASMA
If EXTEM CA5 ≥ 40 mm **AND** EXTEM CT > 80 s
Give 4 additional units of plasma

TRANEXAMIC ACID
If EXTEM LI30 < 85 %
Give additional 1g tranexamic acid

FIBRINOGEN
If FF TEG MA < 20 mm
Give additional 4g equivalent of fibrinogen
(as cryoprecipitate or concentrate)

PLATELETS
If (rTEG MA – FF TEG MA) < 45 mm
Give 1 additional pool of platelets

PLASMA
If rTEG MA ≥ 65 mm **AND** rTEG ACT > 120 s
Give 4 additional units of plasma

TRANEXAMIC ACID
If rTEG LY30 > 10 %
Give additional 1g tranexamic acid

FIBRINOGEN
If Fibrinogen < 2 g/L
Give additional 4g equivalent of fibrinogen
(as cryoprecipitate or concentrate)

PLATELETS
If platelets < 100 x 10^9 /L
Give 1 additional pool of platelets

PLASMA
If INR > 1.2 **AND** Fibrinogen ≥ 2 g/L
Give 4 additional units of plasma

C

penia (< 100 x 10^9/L), univariate regression models were constructed. Area under the curve (AUC) was calculated, and threshold values for TEG and ROTEM parameters with 70% sensitivity were included in the algorithms.

Results: A total of, 2287 adult trauma patients (ROTEM: 2019 and TEG: 968) were enrolled. FIBTEM clot amplitude at 5 minutes (CA5) had the largest AUC and 10 mm detected hypofibrinogenemia with 70% sensitivity. The corresponding value for functional fibrinogen (FF) TEG maximum …A) was 19 mm … d threshold E… …G MA was 46 … 4 mm (80% se… …between viscoe… …shold values … …se analyses, … …used in additio… …: We describe… …eters for ROTEM and T… algorithms to support data-… tics, to optimize damage …

Keywords: algorithms, RO… coagulopathy, viscoelastic …

(*Ann Surg* 2018;xx:xxx…

- TIC, trauma induced coagulopathy
  - Fibrinogen < 2,0 g/l
  - TPK < 100 x 10^9/l
- Prospektiv 2008-2014
- 6 st Europeiska trauma center
- ROTEM 2019 pat, TEG 968 pat
- Fibrinogen om:
  - FIBTEM A5 < 10 mm
  - FF TEG MA < 20 mm
- Trombocyter om:
  - EXTEM A5-FIBTEM A5 < 30 mm
  - TEG MA – FF TEG MA < 45 mm

Desmopressin

Haemophilia

Haemophilia (2012), 18, 25–33 DOI: 10.1111/j.1365-2516.2011.02573.x

REVIEW ARTICLE

A Systematic Review: The use of desmopressin for treatment and prophylaxis of bleeding disorders in pregnancy

D. E. TRIGG, I. STERGIOTOU, P. PEITSIDIS and R. A. KADIR
The Royal Free Hospital, London, UK

Summary. Desmopressin (DDAVP) is commonly used for treatment and prevention of bleeding complications in patients with bleeding disorders including haemophilia A, von Willebrand's disease (VWD) and other less common disorders. This article reviews the current

events as a result of treatment with DDAVP. One case of water intoxication seizure and one case of premature labour following the use of DDAVP was reported in a single study. Other maternal side effects included facial flushing and headache and were reported by one study.

ally well tolerated by
gnificant adverse events
a result of DDAVP use.
in ten studies with no
onclusion, this review
d cases is effective in
s associated with preg-
d safety record. Further
ese findings as they
le evidence from s

in, haemophilia,
isease

- Inga studier på postpartum blödning
- Trauma studier, ingen skillnad blödning
- Indikation profylax vid hemostasrubbning
  - von Willebrand
  - Hemofili A
  - Trombocytdysfunktion
- Risk vattenintoxikation

Rekombinant faktor VIIa

REVIEW

The role of recombinant activated factor VII in obstetric hemorrhage

Jouni Ahonen

Purpose of review
To review the literature regarding the use of recombinant activated factor FVII (rFVIIa) in the treatment of postpartum hemorrhage (PPH).

Recent findings
The previous and recent case reports and case series suggest a potential benefit of rFVIIa in the management of severe PPH refractory to standard treatment. However, the lack of randomized controlled studies limits the value of the available data. rFVIIa cannot work optimally if there is a shortage of the basic components of the coagulation cascade such as fibrinogen. New experimental data suggest that rFVIIa can relocate into the extravascular space and remain functionally active which may prolong its hemostatic effect longer than the short circulatory half-life indicates.

Summary
Although some preliminary guidelines have been published, the case reports and case series illustrate that the practice of using rFVIIa in PPH is far from uniform. rFVIIa should usually not be used to compensate for an inadequate transfusion therapy. Therefore, early and effective administration of red blood cells, fresh frozen plasma, fibrinogen concentrate (or cryoprecipitate), and platelets as well as the control of uterine atony are essential before considering administration of rFVIIa in the treatment of PPH.

Keywords
coagulation, postpartum hemorrhage, recombinant factor VIIa

INTRODUCTION

Recombinant activated factor VII (rFVIIa; NovoSeven, Novo Nordisk A/S, Bagsvaerd, Denmark) is licensed for the treatment of bleeding episodes in patients with congenital hemophilia A or B and who have developed inhibitors to FVIII or FIX; and in patients with FVII deficiency or Glanzmann's thrombasthenia with anti-GpIIb/IIIa antibodies. It induces hemostasis at the site of vascular injury independent of the presence of FVIII and FIX by

clot [5] (Fig. 1). Recent experimental data suggest that rFVIIa can relocate into the extravascular space and remain functionally active which may prolong its hemostatic effect longer than the short circulatory half-life indicates [7▪].

Since the first case report of empirical off-label use of rFVIIa in postpartum hemorrhage (PPH) [8], numerous case reports and case series from all over the world have been published on this topic [9–13]. Furthermore, data from several national and inter-

ws are
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more
ented
uthors

Hospital,

D, PhD,
271852;

- Off label use
- Fallserier, obstetriska blödningar
- En randomiserad studie, 2 trombotiska komplikationer
- Finns i vissa guideline

Mycket viktigare för fungerande hemostas:

Syra-bas

Calcium

Temperatur

Review Article — *The Journal of* TRAUMA® *Injury, Infection, and Critical Care*

Preconditions of Hemostasis in Trauma: A Review. The Influence of Acidosis, Hypocalcemia, Anemia, and Hypothermia on Functional Hemostasis in Trauma

Heiko Lier, MD, Henning Krep, MD, PhD, Stefan Schroeder, MD, PhD, and Frank Stuber, MD, PhD

Background: Beside the often discussed topics of consumption and dilution coagulopathy, additional perioperative impairments of coagulation are caused by acidosis, hypocalcemia, anemia, hypothermia, and combinations.

Methods: Reviewing current literature, cutoff values of these parameters become obvious at which therapy should commence.

Results: A notable impairment of hemostasis arises at a pH ≤7.1. Similar effects are caused by a BE of −12.5 or less. severe bleeding, buffering gic pH values is recomlly with massive transfuBCCs displaying exhausted uffer systems. It completes ostasis n. scular r ione held

From the hemostatic point of view, the optimal Hct is higher than the one required for oxygenation. Even without a "classical" transfusion trigger, the therapy of acute, persistent bleeding should aim at reaching an Hct ≥30%.

A core temperature of ≤34°C causes a decisive impairment of hemostasis. A controlled hypotensive fluid resuscitation should aim at reaching a mean arterial pressure of ≥65 mm Hg (possibly higher for cerebral trauma). Prevention and later aggressive therapy of hypothermia by exclusive infusion of warmed fluids and the use of warming devices are prerequisites for the cure of traumatic coagulopathy.

Combined appearance of single preconditions cause additive impairments of the coagulation system.

Conclusions: The prevention and timely correction, especially of the combination acidosis plus hypothermia, is crucial for the treatment of hemorrhagic coagulopathy.

Key Words: Blood coagulation, Coagulopathy, Acidosis, Hypocalcemia, Anemia, Hypothermia.

J Trauma. 2008;65:951–960.

Generell anestesi och blödning

Spinal, placenta lösning
- Bupivakain tung 6 mg
- Fentanyl 15 ug

The Effects of Volatile Anesthetics on Spontaneous Contractility of Isolated Human Pregnant Uterine Muscle: A Comparison Among Sevoflurane, Desflurane, Isoflurane, and Halothane

Anesth Analg 2006;103(2):443-447

- Inhalationsgaser ger
  - Dosberoende relaxation
  - Uterusmuskulaturen
- Byt inhalationsanestesi
  - Propofolinfusion
  - Optimera O_2/N_2O/fentanyl

We examined the effects of equianesthetic concentrations of sevoflurane, desflurane, isoflurane, and halothane on the spontaneous contractility of isolated human pregnant uterine muscles. We also determined if their action was related to potassium channels. Uterine specimens were obtained from normal full-term pregnant women undergoing elective lower-segment cesarean delivery. Longitudinal muscle strips were mounted vertically in tissue chambers. Their isometric tension was recorded while they were exposed to 0.5–3 minimum alveolar concentration (MAC) of volatile anesthetics in the absence and presence of the high conductance calcium-activated potassium channel blocker, tetraethylammonium, or the adenosine triphosphate-sensitive potassium channel (K_{ATP})-blocker, glibenclamide. The anesthetics examined produced a dose-

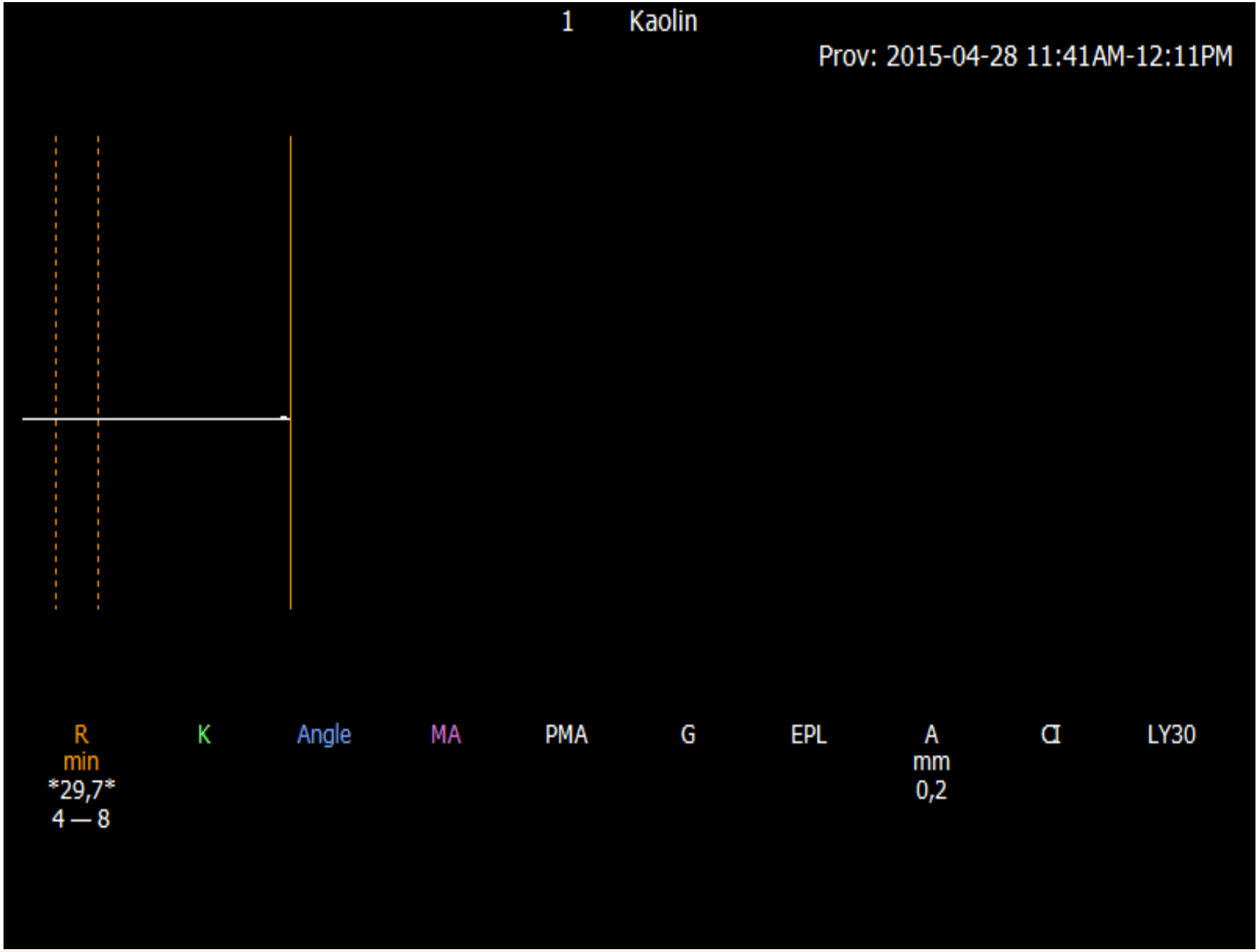
En tisdag vid lunch:
Manuell exploration pga PPH
Frisk kvinna, aortakompression

Diagnos?

1. Tone
   - Postpartum blödning pga atoni
2. Trauma
   - Postpartum blödning pga cervix laceration
3. Tissue
   - Postpartum blödning pga placentarester
4. Trombin
   - DIC pga sepsis

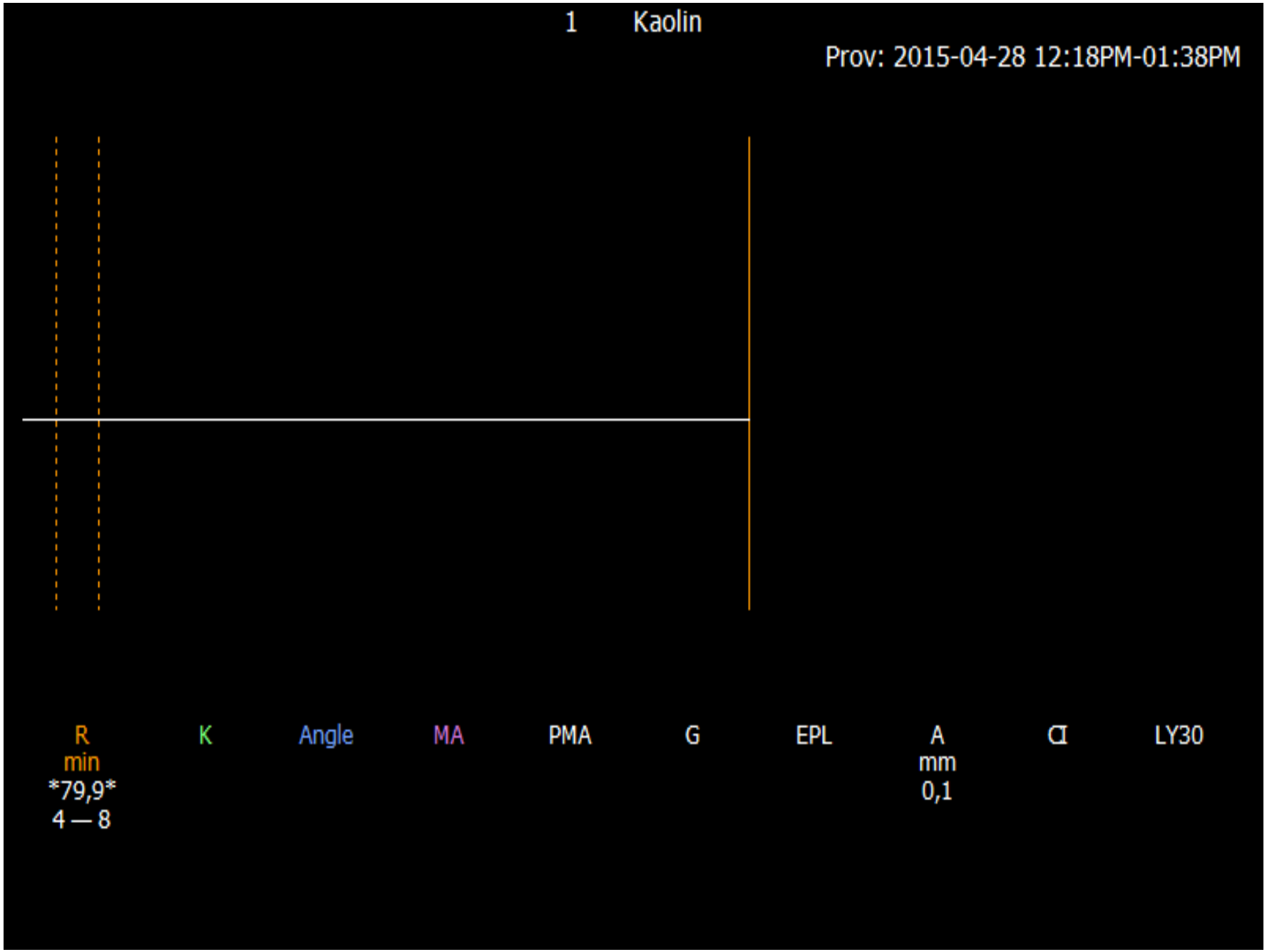
En liten stund senare

- Intubations narkos
  - Alfentanil, tiopental och suxameton
  - Får en cirkulatorisk chock
- Oxytocin, metylergometrin, karboprost samt misoprostol, försök till ballong pga atoni
- Sivande blödning från ytlig bristning
- Ytterligare 1000 ml blödning
- Mörjiga hinnor utbyte


1 Kaolin
Prov: 2015-04-28 11:41AM-12:11PM
R
min
29,7
4 — 8
K
Angle
MA
PMA
G
EPL
A
mm
0,2
CI
LY30

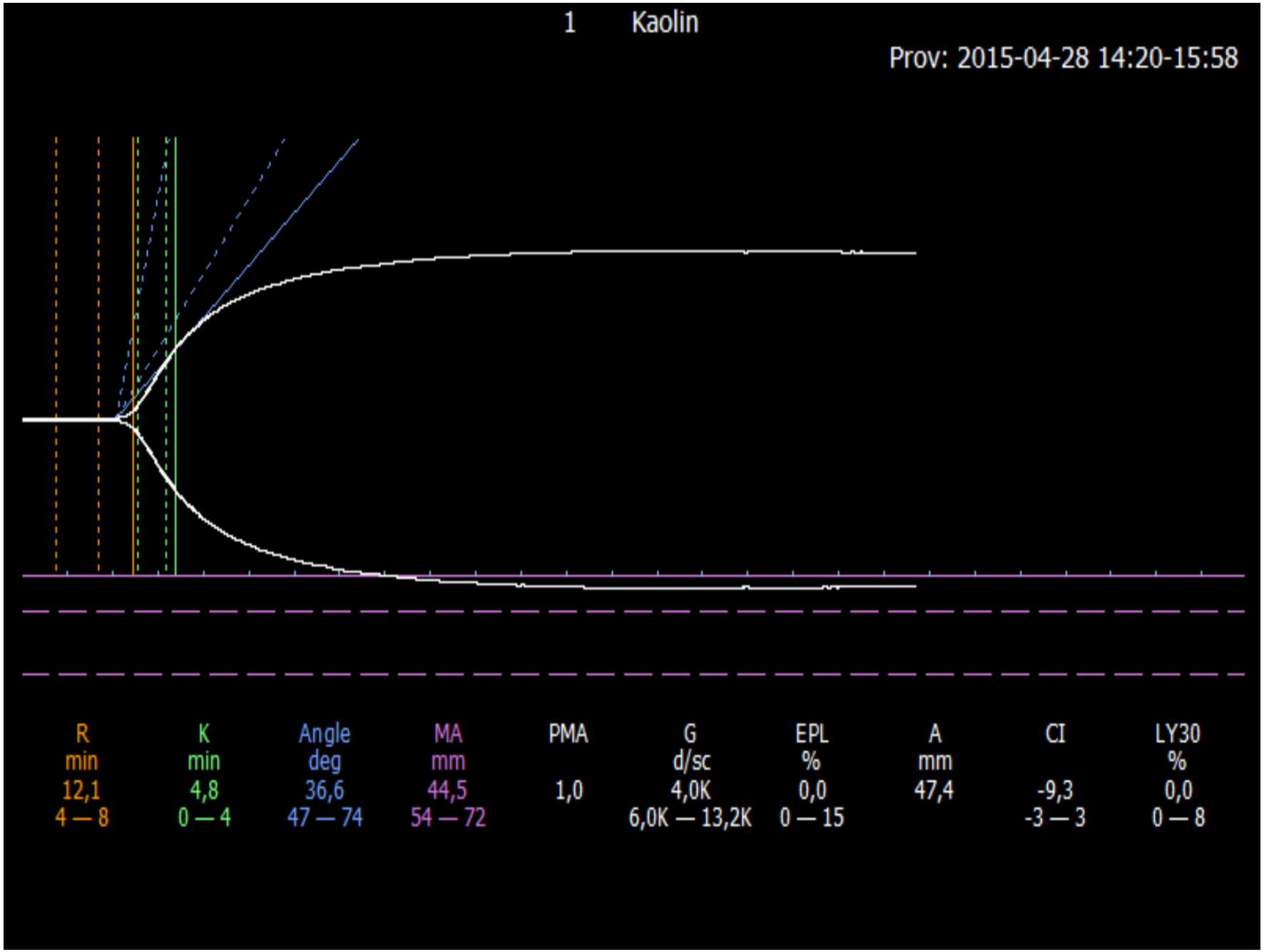
Kvinna född 1979

- Anamnes
  - Frisk
- Aktuell graviditet
  - 3-gravida 1-para
  - Partus
    - Söndag kl 05.06
  - Hem
    - Måndag kl 14.05


1 Kaolin
Prov: 2015-04-28 12:18PM-01:38PM
R
min
79,9
4 — 8
K
Angle
MA
PMA
G
EPL
A
mm
0,1
CI
LY30

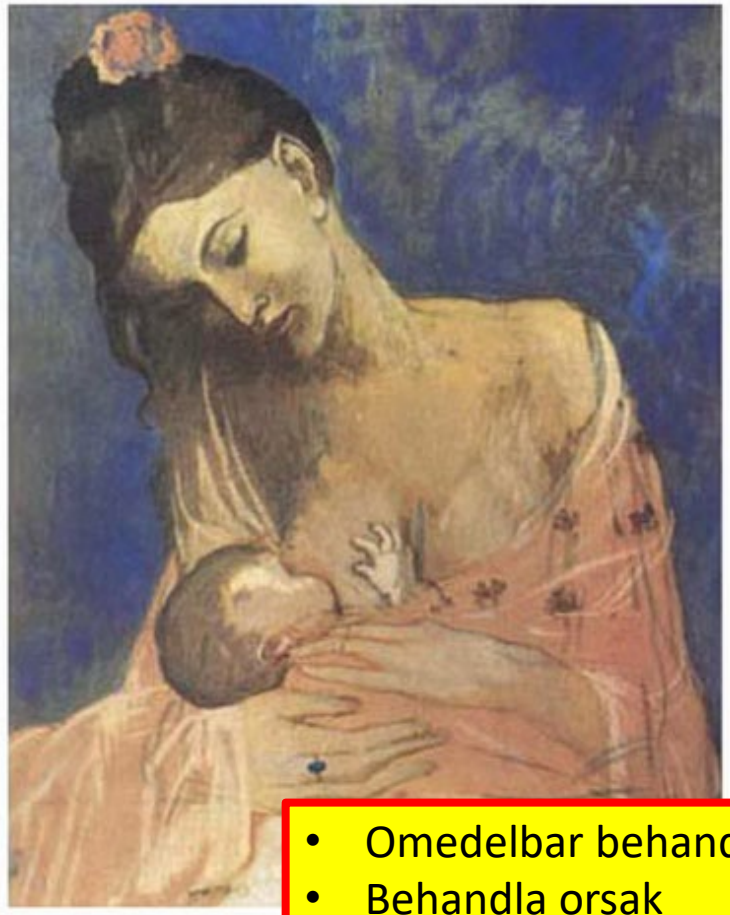
Prover tisdag

- Kl 10.30 på antenatal
  - Hb 117, TPK 123, CRP 150
  - PK 1.0, APTT 96
  - Fibrinogen 1.4
- Kl 11.21 på operation
  - Hb 107, TPK 70
  - PK 1.1, APTT 148
  - Fibrinogen 1.0
  - AT 0.52, D-dimer >20


1 Kaolin
Prov: 2015-04-28 14:20-15:58
R min 12,1 4 — 8
K min 4,8 0 — 4
Angle deg 36,6 47 — 74
MA mm 44,5 54 — 72
PMA 1,0
G d/sc 4,0K 6,0K — 13,2K
EPL % 0,0 0 — 15
A mm 47,4
CI -9,3 -3 — 3
LY30 % 0,0 0 — 8

Sepsis med DIC och PPH
Grupp A Streptokocker

- Söndag — Partus
- Måndag — Hem
- Tisdag — PPH
- Två veckor — IVA
  - En vecka respirator
  - Multiorgansvikt
- 5 ½ vecka — Hem



- Omedelbar behandling
- Behandla orsak
- Ge samtidigt:
  - Tranexamsyra
  - Blod/Plasma/Tromb
  - Fibrinogen
- Upprepa provtagning

Management of ma stpartum haemorrhage

Aortakompression

Tranexamsyra

TEG/ROTEM

NEWS 2/MEOWS

FIBRINOGEN

Upprepa provtagning

Blod/Plasma/Trombocyter 4/4/1

Kommunikation och samarbete

Fibrinogen, D-dimer, a
Bloodgases in

ssion/
us compressi

wer head, admi
• Blood pressu
• 2 large-gauge cannulas

Anesthesia
• Consider terminating inhalational anaest.
• Consider propofol or ketamine infusion
• Opti 20/02 and Fentanyl

ations
ytocin
• Methylergometrin
• Carboprost
• Misoprostol
Tranexamic a
Antibiotics

1000 ml (caution at >2
00 ml, max dose 1
egative blood

ood products
• Erythrocytes / plasma / pl
• Fibrinogen initial d
• Recomb
• A IU/ml

Surg
•
•
• E

2014-09-09