

Tests viscoélastiques :

Cours aux résidents en anesthésiologie

Antoine G Rochon MD FRCPC

Montréal, octobre 2022



**INSTITUT DE
CARDIOLOGIE
DE MONTRÉAL**



Université 
de Montréal

Conflits d'intérêts

– Aucun



Objectifs: à la fin de ce cours, le participant devrait pouvoir :

- Reconnaître la place des tests viscoélastiques dans la prise en charge des patients hémorragiques.
- Décrire comment fonctionnent les tests viscoélastiques.
- Identifier les avantages et les limites des tests viscoélastiques.
- Interpréter des temogrammes cliniques.



Gestion personnalisée du sang

	1 ^{er} pilier Optimiser l'érythropoïèse	2 ^e pilier Minimiser les pertes sanguines & le saignement	3 ^e pilier Optimiser la réponse physiologique à l'anémie
Postopératoire	<ul style="list-style-type: none">◦ Stimuler l'érythropoïèse	<ul style="list-style-type: none">◦ Monitorer attentivement et prendre en charge le saignement postopératoire◦ Éviter toute reprise d'un saignement◦ Éviter toute hypothermie et traiter activement si celle-ci apparaît◦ Récupérer le sang autologue◦ Minimiser les pertes sanguines iatrogènes◦ Prendre en charge l'hémostase et l'anticoagulation◦ Administrer une prophylaxie du saignement digestif haut (?)◦ Éviter/traiter rapidement toute infection	<ul style="list-style-type: none">◦ Maximiser la livraison d'oxygène◦ Minimiser la consommation d'oxygène◦ Éviter/traiter rapidement toute infection◦ Utiliser un seuil transfusionnel restrictif, en accord avec les recommandations internationales



Practice Guidelines for Perioperative Blood Management

*An Updated Report by the American Society of Anesthesiologists
Task Force on Perioperative Blood Management**

Anesthesiology 2015; 122:241-75.

Survey Findings: Both the consultants and ASA members agree that if coagulopathy is suspected, obtain viscoelastic assays (e.g., TEG and ROTEM), when available, as well as platelet count. They both strongly agree that if viscoelastic assays are not available, obtain standard coagulation tests (e.g., INR, aPTT, fibrinogen concentration), as well as platelet count for monitoring.

GUIDELINES

Management of severe perioperative bleeding: guidelines from the European Society of Anaesthesiology

First update 2016

We recommend the application of intervention algorithms incorporating pre-defined triggers and targets based on viscoelastic haemostatic assay (VHA) coagulation monitoring to guide individualised haemostatic intervention in the case of perioperative bleeding. **1C**

**1C Strong recommendation.
Low-quality evidence.**

9.1.4. What is the evidence for the use of haemostatic management algorithms in cardiovascular surgery?

Recommendation

*We recommend the use of standardised VHA-guided haemostatic algorithms with pre-defined intervention triggers. **1B***

**1B Strong recommendation.
Moderate-quality evidence.**

Society of Cardiovascular Anesthesiologists Clinical Practice Improvement Advisory for Management of Perioperative Bleeding and Hemostasis in Cardiac Surgery Patients

Anesth & Analg 2019; 129(5) : 1209-21.

Point of Care Testing

- We recommend the application of transfusion algorithms incorporating predefined intervention triggers based on point-of-care coagulation monitoring assays to guide hemostatic intervention.
- Implementation of transfusion and coagulation management algorithms (based on ROTEM/TEG) can reduce transfusion-associated adverse events.
- Goal-directed therapy with coagulation factor concentrates (fibrinogen and/or PCC)⁵ may reduce transfusion associated adverse events.



Clinical Practice Improvement
Blood Conservation Group 2019

Thromboélasto-graphie/métrie

Zeitschrift f. d. gesamte experimentelle Medizin, Bd. 117, S. 189—203 (1951).

1951

Aus der Medizinischen Universitätsklinik Heidelberg
(Direktor: Prof. Dr. med. R. SIEBECK).

Die Thrombelastographie.

Eine Methode zur physikalischen Analyse des Blutgerinnungsvorganges.

Von
HELMUT HARTERT.

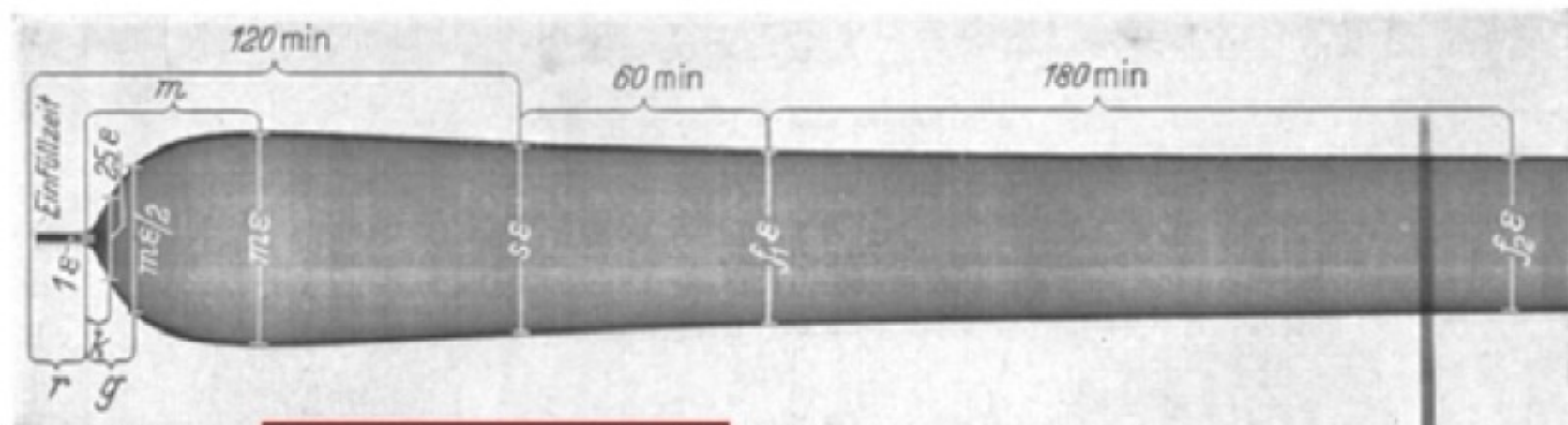


Abb. 4. Normales Thrombelastogramm (TEG). Maßstab 1 : 3. r Reaktionszeit; k absolute Gerinnungsgeschwindigkeit; g stellt den entsprechenden Relativwert dar; m_e maximale Thrombuselastizität.

a

TEG = Thrombelastogram



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Typed Drawing

Word Mark	TEG
Goods and Services	IC 010. US 026 039 044. G & S: computerized blood testing devices for use in recording physical characteristics of a blood clot. FIRST USE: 19540500. FIRST USE IN COMMERCE: 19930819
Mark Drawing Code	(1) TYPED DRAWING
Design Search Code	
Serial Number	74433188
Filing Date	September 7, 1993
Current Filing Basis	1A
Original Filing Basis	1A
Published for Opposition	September 16, 1997
Registration Number	2118613
Registration Date	December 9, 1997
Owner	(REGISTRANT) Haemoscope
Attorney of Record	RICHARD M. LABARGE
Prior Registrations	0077539
Type of Mark	TRADEMARK

Décembre 1997, TEG devient une marque de commerce, propriété de Haemoscope aux USA puis de Haemonetics en 2007

Thromboélasto-graphie/métrie



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The roTEG coagulation analyser - a new thrombelastographic system for whole blood coagulation analysis

Research Area:	Methodology and general Articles	Year:	1996
Type of Publication:	In Proceedings		
Authors:	_ Mößmer G. Hipp R. Calatzis An.		
Editor:	A Proceedings of the 16th international Congress of Clinical Chemistry		

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Thromboélasto-graphie/métrie

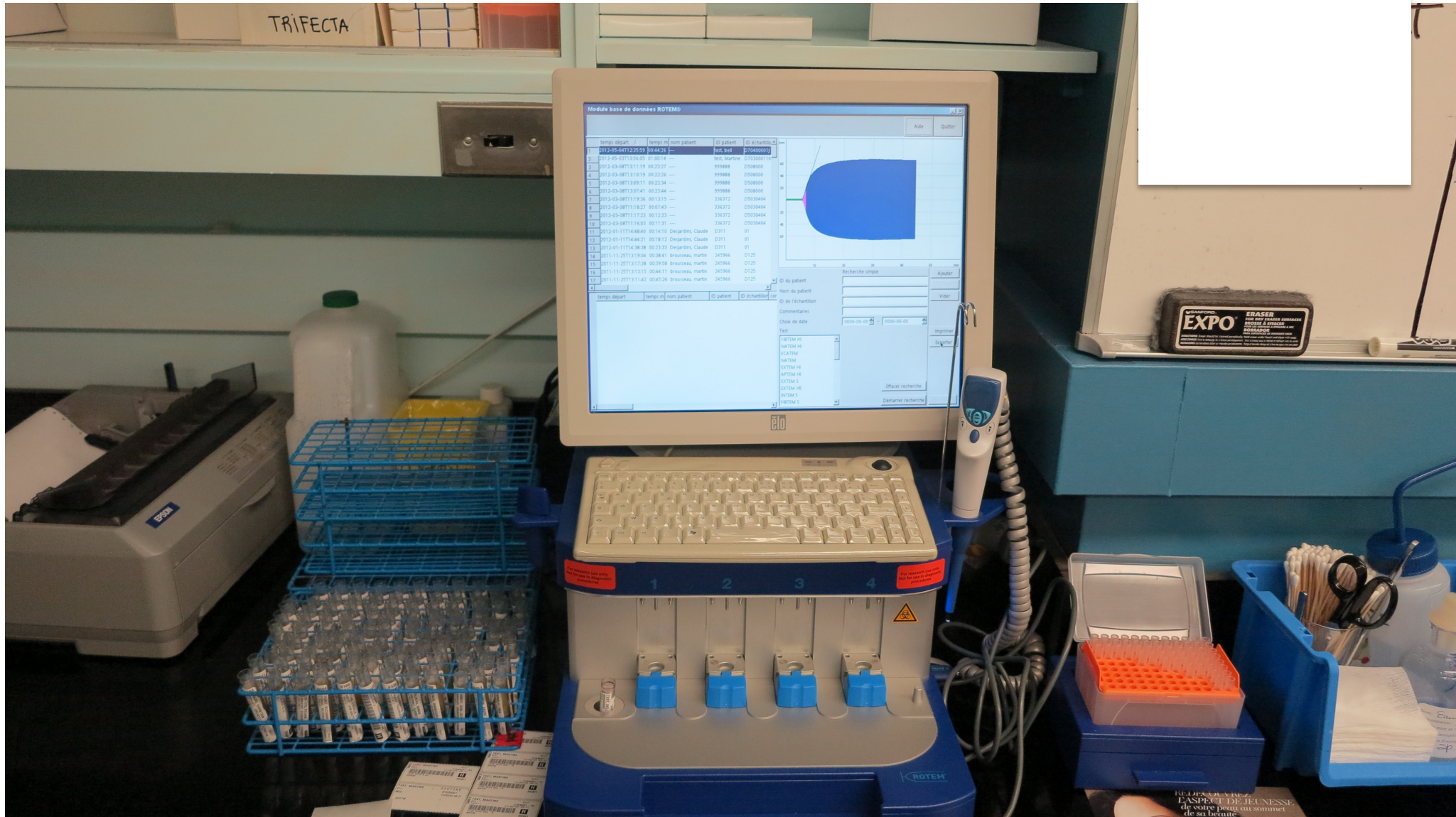
Lawsuit:

*Haemoscope Corp. v. Pentapharm AG,
No. 02 C 4261 (N.D. Ill. Dec. 6, 2002).*



Thromboélastographie → Thromboélastométrie

ROTEM[®] = **T**hrombo**é**lasto**m**étrie **ro**tatoire



Thromboélasto-graphie/métrie



TEG[®] 5000



ROTEM[®] Delta



Thromboelasto-graphie/metrie



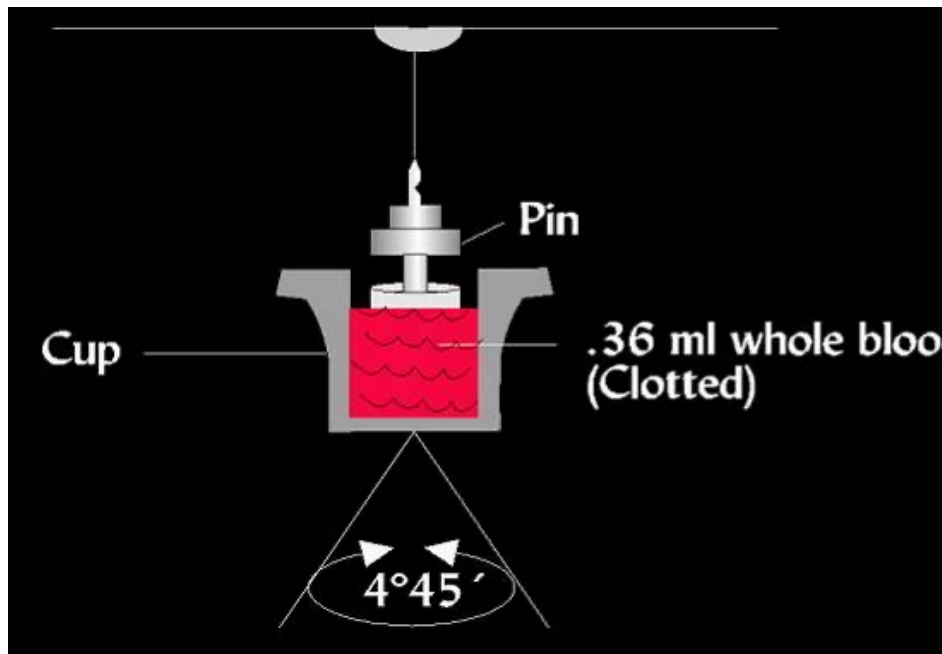
TEG[®] 6s



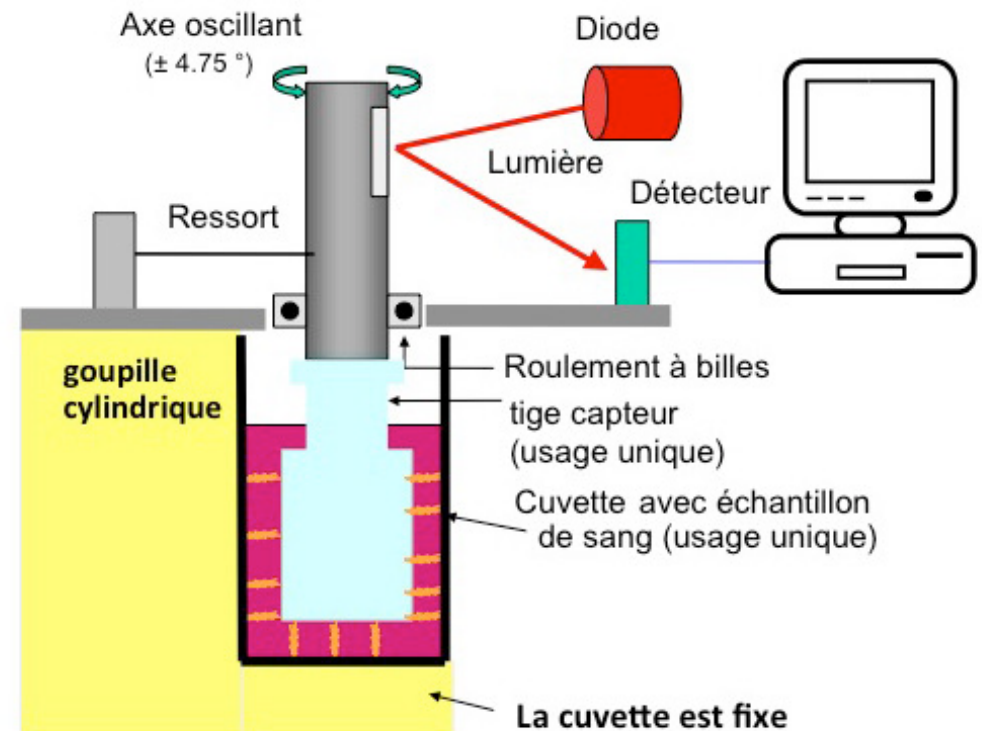
ROTEM[®] sigma

Thromboélasto-graphie/métrie

TEG[®]



ROTEM[®]



Thromboélasto-graphie/métrie

Paramètres ROTEM®	Paramètres TEG®
CT – Clotting Time (secondes)	R – Reaction Time (minutes)
CFT – Clot Formation Time (secondes)	K – Coagulation Time (minutes)
α Angle Alpha (°)	α Angle Alpha (°)
A (x) – Amplitude (mm) à un point temporel X: 5/10/15/20/25/30 (minutes)	Pas de paramètre équivalent
MCF – Maximum Clot Firmness (mm)	MA – Maximum Amplitude (mm)

Thromboelasto-graphie/métrie

ROTEM® vs TEG®

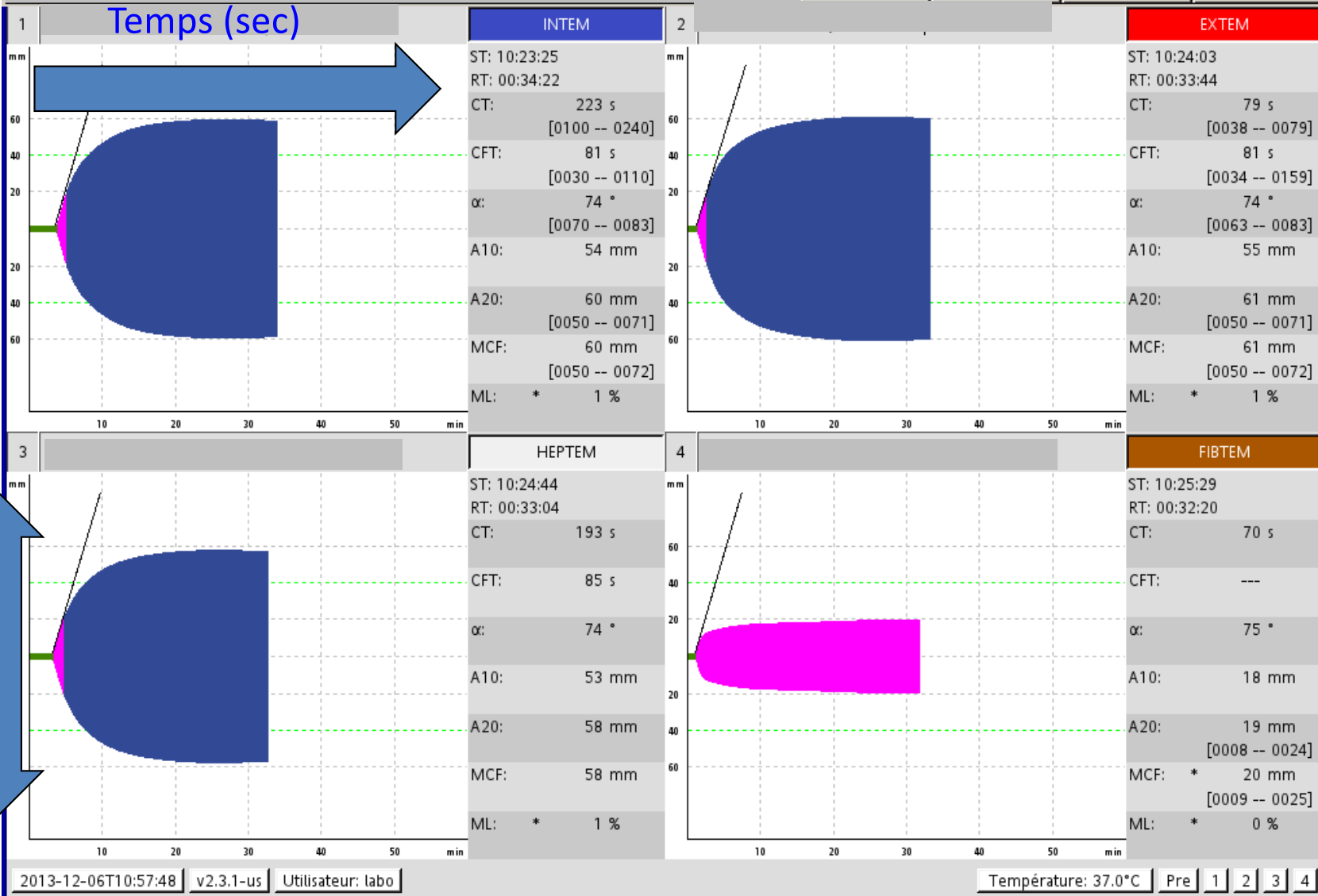
ROTEM®

- ▶ **IN-tem** (intrinsèque)
- ▶ **HEP-tem** (héparinase)
- ▶ **Extem** (extrinsèque)
- ▶ **FIBtem** (Fibrinogène)
- ▶ **Aptem** (Hyperfibrinolyse)
- ▶ **Rotem® plaquettes**

TEG®

- ▶ Koalin (intrinsèque)
- ▶ Cupule héparinase
- ▶ Rapid TEG®
- ▶ Fonctionnalité du fibrinogène
- ▶ Platelet Mapping





Amplitude (mm)

2 types de résultats :

Temps : en secondes

Amplitude : en millimètres

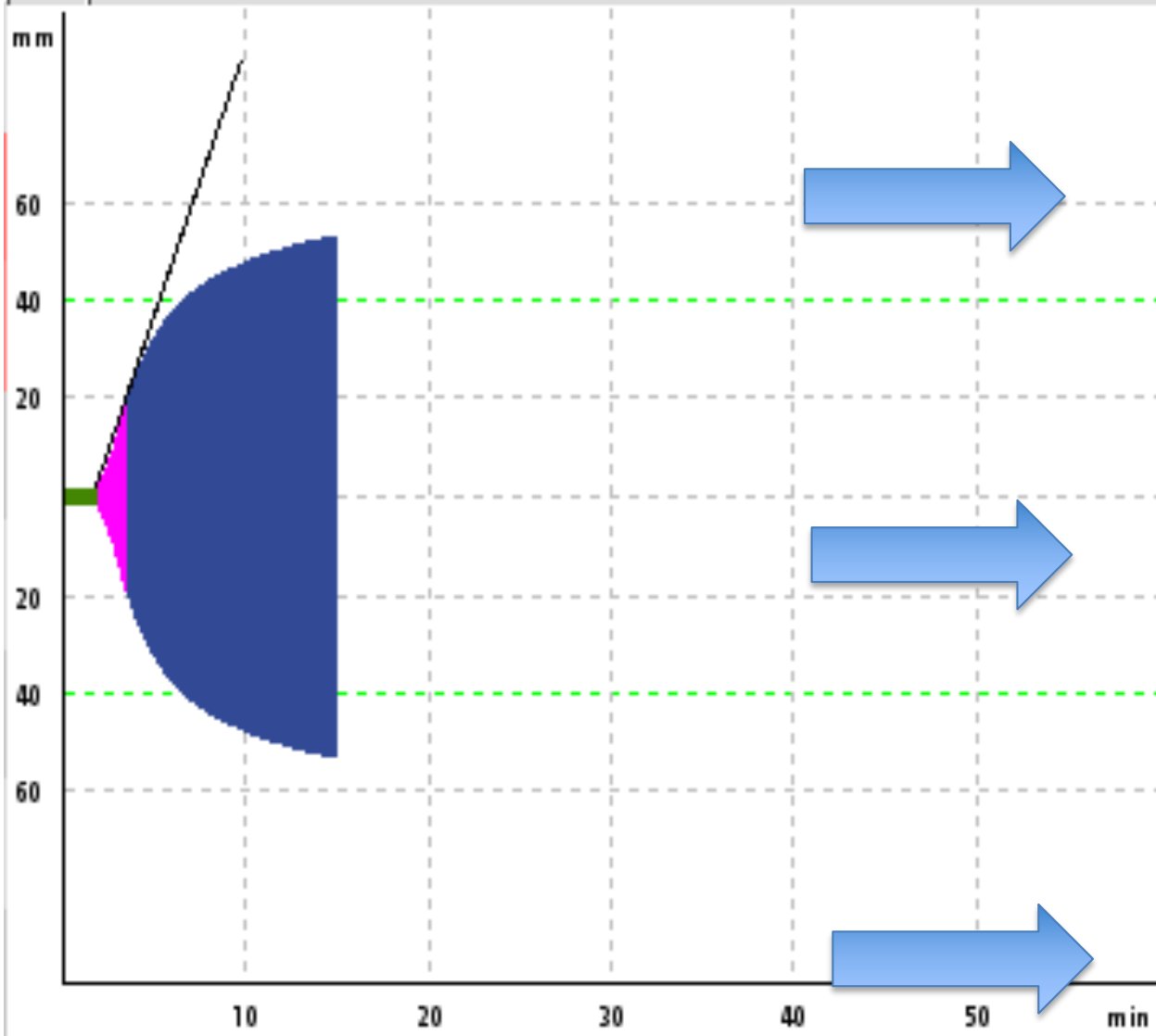
6 TESTS: INTEM / EXTEM

HEPTEM / FIBTEM

APTEM / NATEM



2

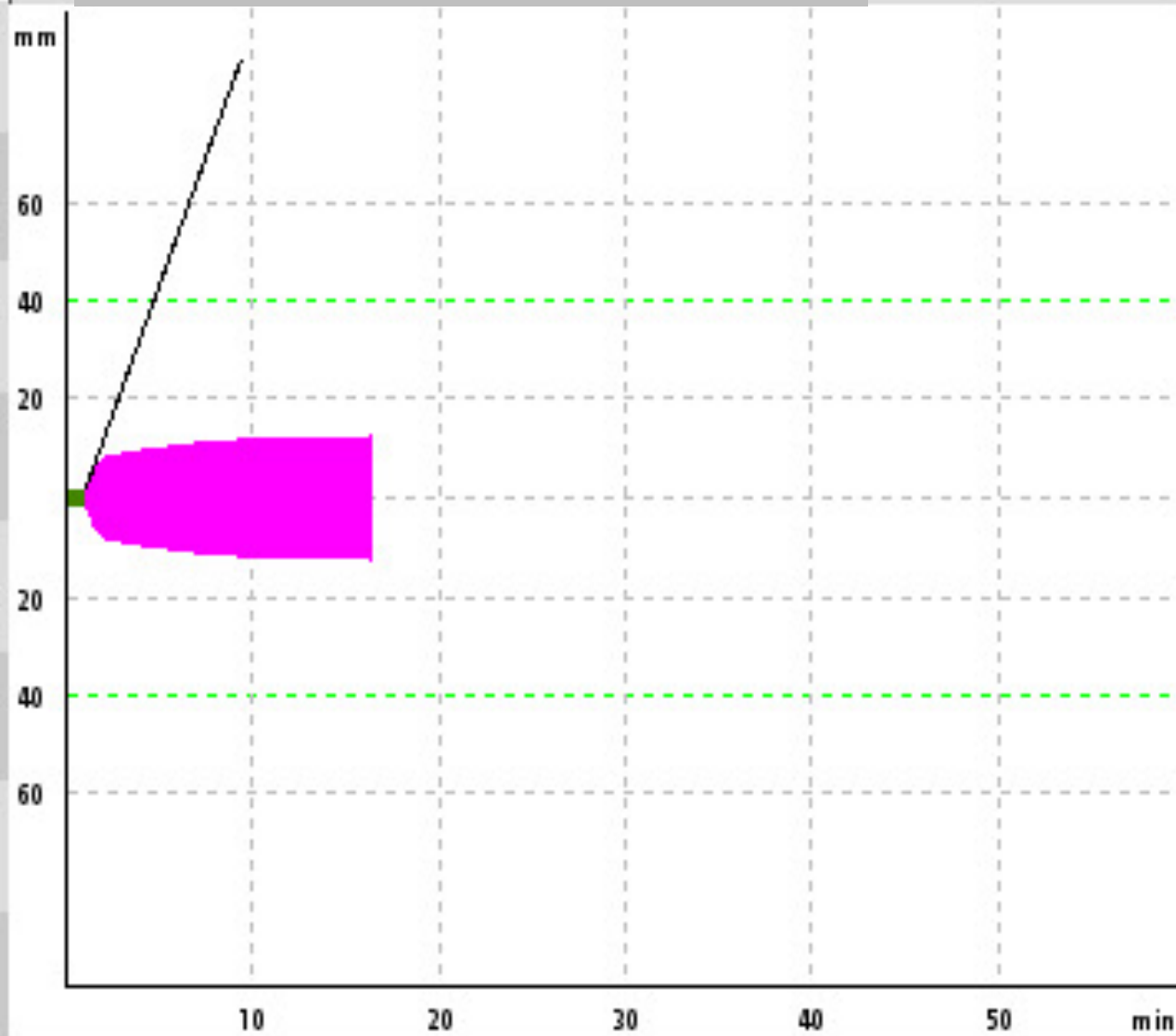


EXTEM	
ST:	11:53:32
RT:	00:15:30
CT:	110 s [0043 -- 0082]
CFT:	98 s [0048 -- 0127]
α :	70 ° [0065 -- 0080]
A10:	51 mm
A20:	---
MCF:	* 53 mm [0052 -- 0070]
ML:	* 0 %



4

FIBTEM



ST: 11:50:57

RT: 00:16:52

CT: 65 s

CFT: ---

α : 69 °

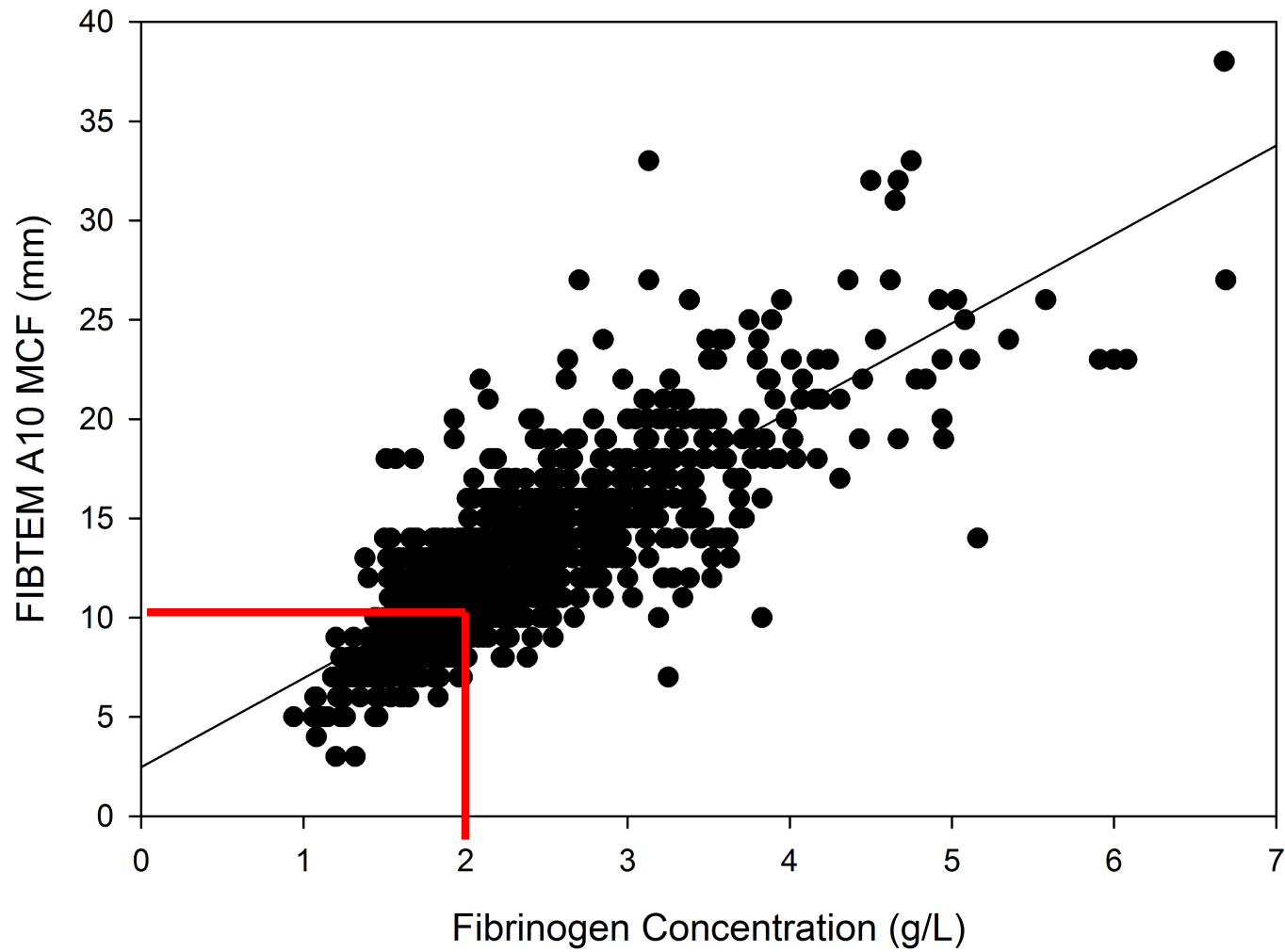
A10: 12 mm

A20: ---

MCF: * 12 mm
[0009 -- 0025]

ML: * 0 %

FIBTEM et corrélation avec [fibrinogène]



Mace, JCVA, 2015

Essen, Allemagne



Insbruck, Autriche



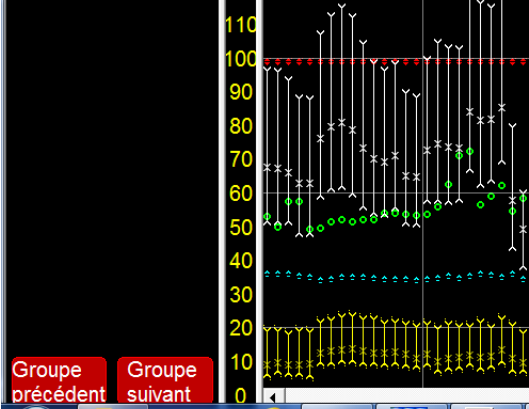


ICM, Québec

Produits sanguins	
Culot	299 ml
Plasma (PFC)	0 ml
Plaquettes	0 ml
Crvoorécipités	0 ml
rFVIIa (Niasase)	0 mg
CCP (Bériplex)	0 unités
Culot (CEC)	336 ml
Plasma (PFC) (CEC)	0 ml

DS3 BavTech 00 09:30

PA	200
98 / 60 75	190
PP	180
23 / 12 16	170
FC	160
67	150
SpO2	140
100	130
CO2fe	120
38	110
Vt	100
761	90
FR	80
10	70
Tgen	60
36,7	50



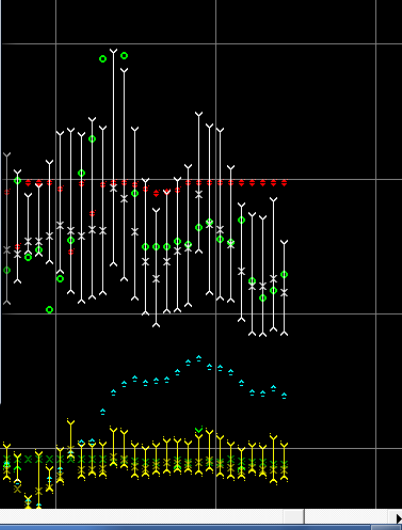
3217:0 Device:_DELTA_LAB1

1	INTEM	EXTEM
	ST: 13:58:29 RT: 00:14:24 CT: 254 s [0100 -- 0240] CFT: 66 s [0030 -- 0110] α : 76 ° [0070 -- 0083] A10: --- A20: --- MCF: * 60 mm [0050 -- 0072] ML: * 0 %	ST: 13:59:42 RT: 00:13:10 CT: 93 s [0038 -- 0079] CFT: 63 s [0034 -- 0159] α : 77 ° [0063 -- 0083] A10: 63 mm A20: --- MCF: * 64 mm [0050 -- 0072] ML: * 0 %
3	HEPTEM	FIBTEM
	ST: 14:00:45 RT: 00:12:06 CT: 260 s CFT: 68 s α : 76 ° A10: --- A20: --- MCF: * 53 mm ML: * 0 %	ST: 14:01:36 RT: 00:11:16 CT: 95 s CFT: --- α : 67 ° A10: --- A20: --- MCF: * 17 mm [0009 -- 0025] ML: * 0 %

2014-08-13T14:12:53 v2.3.1-us Utilisateur: labo Température: 37,0°C Pre 1 2 3 4

13:30 14:00 14:30

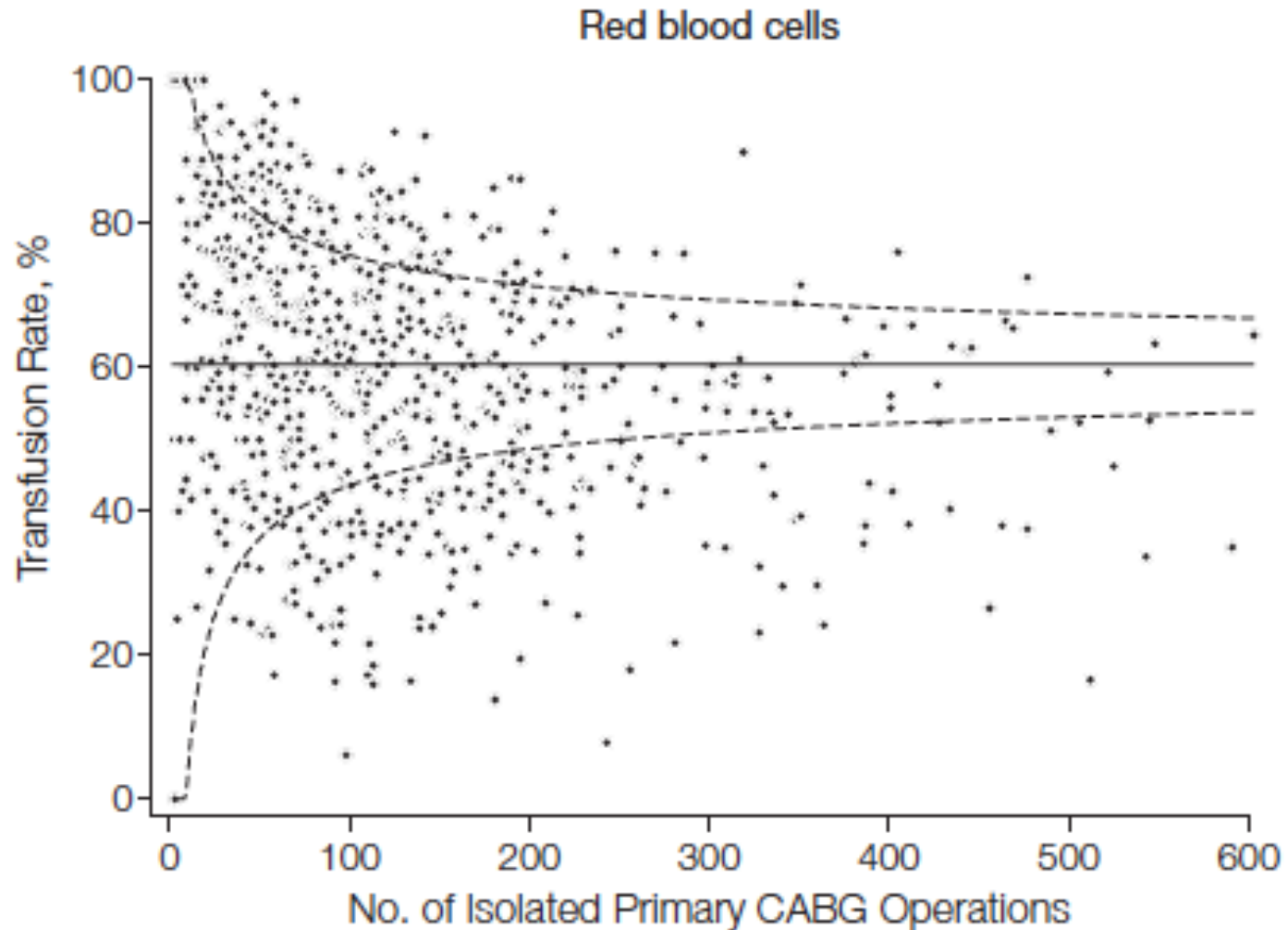
Sternum fermé
Ignorer Masquer



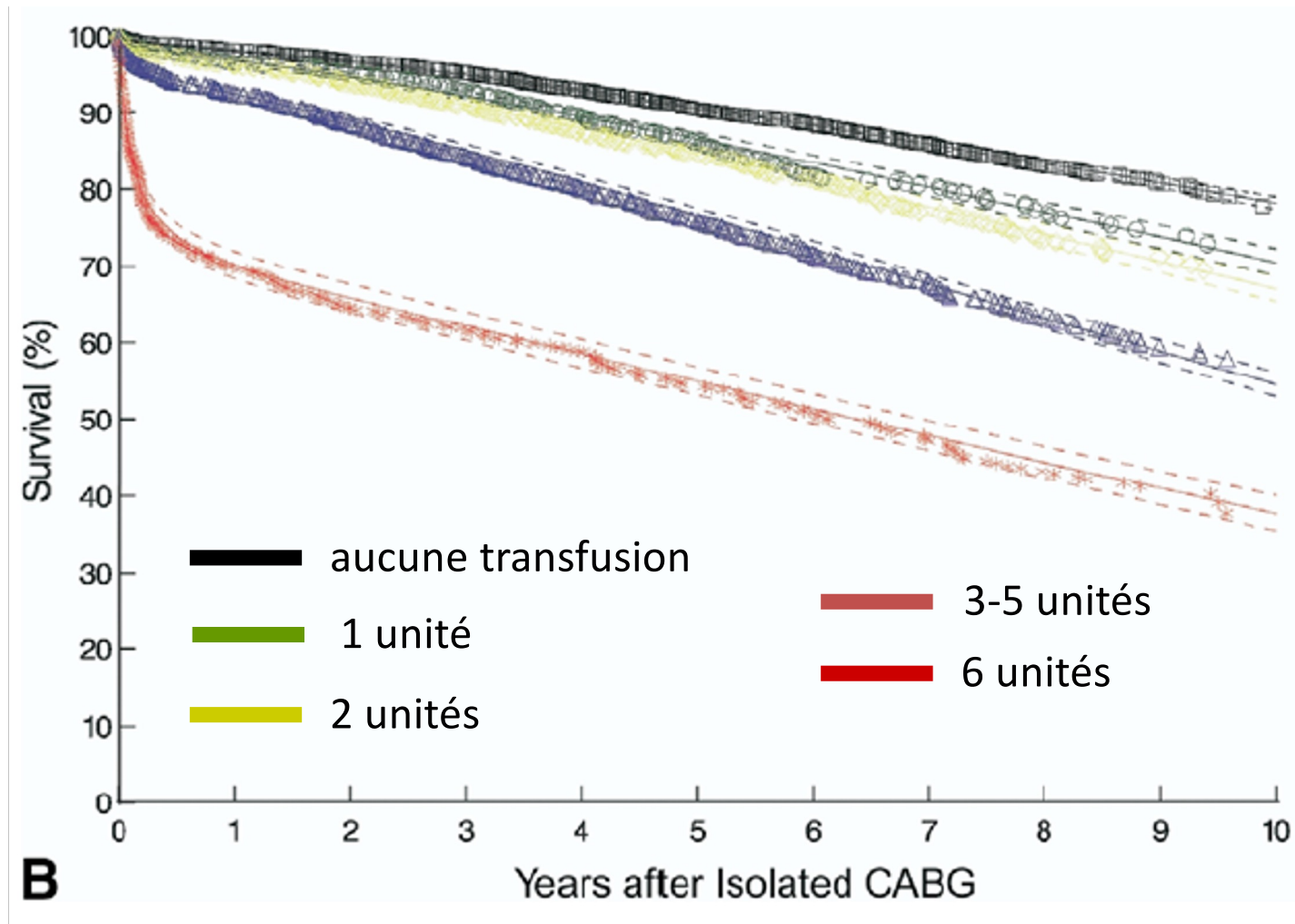
Pourquoi le Rotem?



Transfusion rate – 798 sites - 2008



Pontages, transfusions et survie



Transfusion & mortalité en chirurgie cardiaque

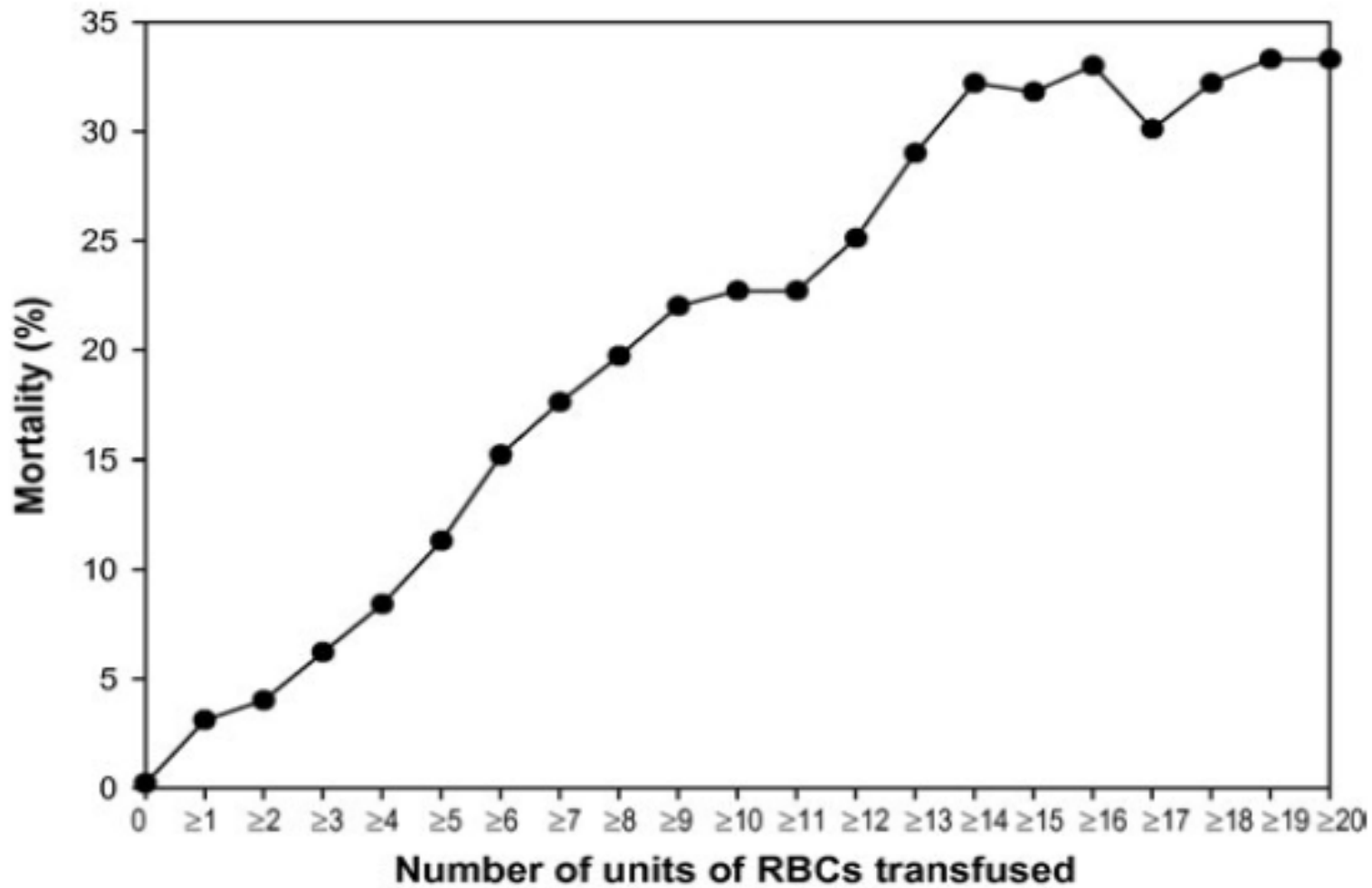
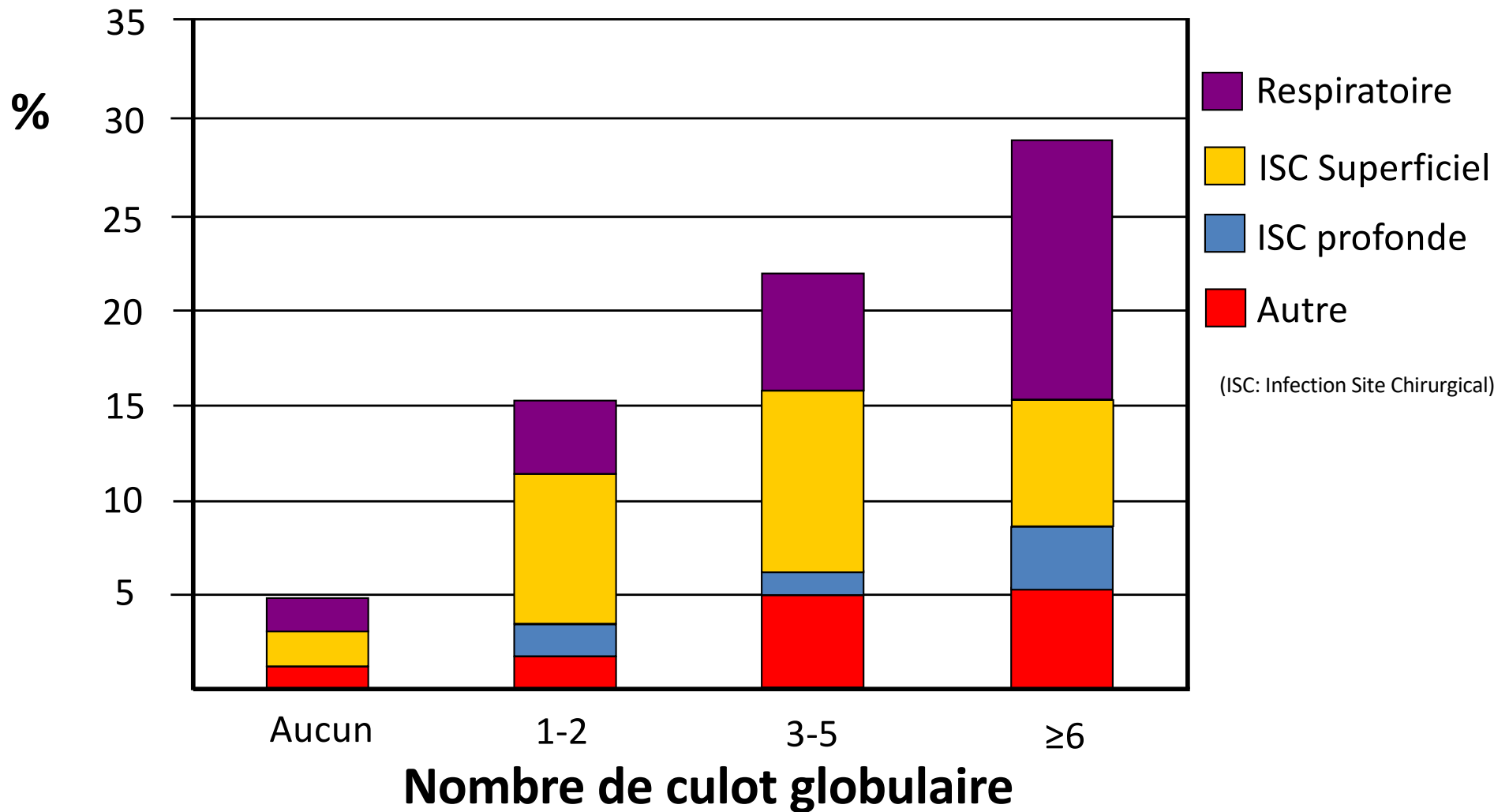
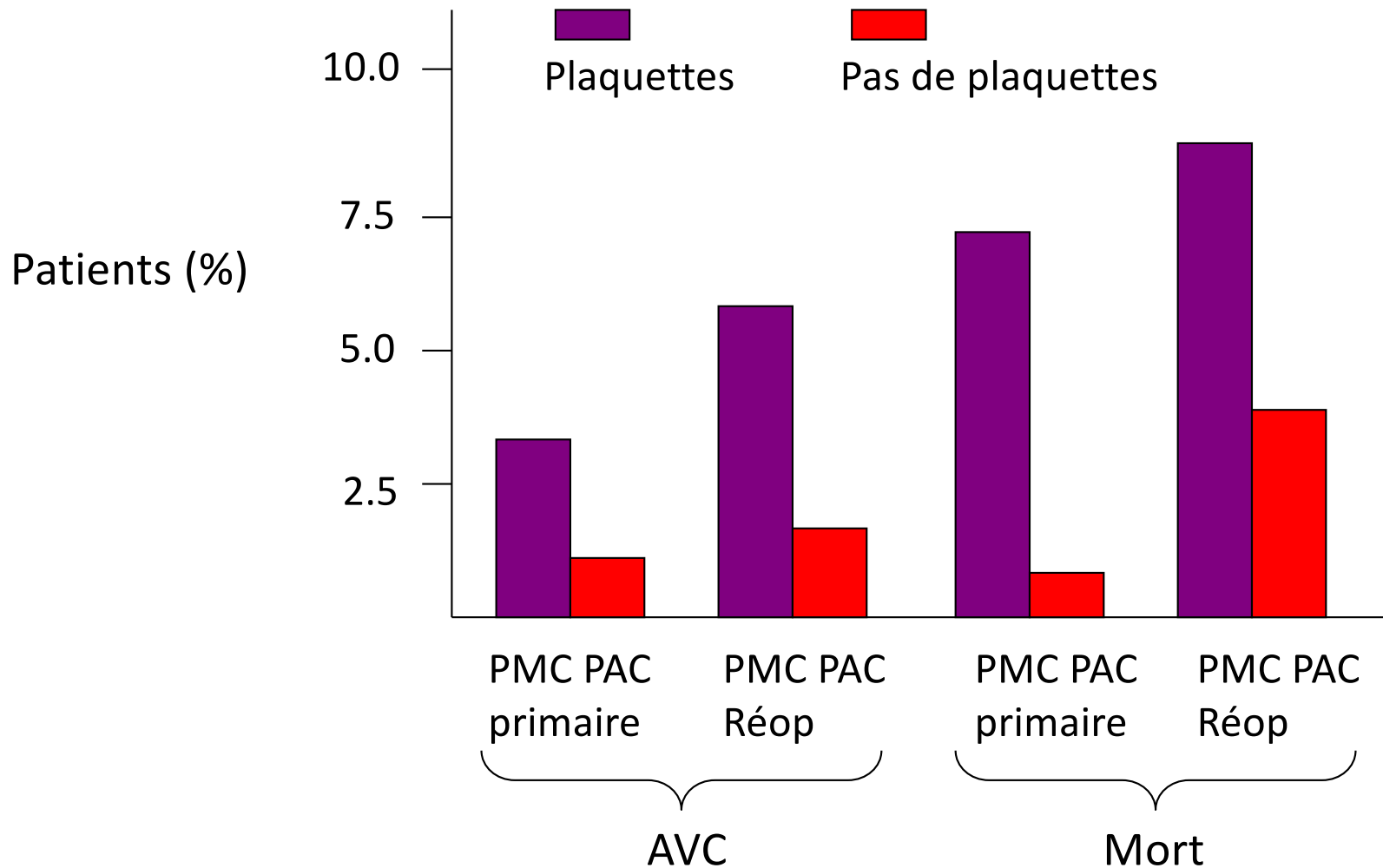


Fig. 1. The unadjusted relationship between perioperative RBC transfusion and mortality.

Pontages: Transfusion & Infection



Transfusion plaquettaire



Spieß BD et al. *Transfusion* 2004;44: 1143 - 8



Transfusion of fresh frozen plasma in critically ill surgical patients is associated with an increased risk of infection

Babak Sarani, MD, FACS; W. Jonathan Dunkman, BA; Laura Dean; Seema Sonnad, PhD;
Jeffrey I. Rohrbach, RN, MSN; Vicente H. Gracias, MD, FACS

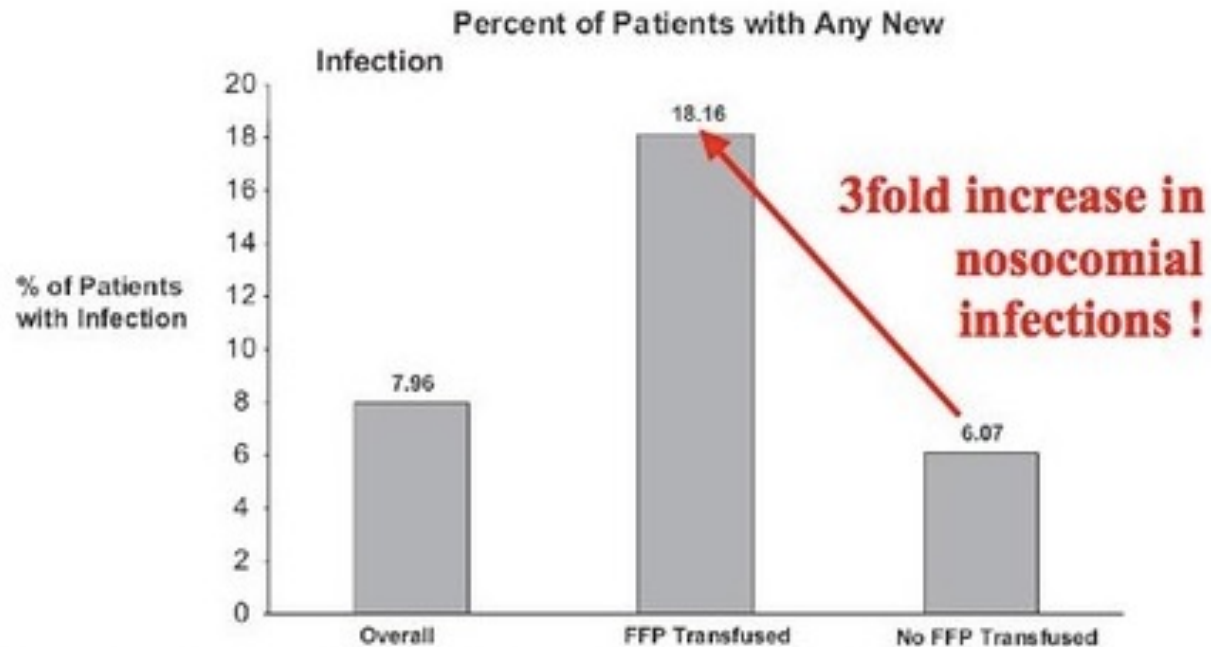


Figure 1. Patients who received fresh frozen plasma (FFP) were significantly more likely to develop an infection than those who did not receive FFP in a univariate model ($p < .01$).

Transfusion of Red Blood Cells, Fresh Frozen Plasma, or Platelets Is Associated With Mortality and Infection After Cardiac Surgery in a Dose-Dependent Manner

Yue Ming, MMed,* Jing Liu, MMed,† Fengjiang Zhang, MD, PhD,* Changwei Chen, MMed,† Li Zhou, MD, PhD,† Lei Du, MD, PhD,† and Min Yan, MD, PhD*

Ming et al. A&A 2020

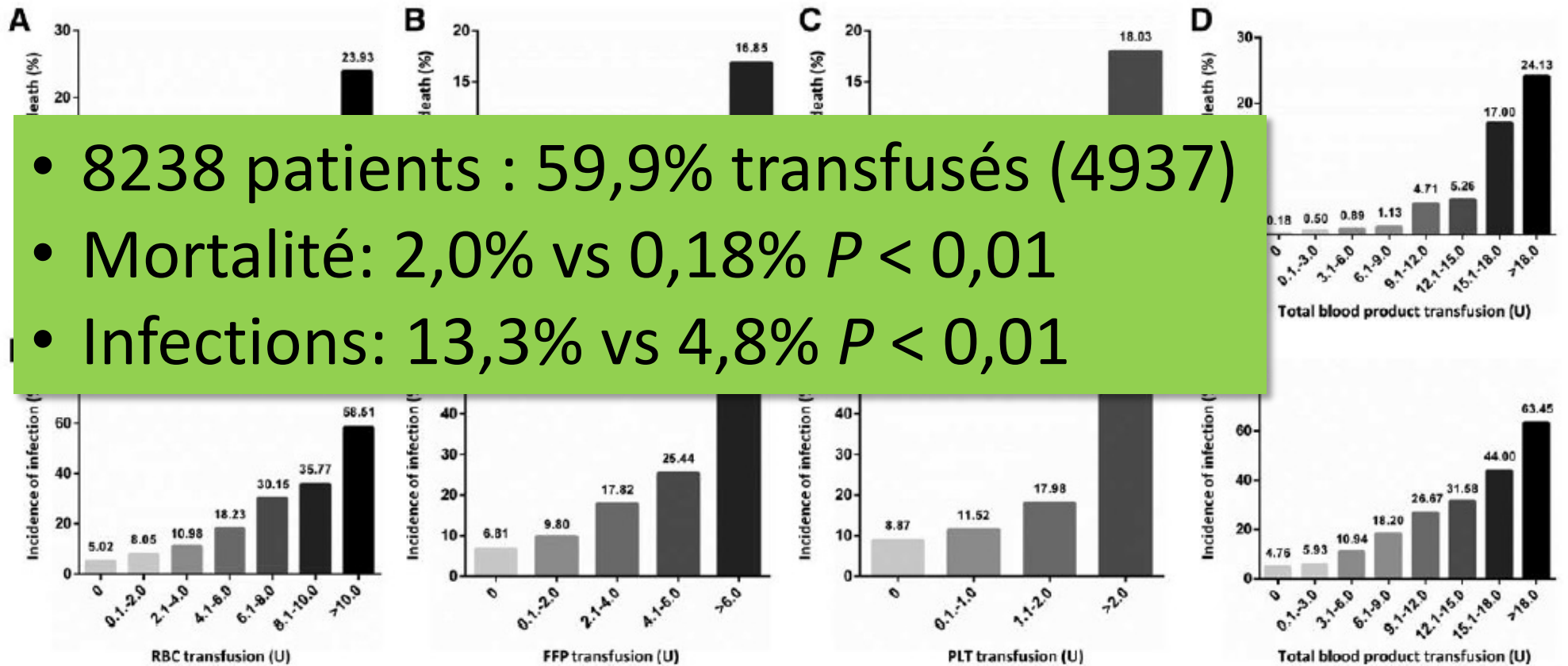


Figure 3. Incidence of all-cause mortality and infection in patients receiving increasing units of red blood cells, fresh frozen plasma, platelets, or any blood product. FFP indicates fresh frozen plasma; PLT, platelets; RBC, red blood cells.

Red Blood Cell Transfusion and Postoperative Infection in Patients Having Coronary Artery Bypass Grafting Surgery: An Analysis of the Society of Thoracic Surgeons Adult Cardiac Surgery Database

Michael A. Mazzeffi, MD, MPH, MSc, FASA,* Sari D. Holmes, PhD,† Bradley Taylor, MD, MPH,† Mehrdad Ghoreishi, MD,† John S. McNeil, MD,‡ Miklos D. Kertai, MD, PhD,§ Bruce A. Bollen, MD,|| Kenichi Tanaka, MD, MSc,¶ Jacob Raphael, MD,‡ and Laurent Glance, MD#**††

A&A 2022; 135 (3):558-566

- Étude observationnelle – base de données STS
- Pontages isolés – juillet 2017 à juin 2019
- 362 954 patients PAC
- 32% transfusés avec culots globulaires
- Risque infection de 11 à 15% > si intraop (16,2%).



Pourquoi le ROTEM:

- La pratique transfusionnelle en chirurgie cardiaque demeure variable avec des taux transfusionnels élevés.
- La transfusion de produits sanguins est associée à des évènements indésirables significatifs.
- L'implantation et l'adoption de la gestion personnalisée du sang avec ses trois piliers est prometteuse.
- Les protocoles transfusionnels basés sur les moniteurs de proximités dont les tests viscoélastiques sont nécessaires pour mieux transfuser.



Délais des tests standards de coagulation en STAT :

- 35 ± 37 minutes (USA)

Chandler et al. Transfusion 2010

- 34 ± 15 minutes (Suisse)

Jeger et al. J Trauma 2009

- 50 ± 20 minutes (ICM)

Ces délais ne tiennent pas compte de l'échantillonnage ni du transport



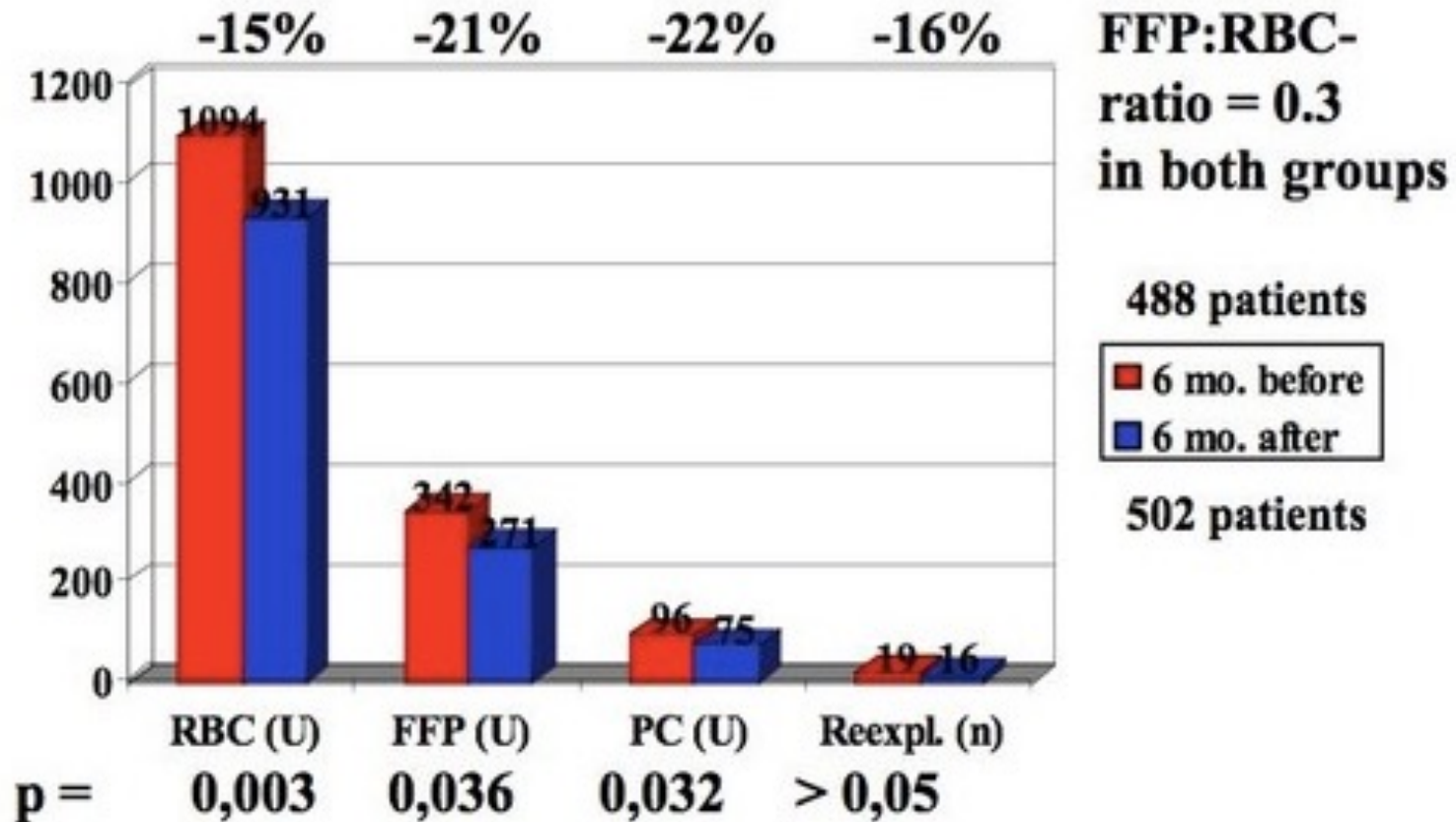
Que dit la littérature?



An audit of red cell and blood product use after the institution of thromboelastometry in a cardiac intensive care unit

L. Anderson,* I. Quasim,* R. Soutar,† M. Steven,* A. Macfie* and W. Korte‡ *Department of Anaesthesia, †Department of Haematology, Western Infirmary, Glasgow, UK, and ‡Institute for Clinical Chemistry and Haematology, Kantonsspital, St Gallen, Switzerland

Transf Med 2006;16:31–39

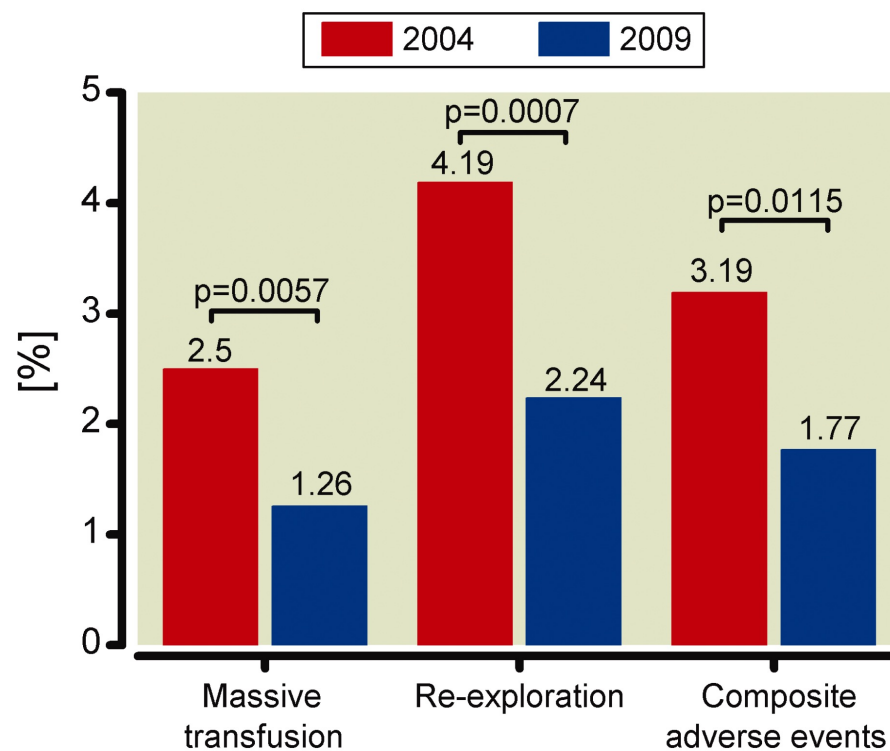


First-line Therapy with Coagulation Factor Concentrates Combined with Point-of-Care Coagulation Testing Is Associated with Decreased Allogeneic Blood Transfusion in Cardiovascular Surgery

A Retrospective, Single-center Cohort Study

Klaus Görlinger, Dr. med,* Daniel Dirkmann, Dr. med,† Alexander A. Hanke, Dr. med,† Markus Kamler, PD Dr. med,‡ Eva Kottenberg, PD Dr. med,* Matthias Thielmann, PD Dr. med,‡ Heinz Jakob, Prof. Dr. med,§ Jürgen Peters, Prof. Dr. med||

Culots (49.7 vs. 40.4%; $P < 0.0001$),
PFC (19.4 vs. 1.1%; $P < 0.0001$)
Plaquettes (10.1 vs. 13.0%; $P = 0.0041$)
CCP: (4.42 vs. 8.9%; $P < 0.0001$)
Concentrés fibrinogène (3.73 vs. 10.01%; $P < 0.0001$)



A Prospective, Randomized Clinical Trial of Efficacy in Coagulopathic Cardiac Surgery Patients

Christian Friedrich Weber, Dr. med.,* Klaus Görlinger, Dr. med.,† Dirk Meininger, P.D. Dr. med.,‡
Eva Herrmann, Prof. Dr. rer. nat.,§ Tobias Bingold, Dr. med.,‡ Anton Moritz, Prof. Dr. med.,||
Lawrence H. Cohn, M.D., Ph.D.,# Kai Zacharowski, Prof. Dr. med., Ph.D., F.R.C.A.**

Anesthesiology 2012; 117:531–47

- Chirurgie cardiaque élektive chez 200 patients
- Pts randomisés si saignement diffus post protamine
- Algorithme conventionnel vs ROTEM®
- Transfusion de culots ad 24 h SIC
- Étude interrompue (50 % recrutement)
- Culots : 5 vs 3 $P < 0,001$



Evaluation of a Novel Transfusion Algorithm Employing Point-of-care Coagulation Assays in Cardiac Surgery

A Retrospective Cohort Study with Interrupted Time–Series Analysis

Karkouti et al. Anesthesiology 2015

	Pre-program (2012; <i>n</i> = 1312)	Post-program (2013; <i>n</i> = 1167)	<i>P</i>	Risk reduction
Culots %	52 %	41 %	< 0,0001	0,72 (0,67 – 0,79)
Plaquettes %	34 %	23 %	< 0,0001	0,59 (0,52 – 0,66)
Plasma %	34 %	14 %	< 0,0001	0,37 (0,32 – 0,43)
Cryo %	4,0 %	4,1 %	0,9	

Point-of-Care Hemostatic Testing in Cardiac Surgery

A Stepped-Wedge Clustered Randomized Controlled Trial

- 12 hôpitaux canadiens pendant 7 mois
- Sites vierges aux tests viscoélastiques
- Tous les patients de chirurgie cardiaque
- Algorithme avec ROTEM[®] & Platelet Works[®]
- *Stepped-Wedge Clustered RCT*
- Algorithme encouragé mais non forcé

Karkouti et al. Circulation 2016

- 7402 patients randomisés
- 3555 dans le groupe contrôle
- 3847 dans le groupe intervention (88,7% respect)



Point-of-Care Hemostatic Testing in Cardiac Surgery

A Stepped-Wedge Clustered Randomized Controlled Trial

Karkouti et al. Circulation 2016

Table 2. Effects of the Intervention on Transfusions and Bleeding

Outcome	Relative Risk (95% Confidence Interval)	P Value
Red blood cell transfusions	0.91 (0.85–0.98)	0.02
Platelet transfusions	0.77 (0.68–0.87)	<0.001
Plasma transfusions	0.98 (0.86–1.12)	0.79
Cryoprecipitate or fibrinogen concentrate transfusions	1.26 (0.94–1.69)	0.11
Major bleeding*	0.83 (0.72–0.94)	0.004



*Le bon produit
au bon moment
au bon patient!*

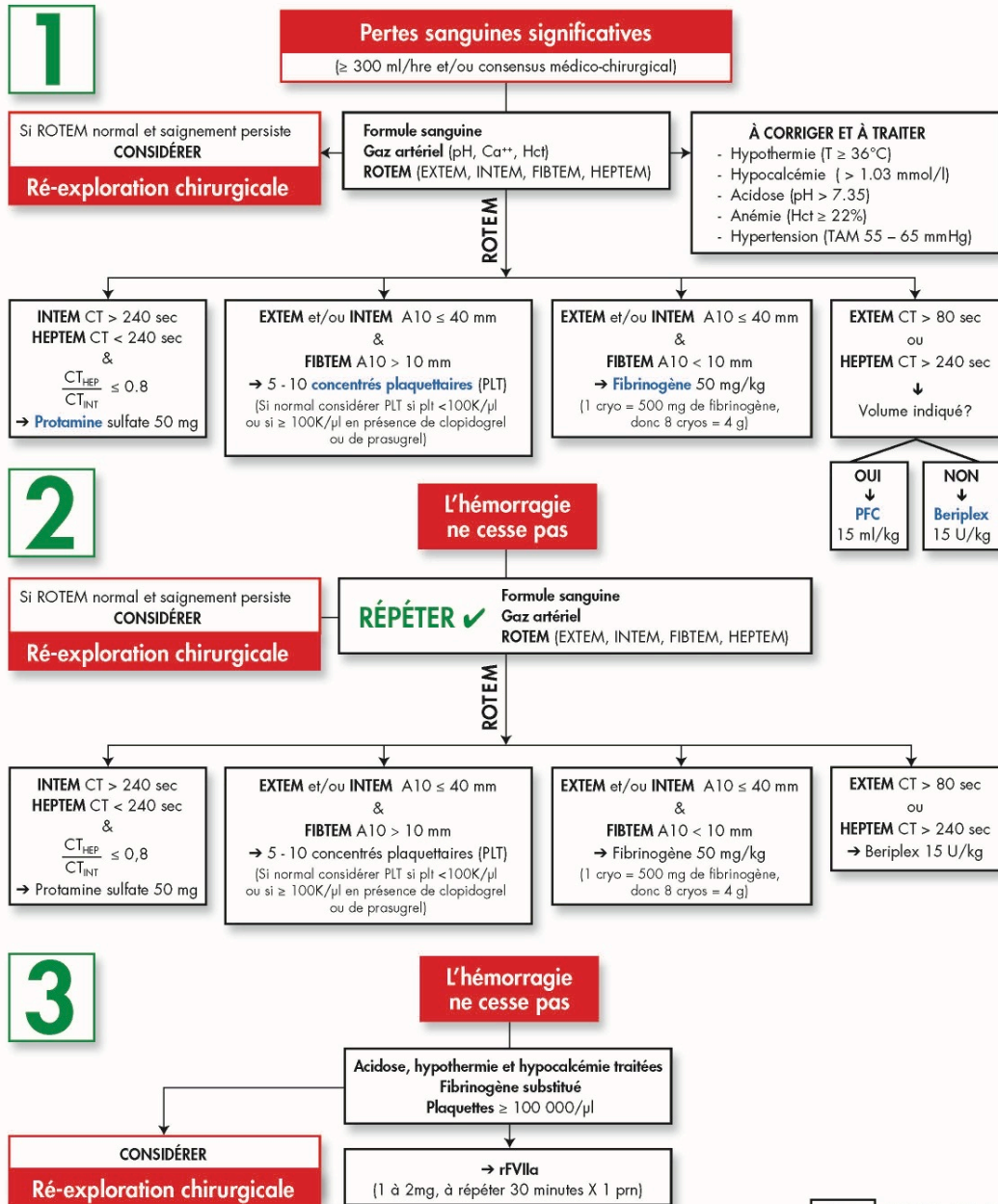


Que faire avec le Rotem?



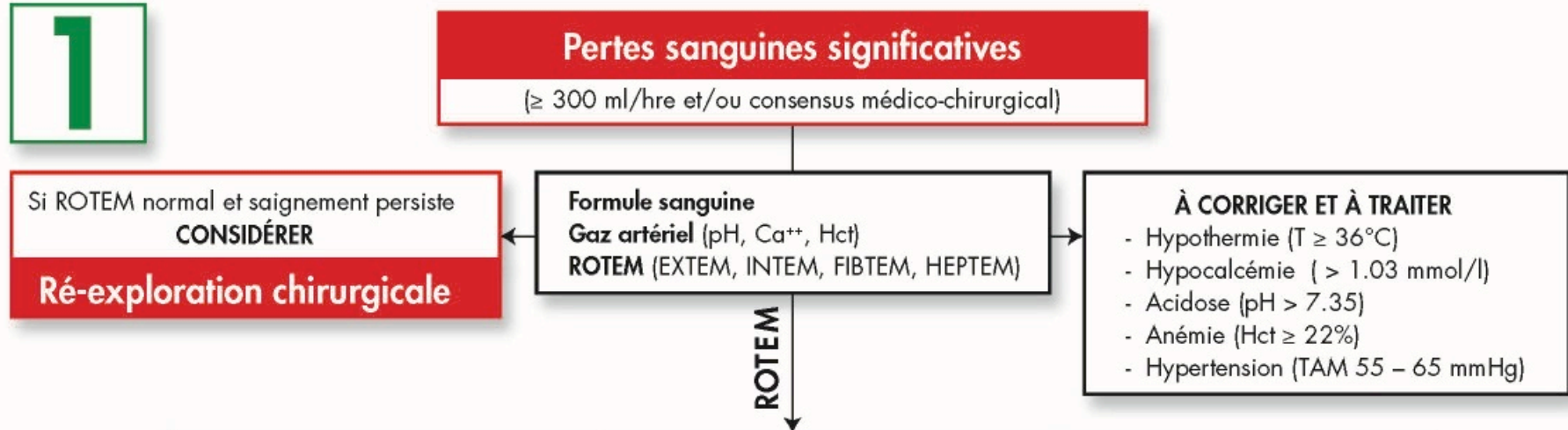
ALGORITHME TRANSFUSIONNEL

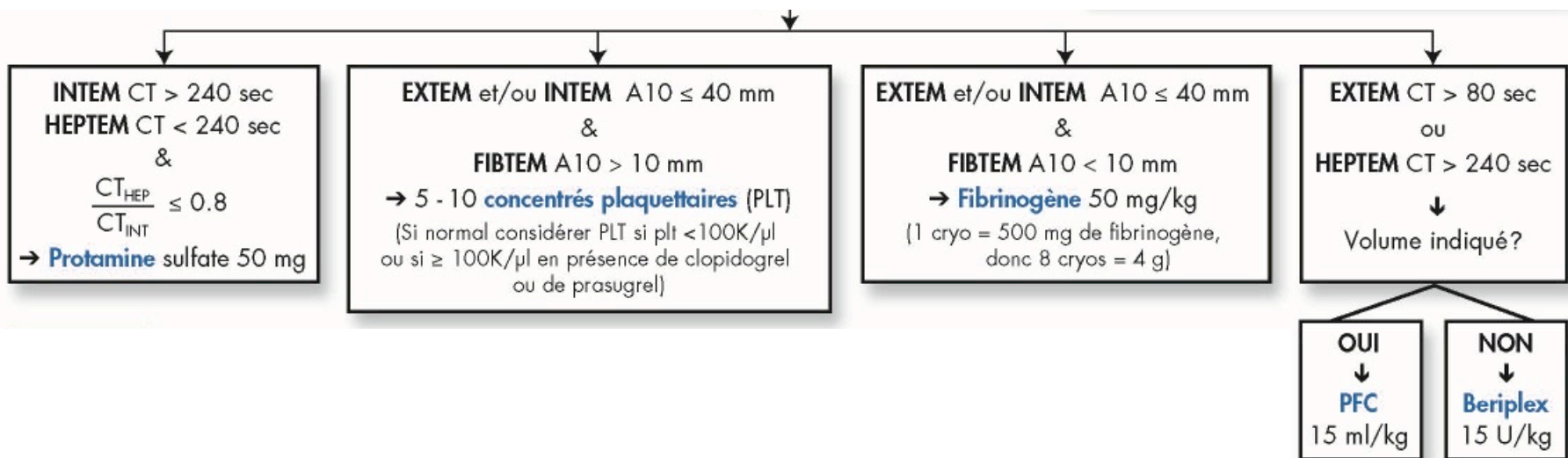
Bloc opératoire et soins intensifs



ALGORITHME TRANSFUSIONNEL

Bloc opératoire et soins intensifs





INTEM CT > 240 sec
HEPTEM CT < 240 sec
&

$$\frac{CT_{HEP}}{CT_{INT}} \leq 0.8$$

→ Protamine sulfate 50 mg

PROTAMINE



EXTEM et/ou **INTEM** A10 \leq 40 mm

&

FIBTEM A10 $>$ 10 mm

→ 5 - 10 concentrés plaquettaires (CP)

(Considérer CP si plt $<$ 100K/ μ l Ou si \geq 100K/ μ l
en présence de clopidogrel ou de prasugrel)

PLAQUETTES



EXTEM et/ou **INTEM** A10 \leq 40 mm

&

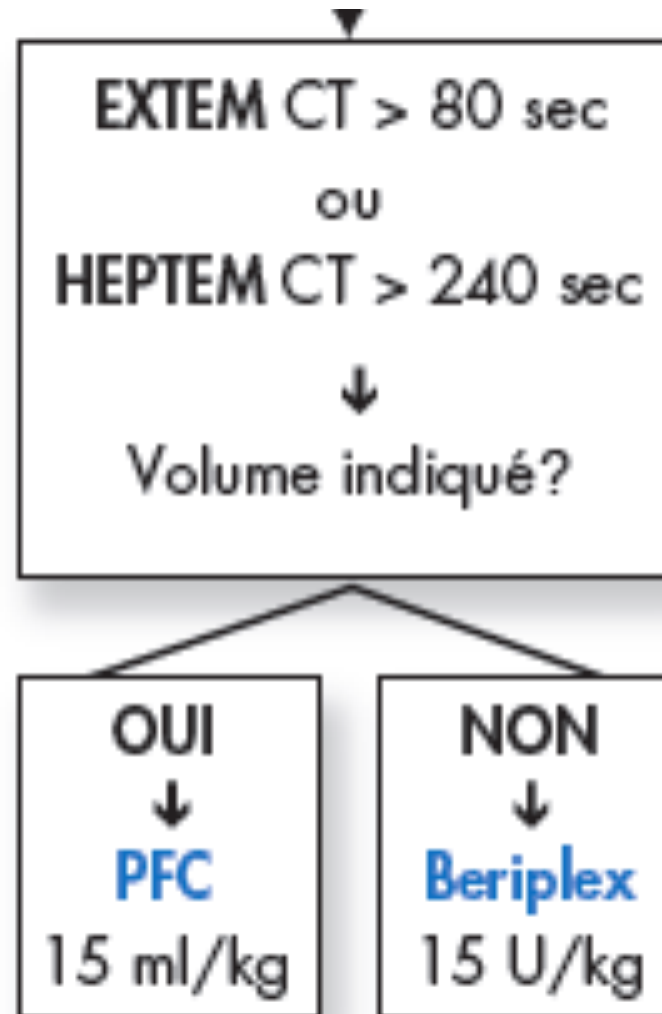
FIBTEM A10 $<$ 10 mm

→ Fibrinogène 50 mg/kg

(1 cryo = 500 mg de fibrinogène,
donc 8 cryos = 4 g)

FIBRINOGENÈ





PLASMA / CCP



2

L'hémorragie ne cesse pas

Si ROTEM normal et saignement persiste
CONSIDÉRER
Ré-exploration chirurgicale

RÉPÉTER ✓
Formule sanguine
Gaz artériel
ROTEM (EXTEM, INTEM, FIBTEM, HEPTEM)

ROTEM

INTEM CT > 240 sec
HEPTEM CT < 240 sec
&
 $\frac{CT_{HEP}}{CT_{INT}} \leq 0,8$
→ Protamine sulfate 50 mg

EXTEM et/ou **INTEM** A10 ≤ 40 mm
&
FIBTEM A10 > 10 mm
→ 5 - 10 concentrés plaquettaires (PLT)
(Si normal considérer PLT si plt < 100K/μl
ou si ≥ 100K/μl en présence de clopidogrel
ou de prasugrel)

EXTEM et/ou **INTEM** A10 ≤ 40 mm
&
FIBTEM A10 < 10 mm
→ Fibrinogène 50 mg/kg
(1 cryo = 500 mg de fibrinogène,
donc 8 cryos = 4 g)

EXTEM CT > 80 sec
ou
HEPTEM CT > 240 sec
→ Beriplex 15 U/kg

3

**L'hémorragie
ne cesse pas**

Acidose, hypothermie et hypocalcémie traitées
Fibrinogène substitué
Plaquettes $\geq 100\ 000/\mu\text{l}$

CONSIDÉRER

Ré-exploration chirurgicale

→ rFVIIa

(1 à 2mg, à répéter 30 minutes X 1 prn)

Rotem[®] : impact à l'ICM

ROTEM® & ICM : produits sanguins labiles

2012 – 2015

ROTEM® disponible SOP & SIC 24 / 7 / 365

	Pré-algorithme (2012-13)	Post-algorithme (2013-14)	Post-algorithme (2014-15)	% Change	Économie (\$)
Culots (n)	5227	3750	3385	-28	516 684
Plaquettes (n)	1459	1048	947	-28	249 283
Plasma (n)	1764	1179	922	-33	97 127
Cryo (n)	1976	1634	1448	-17	55 239
rFVIIa (1mg)	59	26	27	-56	38 806
CCP (500U)	171	234	104	37	-24 255
CCP (1000U)		25	194		932 887

ROTEM® & ICM : produits sanguins labiles

ROTEM® disponible SOP & SIC 24 / 7 / 365

Année	Culots	Plasma	PCC	plaquettes	Cryos	rFVIIa
2011 – 2012	5321	2061	113	1316	2184	85
2012 – 2013	5227	1764	171	1459	1976	63
2013 – 2014	3750	1179	259	1048	1634	26
2014 – 2015	3385	922	298	947	1448	27
2015 – 2016	3459	806	375	1051	1296	23
2016 – 2017	3307	708	510	994	1324	29
2017 – 2018	2967	524	446	930	1090	2
2018 – 2019	3022	703	525	956	837	2
2019– 2020	3455	714	631	1060	1150	12

Prix des produits sanguins labiles & stables

2022 – 2023

Produits	Prix
Culot globulaire	371,46 \$
Cryoprécipité	261,26 \$
Plasma (250 ml)	261,26 \$
Plaquettes	564,96 \$
rFVIIa (1mg)	1270,68 \$
CCP (500U)	275 \$
CCP (1000U)	550 \$

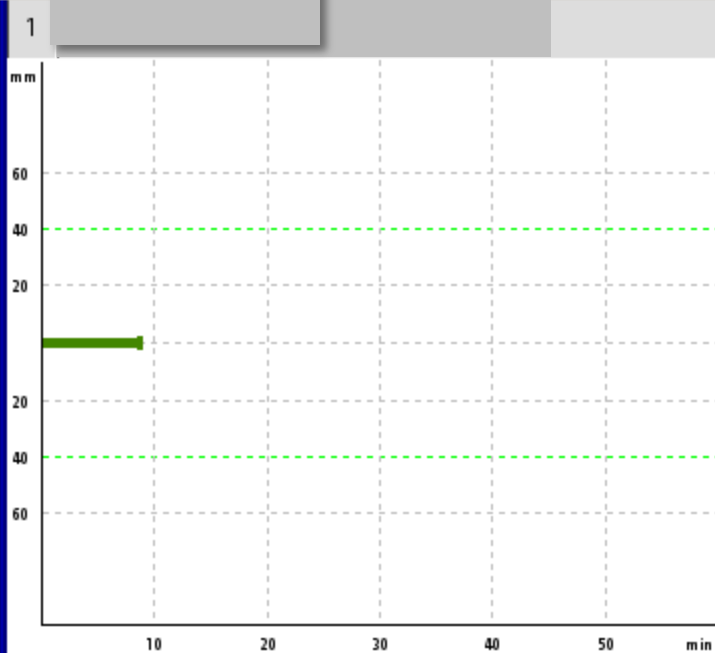
5 x = 1306,30 \$

Rotem[®] : cas cliniques



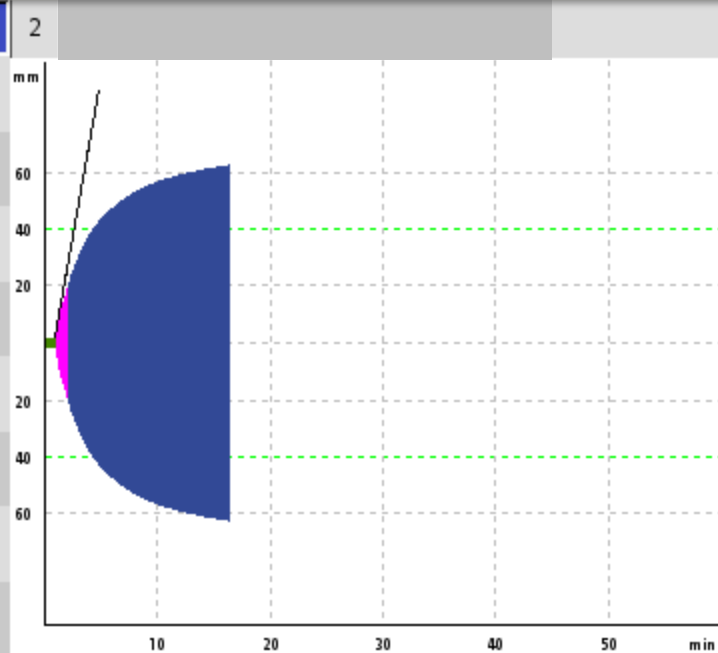
Cas 1

Per CEC



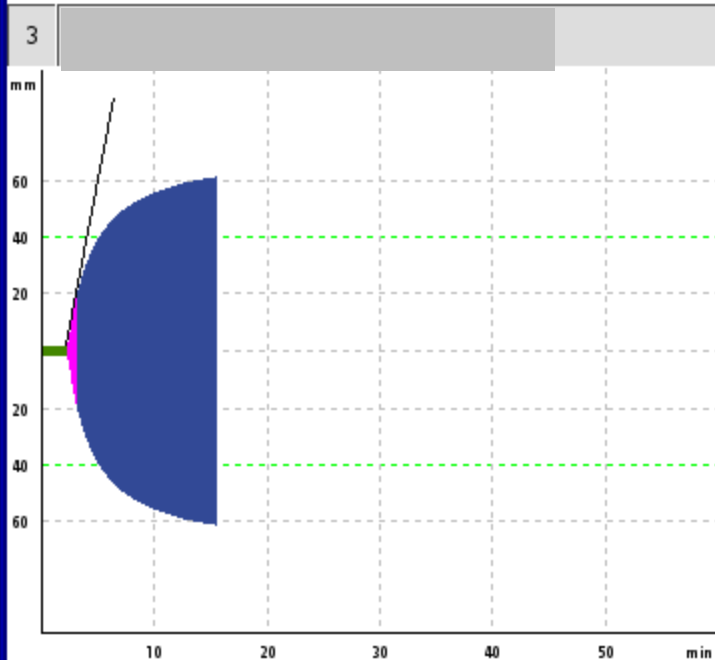
INTEM

ST: 12:49:09
RT: 00:18:12
CT: * 526 s
[0100 -- 0240]
CFT: ---
 α : ---
A10: ---
A20: ---
MCF: ---
ML: ---



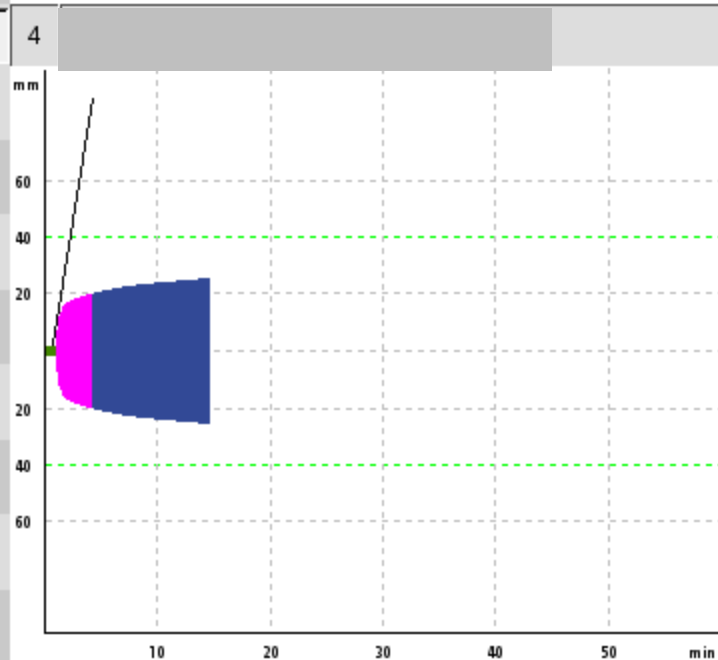
EXTEM

ST: 12:50:33
RT: 00:16:48
CT: 58 s
[0038 -- 0079]
CFT: 63 s
[0034 -- 0159]
 α : 81 °
[0063 -- 0083]
A10: 58 mm
A20: ---
MCF: * 63 mm
[0050 -- 0072]
ML: * 0 %



HEPTEM

ST: 12:51:25
RT: 00:15:56
CT: 134 s
CFT: 53 s
 α : 80 °
A10: 59 mm
A20: ---
MCF: * 61 mm
ML: * 0 %

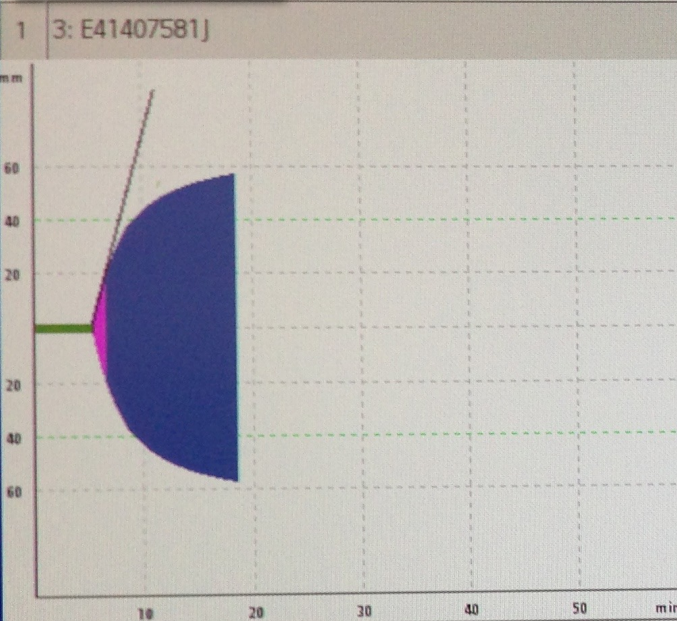
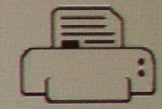


FIBTEM

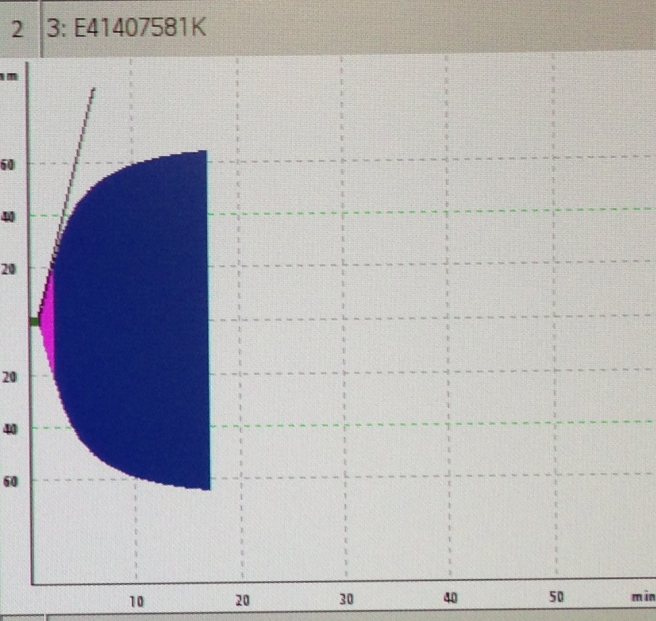
ST: 12:52:16
RT: 00:15:04
CT: 52 s
CFT: 193 s
 α : 82 °
A10: 24 mm
A20: ---
MCF: * 25 mm
[0009 -- 0025]
ML: * 0 %

Cas 2

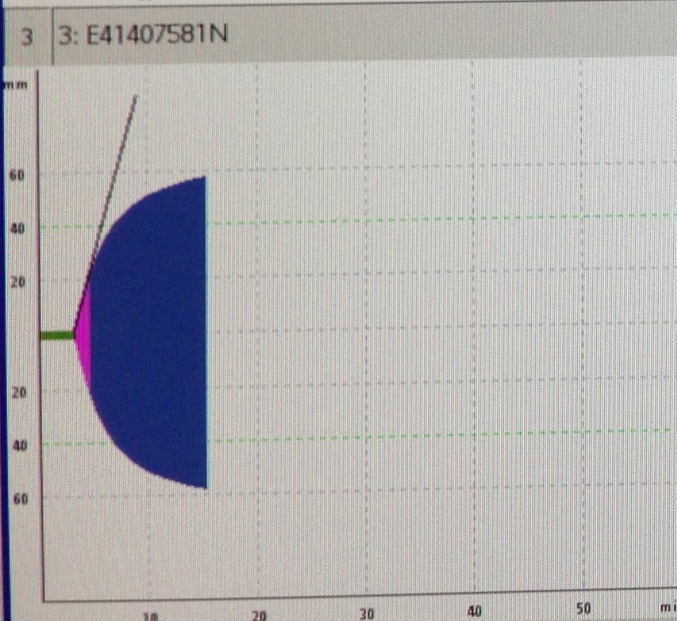
INTEM CT 324 & HEPTEM CT 199 RATIO = 0.6, DONC: PROTAMINE



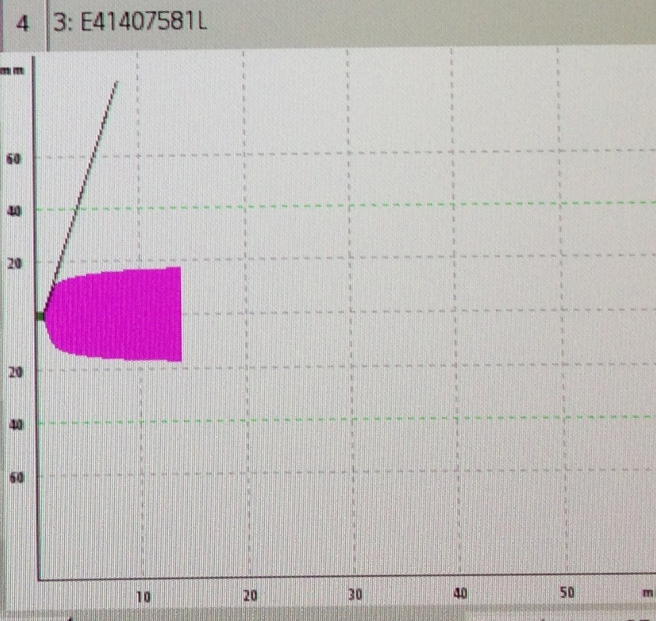
INTEM	
ST:	17:25:54
RT:	00:18:54
CT:	324 s [0100 – 0240]
CFT:	73 s [0030 – 0110]
α :	75 ° [0070 – 0083]
A10:	55 mm [0044 – 0066]
A20:	—
MCF:	* 58 mm [0050 – 0072]
ML:	* 0 %



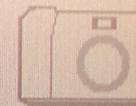
EXTEM	
ST:	17:27:10
RT:	00:17:38
CT:	61 s [0038 – 0079]
CFT:	70 s [0034 – 0159]
α :	76 ° [0063 – 0083]
A10:	61 mm [0043 – 0065]
A20:	—
MCF:	* 65 mm [0050 – 0072]
ML:	* 0 %



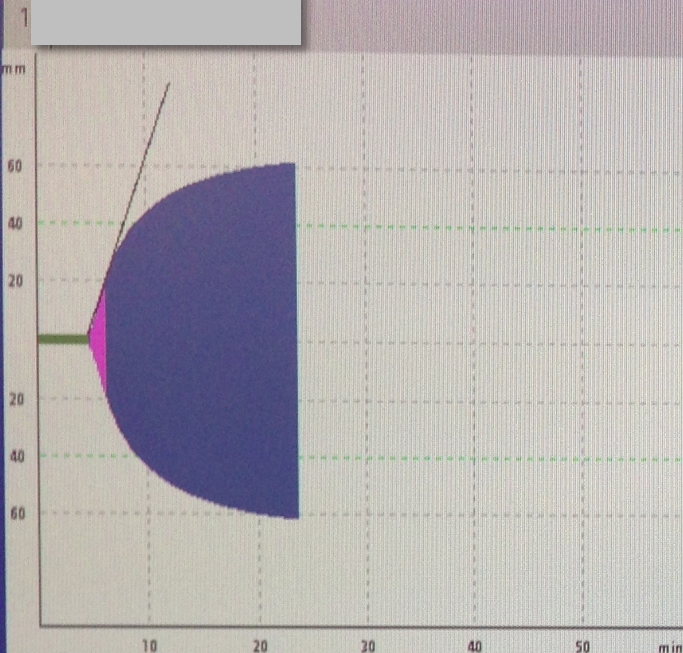
HEPTEM	
ST:	17:29:01
RT:	00:15:46
CT:	199 s
CFT:	70 s
α :	76 °
A10:	57 mm
A20:	—
MCF:	* 58 mm
ML:	* 0 %



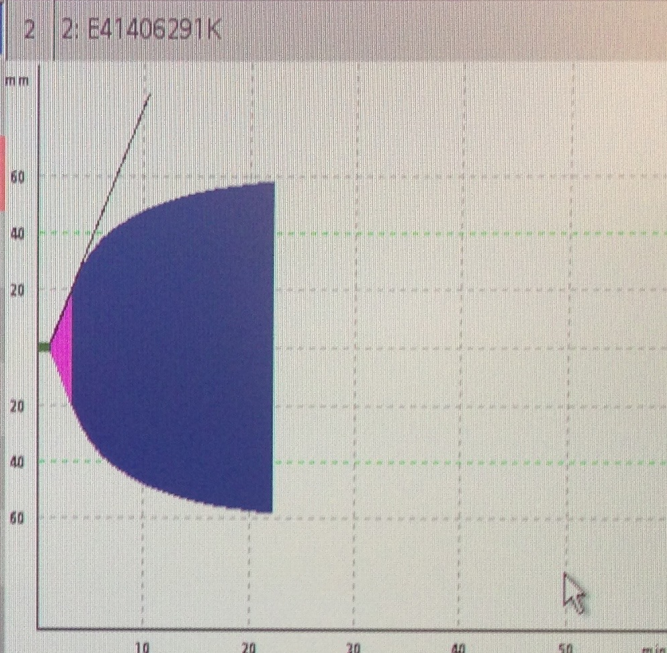
FIBTEM	
ST:	17:30:22
RT:	00:14:26
CT:	54 s
CFT:	—
α :	73 °
A10:	17 mm [0007 – 0023]
A20:	—
MCF:	* 18 mm [0009 – 0025]
ML:	* 0 %



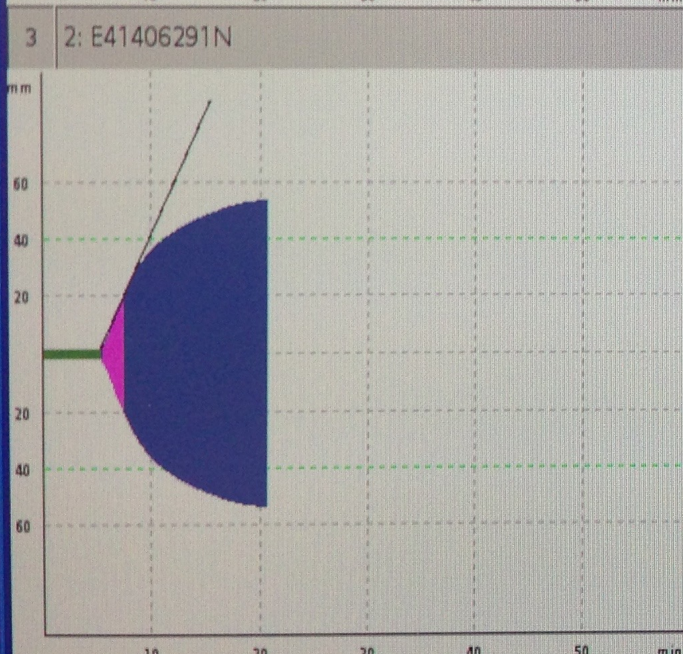
Cas 3



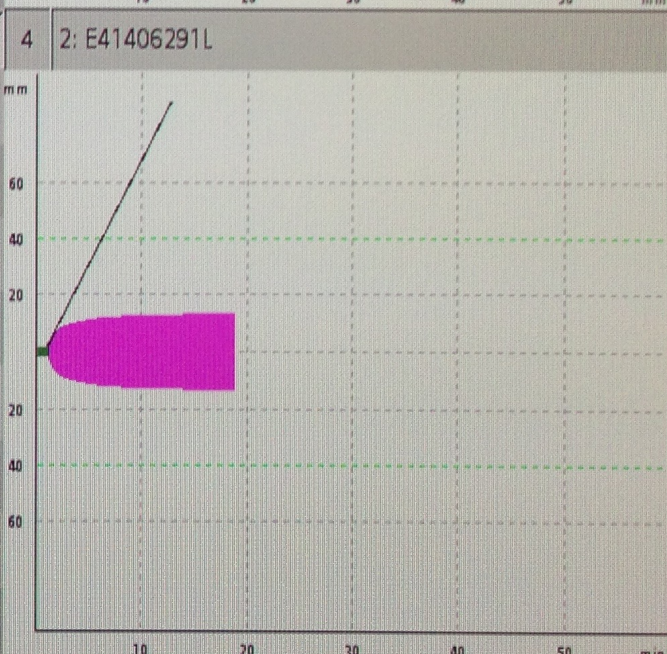
INTEM	
ST:	13:22:52
RT:	00:24:10
CT:	285 s [0100 -- 0240]
CFT:	90 s [0030 -- 0110]
α :	72 ° [0070 -- 0083]
A10:	55 mm [0044 -- 0066]
A20:	---
MCF: *	62 mm [0050 -- 0072]
ML: *	0 %



EXTEM	
ST:	13:24:26
RT:	00:22:36
CT:	77 s [0038 -- 0079]
CFT:	113 s [0034 -- 0159]
α :	67 ° [0063 -- 0083]
A10:	50 mm [0043 -- 0065]
A20:	58 mm [0050 -- 0071]
MCF: *	59 mm [0050 -- 0072]
ML: *	0 %

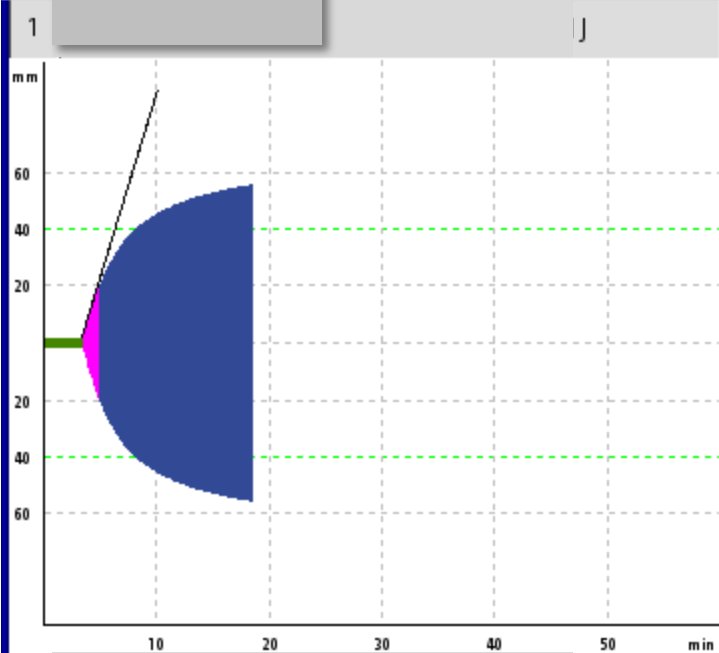


HEPTEM	
ST:	13:25:59
RT:	00:21:02
CT:	321 s
CFT:	122 s
α :	66 °
A10:	49 mm
A20:	---
MCF: *	55 mm
ML: *	0 %



FIBTEM	
ST:	13:27:39
RT:	00:19:22
CT:	69 s
CFT:	---
α :	62 °
A10:	13 mm [0007 -- 0023]
A20:	---
MCF: *	14 mm [0009 -- 0025]
ML: *	0 %

Cas 4



INTEM

ST: 23:45:27
RT: 00:18:59

CT: 207 s
[0100 -- 0240]

CFT: 88 s
[0030 -- 0110]

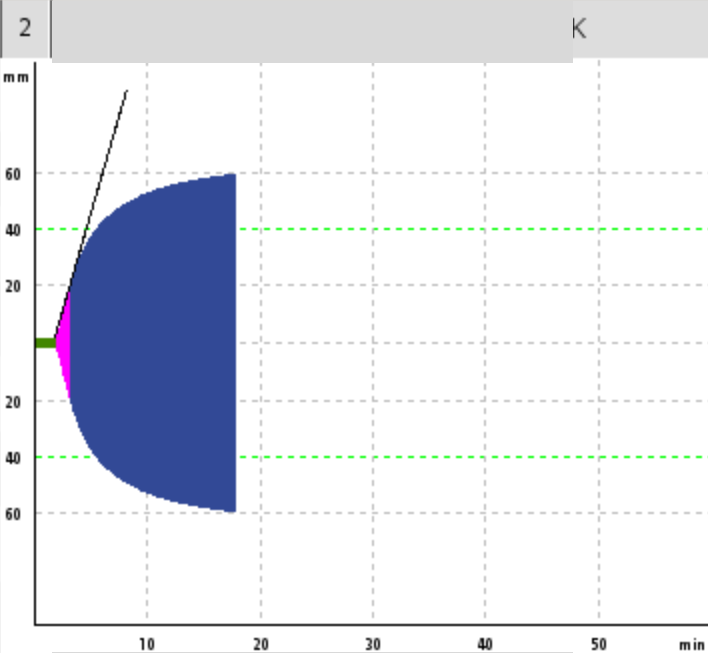
α : 73 °
[0070 -- 0083]

A10: 51 mm

A20: ---

MCF: * 56 mm
[0050 -- 0072]

ML: * 0 %



EXTEM

ST: 23:46:10
RT: 00:18:15

CT: 113 s
[0038 -- 0079]

CFT: 73 s
[0034 -- 0159]

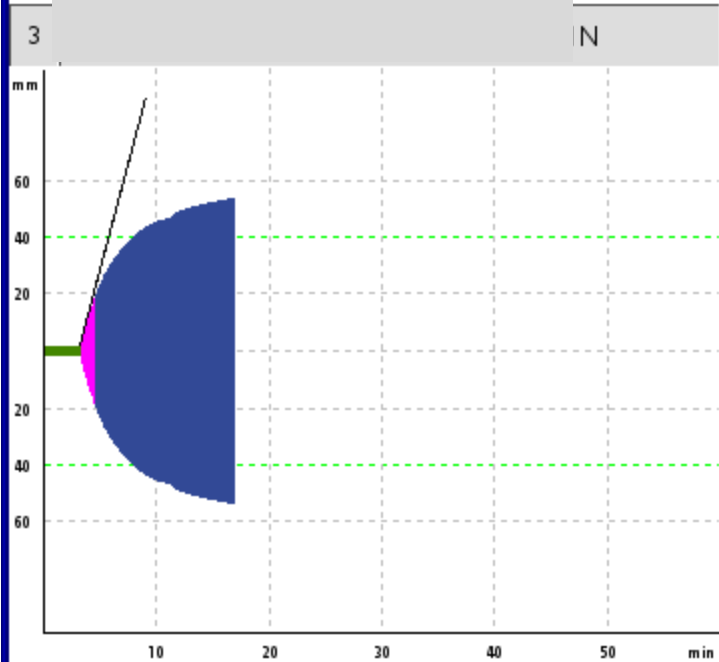
α : 75 °
[0063 -- 0083]

A10: 56 mm

A20: ---

MCF: * 60 mm
[0050 -- 0072]

ML: * 0 %



HEPTEM

ST: 23:47:01
RT: 00:17:25

CT: 195 s

CFT: 82 s

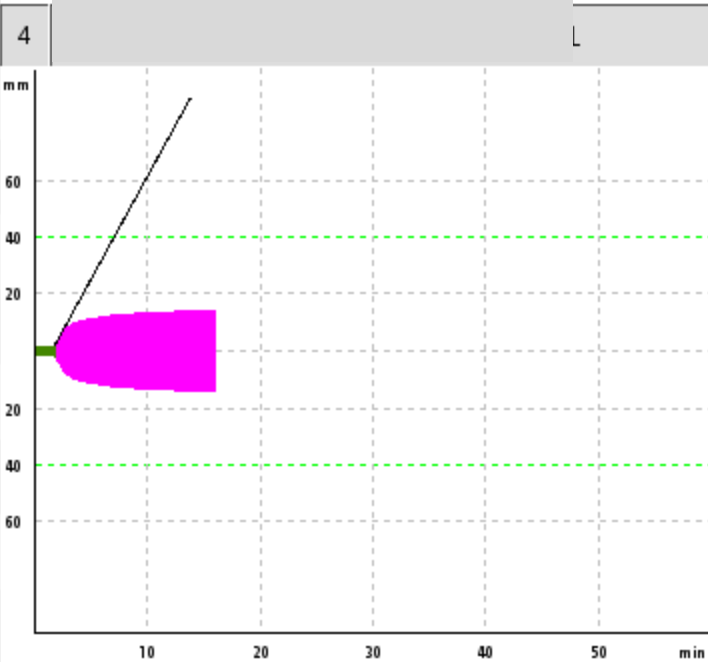
α : 75 °

A10: 51 mm

A20: ---

MCF: * 54 mm

ML: * 0 %



FIBTEM

ST: 23:47:52
RT: 00:16:35

CT: 108 s

CFT: ---

α : 61 °

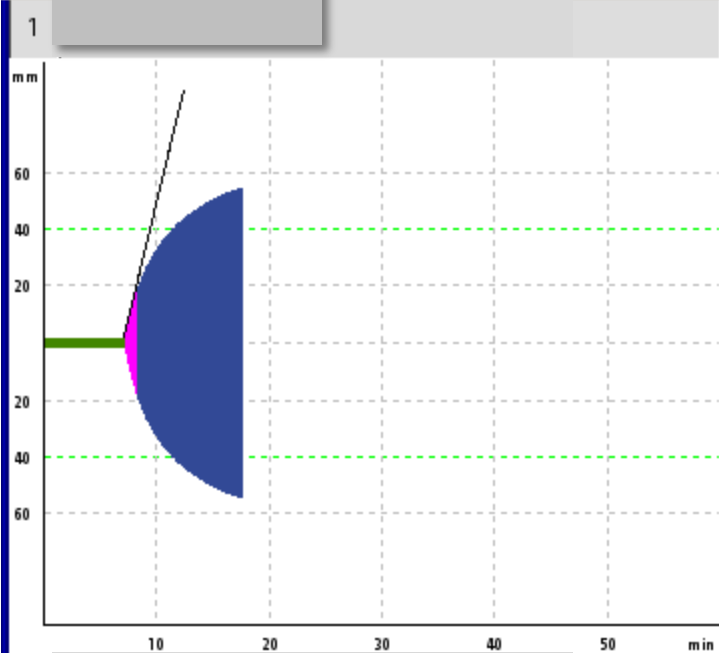
A10: 14 mm

A20: ---

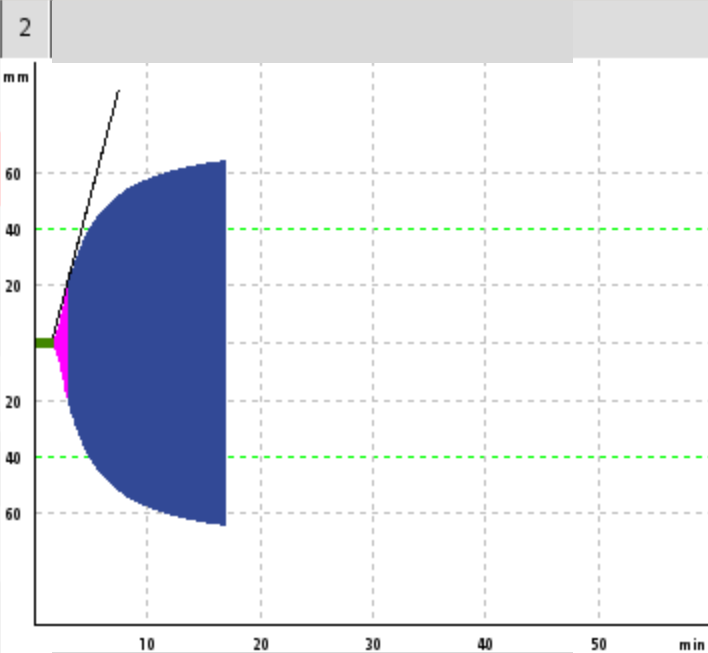
MCF: * 14 mm
[0009 -- 0025]

ML: * 0 %

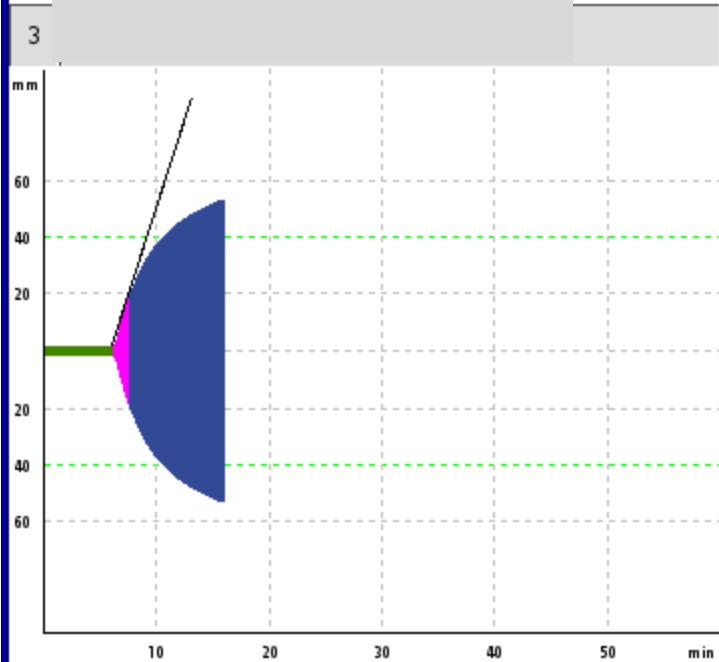
Cas 5



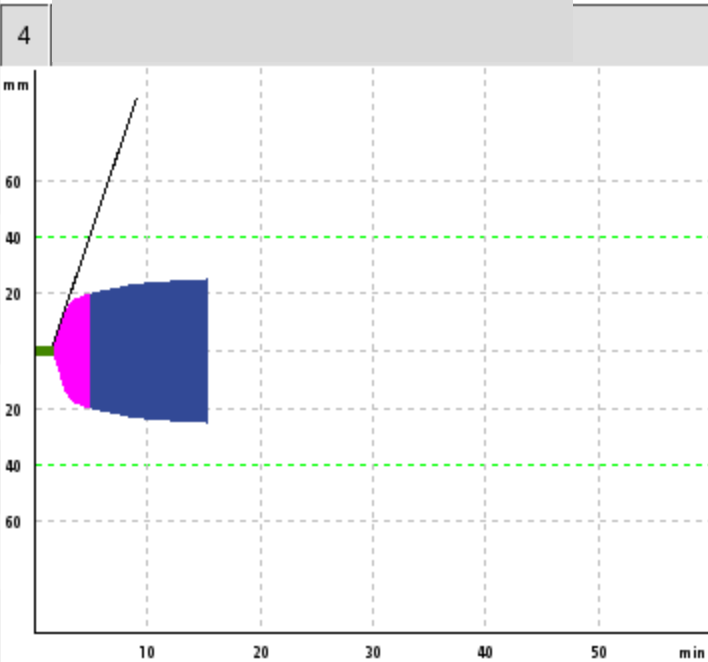
INTEM	
ST:	07:05:47
RT:	00:18:08
CT:	428 s [0100 -- 0240]
CFT:	74 s [0030 -- 0110]
α :	77 ° [0070 -- 0083]
A10:	54 mm
A20:	---
MCF:	* 55 mm [0050 -- 0072]
ML:	* 0 %



EXTEM	
ST:	07:06:36
RT:	00:17:18
CT:	102 s [0038 -- 0079]
CFT:	70 s [0034 -- 0159]
α :	76 ° [0063 -- 0083]
A10:	60 mm
A20:	---
MCF:	* 64 mm [0050 -- 0072]
ML:	* 0 %



HEPTEM	
ST:	07:07:24
RT:	00:16:30
CT:	369 s
CFT:	86 s
α :	73 °
A10:	---
A20:	---
MCF:	* 54 mm
ML:	* 0 %



FIBTEM	
ST:	07:08:14
RT:	00:15:40
CT:	98 s
CFT:	194 s
α :	72 °
A10:	24 mm
A20:	---
MCF:	* 25 mm [0009 -- 0025]
ML:	* 0 %

Limitations des tests viscoélastiques

- La composante vasculaire n'est pas incluse
- Les thérapies anti-thrombotiques ne sont pas détectées
- Les tests viscoélastiques standards sont effectués à 37°C
- Le rôle de l'hématocrite n'est pas réflété
- L'utilité clinique n'a été validé que pour les patients avec un saignement actif



Le Rotem[®] en résumé:

- Test fonctionnel de la coagulation
- Plus rapide que les tests standards
- Utilisé dans un algorithme = patients mieux transfusés = moins de transfusions
- Meilleur devenir post-opératoire



Merci!

