ZABURZENIA KRZEPNIĘCIA
JAKO
KONSEKWENCJA PŁYNOTERAPII

Elżbieta Nowacka
I Klinika Anestezjologii i Intensywnej Terapii WUM
SPSK im. Prof. A. Grucy

WARSZAWSKI
UNIWERSYTET
MEDYCZNY

PŁYNOTERAPIA OKOŁOOPERACYJNA

POSTĘPOWANIE RUTYNOWE

PROWADZONA WEDŁUG ZALECANYCH ALGORYTMÓW

NAKIEROWANA NA CHOREGO

PODAŻ ZBILANSOWANYCH KRYSTALOIDÓW

W WYBRANYCH PRZYPADKACH PODAŻ KOLOIDÓW

JOURNAL OF COAGULATION DISORDERS | REVIEW ARTICLE

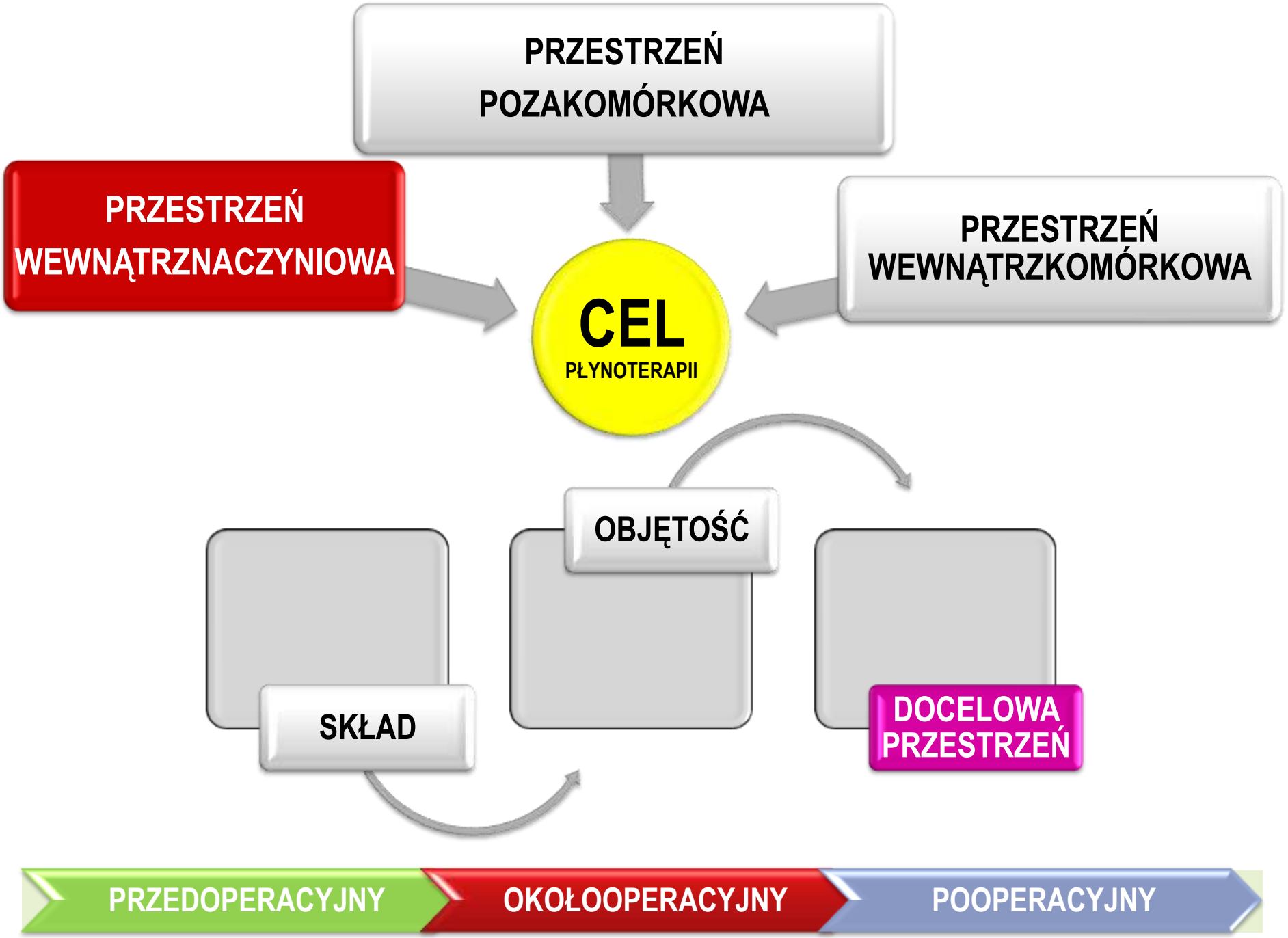
Benefits of Fluid Therapy on the Hemostatic System of Intensive Care Patients

Sibylle A Kozek-Langenecker

Affiliation: Department of Anesthesiology, General Intensive Care and Pain Management, Vienna Medical University, Vienna, Austria

PRZED → ŚRÓD → PO → ZDROWIENIE

PŁYNOTERAPIA OKOŁOOPERACYJNA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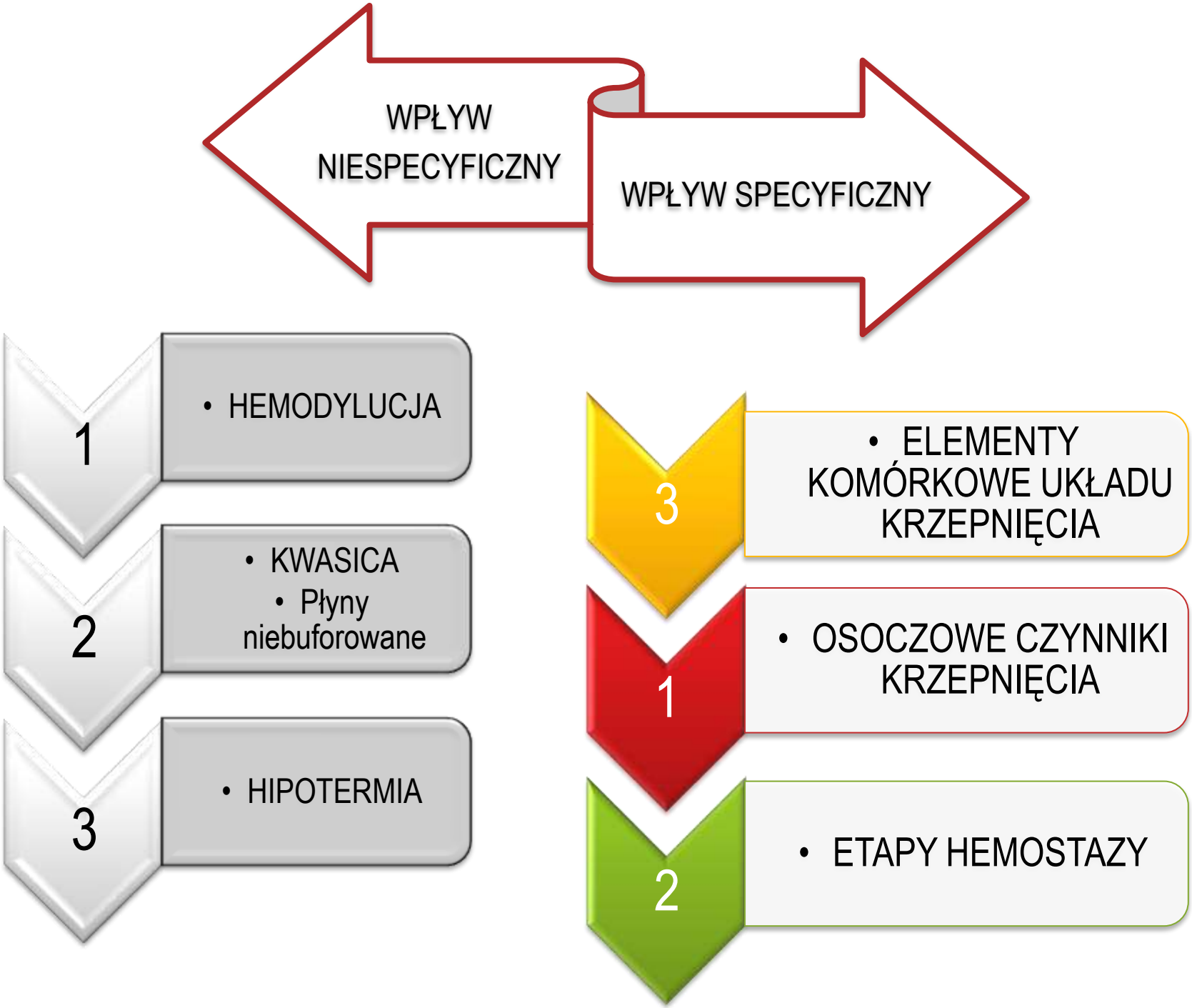
PRZESTRZEŃ WEWNĄTRZNACZYNIOWA
PRZESTRZEŃ WEWNĄTRZKOMÓRKOWA
CEL
PŁYNOTERAPII
OBJĘTOŚĆ
SKŁAD
DOCELOWA PRZESTRZEŃ
PRZEDOPERACYJNY
OKOŁOOPERACYJNY
POOPERACYJNY

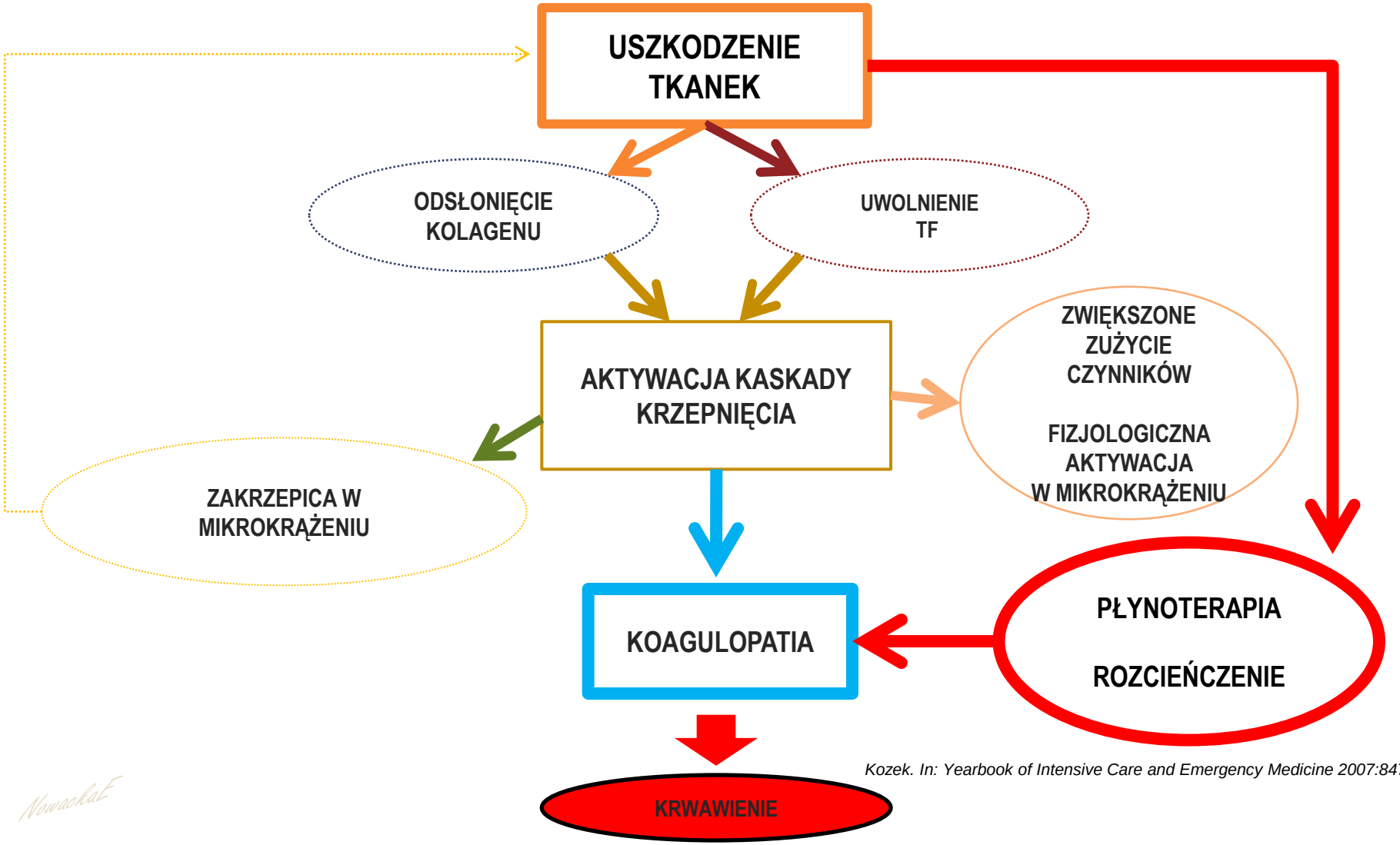
Table 2
Intravenous solutions: composition and compartment distribution

Solution		Concentration/ composition (mmol/l)	Osmolality (mosM/l)	Distribution after infusion of 1 l (fraction)		
				ECF	ICF	Intravascular
Glucose in water	5%	Glucose 278	278	0.33	0.67	0.07
	10%	Glucose 556	556	0.33	0.67	0.07
	20%	Glucose 1112	1112	0.33	0.67	0.07
	40%	Glucose 2224	2224	0.33	0.67	0.07
Saline	0.6%	Na^+ 103; Cl^- 103	206	0.78	0.22	0.16
	0.9%	Na^+ 154; Cl^- 154	308	1	0	0.2
	2.5%	Na^+ 427; Cl^- 427	854	2.2	−1.2	0.44
	3%	Na^+ 513; Cl^- 513	1026	2.6	−1.6	0.52
Glucose in saline	4.3% in 0.18%	Na^+ 31; Cl^- 31 Glucose 239	301	0.47	0.53	0.09
	2.5% in 0.45%	Na^+ 77; Cl^- 77 Glucose 139	293	0.67	0.33	0.13
Polyionic solutions	Ringer's	Na^+ 148; Cl^- 156 K^+ 4; Ca^{2+} 2.2	310	1	0	0.2
	Lactated Ringer's	Na^+ 130; Cl^- 109 K^+ 4; Ca^{2+} 3 Lactate$^-$ 28	273	0.87	0.13	0.17
Colloids	Haemaccel	Normal saline K^+ 5.1; Ca^{2+} 6.3 Macromolecules	280 COP[a] 35 mmHg	1	0	1
	Gelofusine	Normal saline K^+ 0.5; Ca^{2+} 0.6 Macromolecules	275 COP 35 mmHg	1	0	1
	Elo-HES (6%)	Na^+ 154; Cl^- 154 Macromolecules	308 COP 35 mmHg	1	0	1
	Albumin 5%	Albumin 5 g Normal saline	COP 20 mmHg 300	−1 to −1.4		1–1.4
	Albumin 25%	Albumin 25 g Normal saline	COP 100 mmHg 1500	−3 to −5		3 to 5

[a] COP, colloid osmotic pressure; molecular weights: Na 23, Cl 35.5, HCO_3 61, K 39.1, glucose 180.

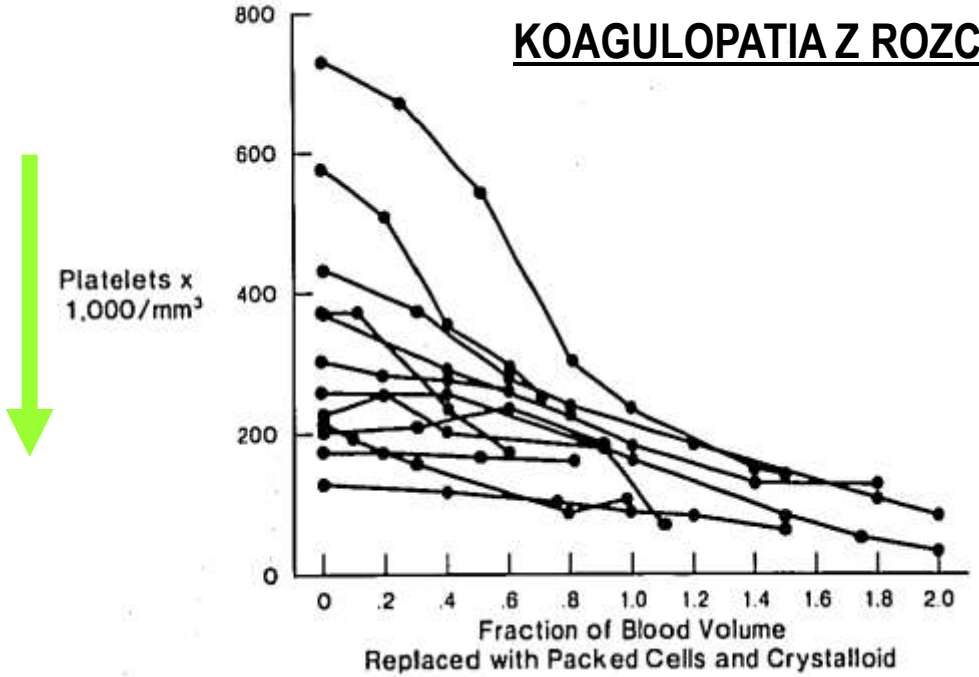

WPŁYW NIESPECYFICZNY
WPŁYW SPECYFICZNY
1
• HEMODYLUCJA
2
• KWASICA
• Płyny niebuforowane
3
• HIPOTERMIA
3
• ELEMENTY KOMÓRKOWE UKŁADU KRZEPNIĘCIA
1
• OSOCZOWE CZYNNIKI KRZEPNIĘCIA
2
• ETAPY HEMOSTAZY

KOAGULOPATIA



Kozek. In: Yearbook of Intensive Care and Emergency Medicine 2007:847

KOAGULOPATIA Z ROZCIEŃCZENIA



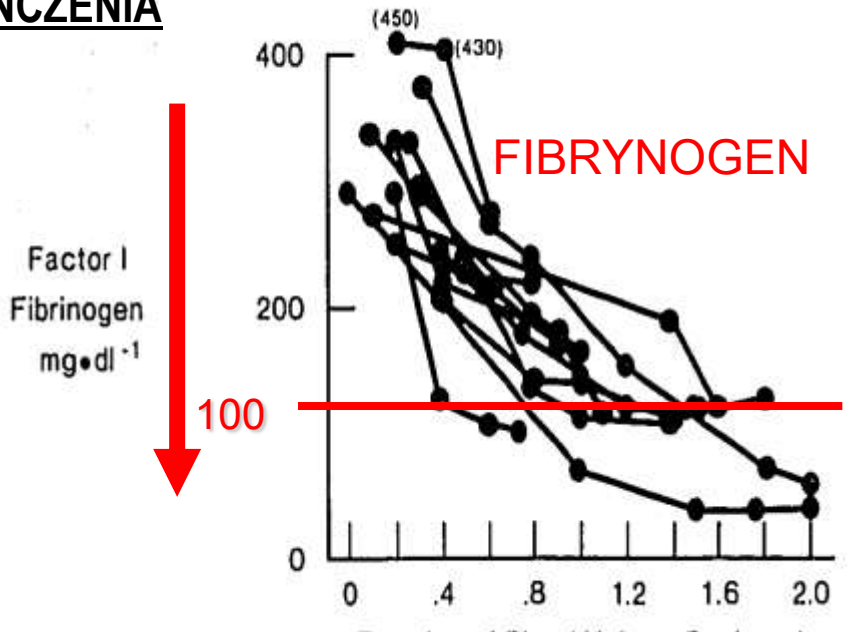
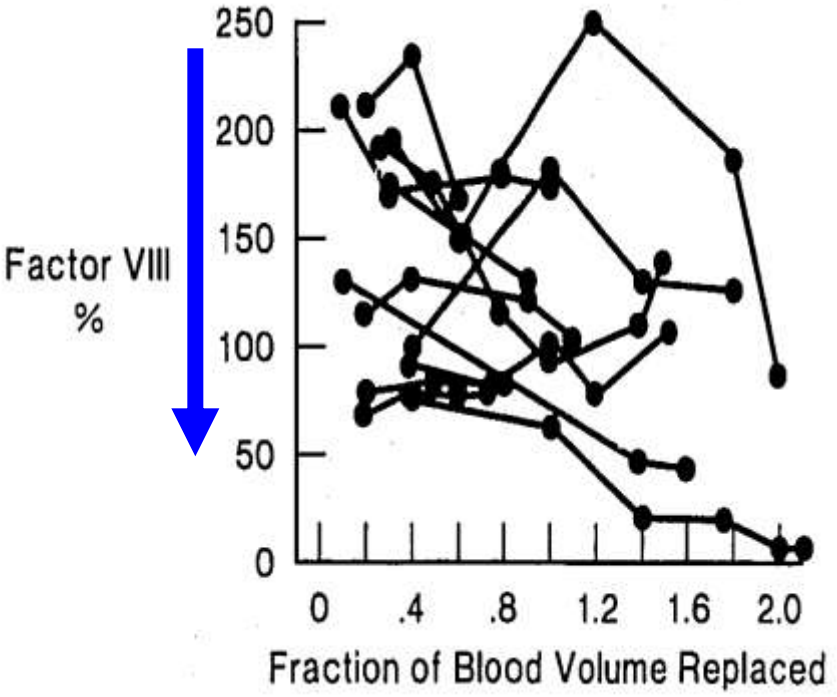


TABLE 1. Estimates of Percent of Original Platelet Count or Factor Levels Following 1 Blood Volume Replacement

	Percent of Original Level Following 1 Blood Volume Replacement*	95% Confidence Interval	Correlation Coefficient of Decline (r^2)
Platelet count	54	±8%	0.78
Fibrinogen	50	±12%	0.81
Factor V	57	±28%	0.74
Factor VIII	74	±38%	0.79
Factor IX	77	±18%	0.71



KOAGULOPATIA
DEFINICJA LABORATORYJNA

1
- > PT o 4 sek

0
- INR > 1,4 ???

2
- PLT < 100 tys

KOAGULOPATIA POKRWOTOCZNA
DEFINICJA LABORATORYJNA

PT > 1,5 x N

50% aktywności czynników krzepnięcia

aPTT > 1,5 x N

50 % aktywności czynników krzepnięcia

PLT < 50 tys

FIBRYNOGEN < 1,0 g/l

PT> 1,8 x N

aPTT> 1,8 x N

30%

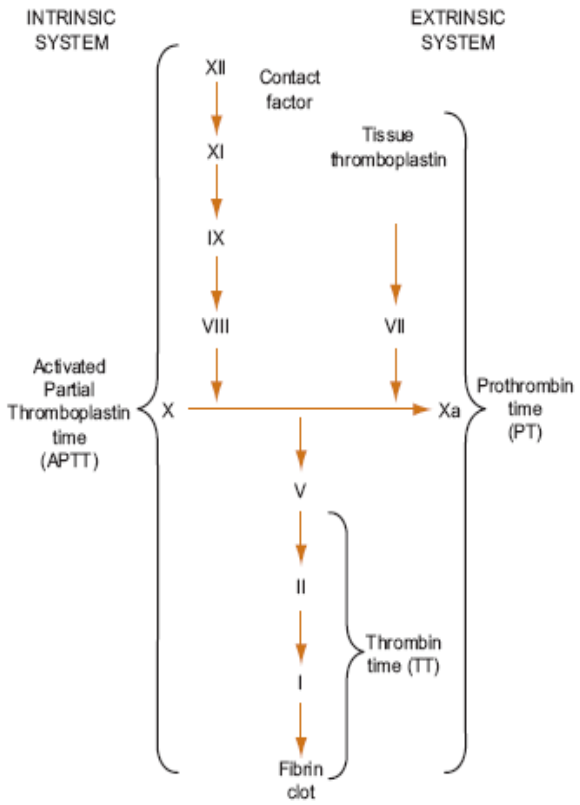
AKTYWNOŚCI

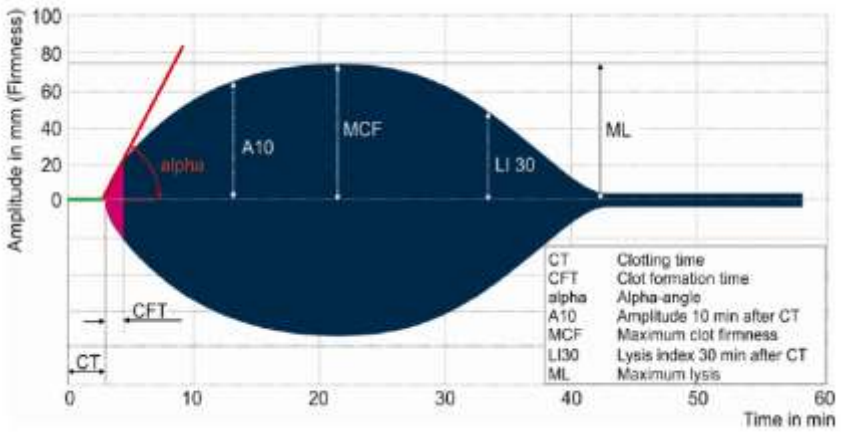
CZYNNIKÓW KRZEPNIĘCIA

HEMOSTAZA PŁYTKOWA

GENERACJA TROMBINY
FORMOWANIE SKRZEPU
STABILIZACJA SKRZEPU

FIBRYNOLIZA





Fluid Administration During Abdominal Surgery Influences on Coagulation in the Postoperative Period

Michal Barak, MD, Michael Rudin, MD,† Oded Vofsi, MD,† Alex Droyan, MD,‡ andYeshayahu Katz, MD†*

TABLE 5. Change of Coagulation Tests After Surgery, Compared with Preoperative Values

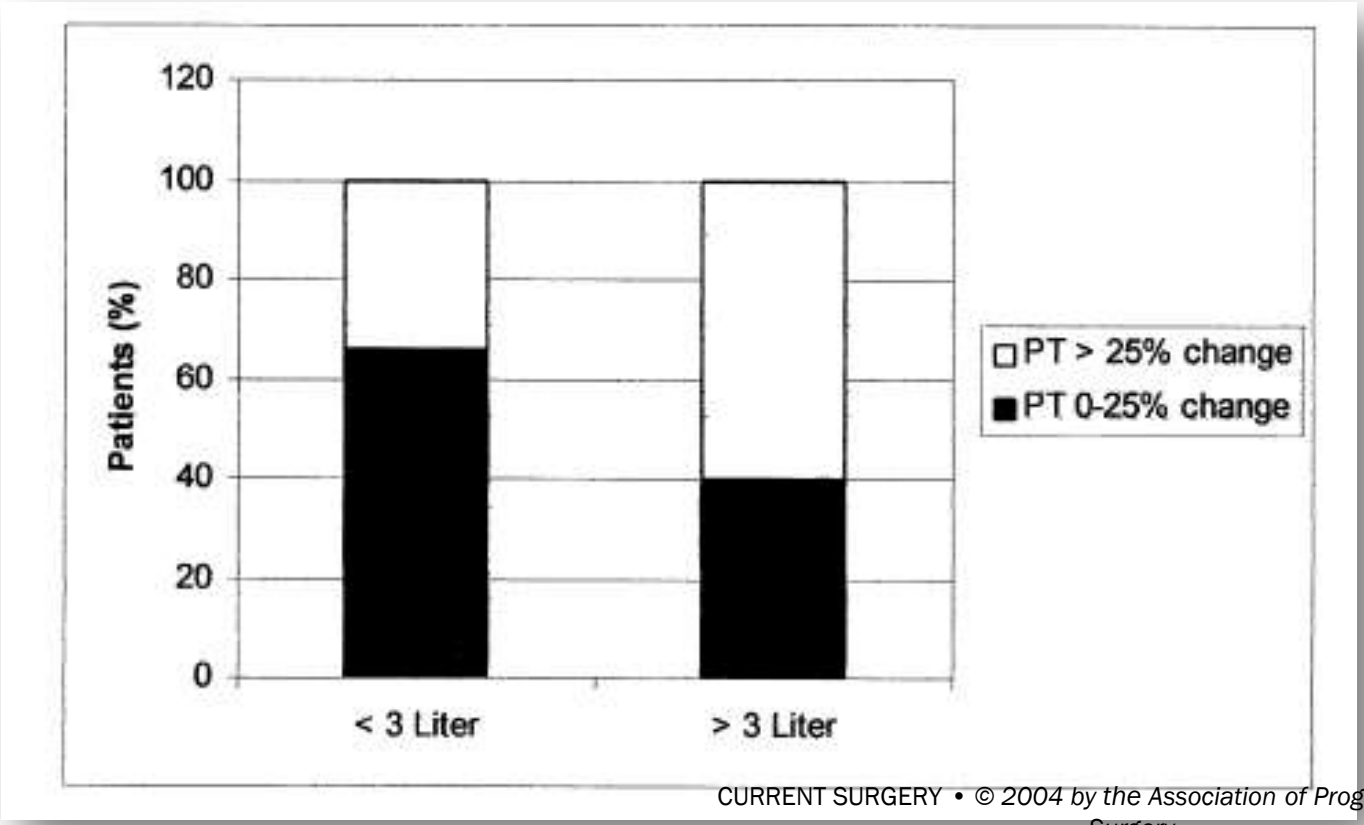
	Number of Patients (%)
10–25% change of PT	62 (41.3)
>25% change of PT	12 (8)
Change of PTT (>5 seconds)	31 (20.7)

CZAS PROTROMBINOWY A OBJĘTOŚĆ PRZETOCZONYCH KRYSTALOIDÓW

MLECZANOWY ROZTWÓR RINGERA

1,5 – 2 ml /kgmc/h

Diureza > 0,5 ml/kgms/h



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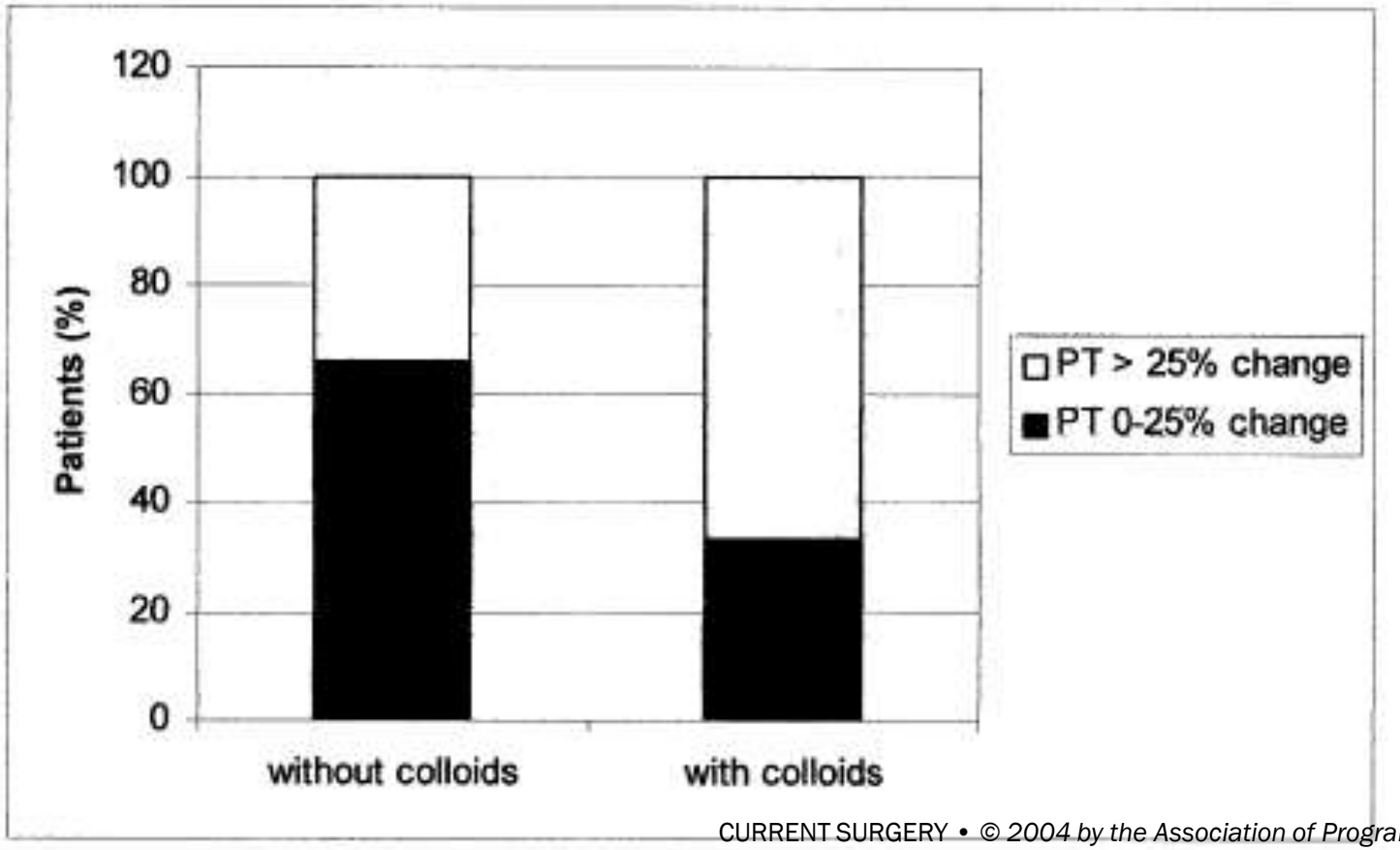
RODZAJ PRZETOCZONEGO PŁYNU

krystaloid v koloid

DECYZJE PODEJMOWAŁ ANESTEZJOLOG
Brak informacji o rodzaju zastosowanego koloidu



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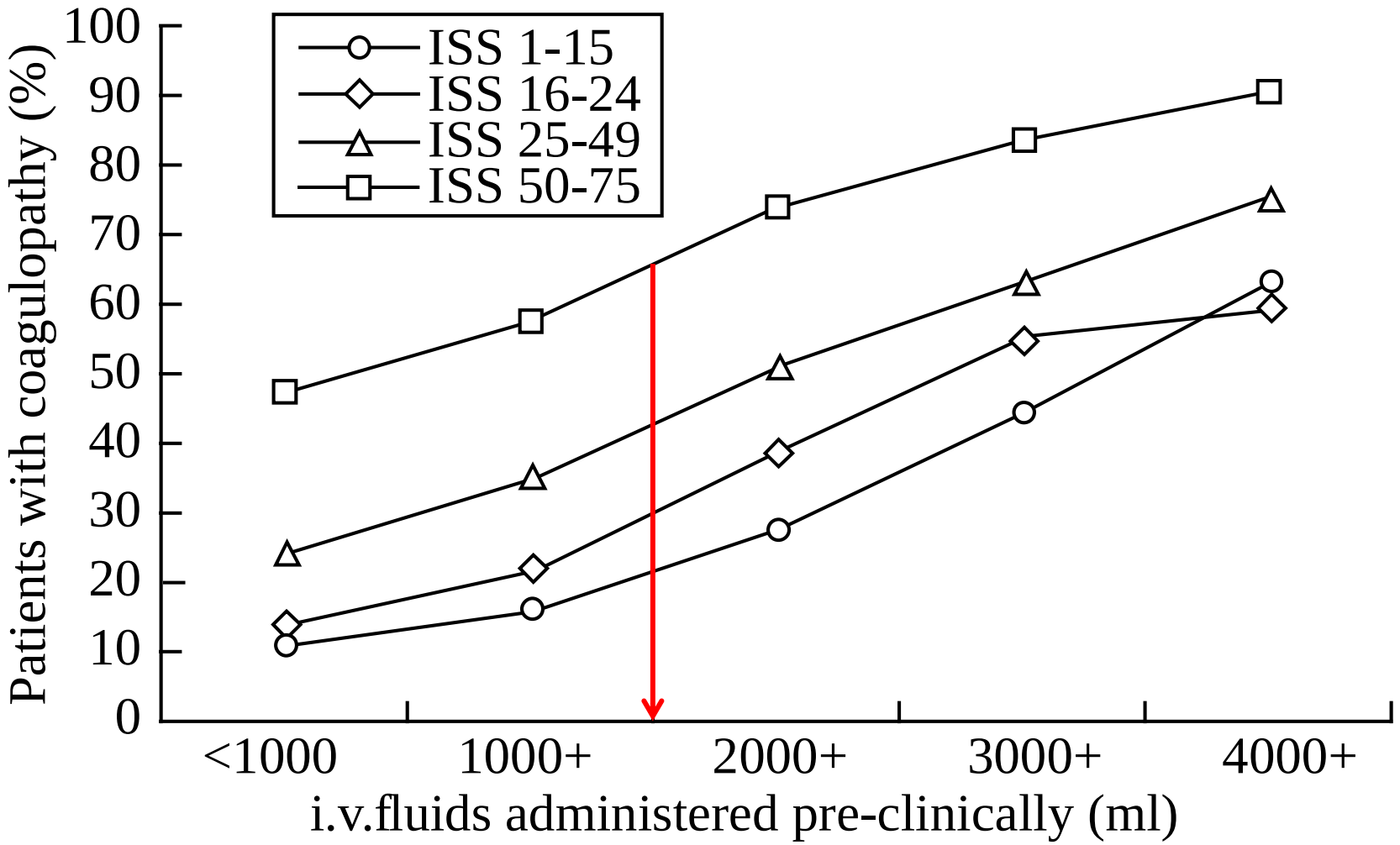
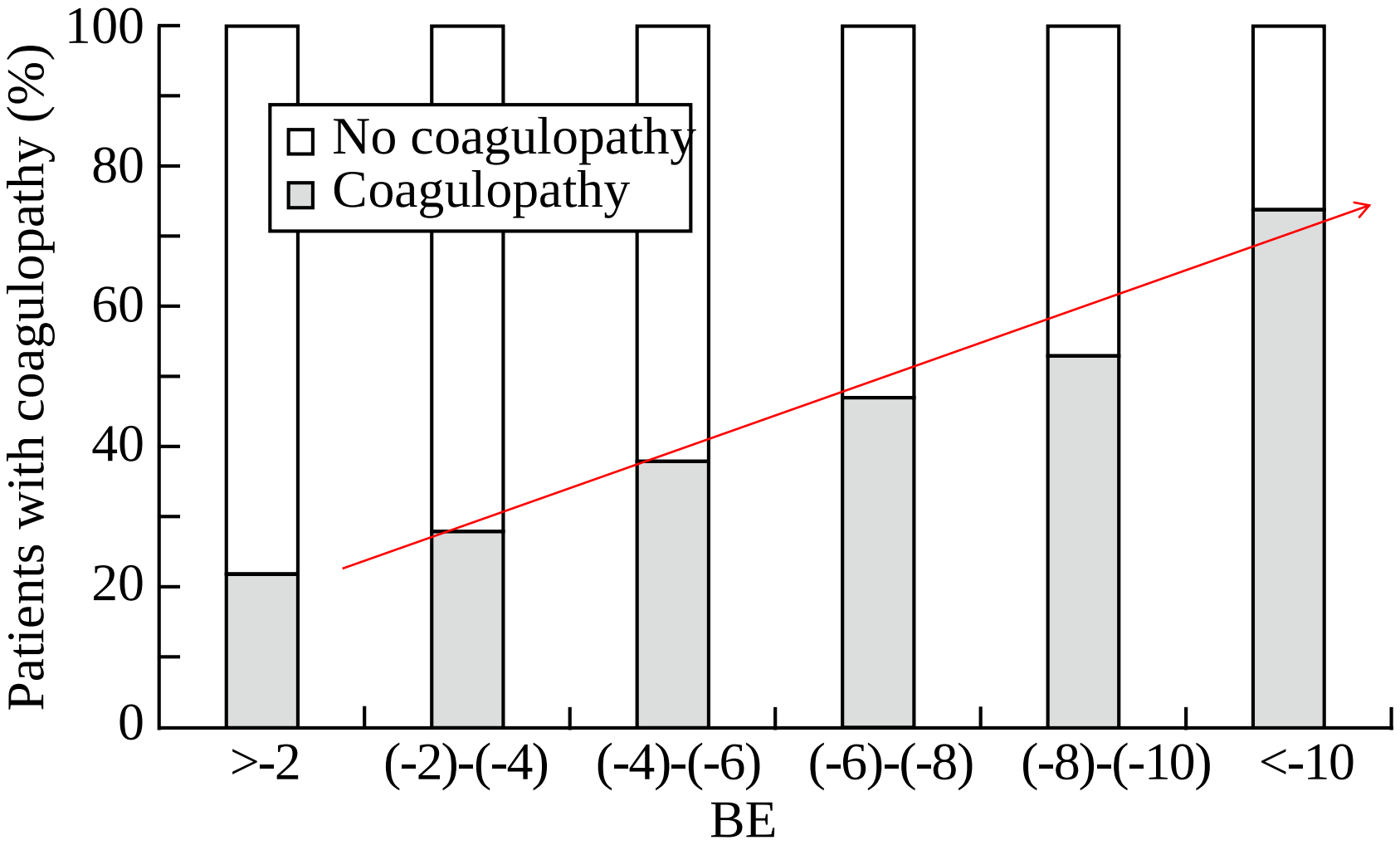
Acute traumatic coagulopathy: Incidence, risk stratification and therapeutic options

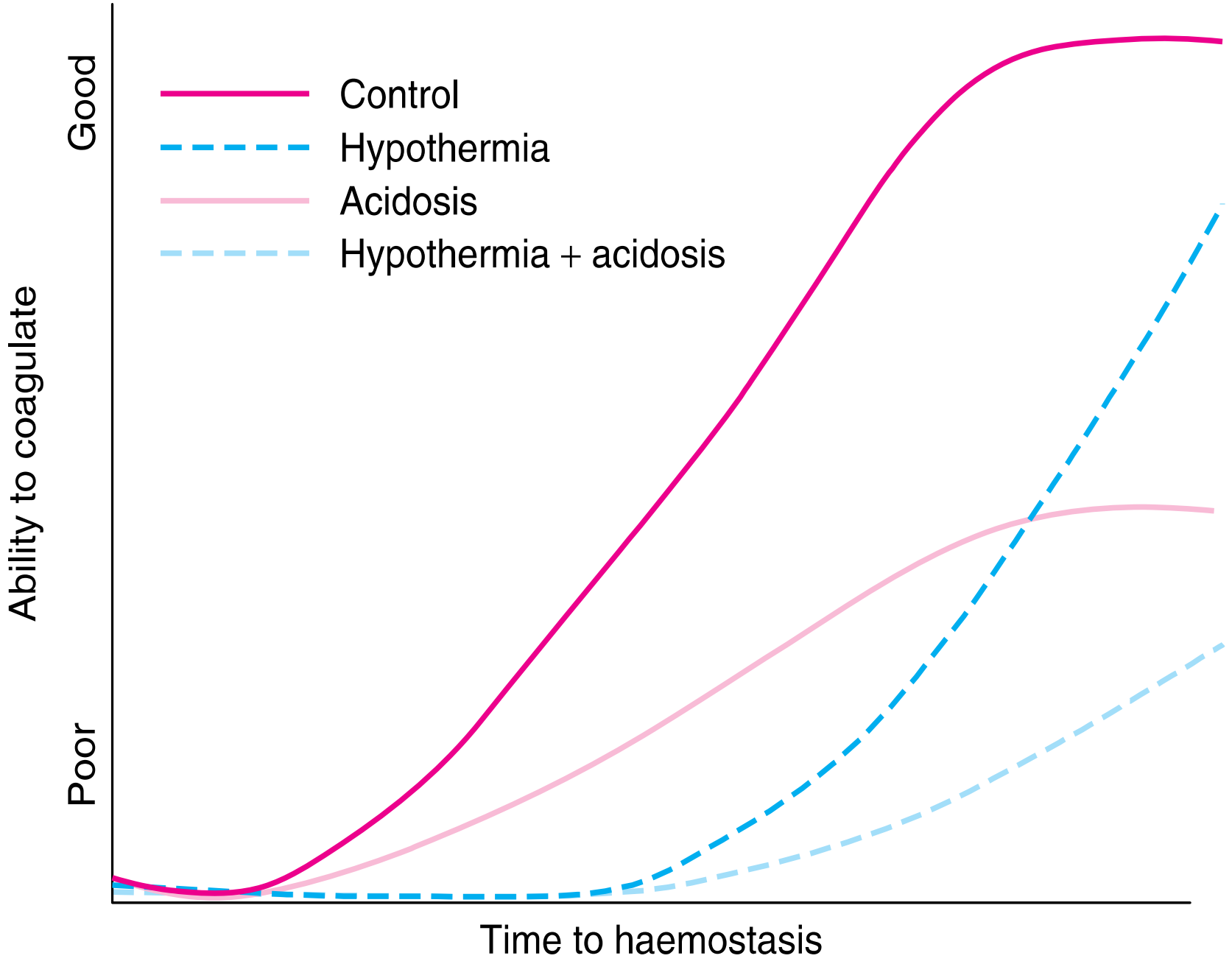
Marc Maegele



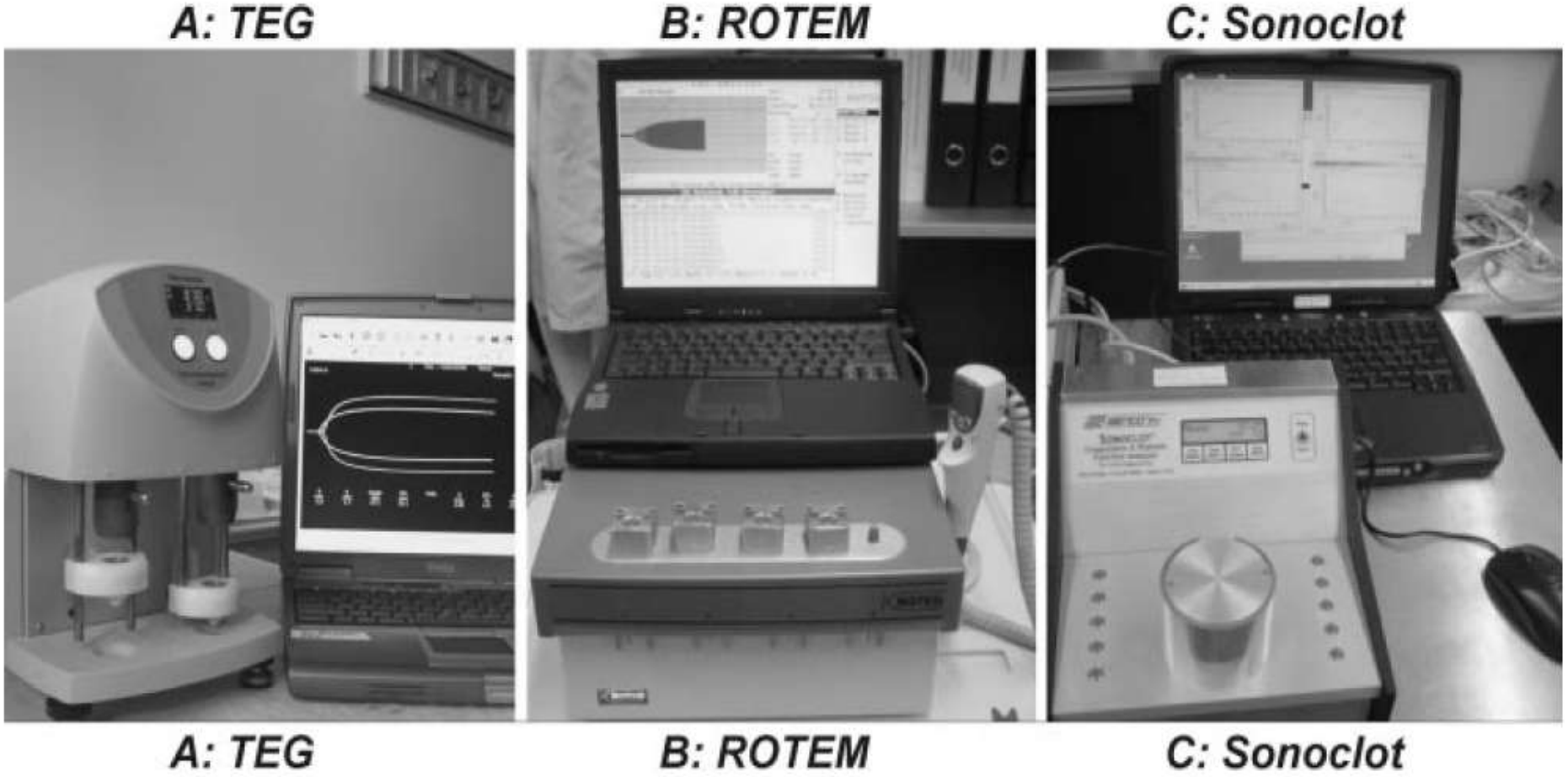
Acute traumatic coagulopathy: Incidence, risk stratification and therapeutic options

Marc Maegele

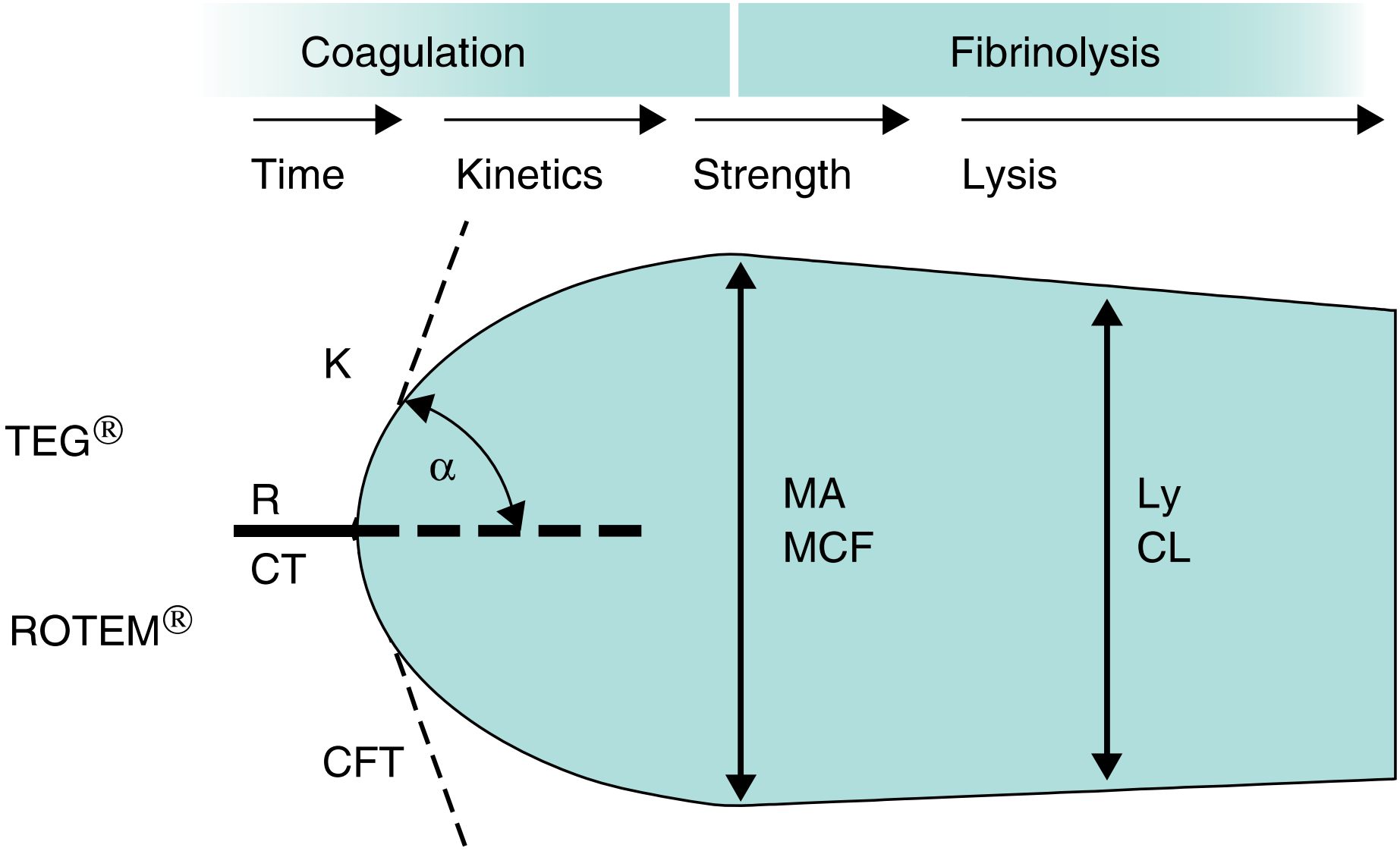



Good
Poor
Ability to coagulate
Control
Hypothermia
Acidosis
Hypothermia + acidosis
Time to haemostasis

GLOBALNA OCENA KRZEPNIĘCIA



Anesth.Analg.2008;106:1366-75



Anesth.Analg.2008;106:1366-75

TEG® value	Clinical cause	Suggested Treatment
R between 7 - 10 min	↓ clotting factors	x 1 FFP or 4 ml/kg
R between 11-14 min	↓↓ clotting factors	x 2 FFP or 8 ml/kg
R greater than 14 min	↓↓↓ clotting factors	x 4 FFP or 16 ml/kg
MA between 49 -54 mm	↓ platelet function	0.3mcg/kg DDAVP
MA between 41 -48 mm	↓↓ platelet function	x5 platelet units
MA at 40 mm or less	↓↓↓ platelet function	x10 platelet units
α less than 45°	↓↓ fibrinogen level	.06 u/kg cryo
LY30 at 7.5% or greater, C.I. < 3.0	Primary fibrinolysis	antifibrinolytic of choice
LY30 at 7.5% or greater, C.I. > 3.0	Secondary fibrinolysis	anticoagulant of choice
LY30 < 7.5%, C.I. > 3.0	Prothrombotic state	anticoagulant of choice

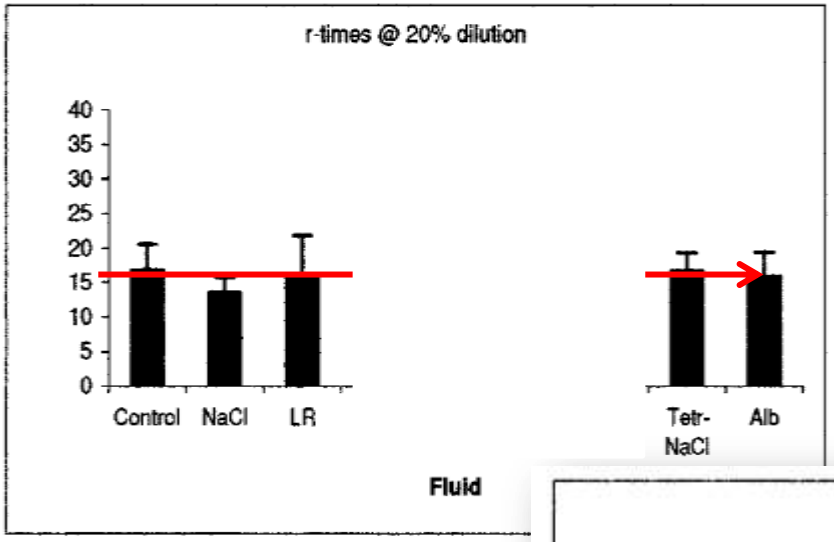
A Head-to-Head Comparison of the *In Vitro* Coagulation Effects of Saline-Based and Balanced Electrolyte Crystalloid and Colloid Intravenous Fluids

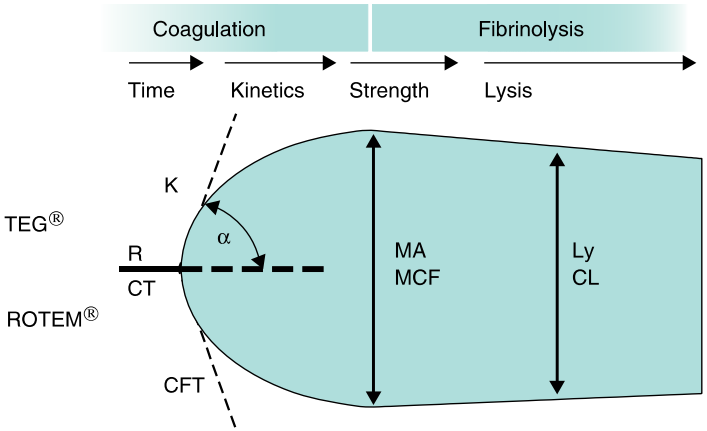
Anthony M. Roche, FRCA, MMed (Anaes)*, Michael F. M. James, FCA (SA), FRCA, PhD†, Elliott Bennett-Guerrero, MD*, and Michael G. Mythen, FRCA, MD‡

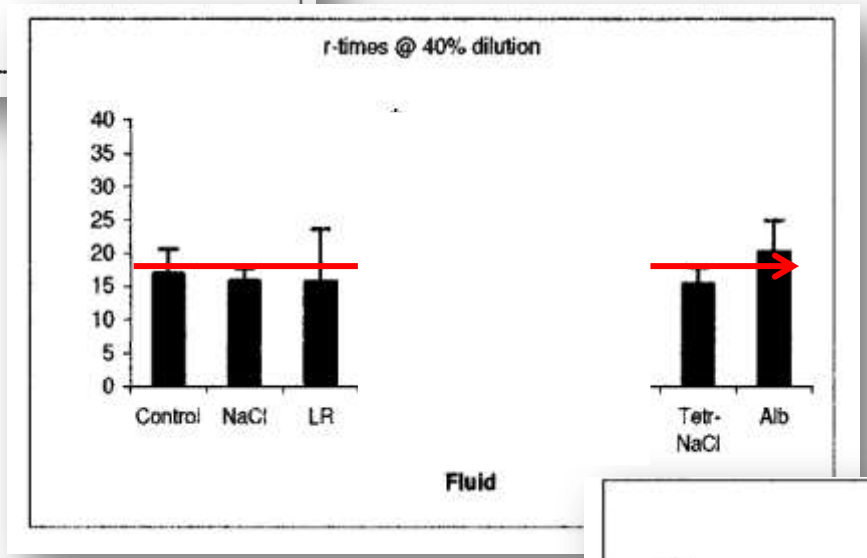
*Department of Anesthesiology, Duke University Medical Center, Durham, North Carolina; †Department of Anaesthesia, University of Cape Town, Cape Town, South Africa; and ‡Centre for Anaesthesia, University College London, Middlesex Hospital, London, United Kingdom

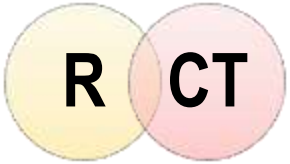
KRYSTALOIDY	KOLOIDY SYNTETYCZNE			KOLOIDY NATURALNE
0,9% NaCl	~~HES 450/06 0,9% NaCl~~	~~HES 250/05 0,9% NaCl~~	HES 130/04\ 0,9% NaCl	4,5% ALBUMINY
Mleczan Ringera				
	~~HES-BAL 670/04~~	~~HES-BAL 200/05~~		

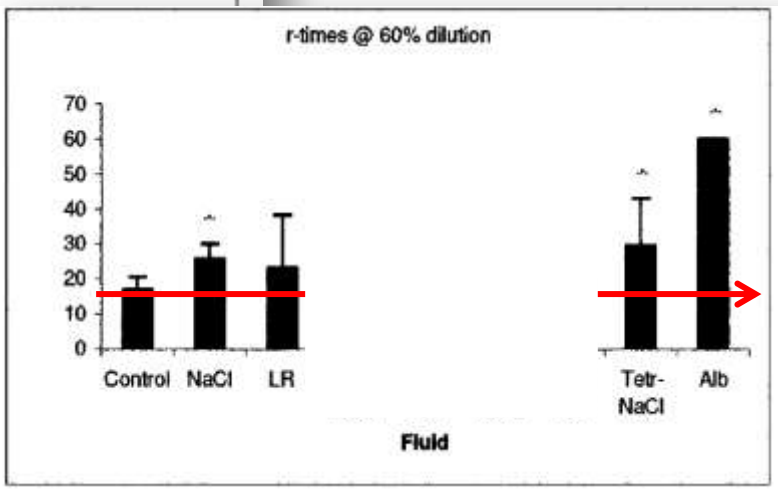
Anesth Analg. 2006;102:1274-9



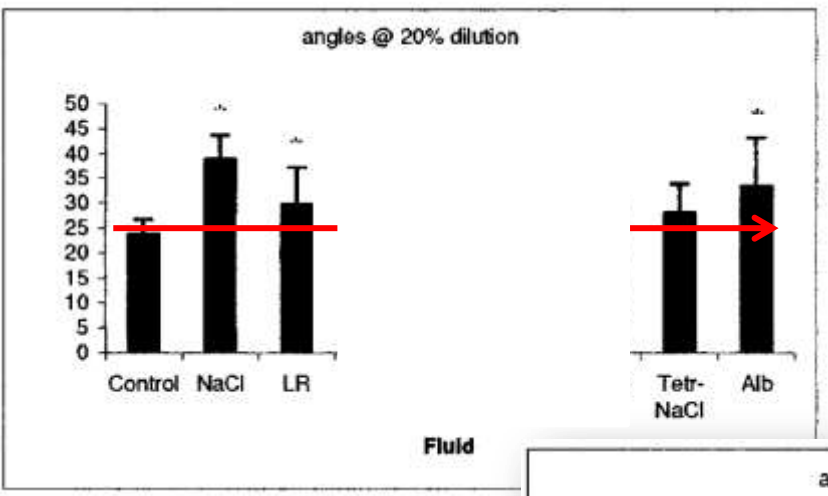


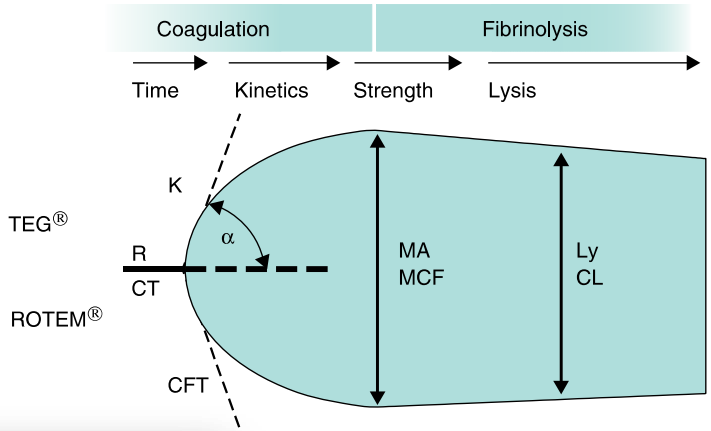


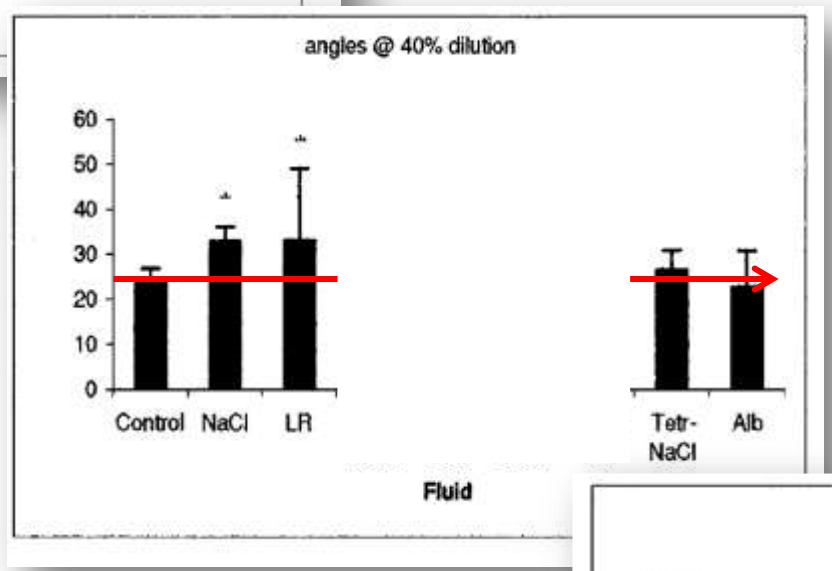


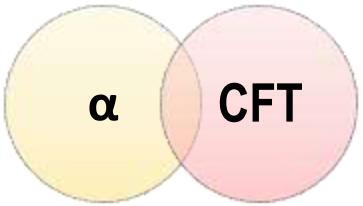


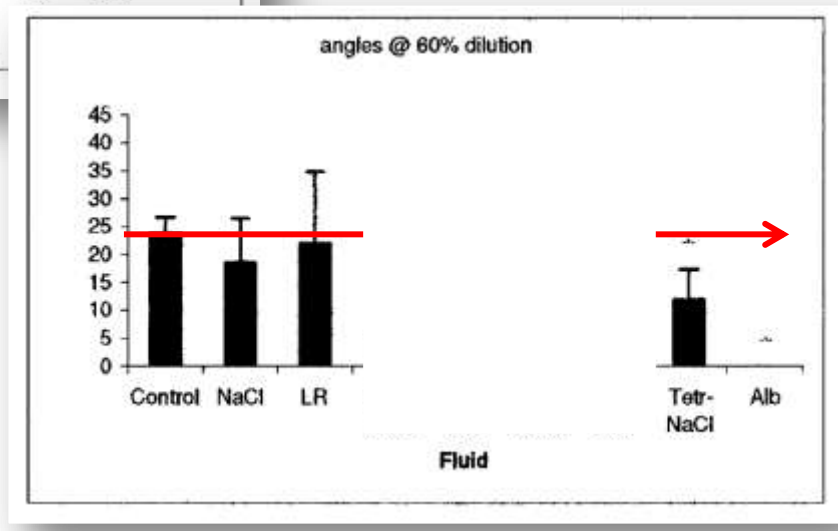
MEMODYLUCJA
20% - 40% - 60 %



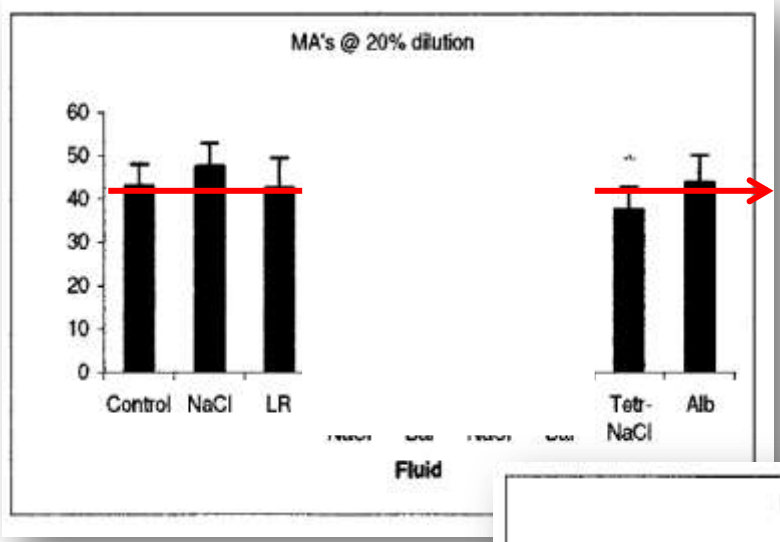


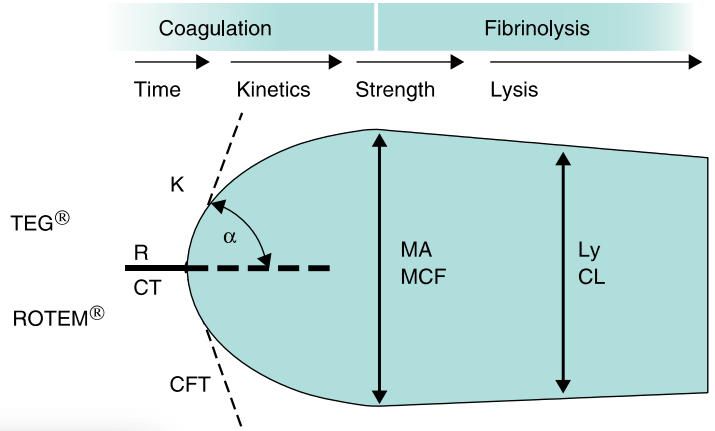


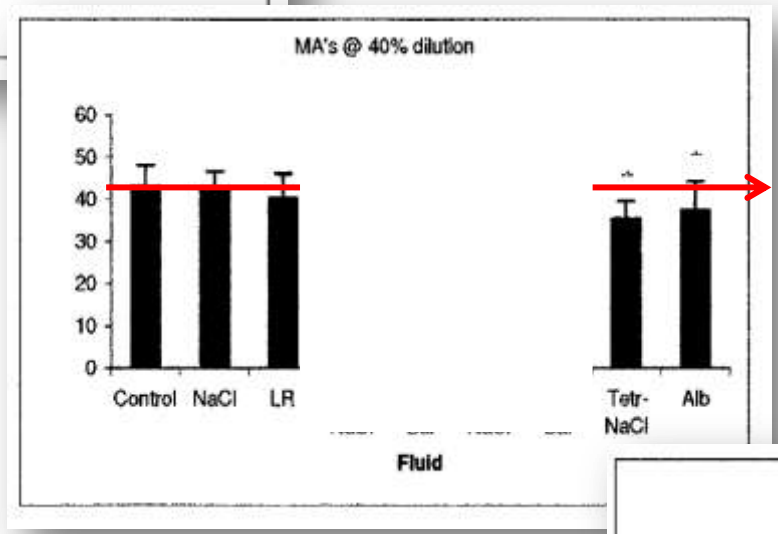


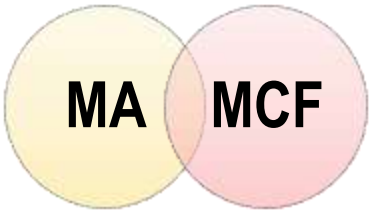


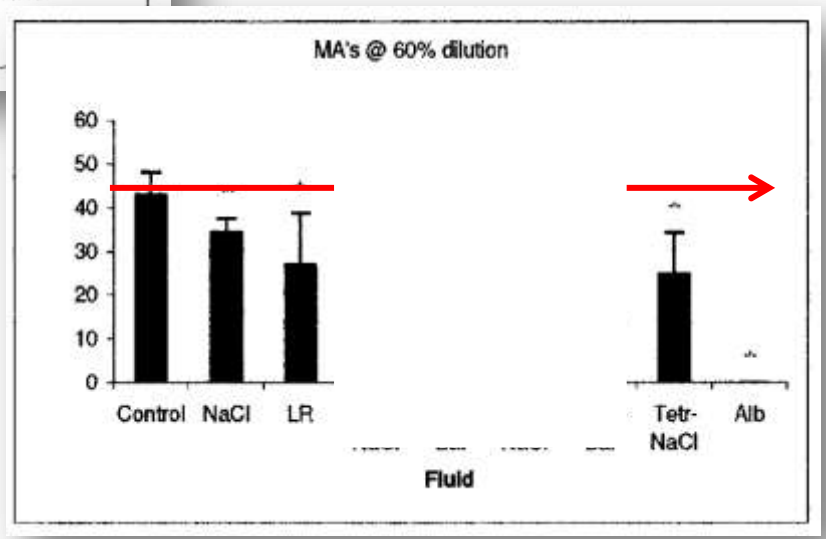
MEMODYLUCJA
20% - 40% - 60 %





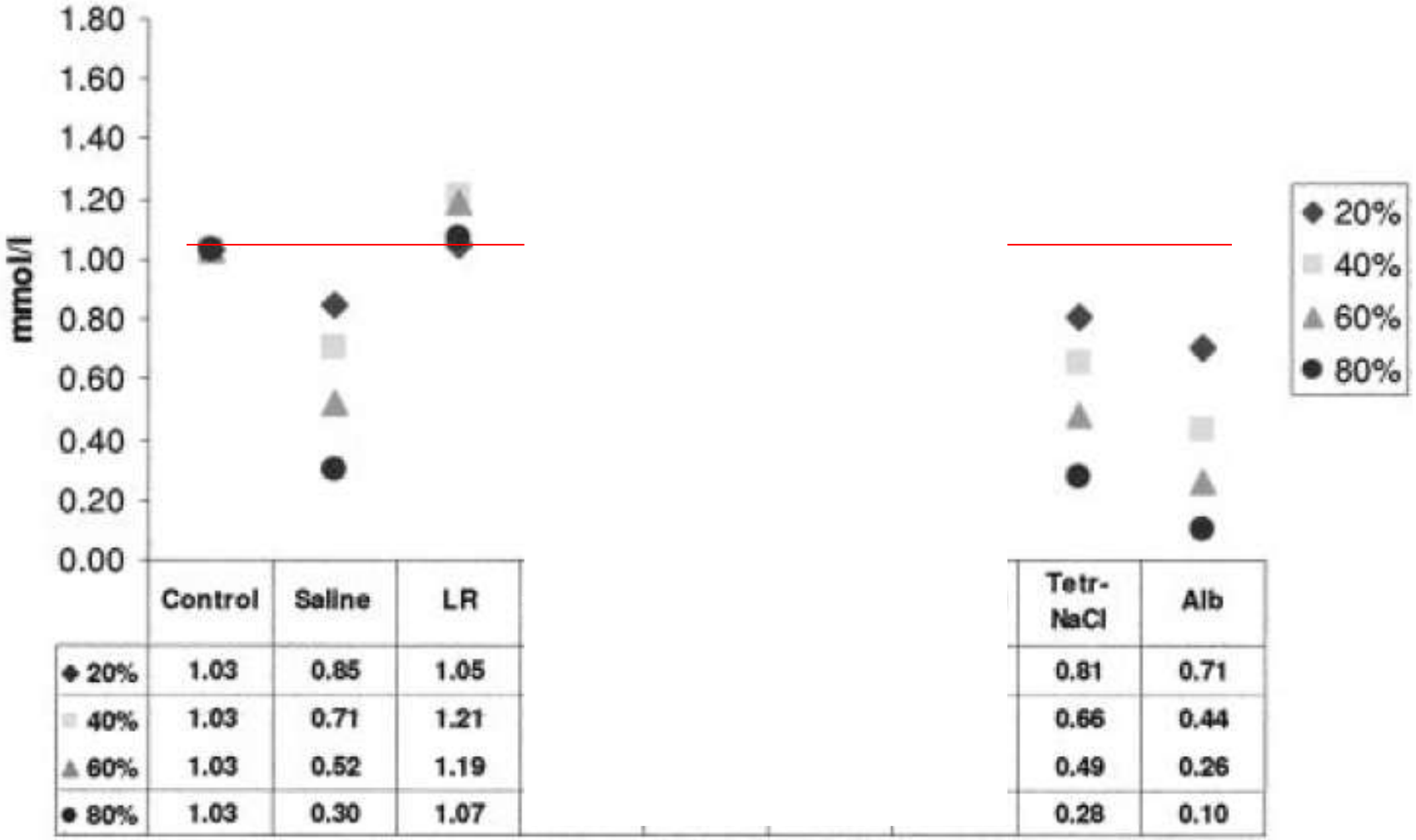






MEMODYLUCJA
20% - 40% - 60 %

Calcium Concentrations



	Control	Saline	LR	Tetr-NaCl	Alb
◆ 20%	1.03	0.85	1.05	0.81	0.71
■ 40%	1.03	0.71	1.21	0.66	0.44
▲ 60%	1.03	0.52	1.19	0.49	0.26
● 80%	1.03	0.30	1.07	0.28	0.10

Anesth Analg. 2006;102:1274-9

KOAGULOPATIA Z ROZCIEŃCZENIA

Efficacy of fibrinogen and prothrombin complex concentrate used to reverse dilutional coagulopathy—a porcine model

D. Fries[1]*, T. Haas[3], A. Klingler[3], W. Streif[4], G. Klima[5], J. Martini[1], H. Wagner-Berger[2] and P. Innerhofer[2]

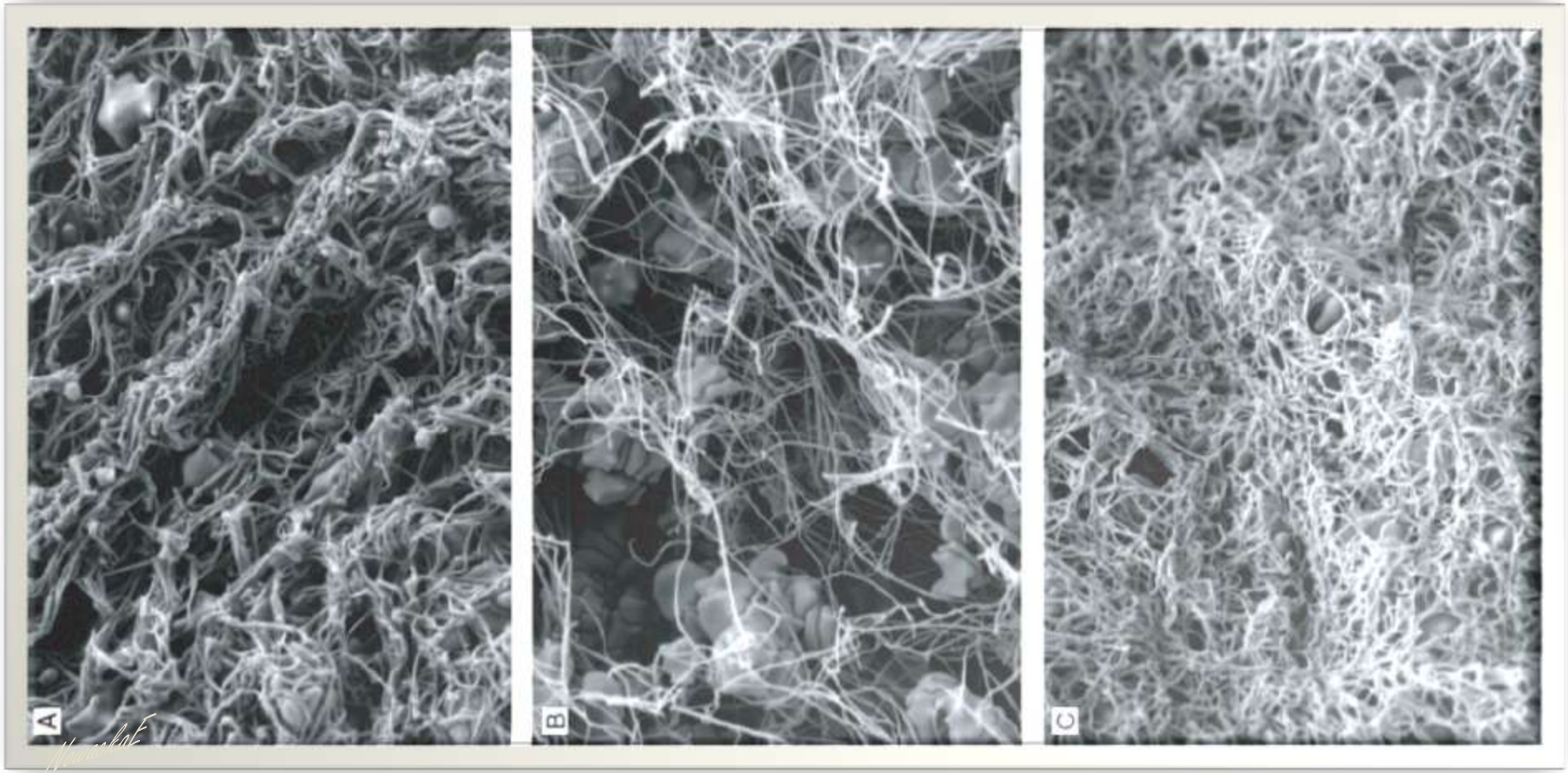
1. • **UTRATA 65% OBJĘTOŚĆI KRWI KRĄŻĄCEJ**
2. • **HES 130/04 – 2500 ml/30 min**
   • **0,9% NaCl – 2500 ml/30 min**
3. • **PCC – 35 j/kg**
   • **FIBRYNOGEN – 2 g**

HES A KOAGULOPATIA Z ROZCIEŃCZENIA

NORMA

HEMODYLUCJA
65% HES 130/04

PCC
+
FIBRYNOGEN



Mechanisms of hydroxyethyl starch-induced dilutional coagulopathy

C. FENGER-ERIKSEN,*† E. TØNNESEN,* J. INGERSLEV† and B. SØRENSEN†‡

*Departments of *Anaesthesiology and †Clinical Biochemistry, Centre for Haemophilia and Thrombosis, Aarhus University Hospital, Aarhus, Denmark; and ‡Centre for Haemostasis and Thrombosis, St Thomas' Hospital, London, UK*

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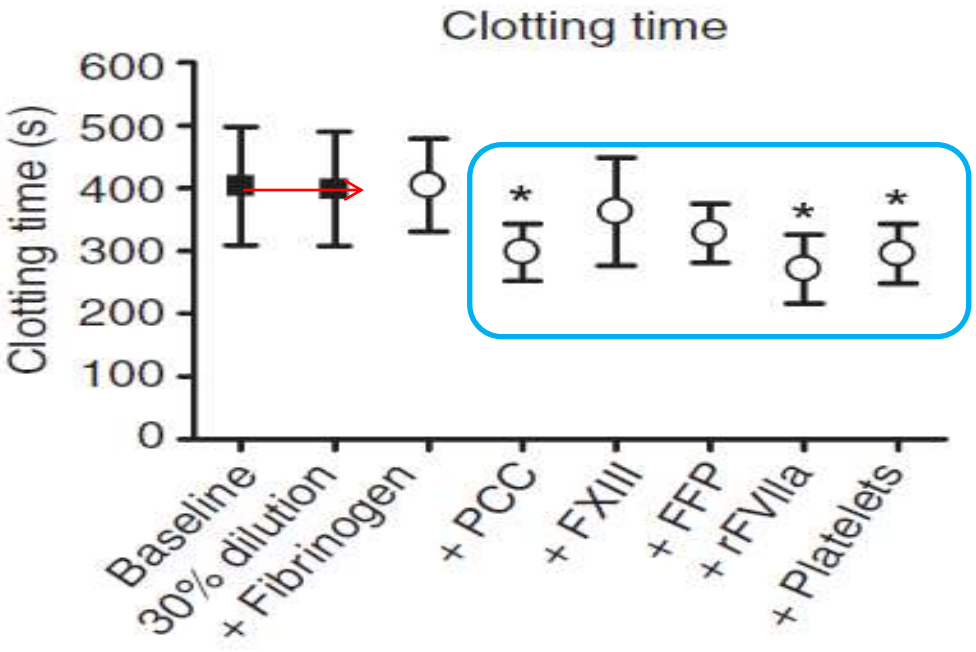
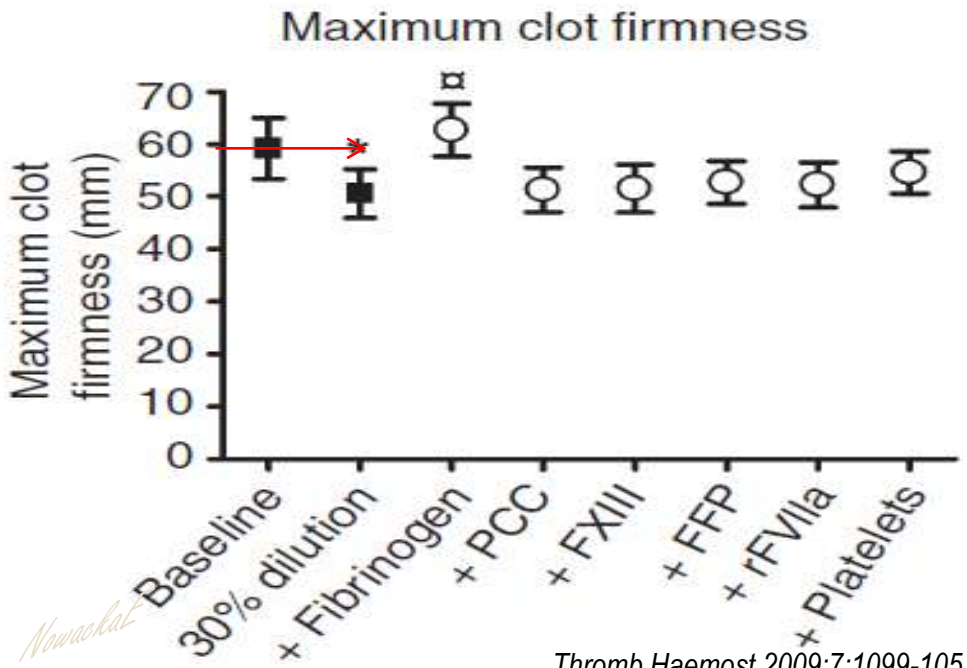
PRZED ROZPOCZĘCIEM BADANIA

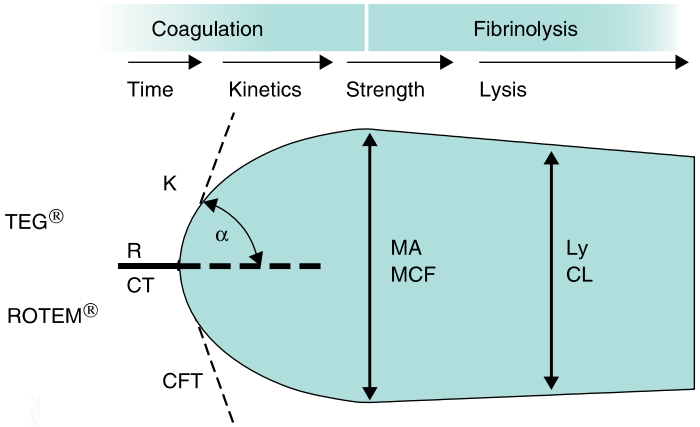
HES 130/04

HEMODYLUCJA 30%

Fibrynogen
PCC
Cz. XII
FFP
rVIIa
KKP







Thromb Haemost 2009;7:1099-105

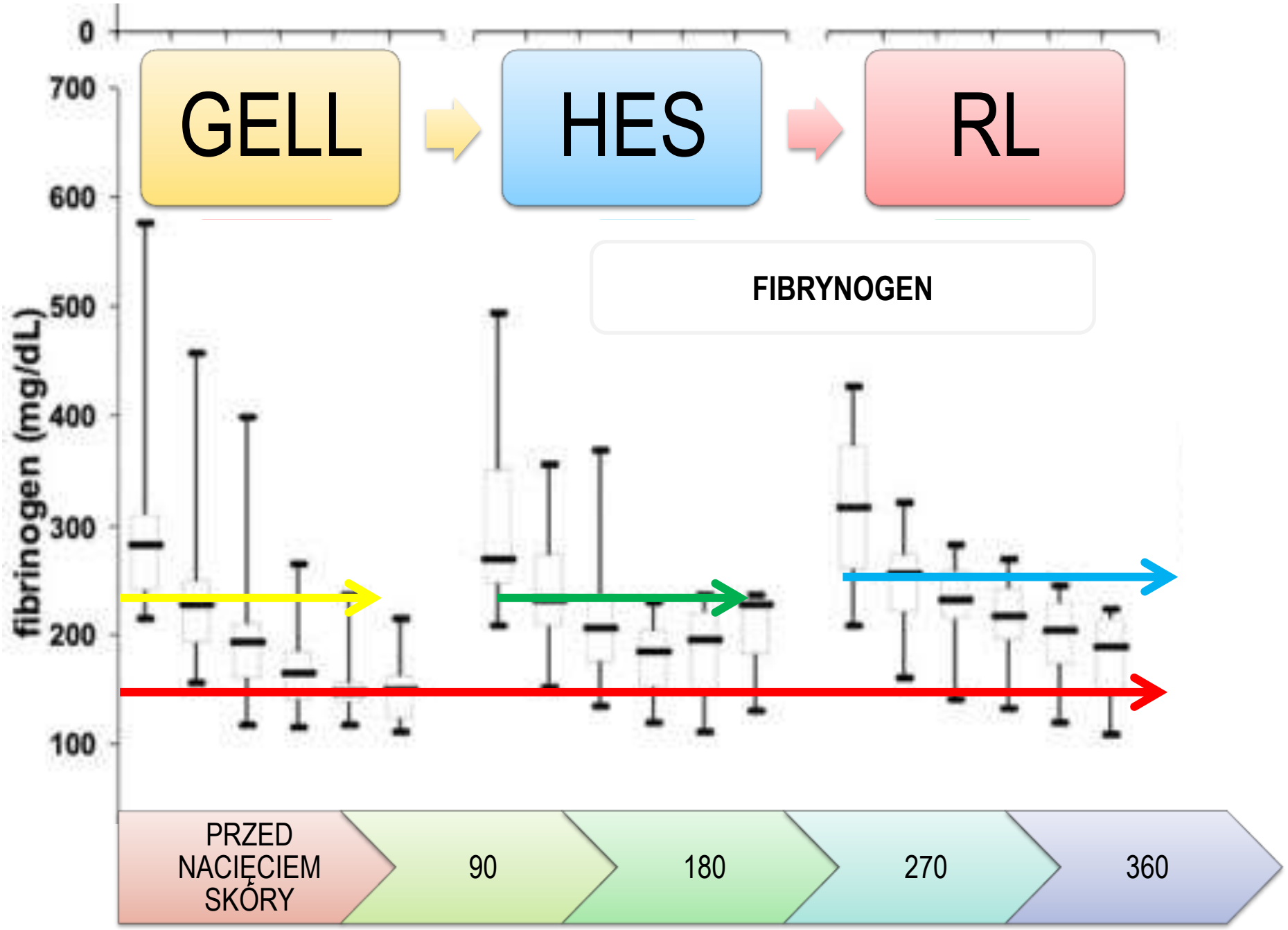
Hemostatic Changes After Crystalloid or Colloid Fluid Administration During Major Orthopedic Surgery: The Role of Fibrinogen Administration

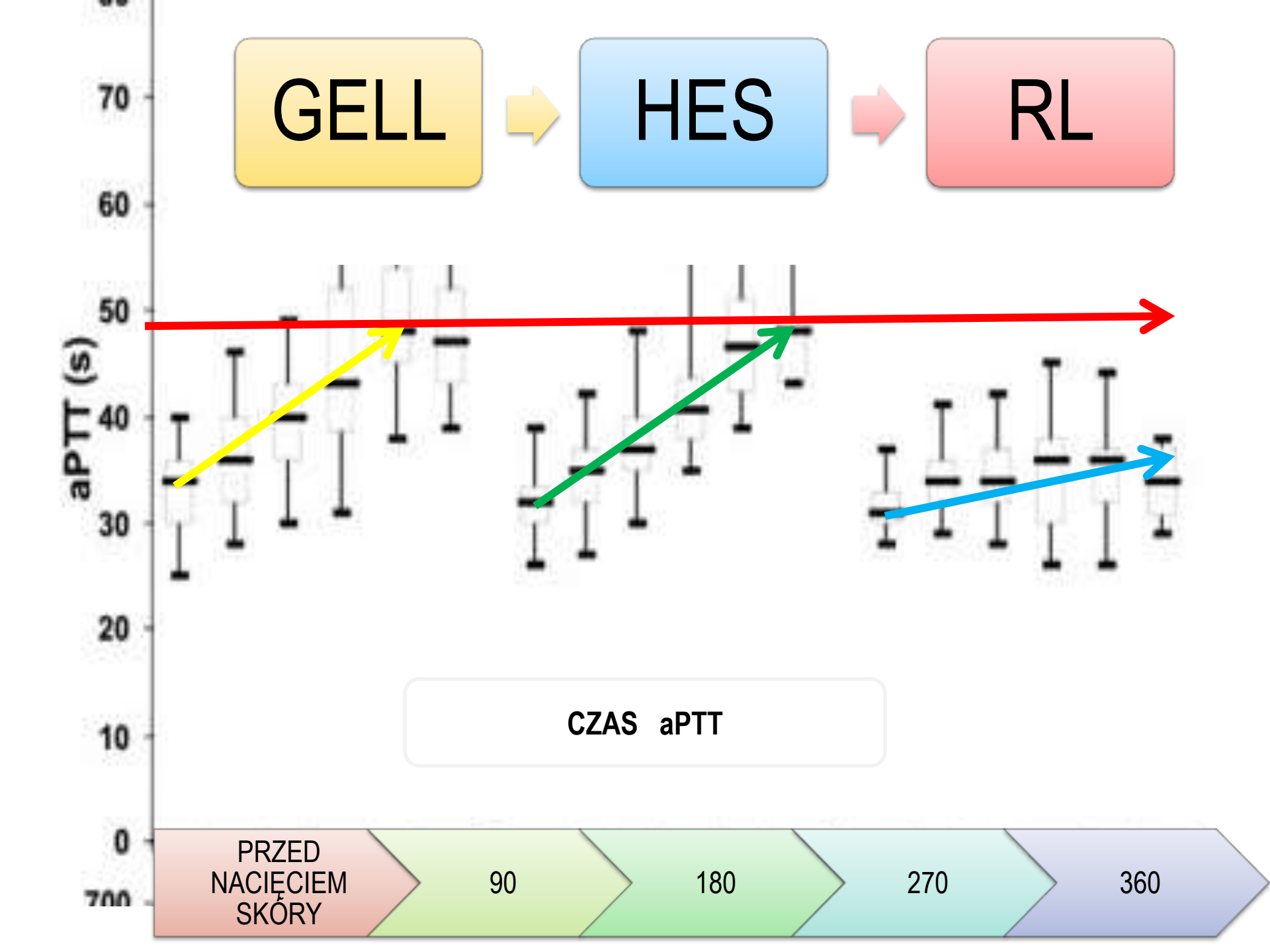
	Gelatin solution	Hydroxyethyl starch	Ringer's lactate solution
Age (yr)	50 (19–78)	47 (18–77)	47 (18–71)
Body weight (kg)	63 (50–112)	66 (40–116)	74 (54–98)
Height (cm)	167 (156–194)	165 (147–185)	171 (156–191)
Baseline calculated red cell volume (mL)	1026 (785–1742)	1044 (666–1986)	1243 (758–3347)
Calculated loss of red cell volume (mL)	526 (7–1559)	319 (4–1744)	296 (47–1064)
Number of patients transfused	8/21	3/19	1/20
Total red cell units transfused	13	9	2
Autologous salvaged red cell volume (mL)	94–572	50–394	200–395
Number of patients needing fibrinogen	7/21	6/19	0/20

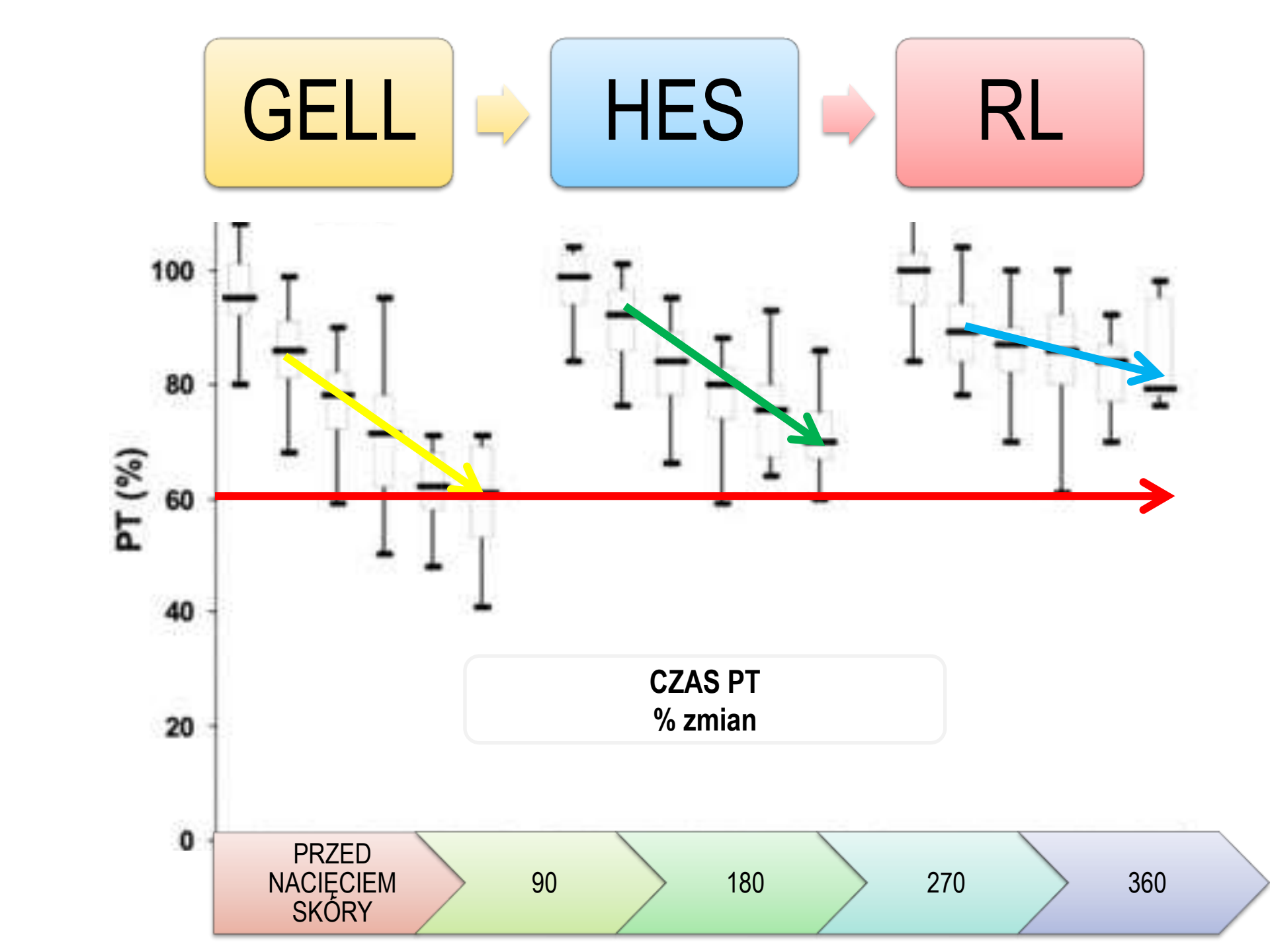
Number of patients per group (gelatin solution/ hydroxyethyl starch/Ringer's lactate solution)	21/19/21	21/19/21	20/18/21	14/10/12	6/5/6
Ringer's lactate solution (mL)					
Gelatin solution group	347 (250–567)	928 (683–1250)	1400 (970–2000)	1950 (1480–3220)	3000 (1800–4000)
Hydroxyethyl starch group	400 (253–700)	894 (546–1300)	1370 (804–2160)	1790 (1181–2500)	2091 (1500–3000)
Ringer's lactate solution group	1600 (700–2700)	3650 (1700–5500)	5890 (3500–9600)	8430 (6300–10860)	12200 (10000–13600)
Colloids (mL)					
Gelatin solution	562 (397–874)	1340 (1060–2001)	2210 (1660–3048)	3044 (2380–4195)	3680 (2960–5199)
Hydroxyethyl starch	420 (300–775)	1060 (656–1657)	1747 (1050–3100)	2196 (1484–3120)	2663 (1921–3660)
Estimated intraoperative blood loss					
Gelatin solution group		300 (50–1000)	850 (300–1800)	1150 (600–3600)	2000 (1200–3070)
Hydroxyethyl starch group		300 (0–1000)	800 (100–3200)	800 (250–3770)	1300 (600–2716)
Ringer's lactate solution group		200 (0–800)	500 (200–1650)	700 (400–3000)	1100 (800–3200)
MAP (mm Hg)					
Gelatin solution group	66 (53–102)	66 (53–89)	66 (55–87)	65 (55–77)	69 (50–82)
Hydroxyethyl starch group	75 (54–105)	68 (56–84)	67 (55–96)	64 (57–79)	66 (61–76)
Ringer's lactate solution group	65 (51–115)	68 (55–88)	65 (55–77)	69 (52–74)	62 (60–75)
Heart rate (bpm)					
Gelatin solution group	66 (43–91)	61 (47–88)	63 (49–94)	75 (50–94)	64 (51–90)
Hydroxyethyl starch group	69 (37–99)	64 (44–100)	69 (46–91)	75 (46–87)	71 (68–83)
Ringer's lactate solution group	69 (45–95)	68 (50–90)	66 (54–86)	75 (61–95)	68 (58–98)

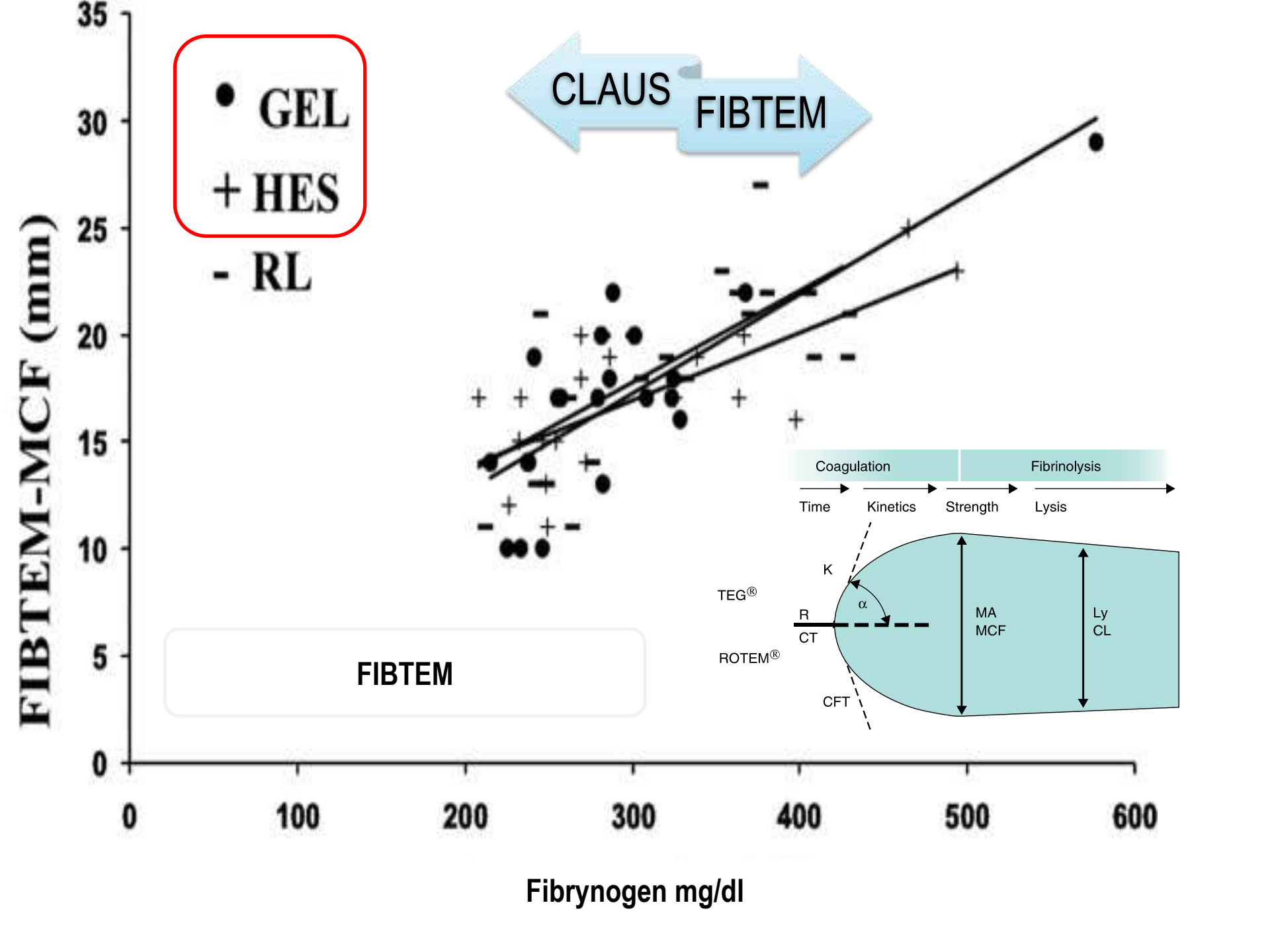
Values are median (min–max).

MAP = mean arterial blood pressure.


GELL
HES
RL
FIBRYNOGEN
fibrinogen (mg/dL)
0
700
600
500
400
300
200
100
PRZED NACIĘCIEM SKÓRY
90
180
270
360

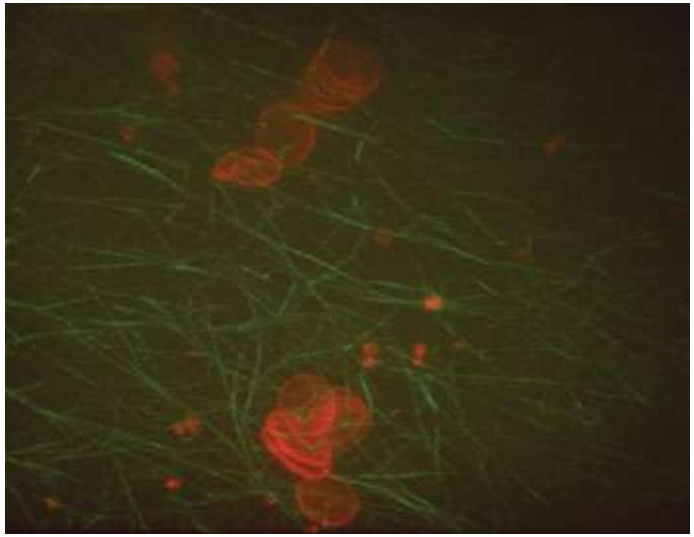

GELL
HES
RL
aPTT (s)
70
60
50
40
30
20
10
0
CZAS aPTT
PRZED NACIĘCIEM SKÓRY
90
180
270
360


GELL
HES
RL
100
80
60
40
20
0
PT (%)
CZAS PT
% zmian
PRZED NACIĘCIEM SKÓRY
90
180
270
360

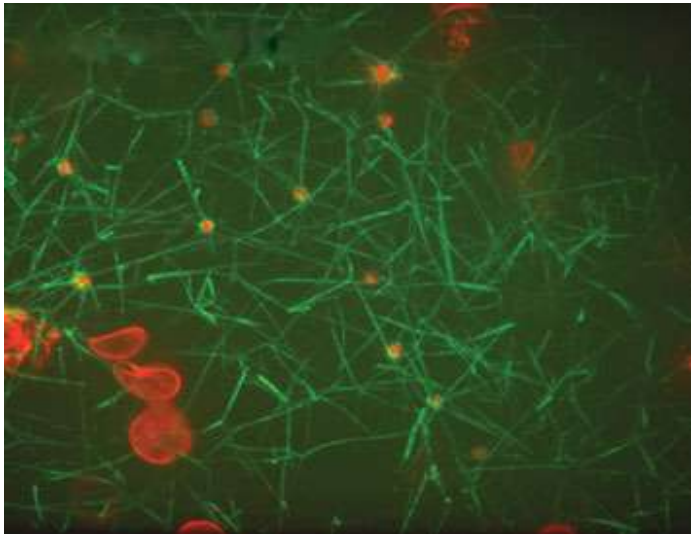

GEL
HES
RL
CLAUS
FIBTEM
FIBTEM-MCF (mm)
Fibrynogen mg/dl
0
5
10
15
20
25
30
35
0
100
200
300
400
500
600
FIBTEM
Coagulation
Fibrinolysis
Time
Kinetics
Strength
Lysis
TEG®
ROTEM®
K
α
R
CT
CFT
MA
MCF
Ly
CL

Emerging treatment strategies for trauma-induced coagulopathy

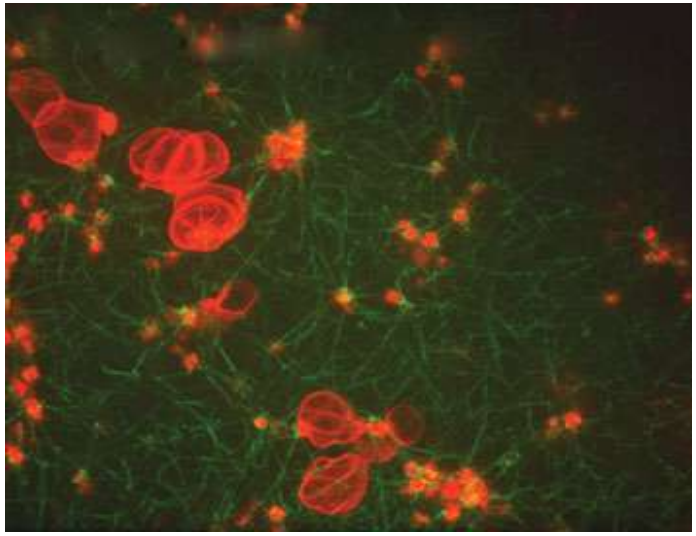
B. Sorensen[1] and D. Fries[2]



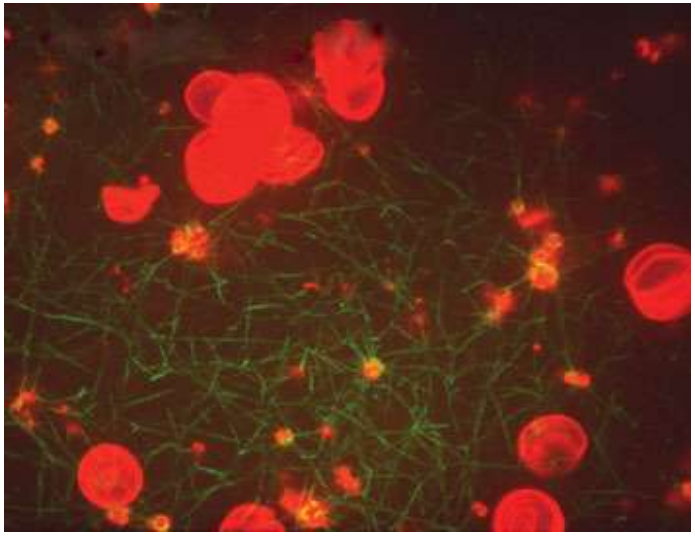
a Control



b Ringer's lactate



c Voluven®



d Gelofusine®

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

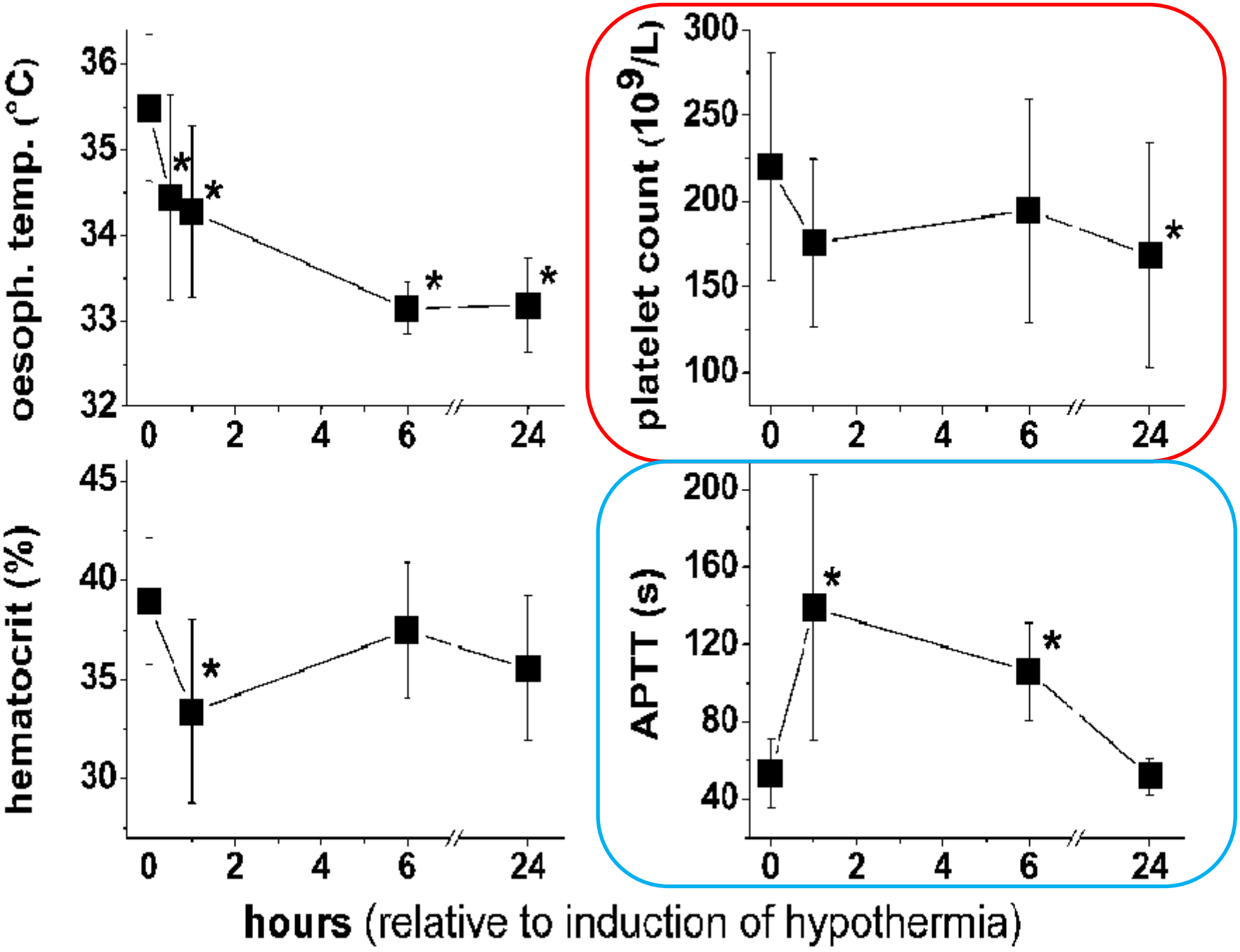
Clinical Paper

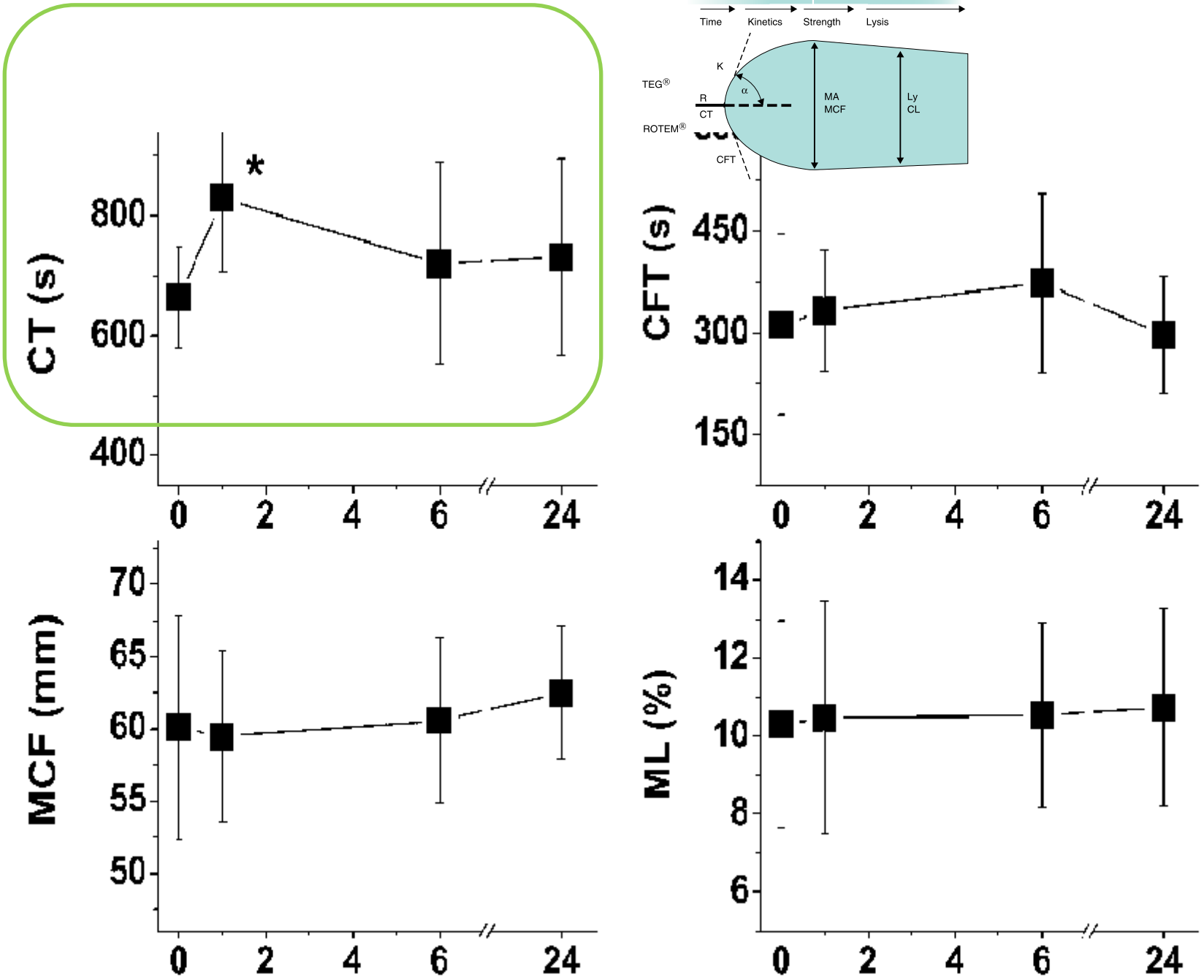
Hemostasis in cardiac arrest patients treated with mild hypothermia initiated by cold fluids☆

Alexander O. Spiel [a], Andreas Kliegel [b], Andreas Janata [b], Thomas Uray [b], Florian B. Mayr [a], Anton N. Laggner [b], Bernd Jilma [a,*], Fritz Sterz [b]

1. • KWALIFIKACJA DO BADANIA
   • Analiza Gazometria, Układ krzepnięcia, Tromboelastografia
2. • **WLEW 0,9% NaCl o temp 4*C – 30 ml/kg**
   • **WLEW RINGER LACTATE o temp 4*C – 30 ml/kg**
3. • **STOP - 33 * C**
   • **STOP - OBRZĘK PŁUC**
4. • **REDUKCJA WLEWU PŁYNÓW do 10 ml/kg**
   • **TEMPERATURA 34 *C**
5. • KONTROLA w 6 i 24 h

CPR related variables	
No flow time (min)	9 ± 23
Time from collapse to ROSC (min)	25 ± 21
Amount of epinephrine during CPR (mg)	1.7 ± 1.7
Defibrillations (*n*)	2.0 ± 1.6
Lactate on admission (mmol/l)	9.1 ± 5.8
pH-value on admission	7.20 ± 0.22
Laboratory values on admission	
Hemoglobin (g/dl)	12.9 ± 2.1
Platelet count (×10*9/l)	223 ± 66
Leukocyte count (×10*9/l)	13.0 ± 6.8
Fibrinogen (mg/dl)	407 ± 166
aPPT (s)	55 ± 34
PT (%)	76 ± 23
In-hospital therapy (during first 24 h)	


oesoph. temp. (°C)
36
35
34
33
32
0
2
4
6
24
*
hematocrit (%)
45
40
35
30
platelet count (10^9/L)
300
250
200
150
100
APTT (s)
200
160
120
80
40
hours (relative to induction of hypothermia)


Coagulation
Fibrinolysis
Time
Kinetics
Strength
Lysis
K
α
R
CT
TEG®
ROTEM®
CFT
MA
MCF
Ly
CL
CT (s)
800
600
400
*
CFT (s)
450
300
150
MCF (mm)
70
65
60
55
50
ML (%)
14
12
10
8
6
0
2
4
6
24

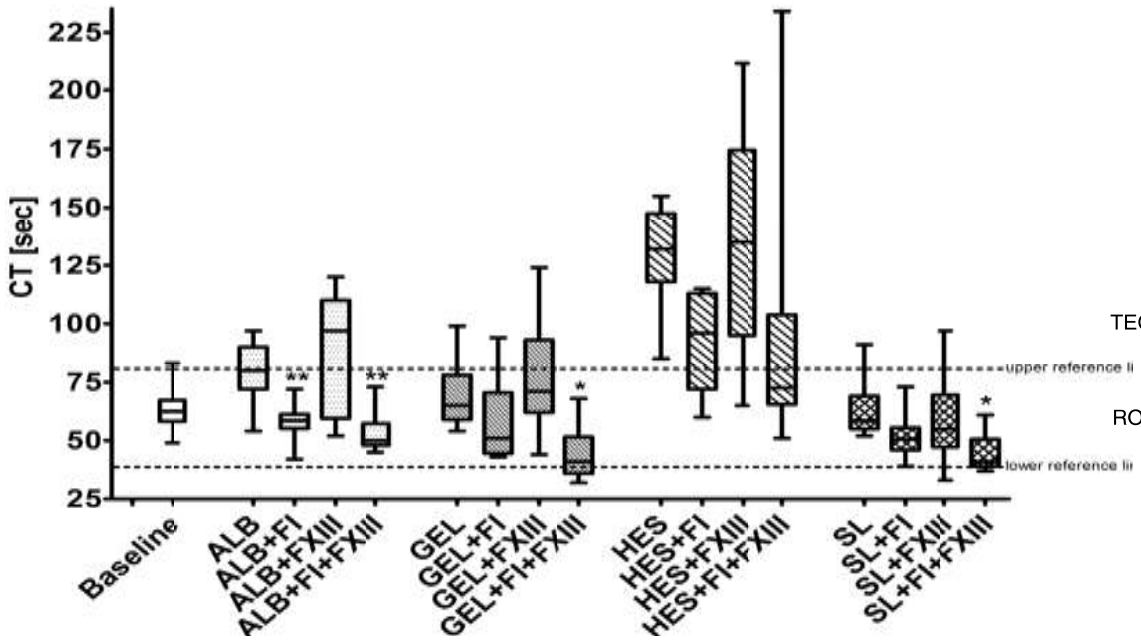
The effect of fibrinogen concentrate and factor XIII on thromboelastometry in 33% diluted blood with albumin, gelatine, hydroxyethyl starch or saline *in vitro*

Christoph Johannes Schlimp[1], Janne Cadamuro[2], Cristina Solomon[1], Heinz Redl[1], Herbert Schöchl[1,3]

1. • HEMODYLUCJA 33%
2. • ALB – GEL- HES - NaCl
3. • FIBRYNOGEN – 3 g
   • CZYNNIK XIII – 10 000 j
4. • ROTEM

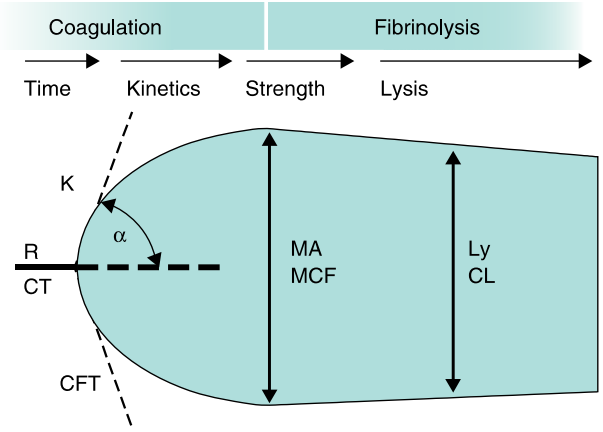
	Hct (%)	Plt (µL−1)	PT (s)	aPTT (s)	Fib (mg/dL)	FXIII (%)
Baseline	45±3	247±44	12.4±0,5	30.7±2.4	314±82	116±22
Dilution	30±3	168±31	16.9±1.2	39.1±3.5	163±48	61±12
% change	32±3%	32±9%	36±7%	27±5%	48±4%	47±2%
P-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

EXTEM CT: baseline, 33% dilution and addition of coagulation factors

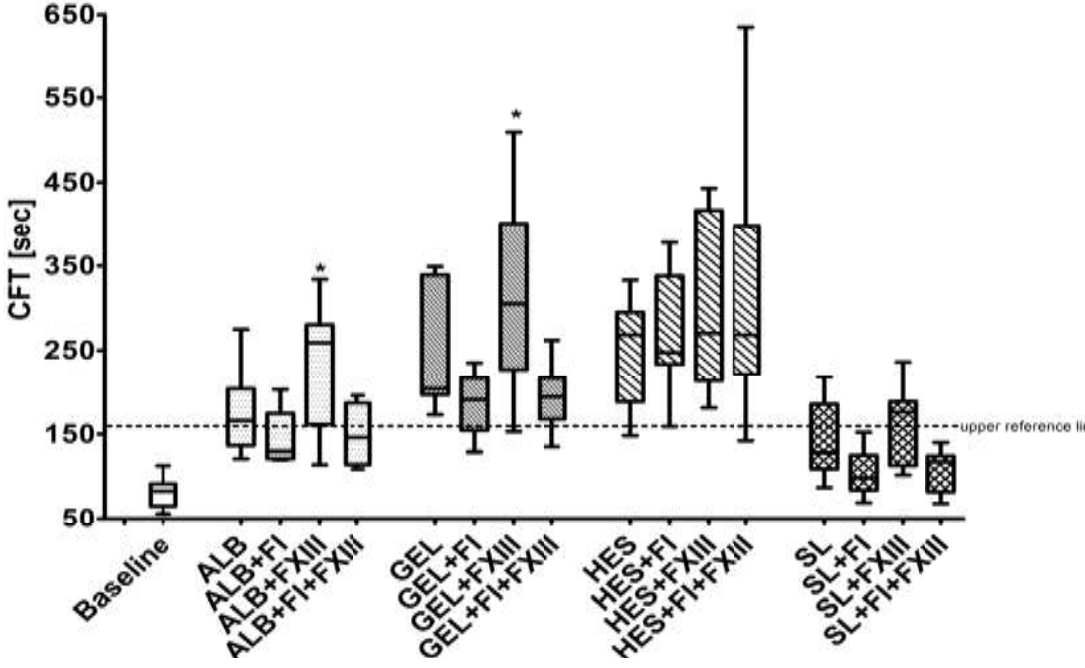


TEG®

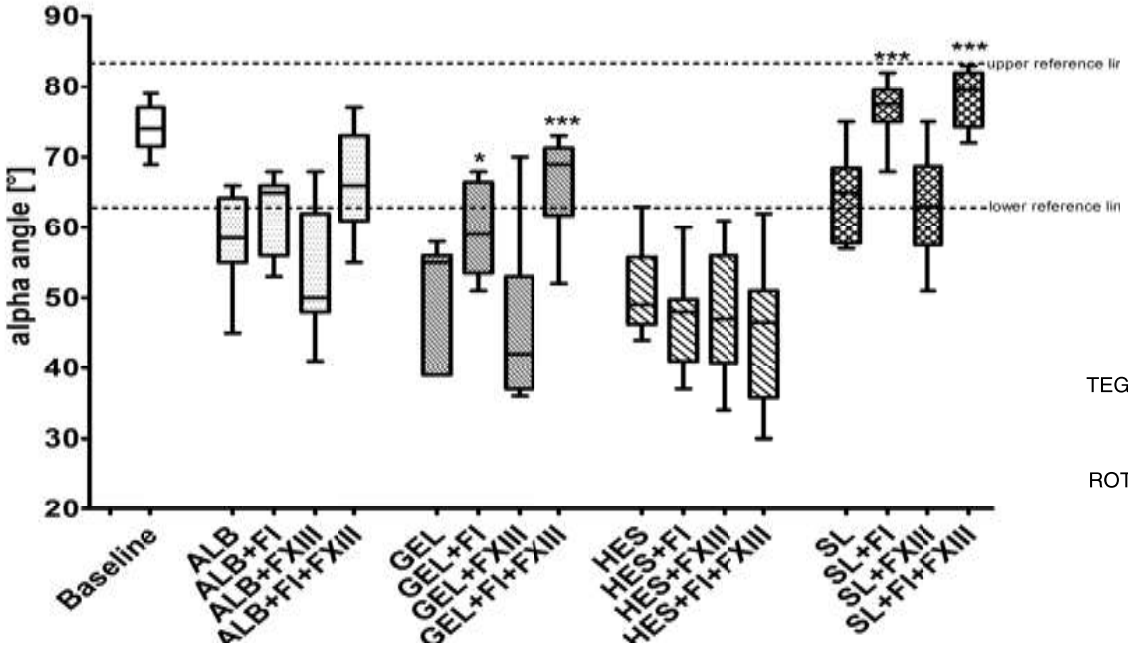
ROTEM®

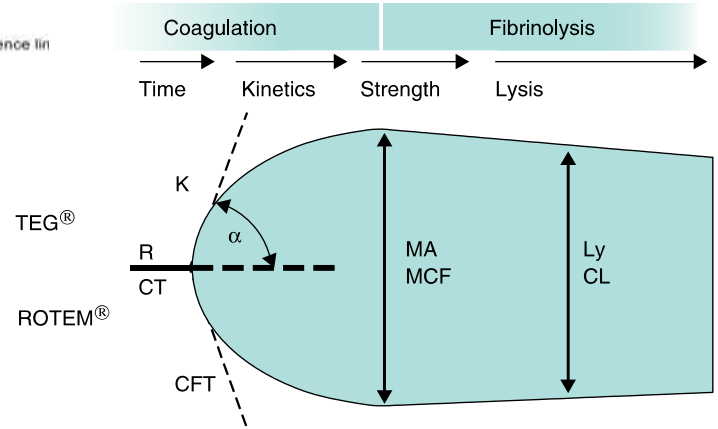


EXTEM CFT: baseline, 33% dilution and addition of coagulation factors

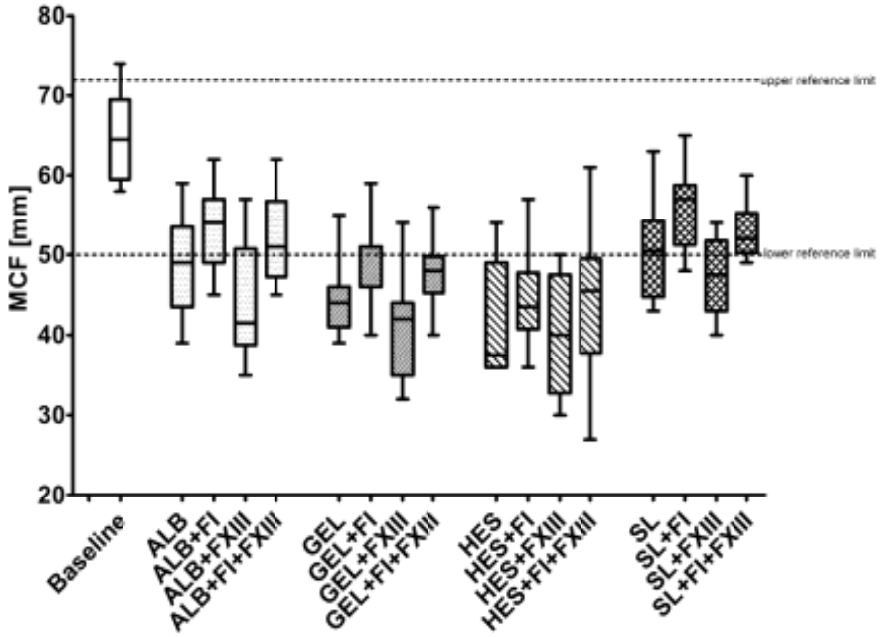


EXTEM alpha: baseline, 33% dilution and addition of coagulation factors





EXTEM MCF: baseline, 33% dilution and addition of coagulation factors



Blood
Disorders & Transfusion

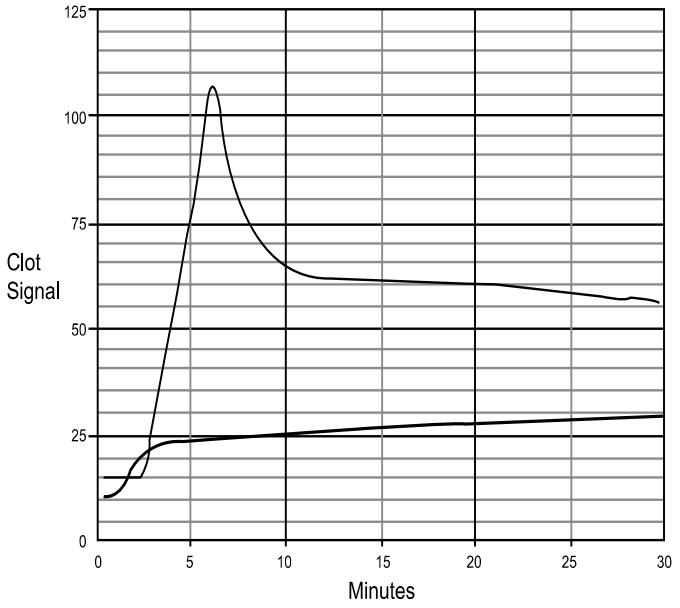
Lidgard. J Blood Disord Transfus 2011, 2:1
http://dx.doi.org/10.4172/2155-9864.1000106

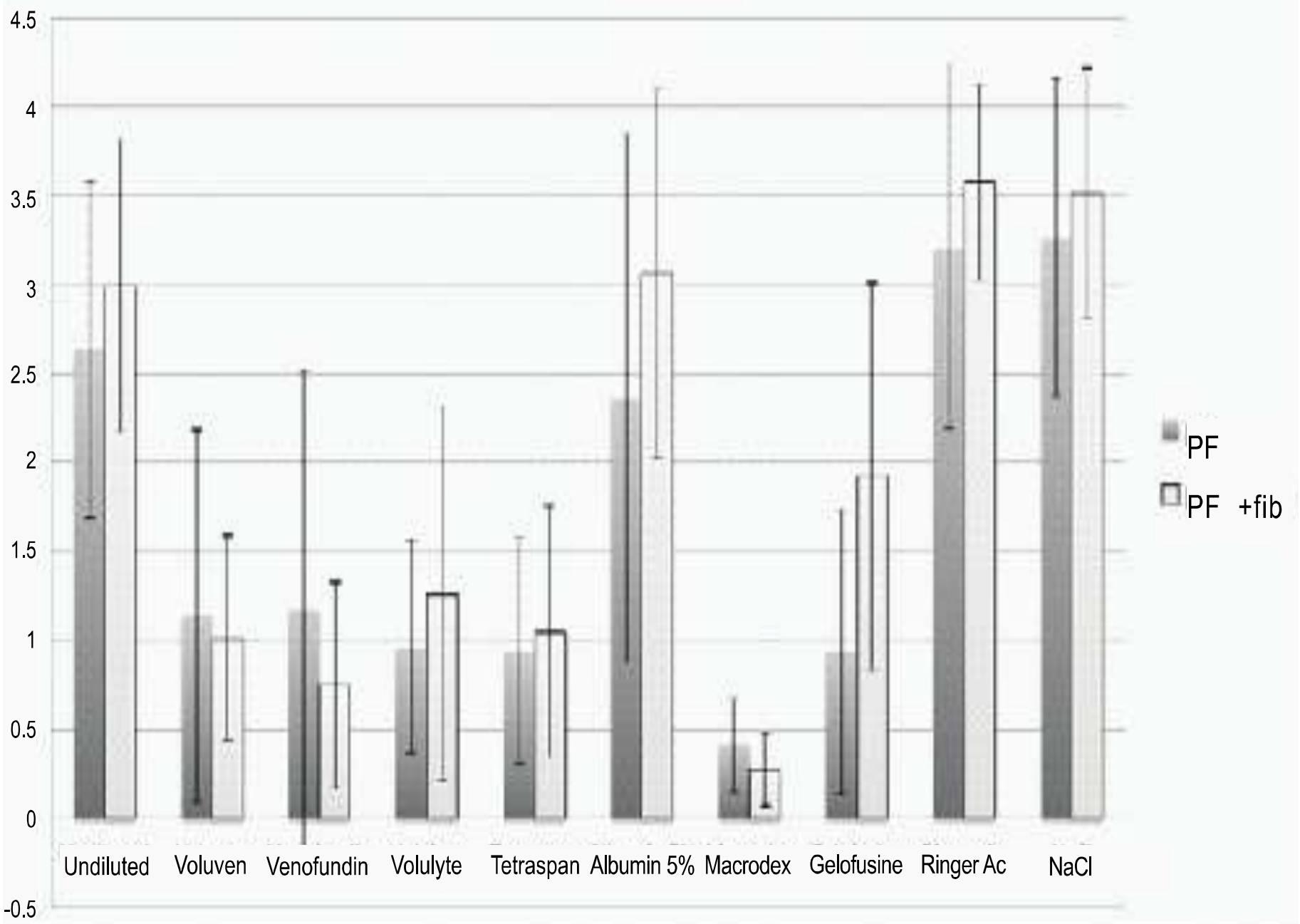
Research Article Open Access

Effects of High Dose Fibrinogen on *in vitro* Haemodilution with Different Therapeutic Fluids

Eric Lidgard[1], Attila Frigyesi[2] and Ulf Schött[3*]

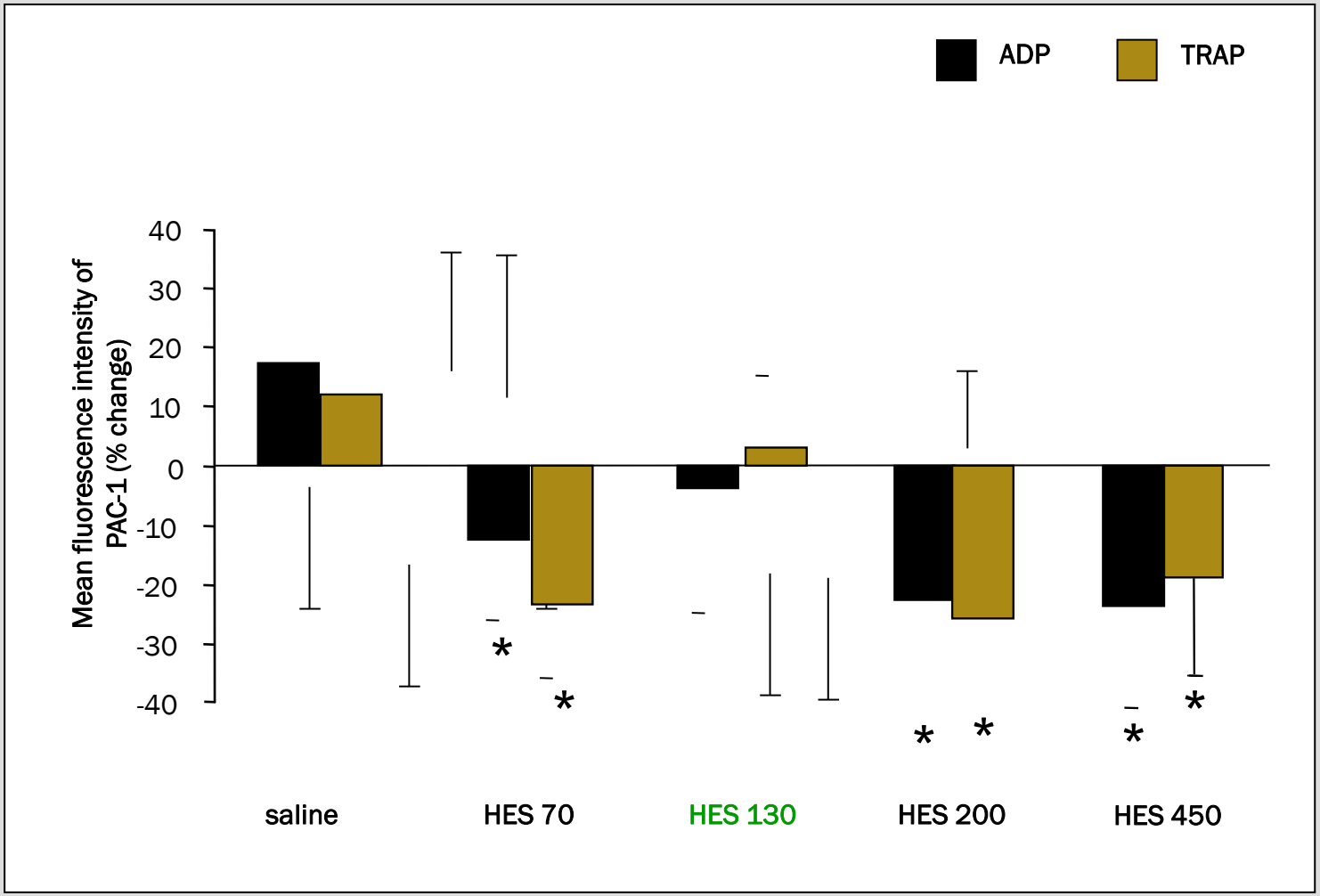
9 PŁYNÓW → **HEMODYLUCJA 50 %** → **FIBRYNOGEN**





OCENA FUNKCJI PŁYTEK

HES-Y A HEMOSTAZA PŁYTKOWA

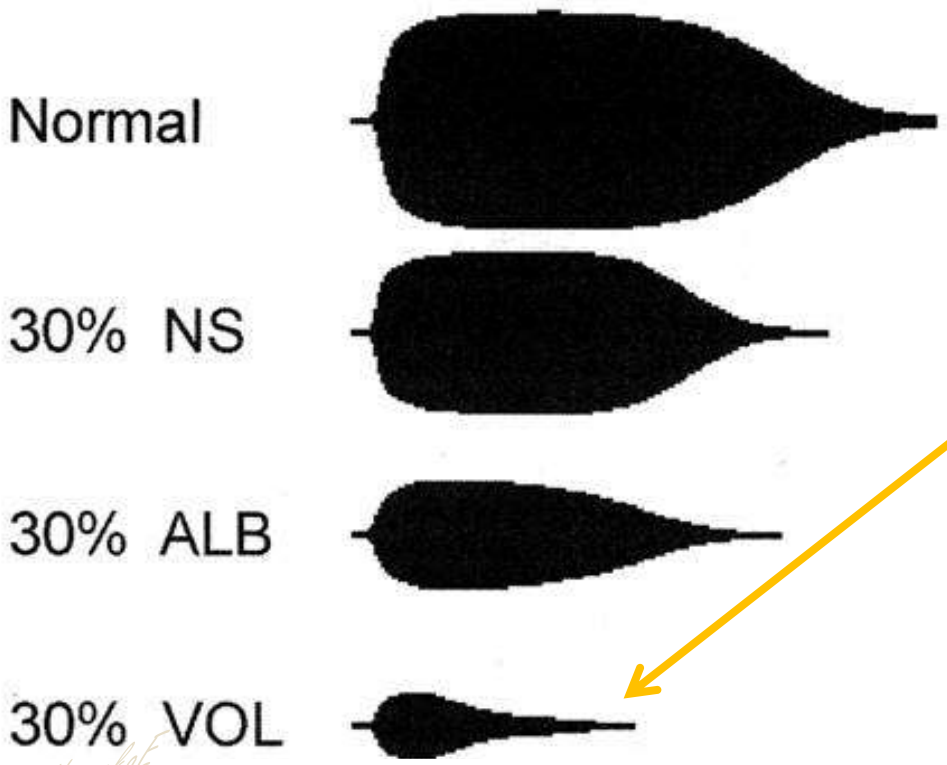


Franz. Anesth Analg 2001;92:1402-7

*p<0.05

KOLOIDY A HIPERFIBRYNOLIZA

30% HEMODYLUCJA I EKSPOZYCJA NA TKANKOWY AKTYWATOR PLAZMINOGENU



WNIOSEK

KOLOIDY
wzmożona fibrynoliza
w odpowiedzi na tPA

Nielsen. J Heart Lung Transplant 2006;25:1344-52
Mittermayr. Br J Anaesth 2008;100:307-14
Kozek Fracta 2009

KOLOIDY A HEMOSTAZA

- ↓ OSOCZOWE CZYNNIKI KRZEPNIĘCIA:
  - Czynnik VIII.
  - Czynnik von Willebranda (vWF).
  - Interakcja trombina-fibrynogen.
  - Interakcja czynnika XIII i polimerów fibryny.
- ↓ HEMOSTAZA PŁYTKOWA:
  - Glikoproteina IIb/IIIa.

Hetastarch > Pentastarch > Tetrastarch

(480 - 600/0,7) (200/0,5) (130/0,4-0,42)

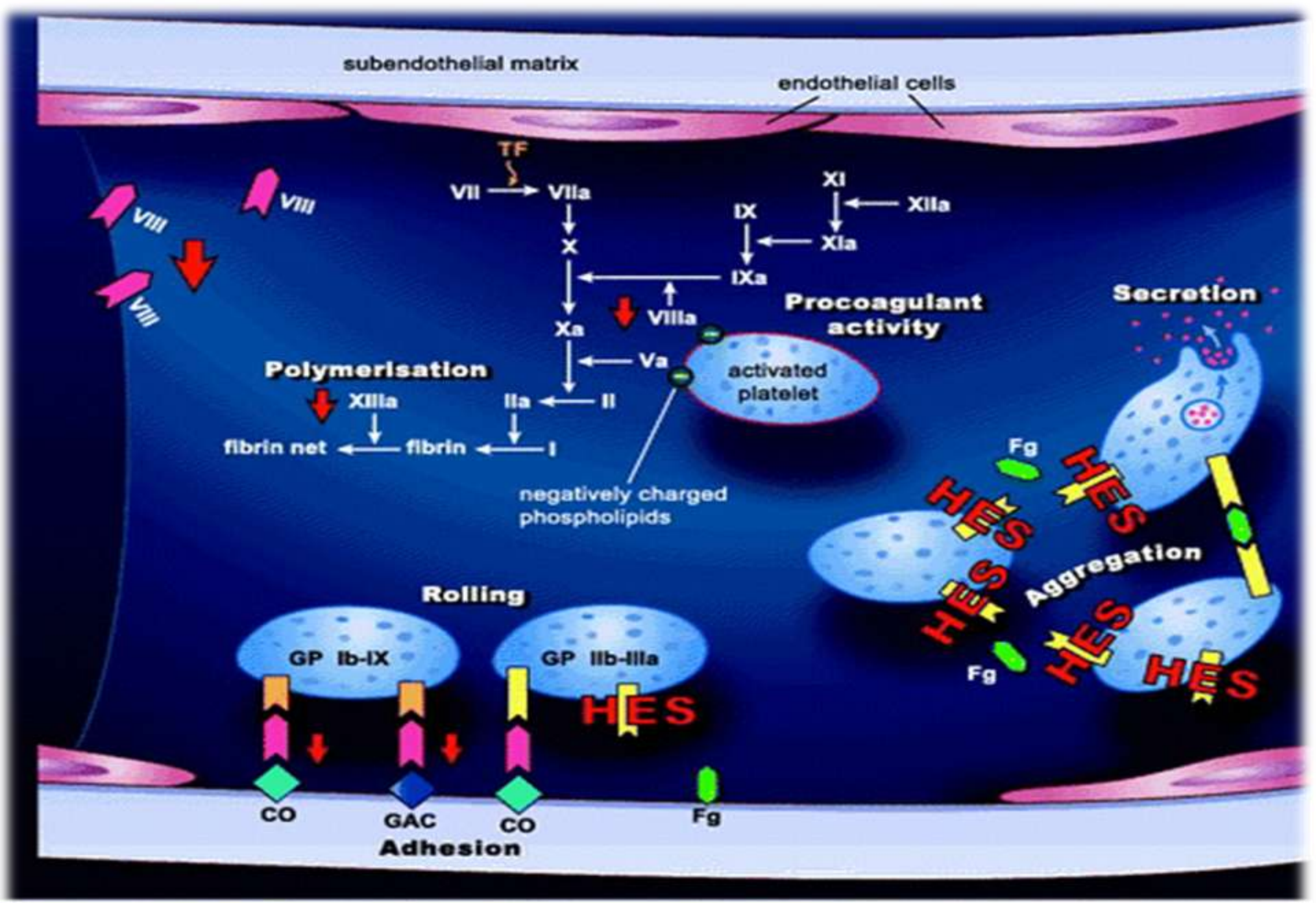
Dextran > Gelatin ≥ Tetrastarch

Semin Thromb Hemost 2007;33:810-815
Kozek FRACTA 2009
Yearbook of Int Care & Emer g Med 2009

Badany parametr	Wynik
Fibrinogen	Gel = HES = RL
Platelet count	Gel = HES = RL
vWF:RiCo	Gel * < HES = RL
F VIII	Gel * < HES * < RL
PT	Gel #* < HES = RL
aPTT	Gel * = HES * > RL
EXTEM CT	HES = Gel = RL
EXTEM alpha	HES #* < Gel * < RL
EXTEM A30	HES #* < Gel * < RL
FIBTEM MCF	HES #* < Gel * < RL

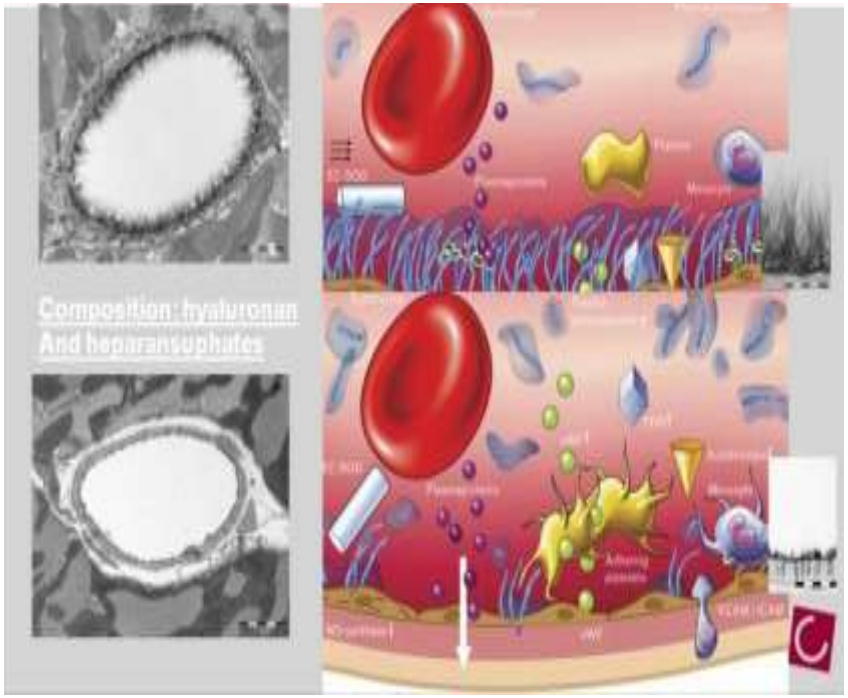
P < 0,05: * vs. RL; # vs. other colloids

Mittermayr. Anesth Analg 2007;105:905-17


subendothelial matrix
endothelial cells
TF
VII
VIIa
X
Xa
Va
II
IIa
I
fibrin
fibrin net
XIII
XIIIa
VIII
VIII
VIII
IX
IXa
XI
XIa
XIIa
VIIIa
Procoagulant activity
activated platelet
negatively charged phospholipids
Polymerisation
Secretion
Fg
HES
Aggregation
Rolling
GP Ib-IX
GP IIb-IIIa
CO
GAC
CO
Adhesion
Fg
vWF
decreased
HES
HES macromolecule

PŁYNOTERAPIA A HEMOSTAZA

- **Przemieszczenie skrzepów.**
- **Rozcieńczenie czynników krzepnięcia.**
- **Zniszczenie glikokaliksu:**
  - **Zakrzepica..**
- **Kwasica**
  - **Hiperchloremiczną (0,9% NaCl)**
  - **Z rozcieńczenia.**
- **Hipotermia**
  - **Większa utrata okołooperacyjna.**



CAN J ANESTH 2006 / 53: 6 / pp S30–S39

Kwasieborski. Europejskie wytyczne postępowania w krwawieniu poprzedzonym poważnym urazem - 2007 r.
Źródło: Management of bleeding following major trauma: a European guideline

WNIOSKI

KRYSTALOIDY

1. • HEMODYLUCJA
2. • < 40%
   • NADKRZEPLIWOŚĆ
3. • > 40%
   • NIEDOKRZEPLIWOŚĆ

KOLOIDY

1. • NIEDOKRZEPLIWOŚĆ
2. • HES
   • GELL