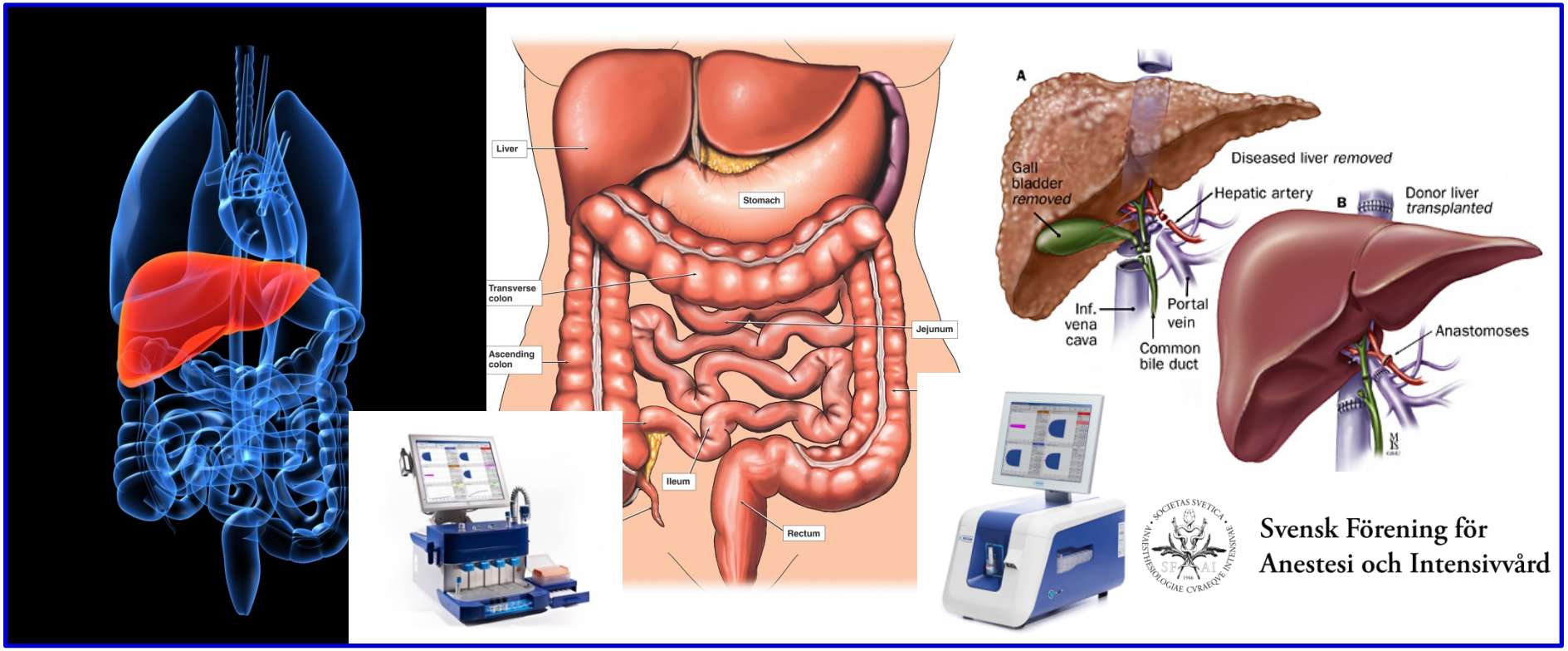


Koagulation och Monitorering: Leverkirurgi

SFAI-Veckan, Göteborg, Sweden, 11 September 2019

Klaus Görlinger, MD

Essen/Munich, Germany

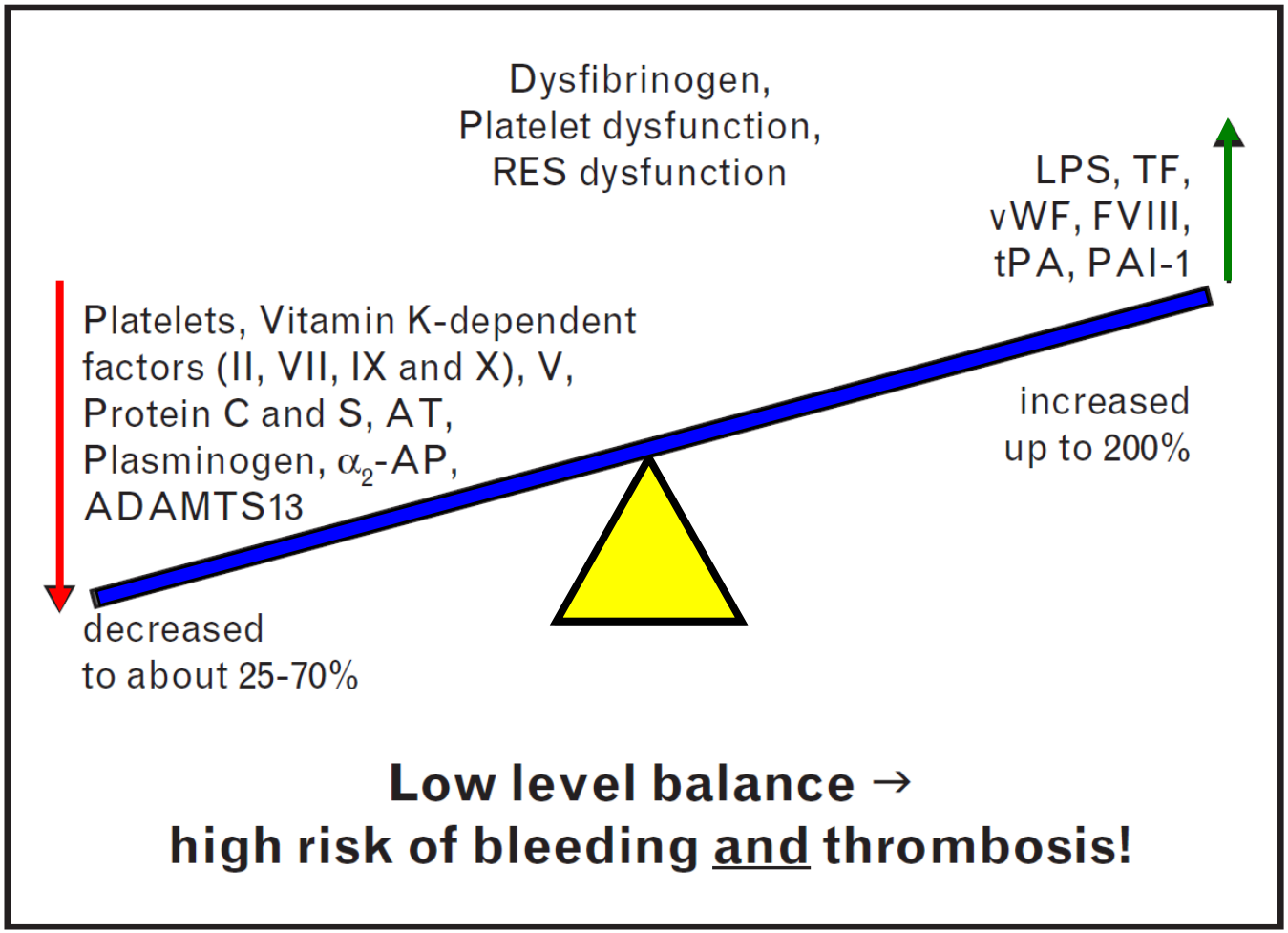
Disclosures

- Senior Consultant for Anesthesiology, Emergency and Intensive Care Medicine, Haemostaseology, and Pain Therapy
- Dec 1986 - June 2012: Senior Consultant at the Department of Anesthesiology and Intensive Care Medicine, **University Hospital Essen, Germany** (Trauma, Liver Transplant and Cardiac Surgery)
- 2010 - 2012: Chair of the Section Clinical Haemotherapy and Haemostasis Management of the German Interdisciplinary Association of Critical Care and Emergency Medicine (**DIVI**)
- 2010 - 2012: Member of the European Society of Anaesthesiology (**ESA**) Scientific Subcommittee Transfusion and Hemostasis and the Task Force / co-author of the **ESA Guidelines on the Management of Severe Perioperative Bleeding**
- Since July 2012, KG is the **Global Medical Director** of **Tem Innovations GmbH**, Munich, Germany.

Curr Opin Crit Care 2013, 19:142–148

Coagulation pattern in critical liver dysfunction

Eva Schaden[a], *Fuat H. Saner*[b], *and Klaus Goerlinger*[c]



Görlinger and Saner *BMC Anesthesiology* (2015) 15:86
DOI 10.1186/s12871-015-0074-0

BMC Anesthesiology

COMMENTARY Open Access

Prophylactic plasma and platelet transfusion in the critically Ill patient: just useless and expensive or even harmful?

Klaus Görlinger[1,2*] and Fuat H. Saner[3]

Data suggest that **30-90% of plasma transfused for these indications is unnecessary and puts the patient at risk.**
Plasma transfusion is associated with a high risk of transfusion-associated adverse events such as transfusion-associated circulatory overload (**TACO**), transfusion-related lung injury (**TRALI**), transfusion-related immunomodulation (**TRIM**), and anaphylaxis/allergic reactions.
Therefore, the authors believe that **thromboelastometry-based strategies should be implemented to optimize patient blood management in perioperative medicine.**

Anesth Analg. 2017 Aug;125(2):609-615.

Reduced Requirement for Prothrombin Complex Concentrate for the Restoration of Thrombin Generation in Plasma from Liver Transplant Recipients

Table 3. Thrombin Generation Parameters

Sample	Control	PCC (0.2 IU/mL)	PCC (0.4 IU/mL)	Plasma 10% vol	*P* Value
LT: T_0 (n = 28)					
Lag time (min)	2.0[a,b] (1.7–3.0)	1.7[c,d] (1.3–2.3)	1.7[c,d] (1.3–2.2)	2.0[a,b] (1.7–2.7)	<.001
Peak (nM)	186.1[a,b,d] (128.5–233.7)	271.7[b,c,d] (255.8–312.5)	365.5[a,c,d] (313.1–418.6)	193.0[a,b,c] (153.4–233.6)	<.001
ETP (nM × min)	1036[a,b] (821.5–1217)	1529[b,c,d] (1364–1854)	2086[a,c,d] (1786–2466)	973.2[a,b] (816.0–1097)	<.001
LT: T_1 (n = 28)					
Lag time (min)	1.8[a,b] (1.7–2.1)	1.3[c,d] (1.3–1.7)	1.7[c,d] (1.3–1.7)	1.7[a,b] (1.7–2.0)	<.001
Peak (nM)	120.7[a,b,d] (88.6–163.4)	249.6[b,c,d] (197.9–290.9)	336.6[a,c,d] (303.9–366.0)	150.5[a,b,c] (126.6–187.8)	<.001
ETP (nM × min)	830.3[a,b] (631.3–933.6)	1625[b,c,d] (1278–1871)	2190[a,c,d] (1889–2472)	845.3[a,b] (721.9–984.4)	<.001
Warfarin (n = 5)					
Lag time (min)	6.8[a,b,d] (6.0–7.6)	2.3[c,d] (2.2–2.8)	2.3[c,d] (2.0–2.5)	4.6[a,b,c] (4.1–4.8)	<.001
Peak (nM)	68.8[a,b] (43.3–86.1)	156.0[b,c,d] (141.1–164.4)	193.5[a,c,d] (191.3–204.8)	85.4[a,b] (58.6–99.6)	<.001
ETP (nM × min)	387.6[a,b] (228.0–437.2)	758.3[b,c,d] (576.9–772.8)	869.7[a,c,d] (773.3–947.4)	442.1[a,b] (284.2–488.7)	<.001

For each category (liver transplant T_0, liver transplant T_1, and warfarin), thrombin generation parameters were compared between 4 treatment groups (control, PCC 0.2 IU/mL, PCC 0.4 IU/mL, and plasma) using repeated-measures ANOVA. Individual treatment groups were then compared using paired *t* tests with a Bonferroni correction. A *P* value of <.008 was considered statistically significant after accounting for multiple comparisons.

Abbreviations: ETP, endogenous thrombin potential; LT, liver transplantation; PCC, prothrombin complex concentrate.

[a]Statistically significant difference from PCC 0.2 IU/mL.
[b]Statistically significant difference from PCC 0.4 IU/mL.
[c]Statistically significant difference from control.
[d]Statistically significant difference from plasma addition.

T_0 = baseline; T_1 = reperfusion

NOTE: 20 IU PCC/kg bw → 0.2 IU PCC/mL

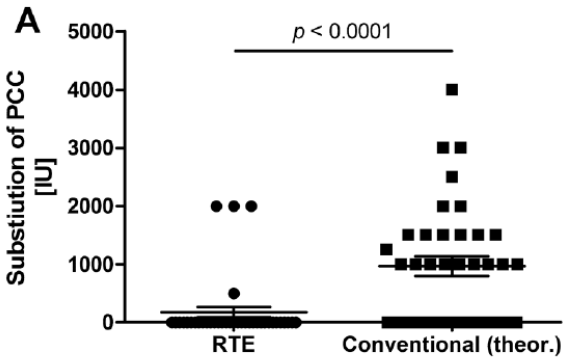
Management of acute-on-chronic liver failure: rotational thromboelastometry may reduce substitution of coagulation factors in liver cirrhosis

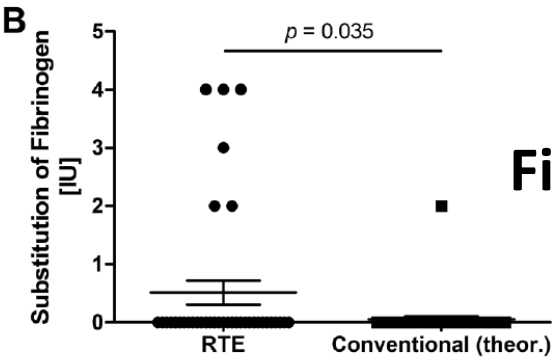
Gut 2016;**65**:357–358.

Sotiria Bedreli,[1] Jan-Peter Sowa,[1] Guido Gerken,[1] Fuat Hakan Saner,[2] Ali Canbay[1]

[1]Department of Gastroenterology and Hepatology, University Hospital, University Duisburg-Essen, Essen, Germany
[2]Department of General, Visceral and Transplantation Surgery, University Hospital, University Duisburg-Essen, Essen, Germany

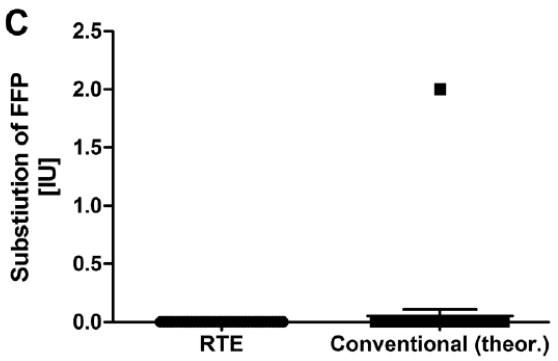
PCC

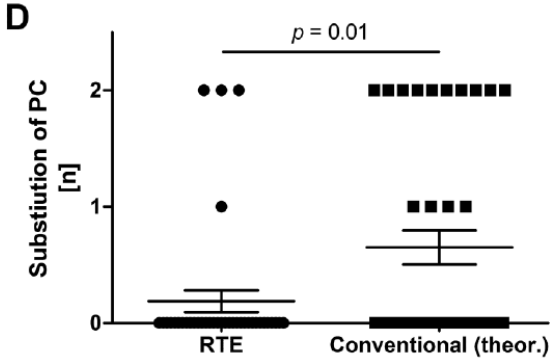




Fibrinogen

FFP





Platelets

Figure 1 Savings of coagulation factors due to rotational thromboelastometry (RTE) guided transfusion. Depicted are the amounts of actually substituted coagulation factors based on RTE measurements and amounts that would have been substituted under a regime of conventional assessment/transfusion protocols. Significant reduction was achieved for prothrombin complex concentrates (PCCs; A) and platelet concentrates (PCs; D). Fibrinogen was substituted in significantly more cases by the RTE-guided protocol than under conventional assessment (B), while no difference was found for substitution of fresh frozen plasma (FFP; C). IU, international units.

Management of acute-on-chronic liver failure: rotational thromboelastometry may reduce substitution of coagulation factors in liver cirrhosis

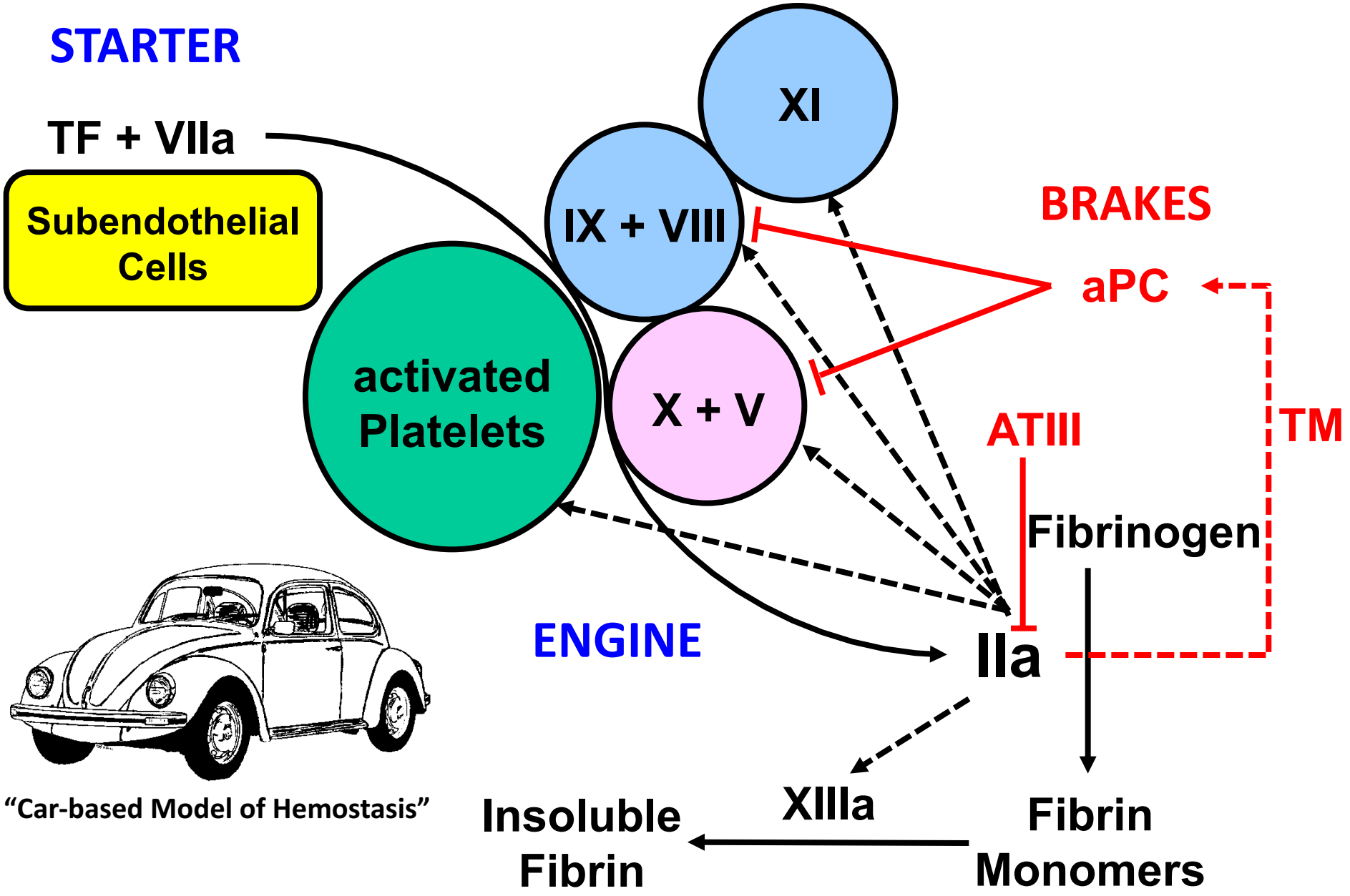
Gut 2016;**65**:357–358.

Sotiria Bedreli,[1] Jan-Peter Sowa,[1] Guido Gerken,[1] Fuat Hakan Saner,[2] Ali Canbay[1]

[1]Department of Gastroenterology and Hepatology, University Hospital, University Duisburg-Essen, Essen, Germany
[2]Department of General, Visceral and Transplantation Surgery, University Hospital, University Duisburg-Essen, Essen, Germany

In the described cohort, **supplementation of coagulation factors according to ROTEM** assessment of coagulopathy **significantly reduced transfused coagulation factors** compared with conventional methods.

This procedure was **not associated with any bleeding or thrombotic complications** and **reduced effective cost** in patient management, **releasing resources for other measures**.


STARTER
TF + VIIa
Subendothelial Cells
XI
IX + VIII
X + V
activated Platelets
BRAKES
aPC
ATIII
TM
Fibrinogen
ENGINE
IIa
XIIIa
Insoluble Fibrin
Fibrin Monomers
"Car-based Model of Hemostasis"

BJA

British Journal of Anaesthesia, 0 (0): 1–9 (2017)

doi: 10.1093/bja/aex122

Assessment of standard laboratory tests and rotational thromboelastometry for the prediction of postoperative bleeding in liver transplantation

T. M. Dötsch[1], D. Dirkmann[2], D. Bezinover[3], M. Hartmann[2], J. W. Treckmann[1], A. Paul[1] and F. H. Saner[1,*]

Conclusion

Our study demonstrates that ROTEM® analyses were better predictors of postoperative bleeding than SLTs in liver transplantation. ROTEM® variables corresponding to PT and aPTT provided similar predictive value, but variables reflecting fibrinogen polymerization were significantly superior with ROTEM® in comparison to plasma fibrinogen concentration, which failed to predict bleeding.

BJA

British Journal of Anaesthesia, 0 (0): 1–9 (2017)

doi: 10.1093/bja/aex122

Assessment of standard laboratory tests and rotational thromboelastometry for the prediction of postoperative bleeding in liver transplantation

Table 4 Accuracy of thromboelastometric and laboratory tests in predicting postoperative bleeding. The AUC and optimal cut-off (Youden index) with corresponding sensitivity (95% CI), specificity (95% CI), and positive and negative predictive values for the prediction of postoperative bleeding. A10, clot firmness after 10 min; aPTT, activated partial thromboplastin time; AUC, area under the receiver operating characteristic curve; CFT, clot formation time; CI, confidence interval; CT, clotting time; MCF, maximal clot firmness; NPV, negative predictive value; PPV, positive predictive value; PT, prothrombin time (Quick)

Parameter	AUC (95% CI)	Optimal cut-off	Sensitivity [% (95% CI)]	Specificity [% (95% CI)]	PPV	NPV
Standard laboratory tests						
PT (%)	0.623 (0.559–0.685); P=0.022	≤29	43 (26–63)	81 (75–86)	24.1	91
aPTT (s)	0.688 (0.625–0.746); P<0.0001	≥50.4	87 (69–96)	47 (40–54)	18.7	96.1
Fibrinogen (g litre^{-1})	0.531 (0.463–0.598); P=0.604	≤1.94	74 (54–89)	39 (32–46)	14.3	91.6
Platelet Count (nl^{-1})	0.541 (0.477–0.605); P=0.481	≤100	60 (41–77)	53 (46–60)	15.3	90.4
Thromboelastometric assays						
CT EXTEM® (s)	0.682 (0.619–0.741); P<0.0001	>65	87 (69–96)	56 (49–62)	22	96.7
CFT EXTEM® (s)	0.564 (0.499–0.628); P=0.28	≥181	43 (26–63)	74 (68–80)	19.4	90.1
A10 EXTEM® (mm)	0.58 (0.515–0.644); P=0.158	≤34	43 (26–63)	79 (73–84)	22.8	90.6
MCF EXTEM® (mm)	0.572 (0.506–0.636); P=0.211	≤43	33 (17–53)	84 (78–89)	23.3	89.7
CT INTEM® (s)	0.567 (0.501–0.631); P=0.196	≥194	90 (74–98)	30 (24–37)	15.9	95.4
CFT INTEM® (s)	0.615 (0.55–0.678); P=0.042	≥121	77 (58–90)	42 (35–49)	16.3	92.5
A10 INTEM® (mm)	0.596 (0.53–0.659); P=0.096	≤45	77 (58–90)	42 (35–49)	16.2	92.6
MCF INTEM® (mm)	0.583 (0.518–0.647); P=0.133	≤56	87 (69–96)	35 (28–42)	16.3	94.7
A10 FIBTEM® (mm)	0.636 (0.571–0.697); P=0.0077	≤13	90 (73–98)	33 (27–40)	15.9	95.8
MCF FIBTEM® (mm)	0.632 (0.567–0.694); P=0.0149	≤15	90 (73–98)	32 (26–39)	15.7	95.7

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British Journal of Anaesthesia, 0 (0): 1–9 (2017)

doi: 10.1093/bja/aex122

Table 2 Intra- and postoperative blood product and coagulation factor administration. Data are presented as the mean (SD) if normally distributed or as the median (25th–75th percentile). *$P<0.05$. FC, fibrinogen concentrate; FFP, fresh frozen plasma; PCC, 4-factor prothrombin complex concentrate; Plt, platelet concentrate (pooled or apheresis); RBCs, red blood cells

Parameter	Non-bleeding (n=213)	Bleeding (n=30)	P-value
Intraoperative			
RBCs (units)	0 (0–2)	2 (0–4)	0.098
FFP (units)	0 (0–0)	0 (0–2)	0.446
Plt (units)	0 (0–0)	0 (0–0)	0.86
PCC (IU)	0 (0–0)	0 (0–1000)	0.12
FC (g)	0 (0–3)	2.5 (0–4)	0.047*
Postoperative			
RBCs (units)	0 (0–0)	3 (2–4)	≤0.001*
FFP (units)	0 (0–0)	0 (0–0)	≤0.001*
Plt (units)	0 (0–0)	0 (0–2)	<0.001*
PCC (IU)	0 (0–0)	750 (0–2000)	<0.001*
FC (g)	0 (0–0.75)	2 (0–8)	<0.001*

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British Journal of Anaesthesia, 0 (0): 1–9 (2017)

doi: 10.1093/bja/aex122

Assessment of standard laboratory tests and rotational thromboelastometry for the prediction of postoperative bleeding in liver transplantation

Table 1 Patient characteristics and perioperative data of patient groups. Data are presented as the mean (SD) if normally distributed or as the median (25th–75th percentile) for non-normally distributed data. *P<0.05. FC, fibrinogen concentrate; FFP, fresh frozen plasma; FXIII, factor XIII concentrate; ICU, intensive care unit; MELD, model for endstage liver disease; PC, platelet concentrate; PCC, 4-factor prothrombin complex concentrate; RBC, red blood cells; RRT, renal replacement therapy

Parameter	Non-bleeding (*n*=213)	Bleeding (*n*=30)	P-value
Age (yr)	52 (11)	47 (12)	0.050
Sex (male/female)	128/85	16/14	0.481
BMI (kg m^{-2})	26 (5)	25 (6)	0.019
MELD	17 (9)	22 (10)	0.003*
Cold ischaemia time (min)	460 (153)	453 (136)	0.769
Warm ischaemia time (min)	30 (7)	30 (5)	0.994
Donor risk index	1.7 (0.3)	1.7 (0.4)	0.801
Early allograft dysfunction (%)	32	47	0.124
Number of patients receiving FXIII	7/213	6/30	≤0.002*
Dose of norepinephrine on admission (μg kg^{-1} min^{-1})	0.34 (0.2–0.6)	0.63 (0.4–1.4)	<0.001*
Preoperative RRT (%)	12	15	0.407
Postoperative RRT (%)	25	67	<0.001*
ICU stay (days)	4.9 (2.5–10.4)	7.5 (3.1–11.7)	0.136
Ventilation time (h)	20.1 (8–59)	77.3 (47–153.5)	<0.001*
Hospital stay (days)	19.8 (15.8–28.5)	19.5 (9.9–32.9)	0.8
30 day mortality (%)	12.2	30	0.01*

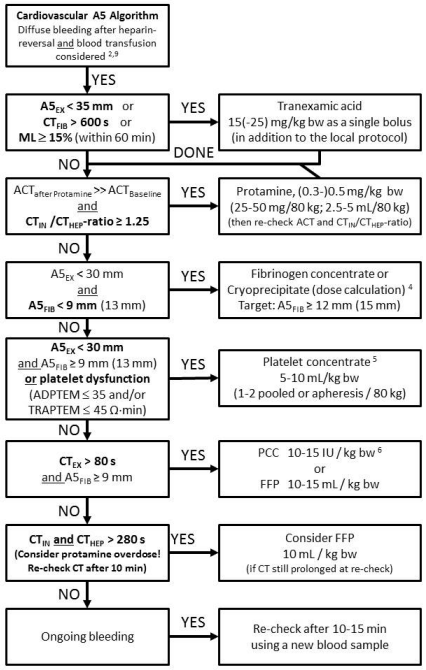
KJA
Korean Journal of Anesthesiology
Korean J Anesthesiol.
2019 August; 72(4): 297-322.

Review Article
pISSN 2005-6419 · eISSN 2005-7563

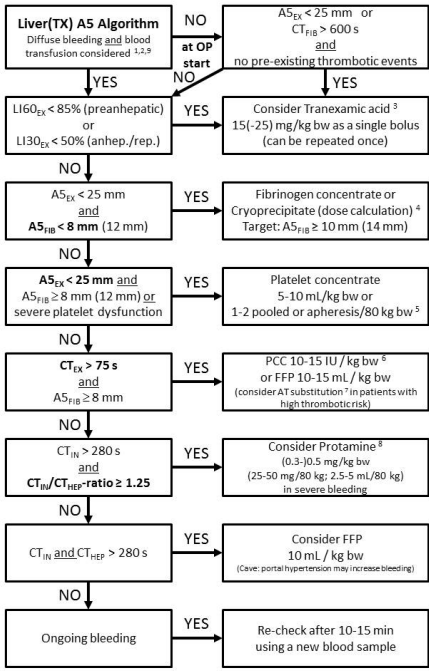
The role of evidence-based algorithms for rotational thromboelastometry-guided bleeding management

Klaus Görlinger[1,2], Antonio Pérez-Ferrer[3], Daniel Dirkmann[1], Fuat Saner[4], Marc Maegele[5,6], Ángel Augusto Pérez Calatayud[7], and Tae-Yop Kim[8]

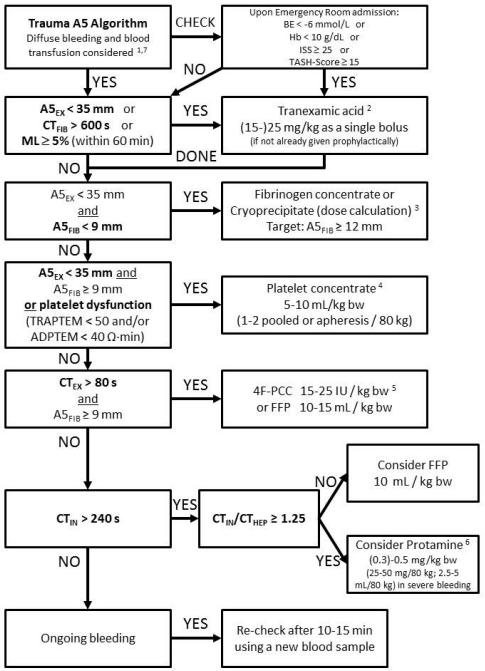
Cardiovascular



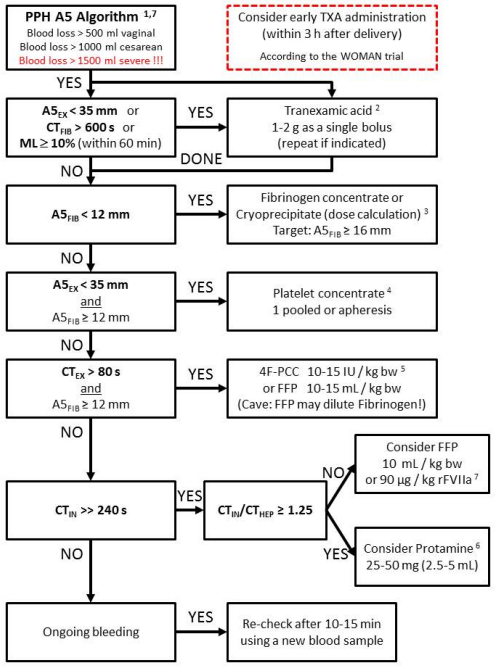
Liver/Abdominal



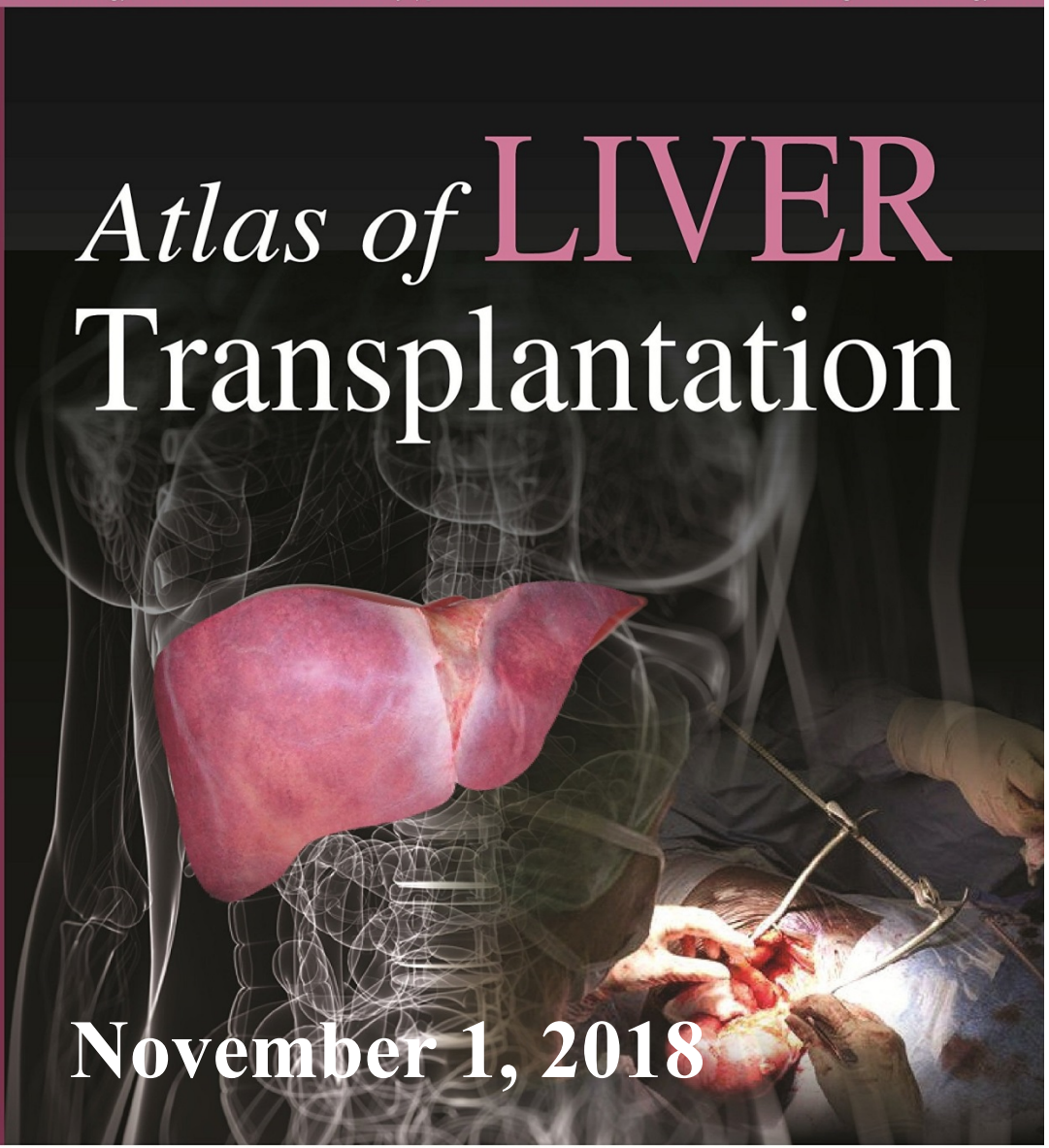
Trauma/Orthopedics



Obstetrics/PPH



Atlas of LIVER Transplantation

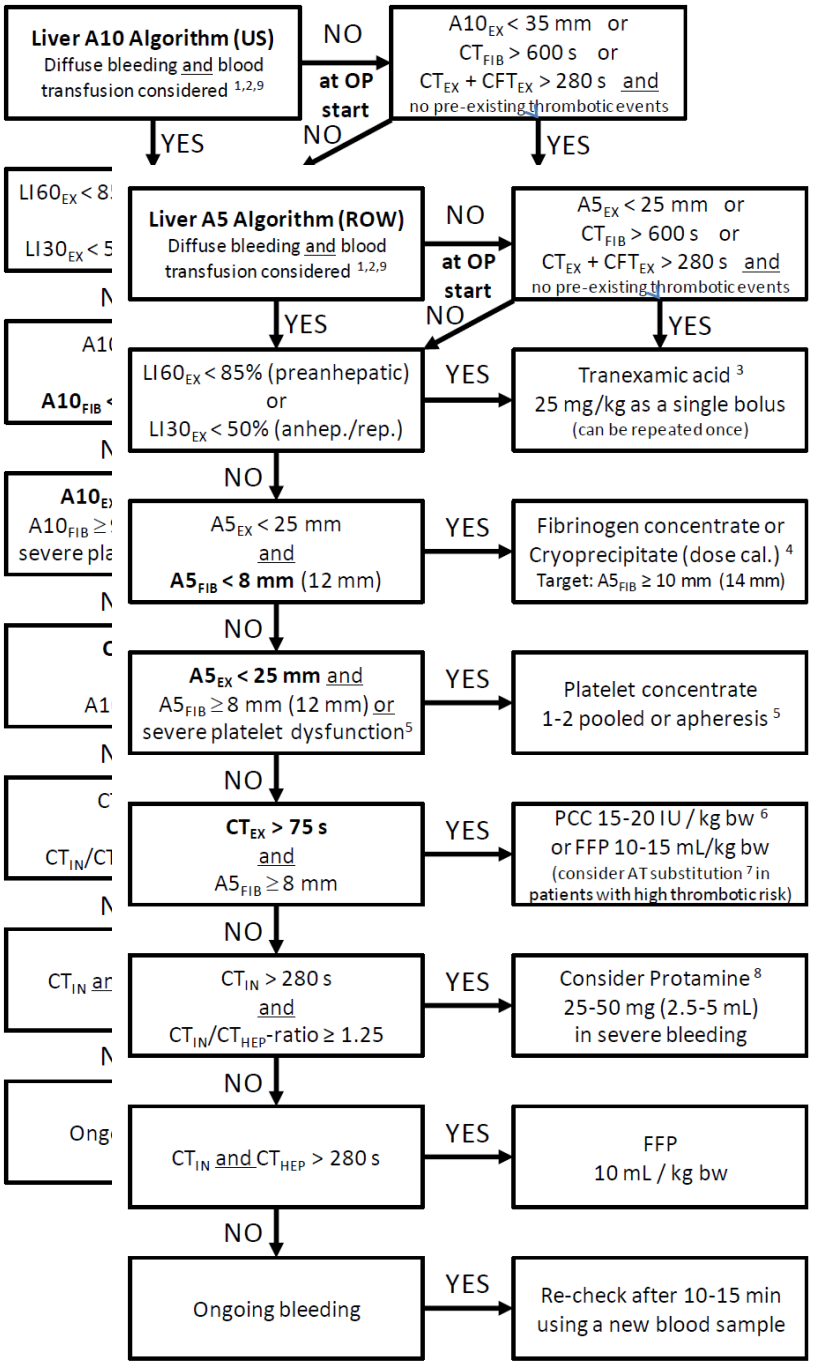


November 1, 2018

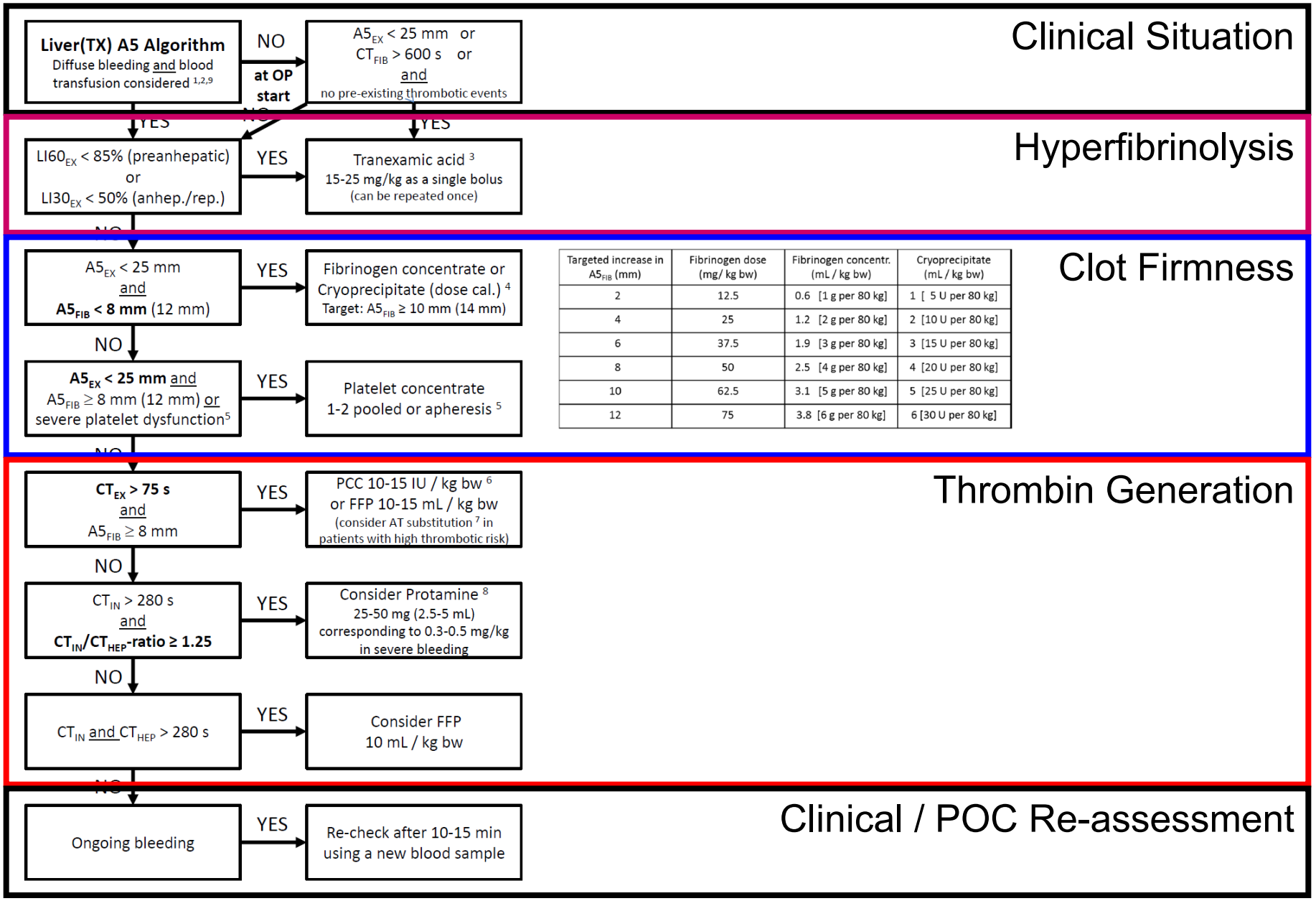
Ernesto Molmenti
Eduardo de Santibañes
Martin de Santibañes

2nd Edition

JAYPEE

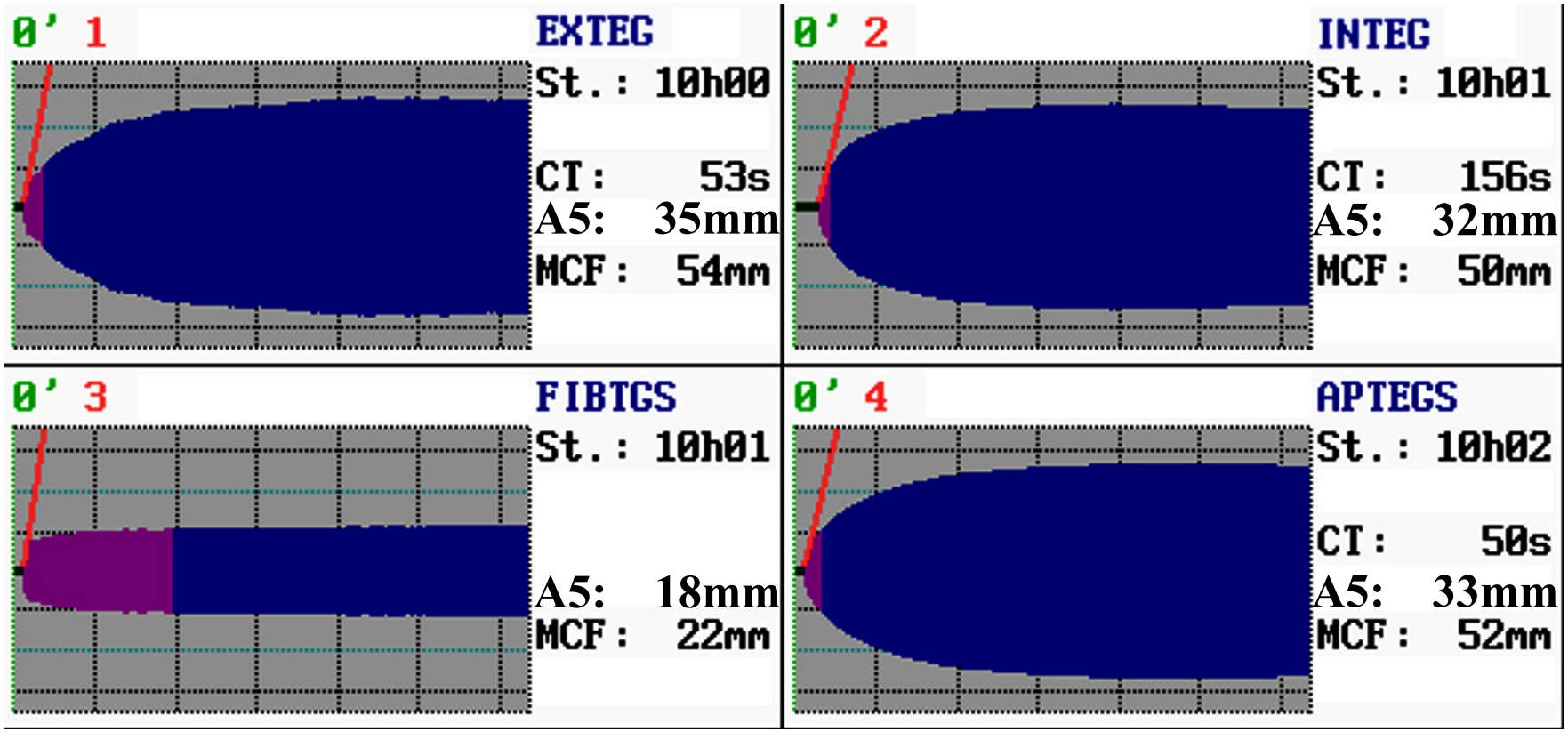


Evidence-based ROTEM A5 Liver Algorithm



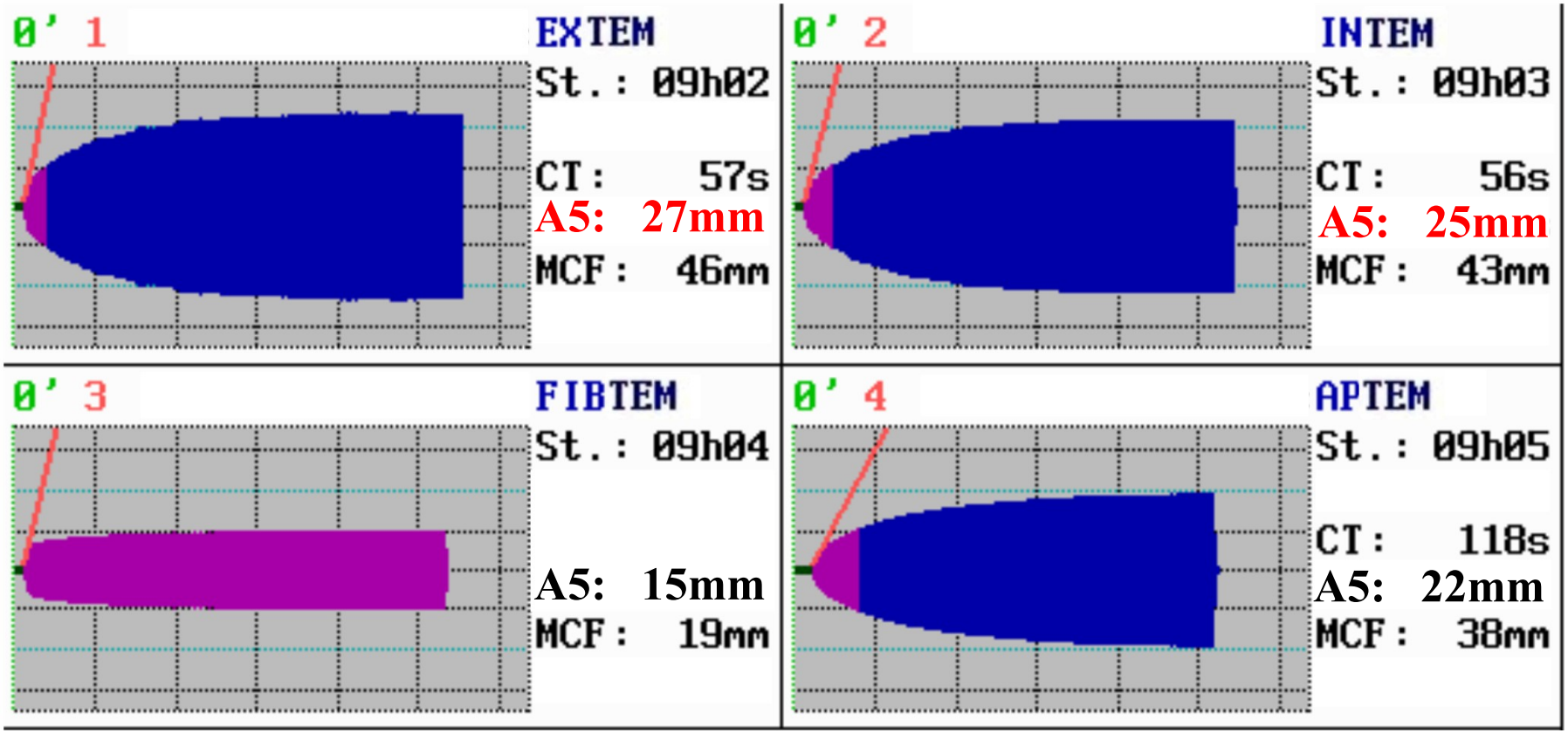
Targeted increase in $A5_{FIB}$ (mm)	Fibrinogen dose (mg/ kg bw)	Fibrinogen concentr. (mL / kg bw)	Cryoprecipitate (mL / kg bw)
2	12.5	0.6 [1 g per 80 kg]	1 [5 U per 80 kg]
4	25	1.2 [2 g per 80 kg]	2 [10 U per 80 kg]
6	37.5	1.9 [3 g per 80 kg]	3 [15 U per 80 kg]
8	50	2.5 [4 g per 80 kg]	4 [20 U per 80 kg]
10	62.5	3.1 [5 g per 80 kg]	5 [25 U per 80 kg]
12	75	3.8 [6 g per 80 kg]	6 [30 U per 80 kg]

$A5_{EX}$ > 25 mm and $A5_{FIB}$ ≥ 14 mm and no bleeding
→ No platelet transfusion required



Thrombocytopenia (48/nL) compensated by high fibrinogen

$A5_{EX}$ > 25 mm and $A5_{FIB}$ ≥ 14 mm and no bleeding
→ No platelet transfusion required



Thrombocytopenia (22/nL) partially compensated by high fibrinogen

FC Bayern München

Women National Soccer Team Germany

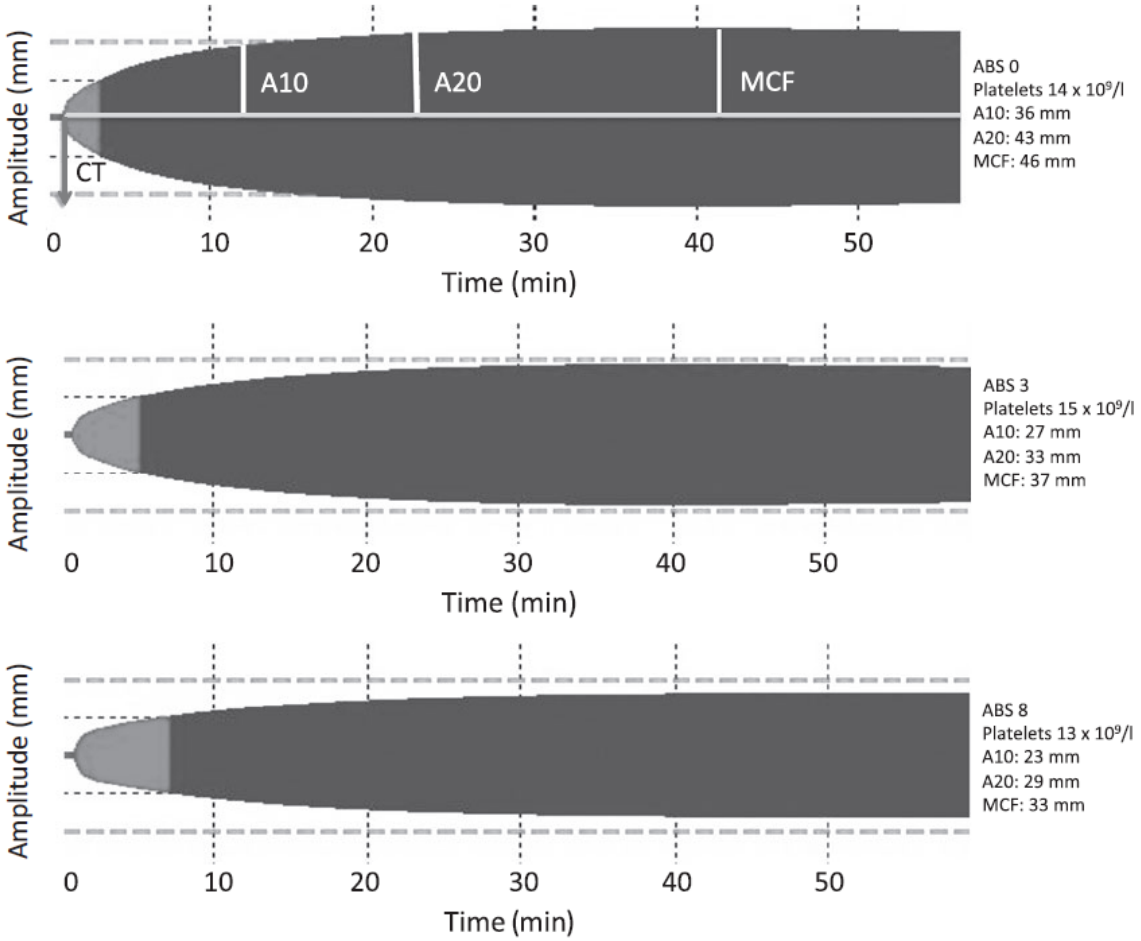
Number ≠ Performance

FC Waltersweiler Bambini

Fortuna Seppenrade Seniors > 50

bjh research paper British Journal of Haematology, 2014, 166, 592–600

Beyond the platelet count: immature platelet fraction and thromboelastometry correlate with bleeding in patients with immune thrombocytopenia



ABS 0; $A10_{EX}$ 36 mm; PC 14 x 10^9/L

$A5_{EX} \geq 25$ mm

ABS 3; $A10_{EX}$ 27 mm; PC 15 x 10^9/L

$A5_{EX}$ 15-24 mm

$A5_{EX} < 15$ mm

ABS 8; $A10_{EX}$ 23 mm; PC 13 x 10^9/L

Fig 4. EXTEM thromboelastogram tracings of three adult subjects with similar platelet counts with varying clinical bleeding symptomatology. ABS = acute bleeding score; CT = clot time; A10 = amplitude 10 min after CT; A20 = amplitude 20 min after CT; MCF = maximal clot firmness; mm = millimetre (firmness).

Therapeutic rather than prophylactic platelet transfusion policy for severe thrombocytopenia during liver transplantation

Nirmeen A. Fayed[1], Ayat A. Roshdy[2], Magdy K. Khalil[1], & Ibraheem K. Marwan[3]

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Recipients of LTx were divided into two groups: group I (GI) (n = 76) platelet count (PC) ≥ 50 × 10^9/L and group II (GII) PC < 50 × 10^9/L (n = 76). Platelets were transfused following a thromboelastometry protocol and clinical signs of diffuse bleeding.

With therapeutic approach, 75% of patients in GII could avoid unnecessary PTx with its hazards without excessive bleeding. PC in GII increased intraoperatively, PTx may lead to delayed recovery of platelets, increased duration of mechanical ventilation and ICU stay. The given cut-off values may help to guide PTx.

Euro J Gastroenterol Hepatol 2015 Nov; 27(11): 1313-9.

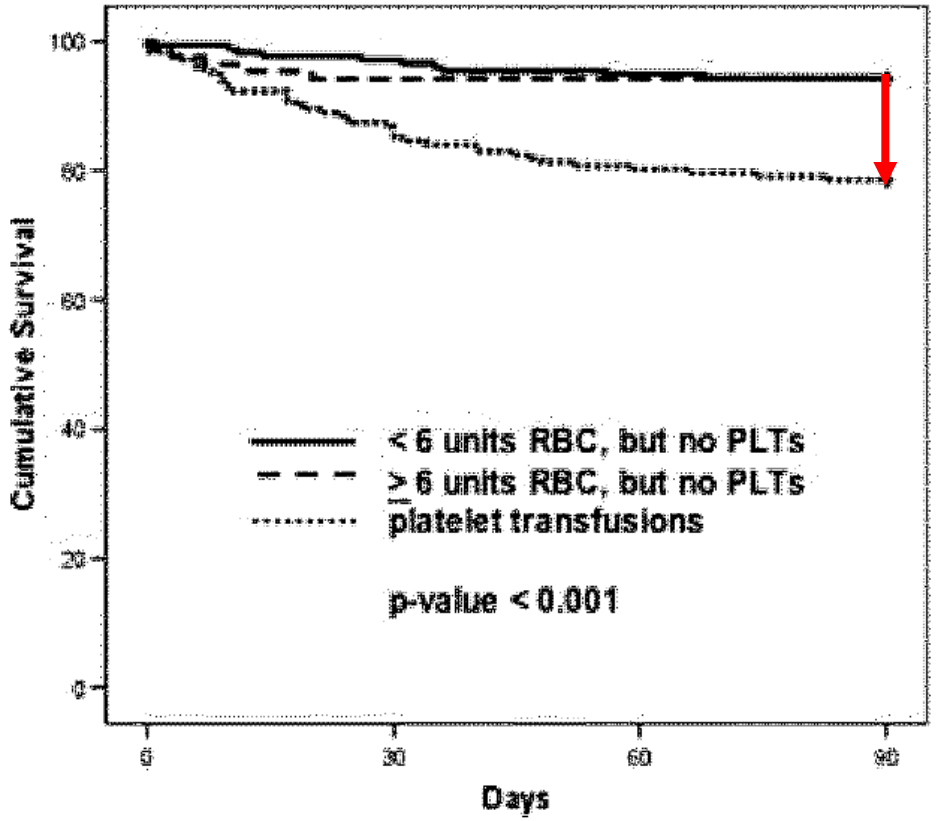
Usefulness of thromboelastometry in predicting the risk of bleeding in cirrhotics who undergo invasive procedures

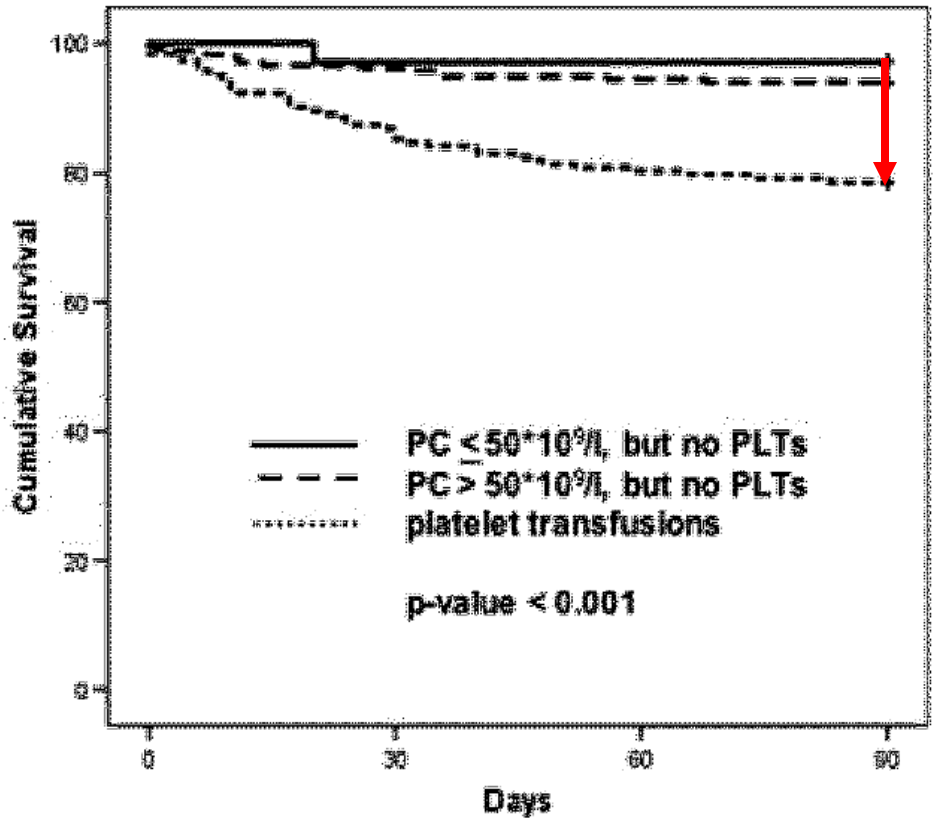
Wilma Debernardi Venon[a,*], Paola Ponzo[a,*], Marco Sacco[a], Giulio Mengozzi[b], Samuele Raso[b], Alessandra Valpreda[c], Mario Rizzetto[a] and Alfredo Marzano[a]

Results: In the test set, **thromboelastometry identified all patients who had a bleeding event.** In patients with a high risk of bleeding, **the use of thromboelastometry was cost-effective, reducing the platelet transfusions by 64%.**

Conclusion: **Thromboelastometry appears to be useful to screen cirrhotic patients undergoing invasive procedures** to identify the risk of bleeding and to optimize the transfusion strategy.

Platelet Transfusion During Liver Transplantation Is Associated with Increased Postoperative Mortality Due to Acute Lung Injury





Patient 1-year survival was significantly reduced in patients who received platelet transfusions, compared with those who did not (74% vs. 92%; $p < 0.001$).

Chin Med J. 2018 Feb 20;131(4):426-434.

Perioperative Single-Donor Platelet Apheresis and Red Blood Cell Transfusion Impact on 90-Day and Overall Survival in Living Donor Liver Transplantation

Wei Zheng, Kang-Mei Zhao, Li-Hui Luo, Yang Yu, Sheng-Mei Zhu

Department of Anesthesiology, The First Affiliated Hospital, College of Medicine, Zhejiang University, Hangzhou, Zhejiang 310003, China

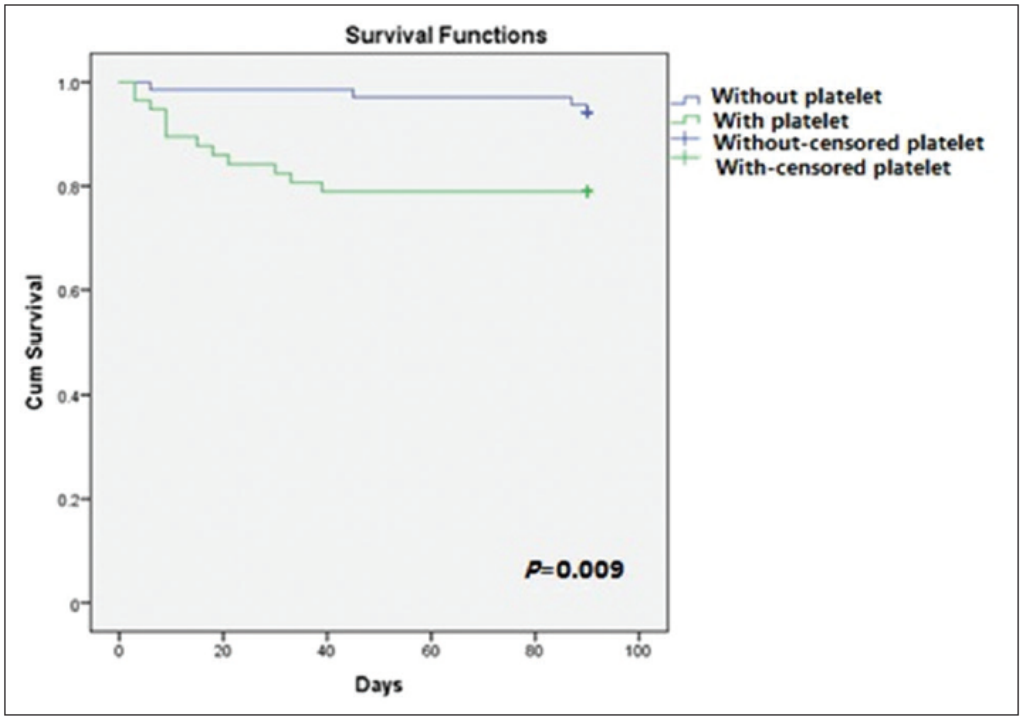


Figure 2: The 90-day survival between recipients with and without intraoperative platelet transfusion using Kaplan-Meier curves and log-rank test.

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Results: Patients who **received apheresis platelet transfusion** had a **lower 90-day cumulative survival (78.9% vs. 94.2%, *P* = 0.009).**

Units of apheresis platelet transfusion (hazard ratio [*HR*] = 3.103, 95% confidence interval [*CI*]: 1.720–5.600, *P* < 0.001) and preoperative platelet count (*HR* = 0.170, 95% *CI*: 0.040–0.730, *P* = 0.017) **impacted 90-day survival independently.**

Clin Gastroenterol Hepatol. 2017 Jan;15(1):46-52.

No Benefit From Platelet Transfusion for Gastrointestinal Bleeding in Patients Taking Antiplatelet Agents.

Zakko L, Rustagi T, Douglas M, Laine L.

RESULTS: Multivariable analyses showed a significant difference between cases (patients who received platelet transfusion, n = 204) and controls (no platelet transfusions, n = 204) in only **risk of death** (**odds ratio, 5.57**; 95% confidence interval, 1.52-27.1). The **adjusted odds ratio for recurrent bleeding was 1.47** (95% confidence interval, 0.73-3.05) for cases vs controls.

CONCLUSIONS: **The use of platelet transfusions in patients with GIB who are taking antiplatelet agents without thrombocytopenia did not reduce rebleeding but was associated with higher mortality.**

Rotational thromboelastometry predicts thromboembolic complications after major non-cardiac surgery

Alexander Hincker, Justin Feit, Robert N Sladen and Gebhard Wagener*

CRITICAL CARE

Hincker *et al. Critical Care* 2014, **18**:549
http://ccforum.com/content/18/5/549

Introduction: Thromboembolic complications contribute substantially to perioperative morbidity and mortality. Routine laboratory tests do not detect patients with acquired or congenital hypercoagulability who may be at risk of perioperative thromboembolism.

Methods: Preoperative ROTEM analysis (EXTEM, INTEM, and FIBTEM) was performed on 313 patients undergoing major non-cardiac surgery. A thromboembolic complication was defined as a new arterial or deep venous thrombosis, catheter thrombosis, or pulmonary embolism diagnosed by ultrasound or spiral chest computed tomography.

Results: There were **no indication of postoperative thromboembolic complications by PTT, INR, or platelet count. INTEM A10 was the best predictor of thromboembolic complications,** with a ROC AUC of 0.751. There was **no significant difference for any FIBTEM parameter.**

Digestive and Liver Disease 49 (2017) 440–445

Thromboelastometry hypercoagulable profiles and portal vein thrombosis in cirrhotic patients with hepatocellular carcinoma

Alberto Zanetto[a,1], Marco Senzolo[a,*,1], Alessandro Vitale[b], Umberto Cillo[b], Claudia Radu[c], Francesca Sartorello[c], Luca Spiezia[c], Elena Campello[c], Kryssia Rodriguez-Castro[a], Alberto Ferrarese[a], Fabio Farinati[d], Patrizia Burra[a], Paolo Simioni[c]

Results: **In HCC, FIBTEM MCF > 25 mm** was associated with a **5-fold increased PVT risk** [RR: 4.8 (2-11.3); p = 0.0001]. Cox multivariate analysis confirmed HCC and increased MCF (FIBTEM) to be independently associated with increased PVT risk.

Conclusions: **Hypercoagulability** in HCC which can be **detected by thromboelastometry** is associated with **increased risk of PVT even in Child A patients.**

Transfusion Medicine and Hemotherapy

Research Article

Transfus Med Hemother 2018;45:404–412
DOI: 10.1159/000489605

Received: June 13, 2017
Accepted: April 23, 2018
Published online: August 24, 2018

Perioperative Thromboelastometry for Adult Living Donor Liver Transplant Recipients with a Tendency to Hypercoagulability: A Prospective Observational Cohort Study

Yasmin Kamel[a] Ashraf Hassanin[a] Abdel Rahman Ahmed[b] Emad Gad[c] Mohamed Afifi[b]
Magdy Khalil[a] Klaus Görlinger[d,e] Khaled Yassen[a]

Patients and Methods: In a prospective observational study (South African Cochrane Registry 20140500814129), 151 potential liver transplant recipients were screened for thrombophilic factors from October 2014 to June 2017 and 57 potential recipients fulfilled the **inclusion criterion of presenting two or more of the following thrombophilic factors: low protein C, low protein S, low anti-thrombin, increased homocysteine, increased antiphospholipid IgG/IgM antibodies, increased lupus anticoagulant, and positive Factor V Leiden mutation.** Seven patients were excluded from the study because they fulfilled the exclusion criteria of cancelling the liver transplantation, oral anticoagulation, or intraoperative treatment with rFVIIa. Accordingly, 50 patients were included in the final analysis.

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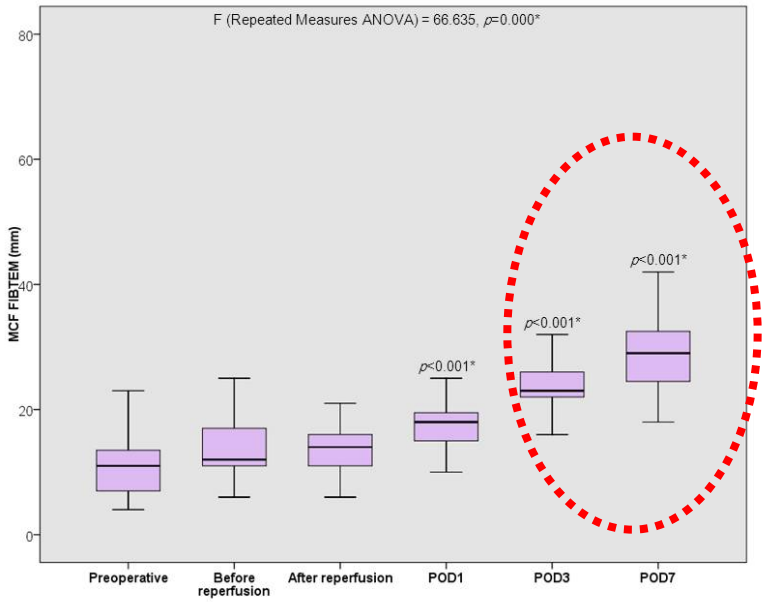
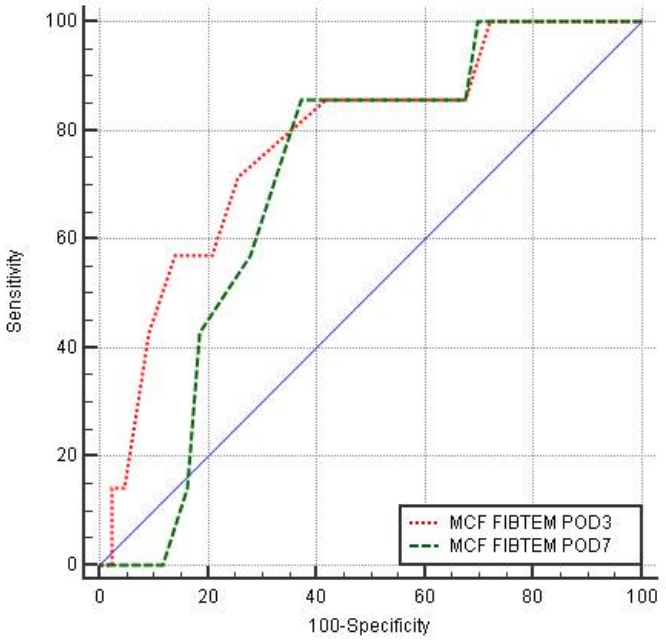
FIBTEM MCF [mm]

POD 3: cut-off >23 mm, 0.779 (0.097), p=0.004
POD 7: cut-off >28 mm, 0.706 (0.089), p=0.020

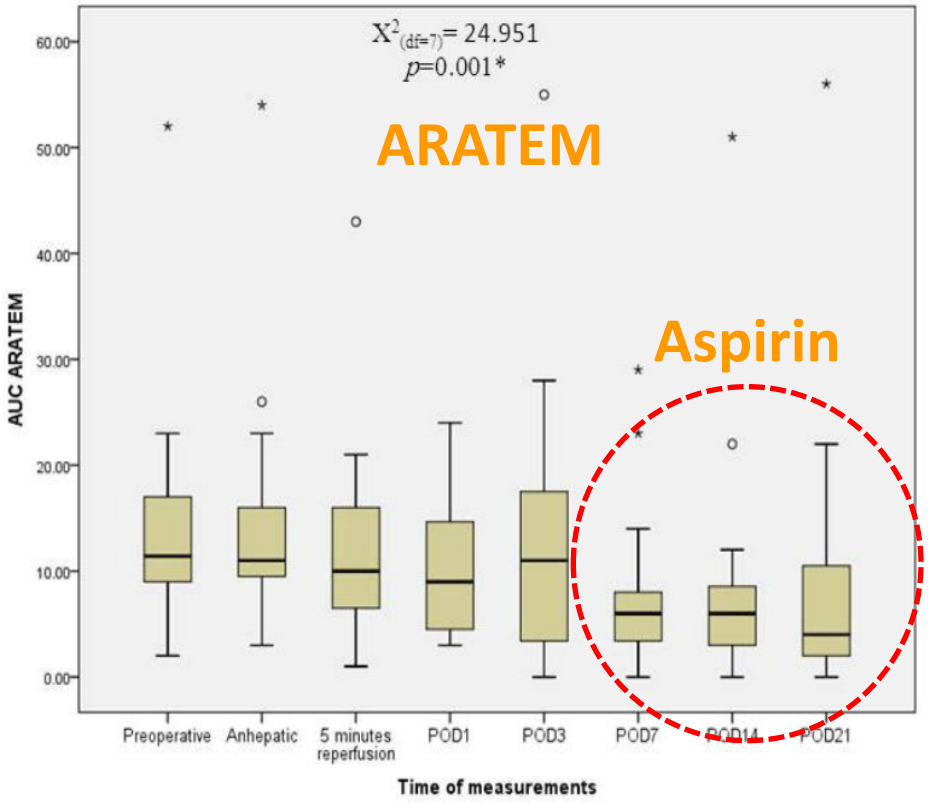


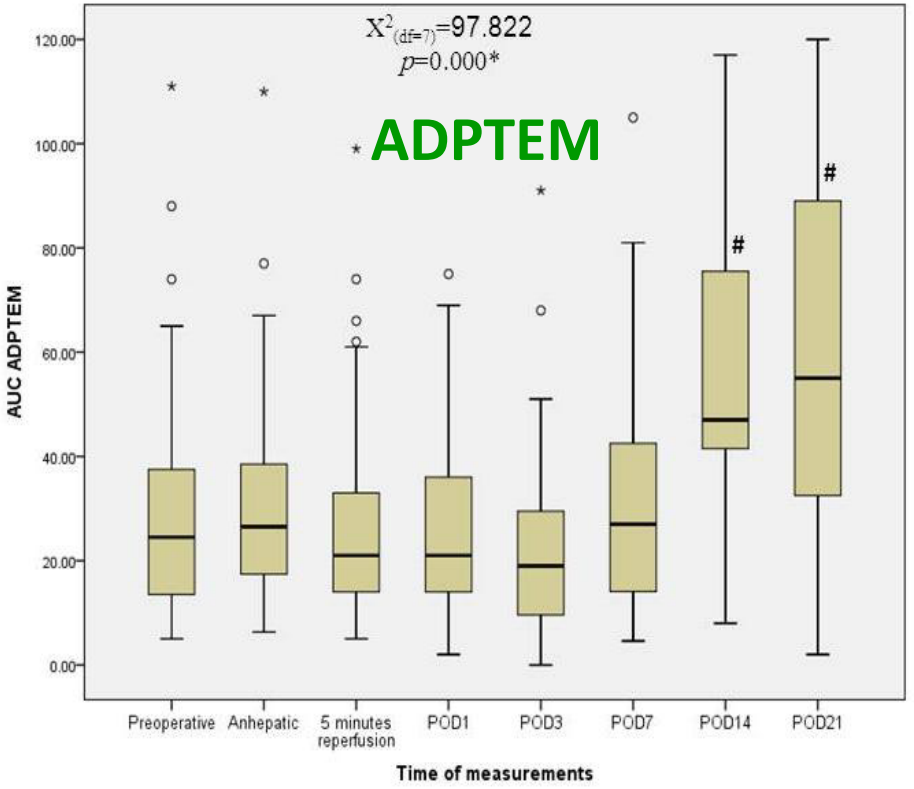


Monitoring of Platelet Function during and for three weeks after Adult Liver Transplantation with ROTEM platelet and Conventional Coagulation Tests

Yassen KA[1], Awad E[1], Refaat E[1], Mahdy W[2], Hassan G[2], Görlinger K[3,4]

[1]Anesthesia Department, Liver Institute and [2]Faculty of Medicine, Menoufia University, Egypt. [3]Department of Anesthesiology and Intensive Care Medicine, University Hospital Essen, Germany and [4]Medical Director, Tem Innovations, Munich, Germany





ANESTHESIOLOGY® 2018

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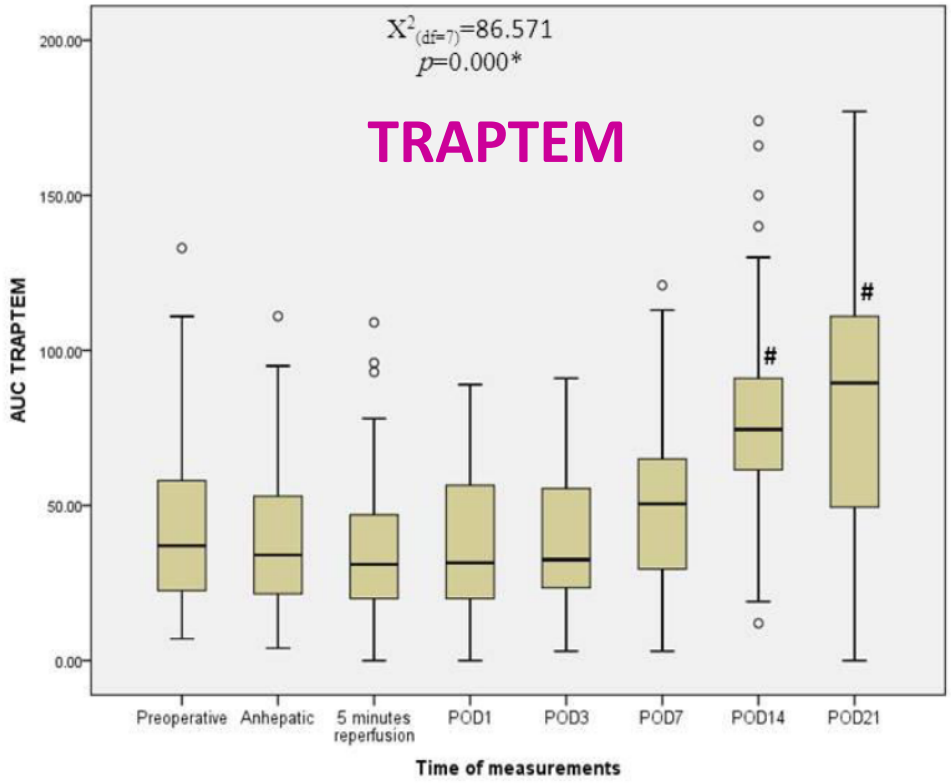

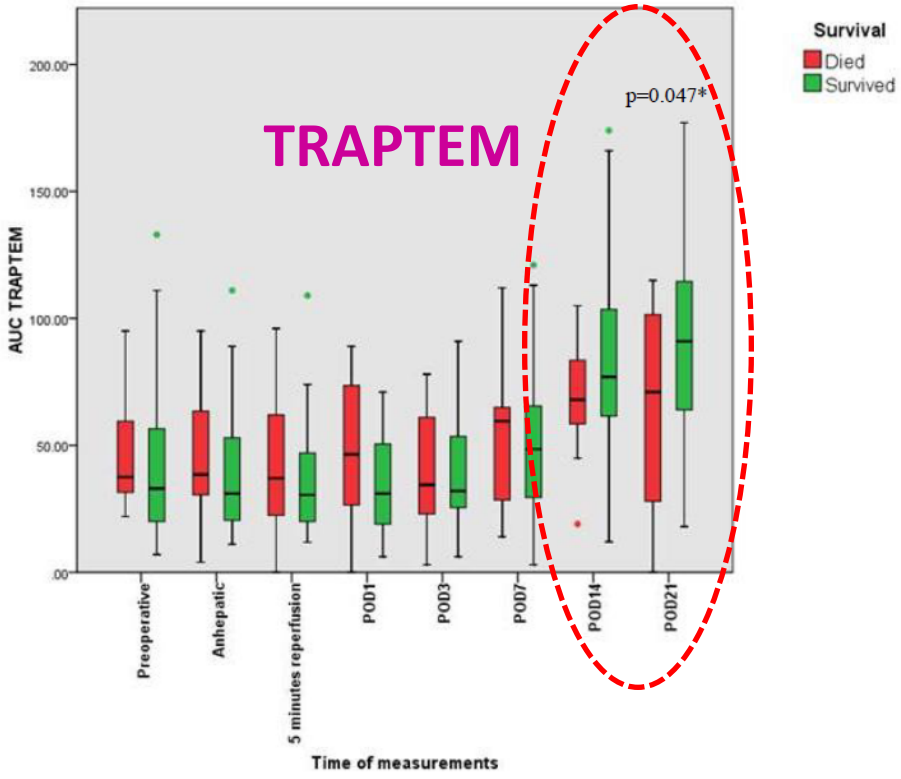

CONCLUSIONS: **ROTEM *platelet*** results prior to transplantation are low due to liver disease and thrombocytopenia. **Platelet function recovers two weeks following transplantation but shows a significant decrease on POD21 in 3-month non-survivors**. PFT with **ROTEM *platelet*** may be helpful to **predict recovery and survival after transplantation** and may be useful to **guide postoperative antiplatelet therapy.**

Zamper *et al. BMC Anesthesiology* (2018) 18:198
https://doi.org/10.1186/s12871-018-0664-8

BMC Anesthesiology

Association between viscoelastic tests-guided therapy with synthetic factor concentrates and allogenic blood transfusion in liver transplantation: a before-after study

Raffael P. C. Zamper[1*], Thiago C. Amorim[2], Veronica N. F. Queiroz[2], Jordana D. O. Lira[2], Luiz Guilherme V. Costa[1], Flavio Takaoka[1], Nicole P. Juffermans[4] and Ary S. Neto[3,4]

Table 3 – Transfusion of blood products

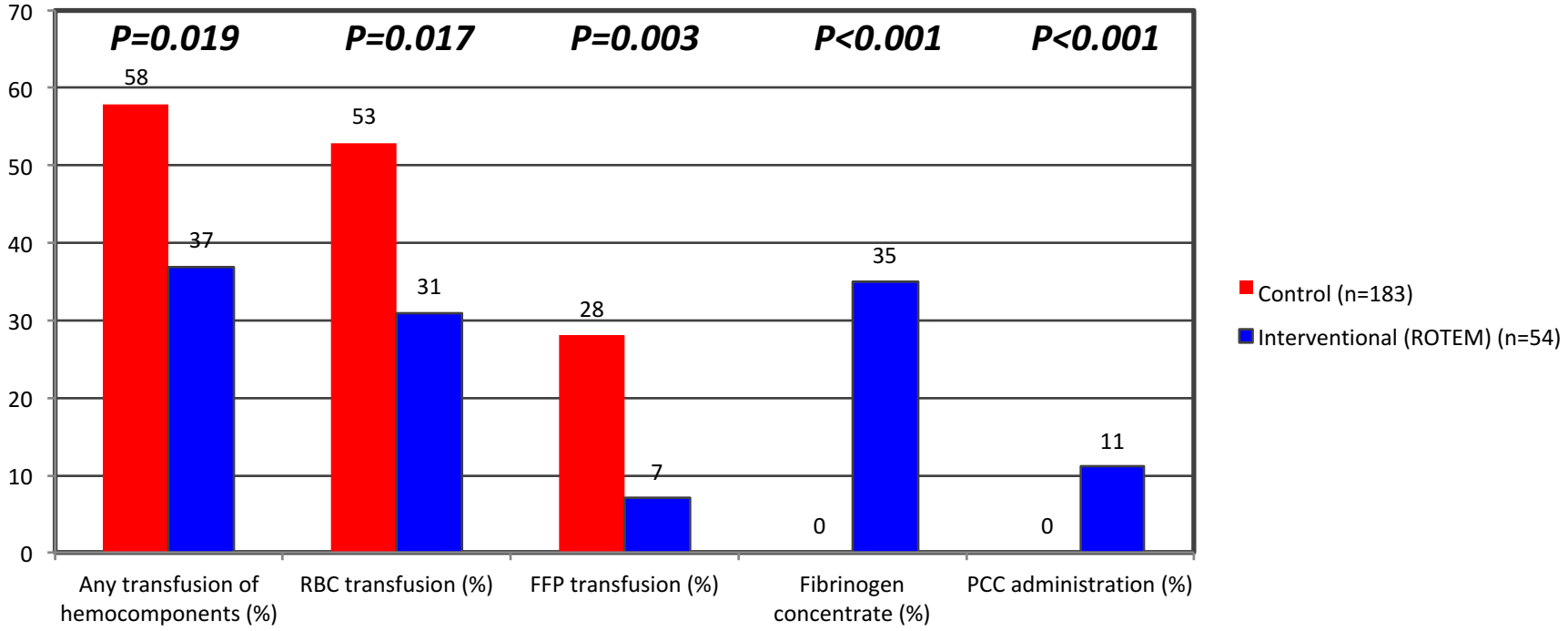

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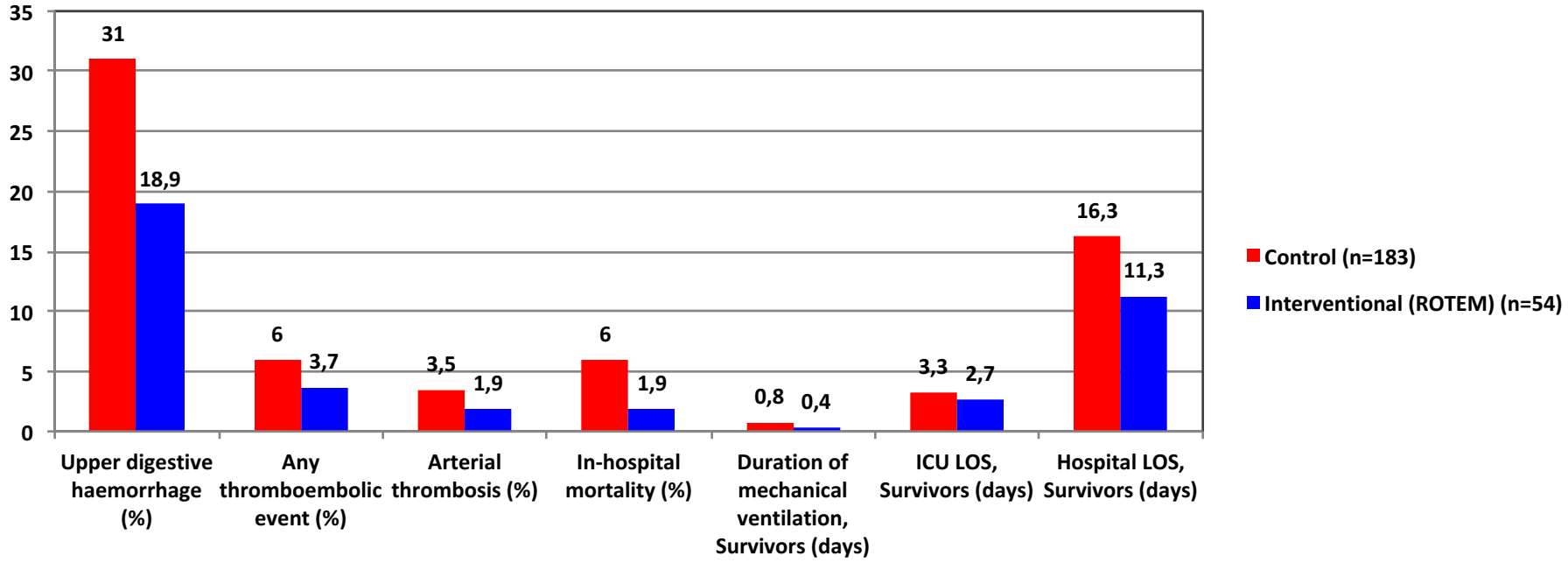
Table 4 – Clinical outcomes after transplantation for unmatched cohorts (n = 237)



Clinica Chimica Acta 446 (2015) 277–283

Point-of-care haemostasis monitoring during liver transplantation reduces transfusion requirements and improves patient outcome

Antonio Leon-Justel [a,*], Jose A. Noval-Padillo [b], Ana I. Alvarez-Rios [b], Patricia Mellado [c], Miguel A. Gomez-Bravo [d], Jose M. Álamo [d], Manuel Porras [e], Lydia Barrero [d], Rafael Hinojosa [e], Magdalena Carmona [f], Angel Vilches-Arenas [g], Juan M. Guerrero [b]

In summary, our results show that a haemostatic therapy algorithm based on POC monitoring (MLU with ROTEM) reduced transfusion and improved outcome in OLT.
POC monitoring during the surgery allows adequate haemostasis and transfusion management and proper fluid administration, which may lead to a faster hemodynamic stabilisation, better graft and kidney function preservation in the postoperative period resulting in better overall outcomes.

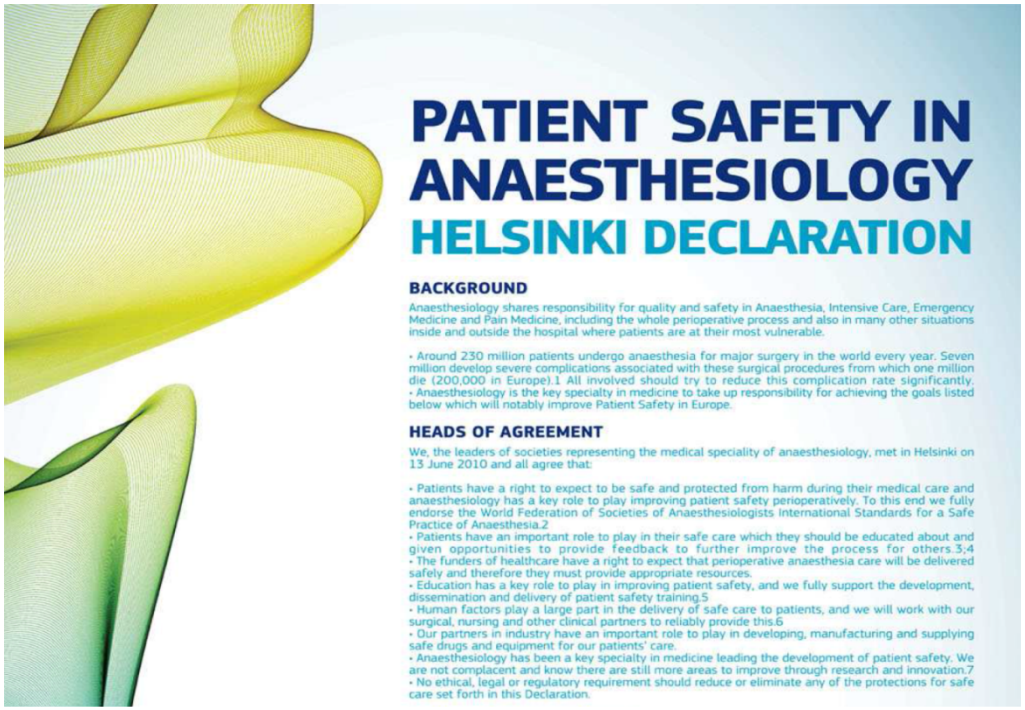
Saner *Critical Care* 2014, **18**:706
http://ccforum.com/content/18/6/706

CRITICAL CARE

COMMENTARY

Rotational thrombelastometry: a step forward to safer patient care

Fuat H Saner



PATIENT SAFETY IN ANAESTHESIOLOGY

HELSINKI DECLARATION

BACKGROUND

Anaesthesiology shares responsibility for quality and safety in Anaesthesia, Intensive Care, Emergency Medicine and Pain Medicine, including the whole perioperative process and also in many other situations inside and outside the hospital where patients are at their most vulnerable.

- Around 230 million patients undergo anaesthesia for major surgery in the world every year. Seven million develop severe complications associated with these surgical procedures from which one million die (200,000 in Europe).1 All involved should try to reduce this complication rate significantly.
- Anaesthesiology is the key specialty in medicine to take up responsibility for achieving the goals listed below which will notably improve Patient Safety in Europe.

HEADS OF AGREEMENT

We, the leaders of societies representing the medical speciality of anaesthesiology, met in Helsinki on 13 June 2010 and all agree that:

- Patients have a right to expect to be safe and protected from harm during their medical care and anaesthesiology has a key role to play improving patient safety perioperatively. To this end we fully endorse the World Federation of Societies of Anaesthesiologists International Standards for a Safe Practice of Anaesthesia.2
- Patients have an important role to play in their safe care which they should be educated about and given opportunities to provide feedback to further improve the process for others.3;4
- The funders of healthcare have a right to expect that perioperative anaesthesia care will be delivered safely and therefore they must provide appropriate resources.
- Education has a key role to play in improving patient safety, and we fully support the development, dissemination and delivery of patient safety training.5
- Human factors play a large part in the delivery of safe care to patients, and we will work with our surgical, nursing and other clinical partners to reliably provide this.6
- Our partners in industry have an important role to play in developing, manufacturing and supplying safe drugs and equipment for our patients' care.
- Anaesthesiology has been a key specialty in medicine leading the development of patient safety. We are not complacent and know there are still more areas to improve through research and innovation.7
- No ethical, legal or regulatory requirement should reduce or eliminate any of the protections for safe care set forth in this Declaration.