Cílená léčba život ohrožujícího krvácení dle trombelastometrie :

soumrak masivních transfuzních protokolů

Ivana Zýková, Pavel Sedlák

ARO, Krajská nemocnice Liberec, a.s.

masivní transfuzní prot

X

„plasma free protokol“

masivní transfuzní protokoly
X
plasma free protokol

Léčba krvácení “ mi transfuzními protokoly” je „terapie naslepo“ - nereflektuje lni požadavky ho mu organismu během ho ceni

ha na použiti ho objemu plazmy (FFP), v které je zka koncentrace ch ch faktorů, která neodpovídá potřebám krvácejícího pacienta

prava a expedice FFP prodlužuje čas do tku by pacienta a zvyšuje expozici m transfuzním přípravkům

masivní transfuzní protokoly
X
plasma free protokol

Koncept „plazma free“ terapie řeši tento m m ch komponent koagulace dle výsledků ch metod (ROTEM, TEG)

Přistupuje k terapii poruch koagulace způsobem „early-goal directed terapie“ – časnou terapií šitou na míru konkrétnímu pacientovi

Okamžita dostupnost komponent koagulace (fibrinogen, PCC, f. XIII) zrychluje čas do zahájení léčby

“plazma free koncept” je dle mnoha studií vysoce efektivni a bezpečný, je spojen s m ho počtu erytrocytů i trombocytů,

se zkrácením pobytu na ICU I délky UPV

Nezvyšuje incidenci trombembolických komplikací

Spahn *et al. Critical Care* 2013, **17**:R76
http://ccforum.com/content/17/2/R76

CRITICAL CARE

RESEARCH Open Access

Management of bleeding and coagulopathy following major trauma: an updated European guideline

Donat R Spahn[1], Bertil Bouillon[2], Vladimir Cerny[3,4], Timothy J Coats[5], Jacques Duranteau[6], Enrique Fernández-Mondéjar[7], Daniela Filipescu[8], Beverley J Hunt[9], Radko Komadina[10], Giuseppe Nardi[11], Edmund Neugebauer[12], Yves Ozier[13], Louis Riddez[14], Arthur Schultz[15], Jean-Louis Vincent[16] and Rolf Rossaint[17*]

European Society of Anaesthesiology ESA | EJA European Journal of Anaesthesiology | European Society of Anaesthesiology ESA

Guidelines on the management of severe perioperative bleeding

2013

Sibylle A. Kozek-Langenecker[1], Arash Afshari[2], Pierre Albaladejo[3], Cesar Aldecoa Alvarez Santullano[4], Edoardo De Robertis[5], Daniela C. Filipescu[6], Dietmar Fries[7], Klaus Görlinger[8], Thorsten Haas[9], Georgina Imberger[10], Matthias Jacob[11], Marcus Lancé[12], Juan Llau[13], Sue Mallett[14], Jens Meier[15], Niels Rahe-Meyer[16], Charles Marc Samama[17], Andrew Smith[18], Cristina Solomon[19], Philippe Van der Linden[20], Anne Juul Wikkelsø[21], Patrick Wouters[22], Piet Wyffels[22]

II. Diagnostika a monitorace krvá

Coagulation monitoring

Recommendation 12

We recommend

trauma

prothrombin time

nboplastin time (APTT),

lets. (Grade 1C)

Použití viskoelastických metod

d that viscoelastic methods also be

med to assist in characterising the coagulopathy and in guiding haemostatic therapy. (Grade 1C)

V. Management krvácení a koagulace

Antifibrinolytic agents

Recommendation 24

We recommend that tranexam
early as possible to th
at risk of signifi **1 g**
infused ov **venous**
infusi

W **d be administered to the**
within 3 h after injury. (Grade 1B)

W **cols for the management of bleeding**
der administration of the first dose of
t **mic acid en route to the hospital. (Grade 2C)**

tranexamová kyselina

V. Management krvácení a koagulace

Plasma

Recommendation 26

We recommend the initial
(fresh frozen plas
plasma) (Gr
patie
, we suggest an optimal
atio of at least 1:2. (Grade 2C)
hat plasma transfusion be avoided in
without substantial bleeding. (Grade 1B)

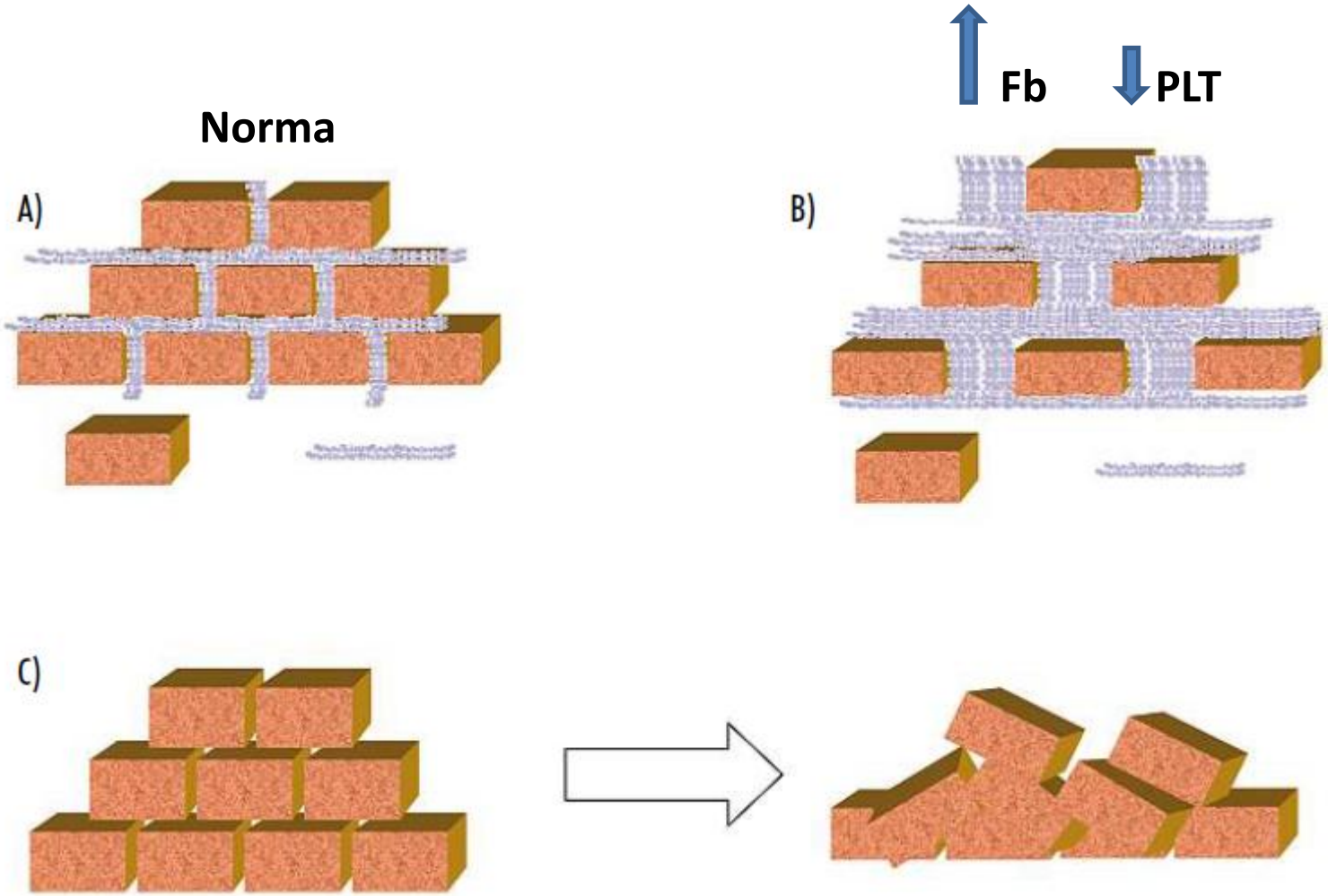
FFP nebo fibrinogen

- **Trauma indukovanou koagulopatii rozvíjí ¼ až ½ všech pacientů s traumatem**

- **V případě masivní krevní ztráty, dosahuje hladina fibrinogenu kritických hodnot dříve než ostatní prokoagulační faktory nebo trombocyty.**

Brohi K, Singh J, Heron M, Coats T: **Acute traumatic coagulopathy.** *J Trauma* 2003, **54(6)**:1127-1130.
Maegele M, Lefering R, Yucel N, Tjardes T, Rixen D, Paffrath T, Simanski C, Neugebauer E, Bouillon B: **Early coagulopathy in multiple injury: an analysis from the German Trauma Registry on 8724 patients.** *Injury* 2007, **38(3)**:298-304.

role fibrinogenu v koagulaci



pouze trombocyty

Possibilities and limitations of thromboelastometry/thromboelastography
T. Lang1,2, M. von Depka2
Hämostaseologie 2006 26 6: 21-29

Fibrinogen & cryoprecipitate

Recommendation 27

We recommend treatm

continuing

ompanied by

deficit or a plasma fibrinogen

Fibrinogen iniciálně 3-4 g dále dle viskoelastických metod

tial fibrinogen concentrate dose of 3-4 g or 50 mg/kg of

cr tate, which is approximately equivalent to 15-20 singe donor units in a 70 kg adult. Repeat doses may be guided by viscoelastic monitoring and laboratory assessment of fibrinogen levels. (Grade 2C)

Prothrombin complex concentrate

Recommendation 31

We recommend the early use of prothrombi

emergency reversal of vitamin K

If a cons we suggest that PCC

be elastometric evidence of delayed

Thromboelastometry appears to be a useful tool to guide

py in patients with traumatic coagulopathy

PCC při prodloužení iniciace

Cena, komplikace

- Implementation of transfusion and coagulation management algorithms (based on ROTEM/TEG) can reduce transfusion-associated costs in trauma, cardiac surgery and liver transplantation. B
- Goal-directed therapy with coagulation factor concentrates (fibrinogen and/or PCC) may reduce transfusion- associated costs in trauma, cardiac surgery and liver transplantation. B
- Thromboembolic events are associated with increased in-hospital and post-hospital costs. B
- Targeted therapy with fibrinogen and/or PCC guided by ROTEM/TEG is not associated with an increased incidence of thromboembolic events. C

ROTEM

Rotem : klasické vyšetření

15 minut : 45 minut

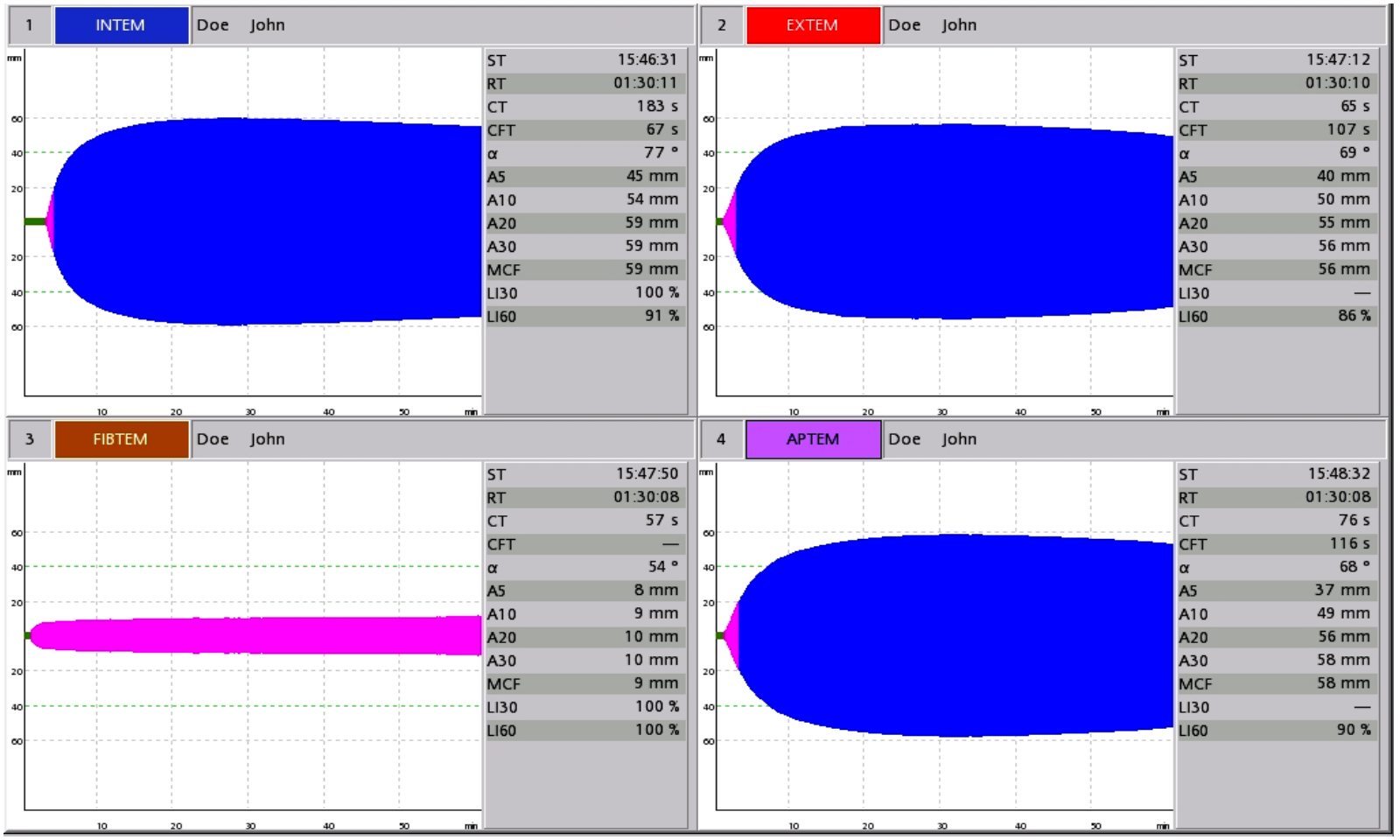
lze i méně ☺

- Špatná citlivost k inhibitorům funkce destiček

  MULTIPLATE, ROTEM PLATELET

- Špatná citlivost ke kumarinům a LMWH

ROTEM - VZOR NORMÁLNÍCH HODNOT



Organizace urgentního traumatologického příjmu KNL

Triage pozitivní pacient

Standardní postup
15 minut

Diagnostika a terapie
Vyloučení či vyřešení život ohrožujících stavů

Dýchací cesty
Zdroje velkého krvácení: hemothorax, hemoperitoneum, nestabilní pánev, fraktury dlouhých kostí, zevní krvácení
Tenzní pneumothorax
Tamponáda srdeční

Oběhově stabilní x nestabilní pacient

CT v režimu polytrauma

Další řešení

PRIORITY U AKUTNÍHO KRVÁCENÍ

- ✓ Optimalizace podmínek **ph, teplota, iCa**
- ✓ Je přítomna **hyperfibrinolýza**
- ✓ Jaká je hladina **fibrinogenu**
- ✓ Dostačuje hladina **koagulačních faktorů**
- ✓ Je dostatečná hladina **trombocytů**

Schöchl et al. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine 2012, 20:15
http://www.sjtrem.com/content/20/1/15

SCANDINAVIAN JOURNAL OF
trauma, resuscitation
& emergency medicine

REVIEW Open Access

Early and individualized goal-directed therapy for trauma-induced coagulopathy

Herbert Schöchl[1,2*], Marc Maegele[3], Cristina Solomon[1], Klaus Görlinger[4] and Wolfgang Voelckel[2]

Abstract

Severe trauma-related bleeding is associated with high mortality. Standard coagulation tests provide limited information on the underlying coagulation disorder. Whole-blood viscoelastic tests such as rotational thromboelastometry or thrombelastography offer a more comprehensive insight into the coagulation
trauma. The results are available within minutes and they provide information about the initia
the speed of clot formation, and the quality and stability of the clot. Viscoelastic tests h
coagulation therapy according to the actual needs of each patient, reducing the
The concept of early, individualized and goal-directed therapy is explored
Hospital algorithm for managing trauma-induced coagulopathy is

Keywords: ROTEM, TEG, trauma, goal-directed coagulati

Introduction

Major brain injury and unco
the primary causes o
[1-3]. One-quar
bit trau

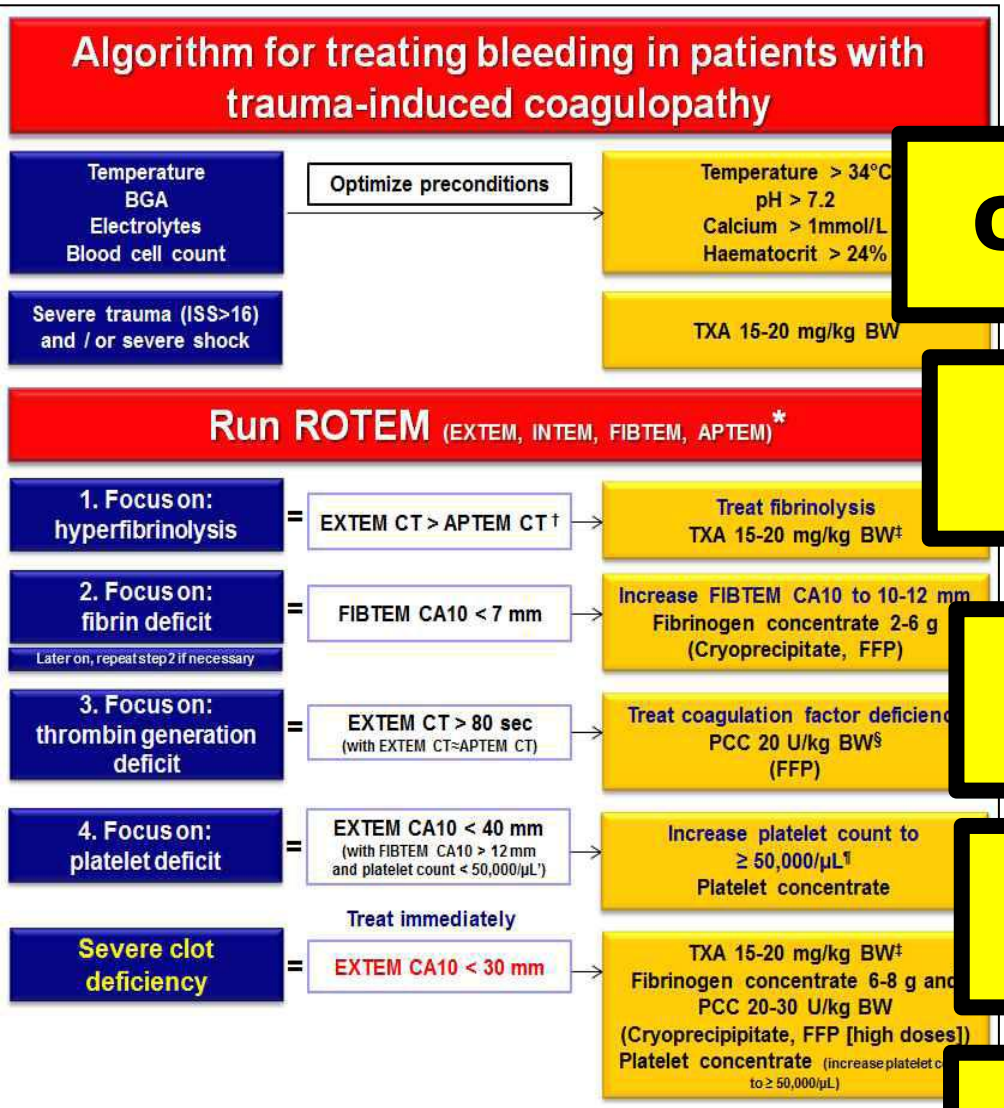
co
Te
bela
MA,

cells
stasis [11].
ied using plasma
hese are removed by cen-
tests are stopped upon forma-
fibrin strands, when only ~5% of the
rbin has been generated [12]. Moreover, these
ts do not assess the quality/the strength of the clot.

* Correspo
[1]Ludwig Bo
Vienna, Austri
Full list of auth

AUVA PROTOKOL

Na našem pracovišti je od poloviny roku 2013 používán AUVA protokol v léčbě život ohrožujícího krvácení, vytvořený v Trauma hospital Salzburg, Austria.



AUVA PROTOKOL

Optimalizace podmínek

Hyperfibrinolýza

Fibrinogen

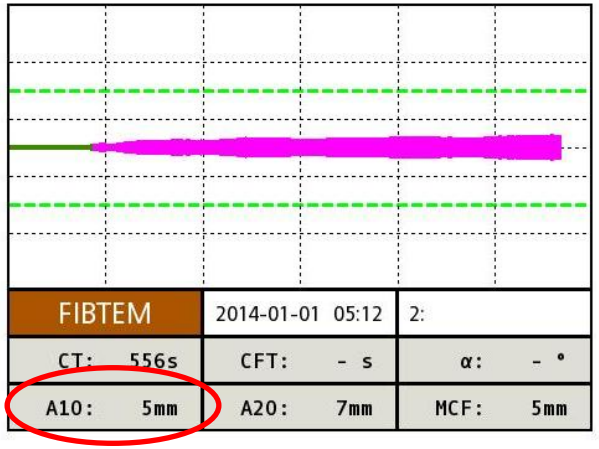
PCC při prodloužení iniciace

Trombocyty

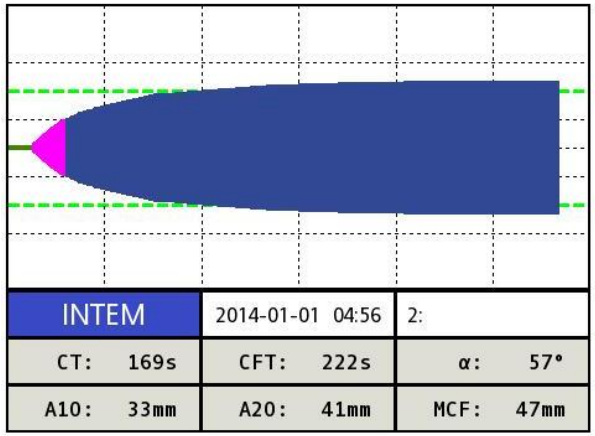
F XIII

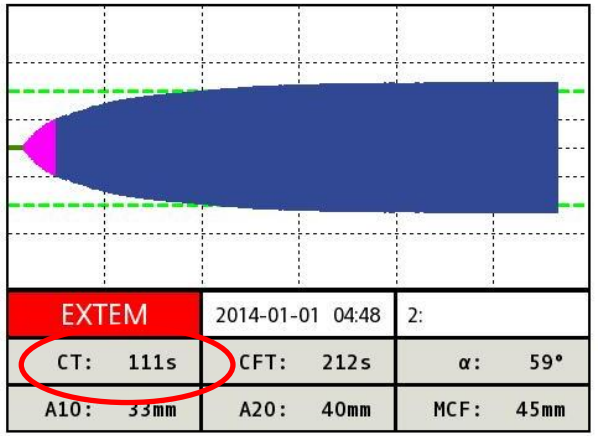
KAZUISTIKA

- Muž 24 let
- Řidič OA – čelní náraz
- Kominutivní fr. femuru + antebrachii l.sin.

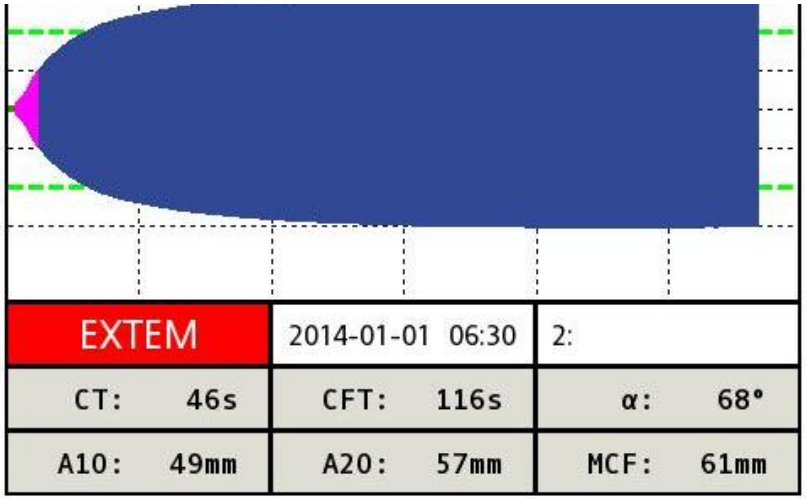


- Fibtem A10 5 mm
- EXTEM CT 111s
- Fb 0,9 g/l
- INR 2,3 aPTT 57,9s

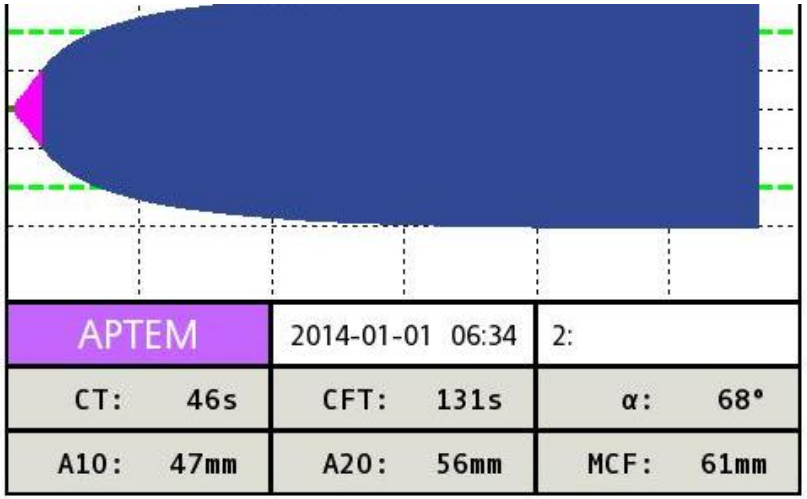




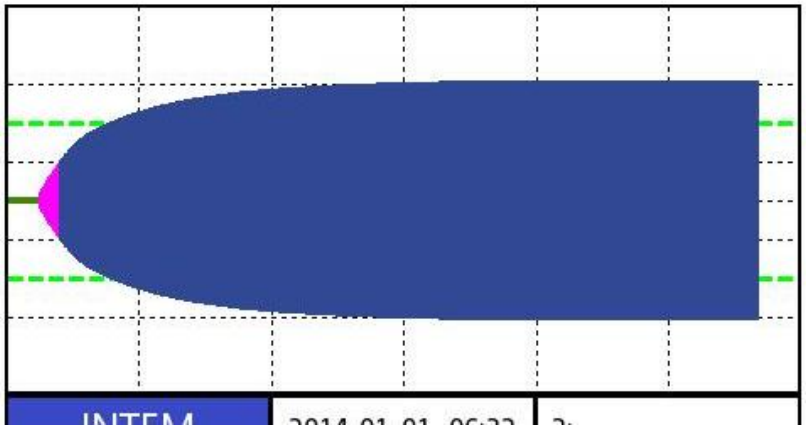
KAZUISTIKA



EXTEM	2014-01-01 06:30	2:
CT: 46s	CFT: 116s	α: 68°
A10: 49mm	A20: 57mm	MCF: 61mm



APTEM	2014-01-01 06:34	2:
CT: 46s	CFT: 131s	α: 68°
A10: 47mm	A20: 56mm	MCF: 61mm



TXA 1000 mg
Fibrinogen 6 g
PCC 1000 i.u.
6 x EBR

NCBI Resources How To

PubMed.gov
US National Library of Medicine
National Institutes of Health

PubMed

Advanced

Display Settings: Abstract

Send to:

Anesth Analg. 2013 Nov;117(5):1063-71. doi: 10.1213/ANE.0b013e3182a52876.

Is dilutional coagulopathy induced by different colloids reversible by replacement of fibrinogen and factor XIII concentrates?

Kind SL[1], Spahn-Nett GH, Emmert MY, Eismon J, Seifert B, Spahn DR, Theusinger OM.

Author information

Abstract

BACKGROUND: In this in vitro trial, we assessed the effect on blood coagulation of 60% dilution with different colloids and investigated reversibility by replacement of factor XIII (F XIII), fibrinogen, and the combination of fibrinogen and F XIII.

METHODS: Using the blood of 12 volunteers, the following measurements were performed at baseline and after 60% dilution with (hydroxyethyl starch solutions) HES 130/0.42, gelatin, or balanced gelatin solution: blood gas analyses, coagulation factor concentrations (F I, F II, F VII, F VIII, F XIII), impedance aggregometry (Multiplate®), and rotational thromboelastometry (ROTEM). Then F XIII and fibrinogen as well as a combination of both were added, in concentrations corresponding to 6 g fibrinogen and 1250 IU F XIII in adults. ROTEM measurements and determination of factor concentrations were again performed.

RESULTS: Colloid dilution led to a significant reduction of fibrinogen polymerization, especially with HES. Platelet function was impaired by all colloids, with gelatin having a significantly greater effect (area under the curve, collagen Test, $P \leq 0.008$) than HES and balanced gelatin solution. The substitution of F XIII only did not improve clot formation. Substitution of fibrinogen improved the polymerization of fibrinogen in dilutions with gelatin and balanced gelatin solution ($P = 0.002$), whereas HES-induced coagulopathy could not be corrected. The combination of fibrinogen and F XIII showed a better effect than the addition of fibrinogen only for certain variables.

CONCLUSION: Coagulation and platelet function are impaired by all 3 colloids. However, in vitro gelatin-induced coagulopathy was significantly more reversible than HES-induced coagulopathy.

PMID: 24029856 [PubMed - indexed for MEDLINE]

Publication Types, MeSH Terms, Substances

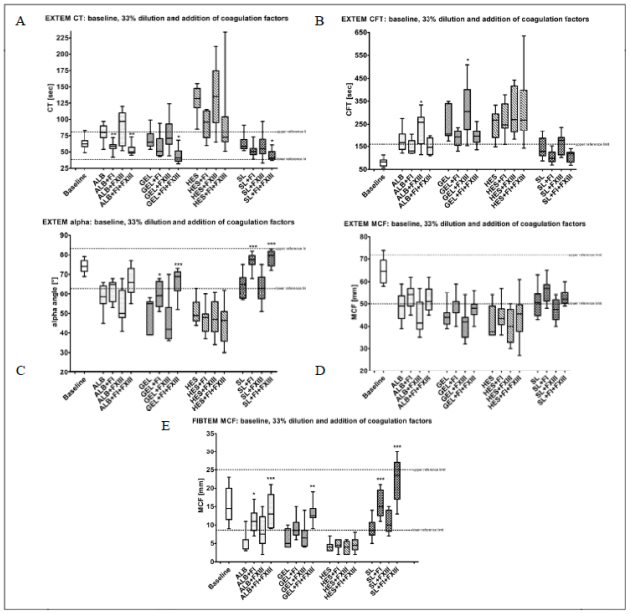


Figure 1 - Effects of in vitro 33% dilution of human (n=8) whole blood with albumin (ALB), gelatin (GEL), hydroxylethyl starch (HES) and physiological saline (SL) and administration of fibrinogen (FI) corresponding to 3 g in a patient of 70 kg bodyweight, factor XIII (FXII) corresponding to approximately 10,000 IU in a patient of 70 kg bodyweight, or the combination of both to the diluted sample.
Box plot (minimum, 25th percentile, median, 75th percentile, maximum) values are from thromboelastometry using the extrinsic activated (EXTEM) and the functional fibrin polymerisation (FIBTEM) tests with following parameters: clotting time (CT), clot formation time (CFT), alpha angle and maximum clot firmness (MCF). *P<0.05; **P<0.01; ***P<0.001 after substitution of the coagulation factor(s) as compared with dilution alone in each group.

ORIGINAL ARTICLE

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]Ludwig Boltzmann Institute for Experimental and Clinical Traumatology, Austrian Workers' Compensation Board (AUVA) Research Centre, Vienna; [2]Department of Laboratory Medicine, University Hospital of Salzburg, Salzburg; [3]Department of Anaesthesiology and Intensive Care, Austrian Workers' Compensation Board (AUVA) Trauma Hospital Salzburg, Salzburg, Austria

Koloidy

Discussion. ROTEM parameters in dilutional coagulopathy *in vitro* cannot be improved with factor XIII alone in any tested diluent. The combination of fibrinogen and factor XIII is highly effective in raising FIBTEM maximum clot firmness after dilution with albumin, gelatine and saline back to normal values, but is ineffective in 130/0.4 hydroxyethyl starch.

Pokud vás daná problematika zajímá, dovolujeme si vás pozvat do Liberce na námi pořádaný kurz :

„ KURZ POUŽITÍ ROTAČNÍ TROMBELASTOMETRIE V PERIOPERAČNÍ A INTENZIVNÍ MEDICÍNĚ “

V případě zájmu nás prosím kontaktujte na :

ivana.zykova@nemlib.cz, nebo paya.sedlak@gmail.com

Příští kurz bude probíhat v termínech: **21.10.2014**