Druhá strana mince: terapie krvácení

ivana zýková

ARO, Krajská nemocnice Liberec

střet zájmů

přednášková aktivita pro CSL Behring

Instruktor ATLS

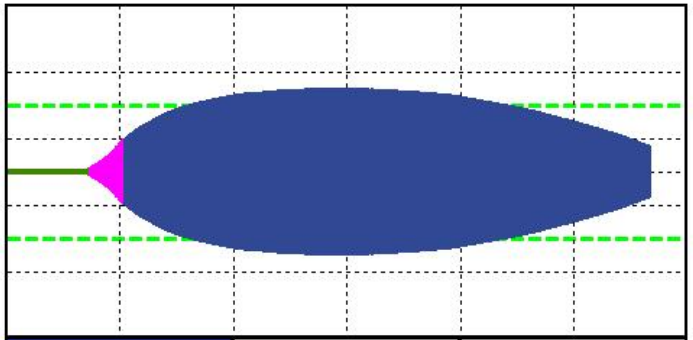
přednemocniční péče

- kyselina tranexamová
- oběh a tekutiny

tranexamová kyselina

HYPERFIBRINOLÝZA

- Mimo ROTEM prakticky nediagnostikovatelná
- Proces který u je přítomen u těžkého krvácení vždy ! (pouze záleží na jeho míře)
- Pro **TIC** (Trauma Induced coagulopathy) charakteristická
- Není ale jen u TIC !!



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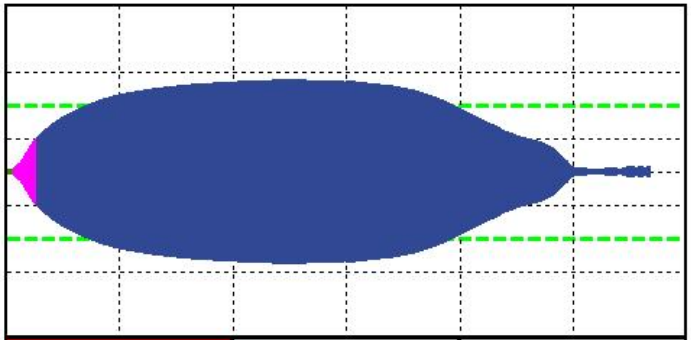
CT: 464s	CFT: 202s	α: 53°
A10: 41mm	A20: 50mm	MCF: 50mm



EXTEM	2014-06-08 13:09	2:
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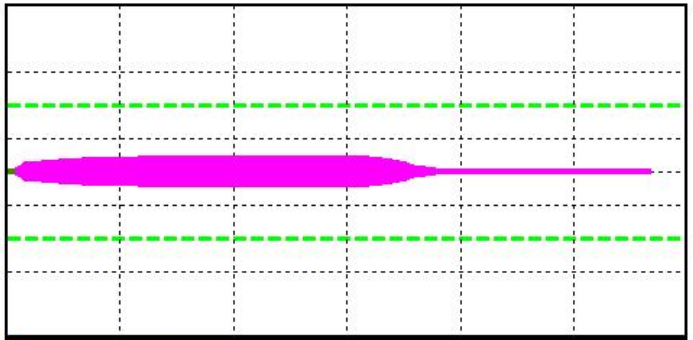
A10: 46mm	A20: 54mm	MCF: 55mm



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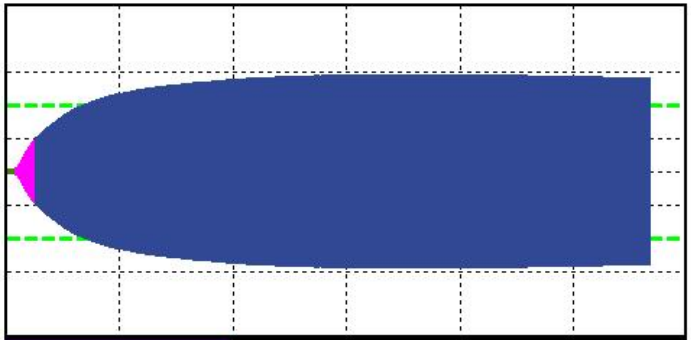

APTEM	2014-06-08 14:12	2:
CT: 59s	CFT: 113s	α: 68°
A10: 47mm	A20: 55mm	MCF: 58mm

kyselina tranexamová

CRASH2
Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage

Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

More than 20.000 patients were randomized to receive either tranexamic acid or placebo
10.060 patients received 1g tranexamic acid, initially followed by an infusion of 1g over 8 hours. 10.067 received placebo.

	Tranexamic acid (n=10 060)	Placebo (n=10 067)	RR (95% CI)	p value (two-sided)
Any cause of death	1463 (14·5%)	1613 (16·0%)	0·91 (0·85–0·97)	0·0035
Bleeding	489 (4·9%)	574 (5·7%)	0·85 (0·76–0·96)	0·0077
Vascular occlusion*	33 (0·3%)	48 (0·5%)	0·69 (0·44–1·07)	0·096
Multiorgan failure	209 (2·1%)	233 (2·3%)	0·90 (0·75–1·08)	0·25
Head injury	603 (6·0%)	621 (6·2%)	0·97 (0·87–1·08)	0·60
Other causes	129 (1·3%)	137 (1·4%)	0·94 (0·74–1·20)	0·63

Data are number (%), unless otherwise indicated. RR=relative risk. *Includes myocardial infarction, stroke, and pulmonary embolism.

Table 2: Death by cause

CRASH2
Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage

Effects of tranexamic acid on death, vascular occlusive events, and blood transfusion in trauma patients with significant haemorrhage (CRASH-2): a randomised, placebo-controlled trial

A further analysis of the CRASH-2 data [323] showed that early treatment (≤1 h from injury) significantly reduced the risk of death due to bleeding [198/3747 (5.3%) events TXA vs. 286/3704 (7.7%) placebo; relative risk (RR) 0.68, 95% CI 0.57-0.82; P<0.0001].

Rossaint et al. Critical Care (2016) 20:100
DOI 10.1186/s13054-016-1265-x

Critical Care

RESEARCH Open Access

The European guideline on management of major bleeding and coagulopathy following trauma: fourth edition

Rolf Rossaint[1], Bertil Bouillon[2], Vladimir Cerny[3,4,5,6], Timothy J. Coats[7], Jacques Duranteau[8], Enrique Fernández-Mondéjar[9], Daniela Filipescu[10], Beverley J. Hunt[11], Radko Komadina[12], Giuseppe Nardi[13], Edmund A. M. Neugebauer[14], Yves Ozier[15], Louis Riddez[16], Arthur Schultz[17], Jean-Louis Vincent[18] and Donat R. Spahn[19*]

Antifibrinolytic agents

Recommendation 25 **We recommend that tranexamic acid be administered as early as possible to the trauma patient who is bleeding or at risk of significant haemorrhage at a loading dose of 1 g infused over 10 min, followed by an i.v. infusion of 1 g over 8 h. (Grade 1A)**

We recommend that tranexamic acid be administered to the bleeding trauma patient within 3 h after injury. (Grade 1B)

We suggest that protocols for the management of bleeding patients consider administration of the first dose of tranexamic acid en route to the hospital. (Grade 2C)

Trauma Surgery & Acute Care Open

Prehospital tranexamic acid: what is the current evidence?

M Napolitano

PATCH (Prehospital Antifibrinolytics for Traumatic Coagulatophy & Haemorrhage) study[30 31]

STAAMP: study of TXA during air medical prehospital transport[28 29]

Box 1 Prehospital TXA guidelines (from Rossaint *et al*)

(Recommendation 25)
amic acid be administered as early as
is bleeding or at risk of
of 1 g infused over
10 min,
over 8 hours.
(Grade 1A)
We recommend that tra
bleeding trauma patient within
We suggest that protocols for the manag
patients consider administration of the first dose
acid en route to the hospital. (Grade 2C)

Box 2 guidelines (from

TXA administration to bleeding patients
Objective measurements should be used to guide prehospital TXA administration protocols. The focus for management of
ssible, external bleeding should be on direct pressure,
mostatic agents, and/or wound packing.
istent with non-compressible hemorrhage
al trauma or unstable pelvis
m and SBP <90 mm Hg
ital sign
adjustmen

Don't forget the basics
In the bleeding patient, hemo
nd appropriate resuscitation remain the priority. Preho
TXA use should never supersede field bleeding control techniques, rapid transport to a trauma center, or the administration of blood or plasma.

Roberts *et al. Trials* (2017) 18:48
DOI 10.1186/s13063-016-1750-1

Trials

RESEARCH Open Access

Tranexamic acid in bleeding trauma patients: an exploration of benefits and harms

Ian Roberts[1*], Phil Edwards[1], David Prieto[1,2], Miland Joshi[1], Abda Mahmood[1], Katharine Ker[1] and Haleema Shakur[1]

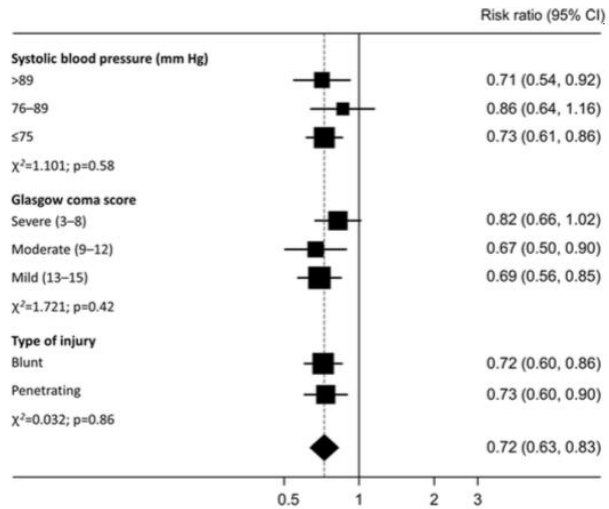

Fig. 2 Effects of early tranexamic acid (TXA) treatment stratified by systolic blood pressure (SBP), Glasgow Coma Scale (GCS) score and type of injury

Results: There was no substantial variation in age or capillary refill by time to treatment. However, the proportion of patients with blunt trauma, the proportion with head injury and mean systolic blood pressure increased as time to treatment increased. Mean GCS decreased as time to treatment increased. Analyses restricted to patients with blunt trauma, those without head injury and those with a systolic blood pressure <100 mmHg showed that these characteristics did not explain the time-dependent treatment effect. In a multivariable analysis the interaction with time to treatment remained highly significant ($p < 0.0001$). Separate subgroup analyses that examine how the benefits of early TXA treatment and the harms of late TXA treatment vary by systolic blood pressure (≤75, 76–89, >89 mmHg); GCS (severe 3–8, moderate 9–12, mild 13–15); and type of injury (penetrating versus blunt) showed no significant heterogeneity.

Conclusions: The time-dependent effect of TXA in bleeding trauma patients is not explained by the type of injury, the presence or absence of head injury or systolic blood pressure. When given within 3 h of injury, TXA reduces death due to bleeding regardless of type of injury, GCS or blood pressure.

Eur J Trauma Emerg Surg (2016) 42:303–310
DOI 10.1007/s00068-015-0613-x

ORIGINAL ARTICLE

Pharmacological adjuncts to stop bleeding: options and effectiveness

M. Panteli[1] · I. Pountos[1] · P. V. Giannoudis[1,2]

Nevertheless, an unexpected observation from the CRASH-2 trial was an increase in mortality because of bleeding in patients where TXA was administered more than 3 h[illegible]e injury; however, an increase in the all-c[illegible]as not evident in the same group of [illegible] though this observation is not easy to [illegible]ble explanations may include: the adverse [illegible] TXA in the established disseminated intravascular coagulation [23, 35]; the development of a pro-thrombotic state [23, 35]; reduced effectiveness of TXA when hypothermia or acidosis is present [23, 35]; the possibility of a different effect of the TXA when administered at different times following trauma [23, 35]; and the fact that these patients may have otherwise died from a non-bleeding cause [35].

Jiný efekt??

Transfuzní přípravky a krevní deriváty v přednemocniční péči

Anaesthesist. 2017 Nov;66(11):867-878. doi: 10.1007/s00101-017-0350-0.

[Approaches to pre-hospital bleeding management : Current overview on civilian emergency medicine].

[Article in German]

Lier H[1,2], Bernhard M[3,4], Knapp J[5,6], Buschmann C[7], Bretschneider I[8], Hossfeld B[8,9].

⊕ Author information

Abstract

Severe bleeding is a typical result of traumatic injuries. Hemorrhage is responsible for almost 50% of deaths within the first 6 h after trauma. Appropriate bleeding control and coagulation therapy depends on an integrated concept of local hemostasis by primary pressure with the hands, compression, and tourniquets accompanied by prevention of hypothermia, acidosis and hypocalcemia. Additionally, permissive hypotension is accepted for suitable patients and tranexamic acid should be administered early. Multiple publications prove that prehospital transfusion of blood products (e. g. red blood cells and plasma) and coagulation factors (e. g. fibrinogen) is feasible and safe, but only required for <5% of polytrauma patients in the civilian setting.

oběh a volumoterapie

koncept permisivní hypotenze

Rossaint *et al. Critical Care* (2016) 20:100
DOI 10.1186/s13054-016-1265-x

Critical Care

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Recommendation 13 **We recommend a target systolic blood pressure of 80–90 mmHg until major bleeding has been stopped in the initial phase following trauma without brain injury. (Grade 1C)**

In patients with severe TBI (GCS ≤8), we recommend that a mean arterial pressure ≥80 mmHg be maintained. (Grade 1C)

J Trauma Acute Care Surg. 2018 May;84(5):802-808. doi: 10.1097/TA.0000000000001816.

Permissive hypotension versus conventional resuscitation strategies in adult trauma patients with hemorrhagic shock: A systematic review and meta-analysis of randomized controlled trials.

Tran A[1], Yates J, Lau A, Lampron J, Matar M.

⊕ Author information

Abstract

BACKGROUND: Aggressive fluid resuscitation in trauma promotes deleterious effects such as clot disruption, dilutional coagulopathy and hypothermia. Animal studies suggest that permissive hypotension maintains appropriate organ perfusion, reduces bleeding and improves mortality. This review assesses the efficacy and safety of permissive hypotension in adult trauma patients with hemorrhagic shock.

METHODS: We searched the MEDLINE and EMBASE databases from inception to May 2017 for randomized controlled trials comparing permissive hypotension vs. conventional resuscitation following traumatic injury. We included preoperative and intraoperative resuscitation strategies. The primary outcome was 30-day or in-hospital mortality. Secondary outcomes included blood product utilization, estimated blood loss and in-hospital complications. Pooling was performed with a random-effects model.

RESULTS: We screened 722 abstracts, from which five randomized trials evaluating 1,158 patients were included. Blood pressure targets in the intervention arms varied from systolic BP 50 mm Hg to 70 mm Hg or mean arterial pressure of 50 mm Hg or higher as compared to systolic BP 65 mm Hg to 100 mm Hg or mean arterial pressure of 65 or higher in the control arms. Two studies evaluated only patients with penetrating injury while the remaining three additionally included blunt injuries. Four trials suggested a survival benefit for 30-day or in-hospital mortality with hypotensive resuscitation, although three studies were insufficiently powered to find statistical significance. Studies were of poor to moderate quality due to poor protocol reporting and lack of blinding. The pooled odds ratio was 0.70 (95% confidence interval, 0.53-0.92), suggesting a survival benefit for permissive hypotension. Those patients received fewer blood products and had lesser estimated blood loss.

CONCLUSION: Permissive hypotension may offer a survival benefit over conventional resuscitation for patients with hemorrhagic injury. It may additionally reduce blood loss and blood product utilization. However, the majority of studies were underpowered, thus reflecting a need for high quality, adequately powered trials.

tekutiny

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Restricted volume replacement

Recommendation 14 **We recommend use of a restricted volume replacement strategy to achieve target blood pressure until bleeding can be controlled. (Grade 1B)**

Type of fluid

Recommendation 16 **We recommend that fluid therapy using isotonic crystalloid solutions be initiated in the hypotensive bleeding trauma patient. (Grade 1A)**

We suggest that excessive use of 0.9 % NaCl solution be avoided. (Grade 2C)

We recommend that hypotonic solutions such as Ringer's lactate be avoided in patients with severe head trauma. (Grade 1C)

We suggest that the use of colloids be restricted due to the adverse effects on haemostasis. (Grade 2C)

Rossaint et al. Critical Care (2016) 20:100
DOI 10.1186/s13054-016-1265-x

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ACS. Moreover, another retrospective analysis using the German Trauma Registry database, including 17,200 multiply injured patients, showed that the incidence of coagulopathy increased with increasing volume of i.v. fluids administered pre-clinically [9]. Coagulopathy was observed in >40 % of patients with >2000 ml, in >50 % with >3000 ml and in >70 % with >4000 ml administered. Using the same trauma registry, a retrospective matched pairs analysis (n = 1896) demonstrated that multiply injured trauma patients with an Injury Severity Score (ISS) ≥16 points and a systolic blood pressure ≥60 mmHg at the accident site who received pre-hospital low-volume resuscitation (0–1500 ml) had a higher survival rate than patients in whom a pre-hospital high-volume strategy (≥1501 ml) was used [28]. These results are supported by another retrospective analysis of patients from the US National Trauma Data Bank [222]. In this study the authors

vasopresory

Rossaint *et al. Critical Care* (2016) 20:100
DOI 10.1186/s13054-016-1265-x

Critical Care

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Vasopressors and inotropic agents

Recommendation 15 **In the presence of life-threatening hypotension, we recommend administration of vasopressors in addition to fluids to maintain target arterial pressure. (Grade 1C)**

BMJ Open. 2017 Feb 28;7(2):e014166. doi: 10.1136/bmjopen-2016-014166.

Vasopressor use following traumatic injury: protocol for a systematic review.

Hylands M[1], Toma A[2], Beaudoin N[3], Frenette AJ[4], D'Aragon F[3,5], Belley-Côté E[2,6], Hylander M[7], Lauzier F[8], Siemieniuk RA[2], Charbonney E[4], Kwong J[9], Laake JH[10], Guyatt G[2], Vandvik PO[11], Rochwerg B[2], Green R[12], Ball I[13], Scales D[14], Murthy S[15], Rizoli S[16], Asfar P[17], Lamontagne F[5,6].

Author information

Abstract

INTRODUCTION: Worldwide, traumatic casualties are projected to exceed 8 million by year 2020. Haemorrhagic shock and brain injury are the leading causes of death following trauma. While intravenous fluids have traditionally been used to support organ perfusion in the setting of haemorrhage, recent investigations have suggested that restricting fluid therapy by tolerating more severe hypotension may improve survival. However, the safety of permissive hypotension remains uncertain, particularly among patients who have suffered a traumatic brain injury. Vasopressors preferentially vasoconstrict blood vessels that supply non-vital organs and capacitance vessels, thereby mobilising the unstressed blood volume. Used as fluid-sparing adjuncts, these drugs can complement resuscitative measures by correcting hypotension without diluting clotting factors or increasing the risk for tissue oedema.

METHODS AND ANALYSIS: We will identify randomised control trials comparing early resuscitation with vasopressors versus placebo or standard care in adults following traumatic injury. Data sources will include MEDLINE, EMBASE, CENTRAL, clinical trial registries and conference proceedings. Two reviewers will independently determine trial eligibility. For each included trial, we will conduct duplicate independent data extraction and risk of bias assessment. We will assess the overall quality of the data for each individual outcome using the GRADE approach.

ETHICS AND DISSEMINATION: We will report this review in accordance with the PRISMA statement. We will disseminate our findings at critical care and trauma conferences and through a publication in a peer-reviewed journal. We will also use this systematic review to create clinical guidelines (http://www.magicapp.org), which will be disseminated in a standalone publication.

Časná nemocniční péče

Iniciální resuscitace koagulace

Další (cílená) resuscitace koagulace

Iniciální resuscitace koagulace

Initial coagulation resuscitation

Recommendation 24 In the initial management of patients with expected massive haemorrhage, we recommend one of the two following strategies:

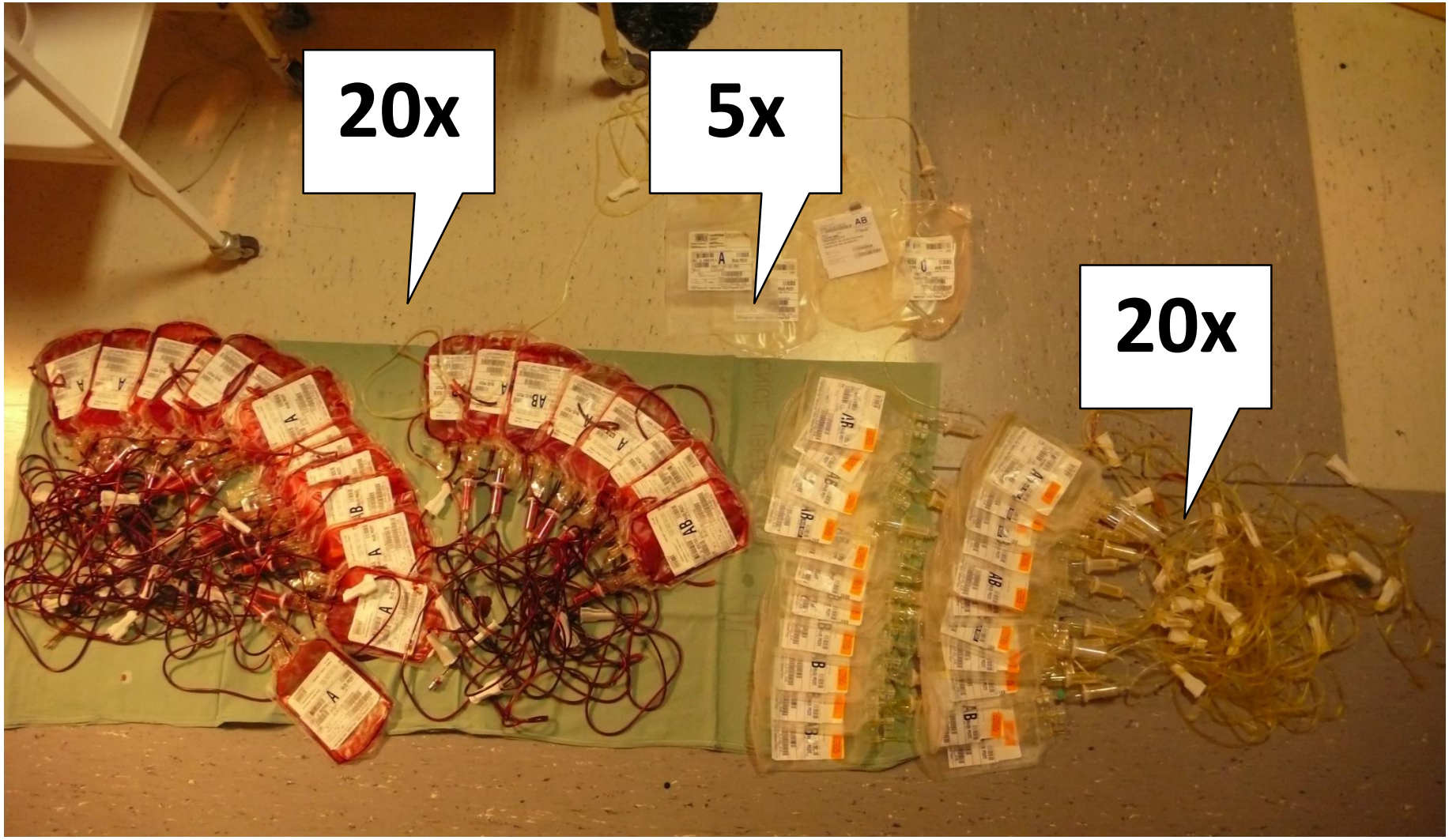
- Plasma (FFP or pathogen-inactivated plasma) in a plasma–RBC ratio of at least 1:2 as needed. (Grade 1B)
- Fibrinogen concentrate and RBC according to Hb level. (Grade 1C)

od záchytu krvácení do prvních výsledků

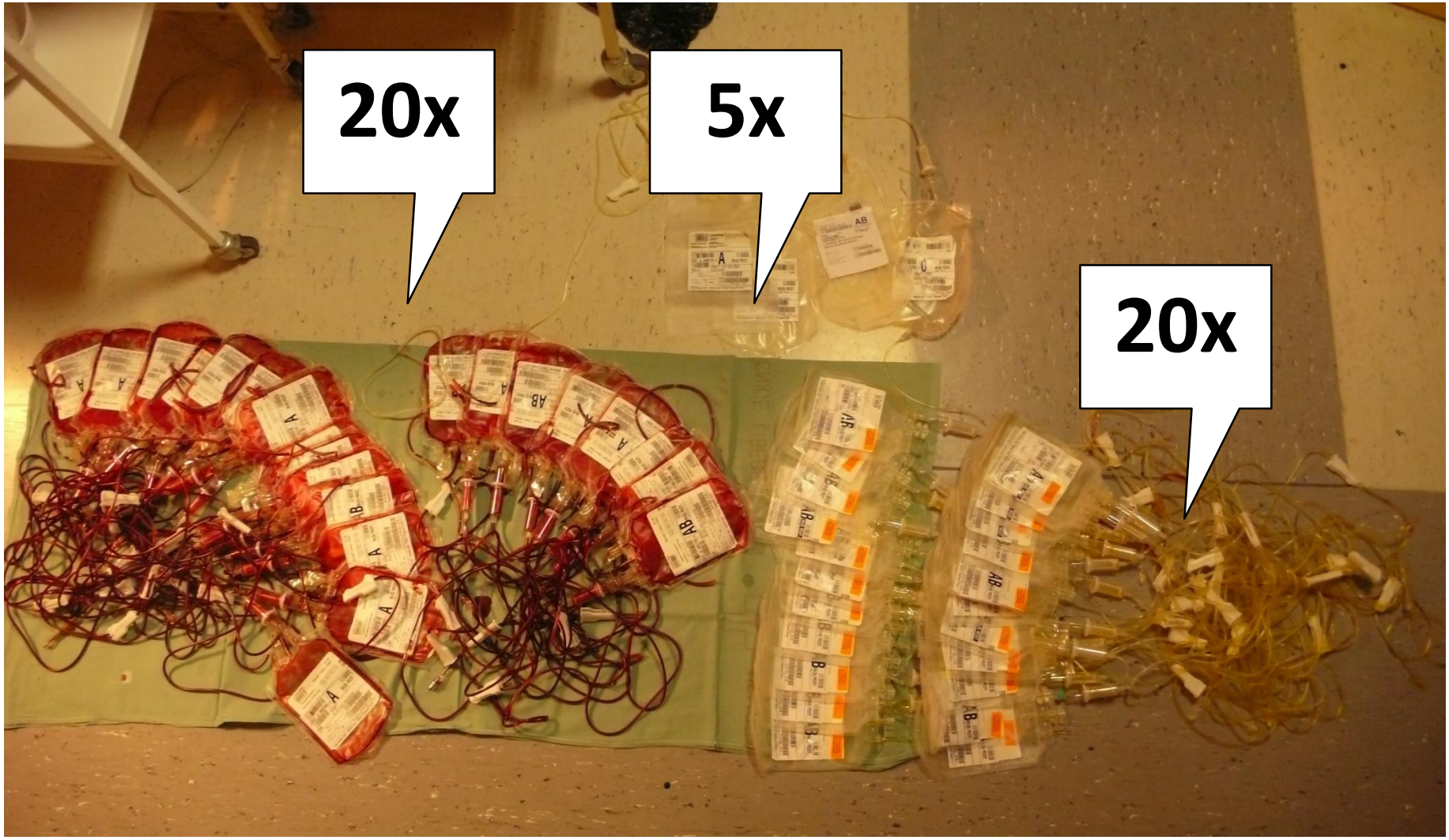
2 přístupy k léčbě život ohrožujícího krvácení

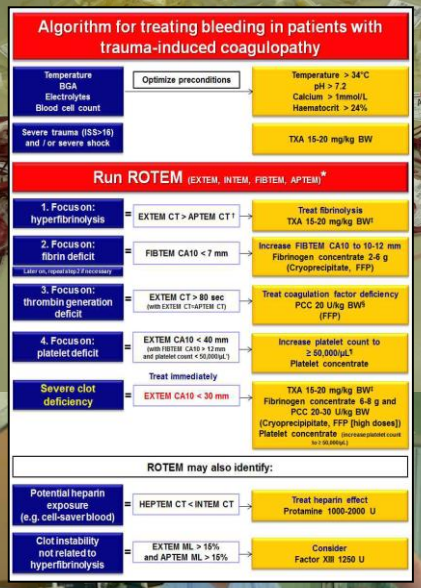
(kombinují se ☺)

4 EBR : 4 FFP : 1 t.d. trombo



a fibrinogen





Cílená léčba koncentráty koagulačních faktorů

Podání již při podezření na deficit fibrinogenu

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

Guidelines on the management of severe perioperative bleeding

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]

Kritických hodnot fibrinogenu může být dosaženo dříve než je nutné podávat PRBC

- **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.

4 g fibrinogenu ...vzestup o 1g/l fibrinogenu

4 g fibrinogenu nebo 16 x FFP

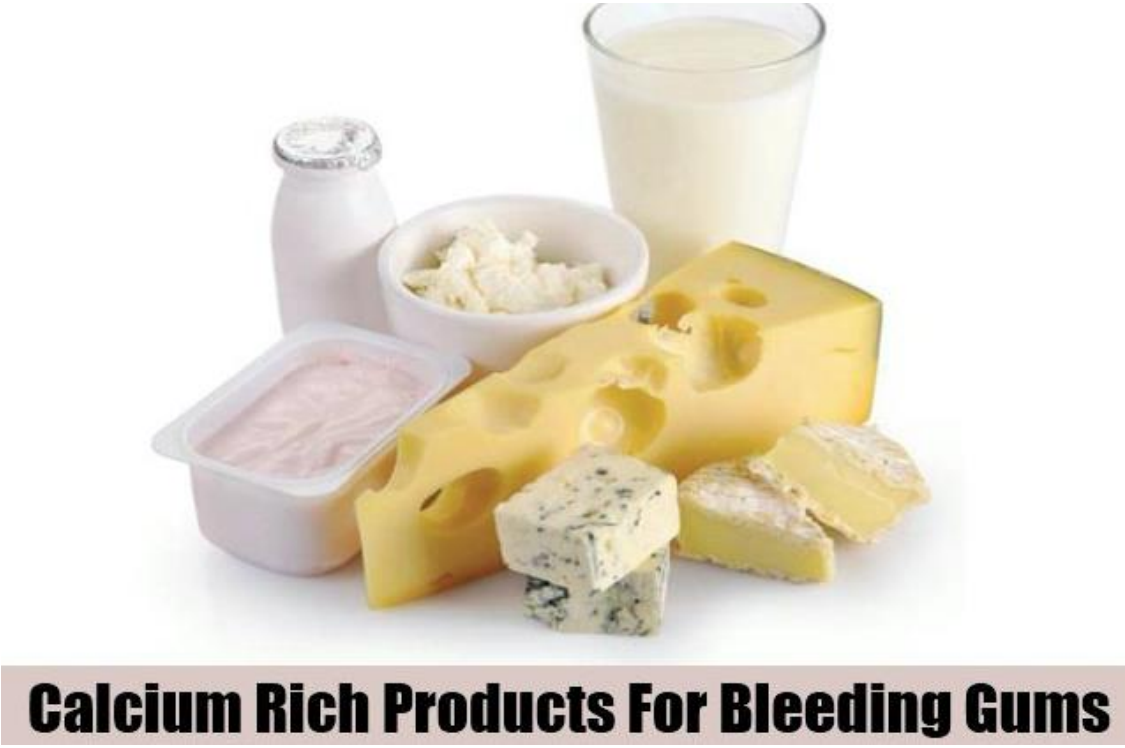
Iniciální resuscitace koagulace

Rationale

We define "initial resuscitation" as the period between arrival in the emergency department and availability of results from coagulation monitoring (coagulation screen, fibrinogen level and/or viscoelastic monitoring and platelet count). There are still conflicting opinions about use of plasma as the initial strategy to support coagulation, and several authors, mainly in Europe, strongly disagree with the initial transfusion of patients based on an empirical ratio rather than guided by concurrent laboratory data (goal-directed therapy) [388]. In the absence of rapid point-of-care coagulation testing to facilitate goal-directed therapy, initial treatment with blood components in a fixed ratio may constitute a reasonable approach. If concurrent coagulation results are available, they should be used to guide therapy.

Administration of plasma to bleeding patients may stabilise fibrinogen levels, avoiding a further decrease, but plasma transfusions cannot contribute to a significant increase in fibrinogen level unless very high volumes are infused [406]. The Activation of Coagulation and Inflammation in Trauma (ACIT) study [396] confirmed these findings, showing that the percentage of coagulopathic patients increased with a standard near 1:1 FFP:RBC transfusion protocol. Similar results were recently reported by Khan et al. [15]. Again, a 1:1 FFP:RBC transfusion protocol did not alleviate coagulopathy; the percentage of coagulopathic patients even increased the longer this treatment lasted. Interestingly, in the same study it was shown that only high-dose fibrinogen administration resulted in improved coagulation and a reduction in coagulopathy. Furthermore, both FFP and

na co se často zapomíná:
kalcium



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Calcium

Recommendation 30 **We recommend that ionised calcium levels be monitored and maintained within the normal range during massive transfusion. (Grade 1C)**

Early hypocalcaemia following traumatic injury shows a significant correlation with the amount of FFP transfused and also with the amount of infused colloids, but not with crystalloids. Hypocalcaemia is most common in association with FFP and platelet transfusion because these products contain high citrate concentrations. Citrate undergoes rapid hepatic metabolism, and hypocalcaemia is generally transient during standard transfusion procedures. Citrate metabolism may be dramatically impaired by hypoperfusion states, hypothermia and in patients with hepatic insufficiency [489].

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The European guideline on management of major bleeding and coagulopathy following trauma: fourth edition

Rolf Rossaint[1], Bertil Bouillon[2], Vladimir Cerny[3,4,5,6], Timothy J. Coats[7], Jacques Duranteau[8], Enrique Fernández-Mondéjar[9], Daniela Filipescu[10], Beverley J. Hunt[11], Radko Komadina[12], Giuseppe Nardi[13], Edmund A. M. Neugebauer[14], Yves Ozier[15], Louis Riddez[16], Arthur Schultz[17], Jean-Louis Vincent[18] and Donat R. Spahn[19*]

ionised fraction [485]. Two observational cohort studies showed that low ionised calcium levels at admission are associated with increased mortality as well as an increased need for massive transfusion [486, 487]. Hypocalcaemia during the first 24 h can predict mortality and the need for multiple transfusion better than the lowest fibrinogen concentrations, acidosis and the lowest platelet counts [486]. Measurement of ionised calcium levels at admission may facilitate the rapid identification of patients who require massive transfusion, allowing for earlier preparation and administration of appropriate blood products. However, no data are available to demonstrate

odběry

Haemoglobin

Recommendation 10 We recommend that a low initial Hb be considered an indicator for severe bleeding associated with coagulopathy. (Grade 1B)

We recommend the use of repeated Hb measurements as a laboratory marker for bleeding, as an initial Hb value in the normal range may mask bleeding. (Grade 1B)

Hb

II. Diagnostika a mon

Coagulation mo

Recomm

W **etice t**

include

easure

ted pa

inogen

We r **hods also be**

eterising the

guiding haemostatic therapy.

APTT, Quick, fibrinogen, trombocyty…opakovaně!!!!

Použití viskoelastických metod

and fibrinogen. Increasing emphasis focuses on the importance of fibrinogen and platelet measurements. It is often assumed that the conventional coagulation screens [international normalised ratio (INR) and APTT] monitor coagulation, however these tests monitor only the initiation phase of blood coagulation, and represent only the first 4 % of thrombin production [178]. It is therefore possible that the conventional coagulation screen appears normal, while the overall state of blood coagulation is abnormal [13, 179–183]. In addition, the delay in detection of traumatic coagulopathy can influence outcome, and the turnaround time of thromboelastometry has been shown to be significantly shorter than conventional laboratory testing, with a time saving of 30–60 min [181, 184, 185]. Viscoelastic testing may

Fibrinogen administration using

to measuring

Podávání fibrinogenu dle viskoelastických metod

V. Management krvácení a koagulace

Coagulation support

Recommendation 23

We recomme asures

to su ted as early as

Co nejdříve!!!!!!!!

Coagulation monitoring

Recommendation 12 W

practice include

coagulati atory

det 1), activated

T) platelet counts

A) and/or a viscoelastic

A/NEBO

30–60 min [181, 184, 185]. Viscoelastic testing may also be useful in the detection of coagulation abnormalities associated with the use of direct thrombin inhibitors such as dabigatran, argatroban, bivalirudin or hirudin. Furthermore, (early) variables of clot firmness assessed by viscoelastic testing have been shown to be good predictors for the need for massive transfusion, the incidence of thrombotic/thromboembolic events and for mortality in surgical and trauma patients

tion and standardisatio
limitation of visc
ity to det due
to on is ex-
on tests, for ex-
aggregometry, should be
oelastic tests [213, 214]. More

agregometrie

Další resuscitace koagulace

VI. Further resuscitation

Goal-directed therapy

Recommendation 26 We recommend that resuscitation measures be continued using a goal-directed strategy guided by standard laboratory coagulation values and/or viscoelastic tests. (Grade 1C)

BUĎ

Fresh frozen plasma

Recommendation 27 If a plasma-based coagulation resuscitation strategy is used, we recommend that plasma (FFP or pathogen-inactivated plasma) be administered to maintain PT and APTT <1.5 times the normal control. (Grade 1C)

We recommend that plasma transfusion be avoided in patients without substantial bleeding. (Grade 1B)

ANEBO

Fibrinogen and cryoprecipitate

Recommendation 28 If a concentrate-based strategy is used, we recommend treatment with fibrinogen concentrate or cryoprecipitate if significant bleeding is accompanied by viscoelastic signs of a functional fibrinogen deficit or a plasma fibrinogen level of less than 1.5–2.0 g/l. (Grade 1C)

We suggest an initial fibrinogen supplementation of 3–4 g. This is equivalent to 15–20 single donor units of cryoprecipitate or 3–4 g fibrinogen concentrate. Repeat doses must be guided by viscoelastic monitoring and laboratory assessment of fibrinogen levels. (Grade 2C)

PCC

Prothrombin complex concentrate

Recommendation 33 We recommend the early use of prothrombin complex concentrate (PCC) for the emergency reversal of vitamin K-dependent oral anticoagulants. (Grade 1A)

We suggest the administration of PCC to mitigate life-threatening post-traumatic bleeding in patients treated with novel oral anticoagulants. (Grade 2C)

Provided that fibrinogen levels are normal, we suggest that PCC or plasma be administered in the bleeding patient based on evidence of delayed coagulation initiation using viscoelastic monitoring. (Grade 2C)

Prothrombin complex concentrate

Recommendation 31

We recommend the early use of prothrombin

emergency reversal of vitamin K

If a con we suggest that PCC

be elastometric evidence of delayed

Thromboelastometry appears to be a useful tool to guide

in patients with traumatic coagulopathy

PCC při prodloužení iniciace

Management koagulace – F XI

- In cases of ongoing o
  strength despi
  concen tivity is
  ignificant FXIII
  tivity), we sug
  10 kg) can be

F XIII – testujeme po podání
6 – 8 PRBC – hladina XIII > 60 %

Test : 24/7
Koncentrát v lednici

Management koagulace

- We suggest that
  recombin
  be
  ial, surgical or
  adiological means and/or
  omprehensive coagulation therapy
  ails. 2C

rFVIIa

„chirurgicky neřešitelné krvácení“

hypotermie

acidoza

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ORIGINAL ARTICLE

Damage control resuscitation: lessons learned

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Correction of acidosis

The ultimate treatment to reverse metabolic acidosis in the severely injured is the restoration of organ perfusion through volume replacement, permitting acid-base balance to normalise by homeostatic mechanisms. This may be difficult to achieve until haemorrhage is controlled, indeed such measures provide good endpoints to guide resuscitation and persisting abnormalities of acid-base balance should prompt investigation for on-going occult bleeding and hypoperfusion. Whilst it is possible to correct acid-base disturbances pharmacologically, this has more relevance where the cause includes base losses such as in diabetic ketoacidosis. Administration of sodium bicarbonate has been shown to cause the production of carbon dioxide, paradoxically lowering intra cellular pH and leading to a fall in the ionised calcium concentration which has implications for coagulation and cardiac function. Tris(hydroxymethyl) aminomethane leads to a similar effect by accepting hydrogen ions and it's use has been reported in trauma patients [23]. However, it is widely accepted that correction of metabolic acidosis in these patients is best achieved through aggressive blood and blood product administration alongside appropriate use of vasopressors until the other components of the lethal triad can be addressed [11]. No studies have shown any advantage to pharmacologic management of acidosis in the trauma setting and there are currently no specific guidelines to address the specific reversal of acidosis in the trauma patient [11].

acidoza

- vliv samotné acidozy na koagulaci
- potenciace v terénu krvácení
- korekce acidozy před podáním rFVIIa
- parametr zlepšení hemodynamiky a zástavy krvácení

cave NOAC a antiagregace

Nezapomenout na časně zahájenou profylaktickou antikoagulační léčbu