

“plasma free” PRO



ivana zýková
ARO
Krajská nemocnice Liberec, a.s.

střet zájmů

- **přednášková aktivita pro CSL Behring**
- **práce na ARO Liberec, kde je ROTEM od roku 2009 😊**

“plasma free”

- špatný název 😊
- Zbytečné dělení a radikalizace postojů 😊
- Princip: podávám koncentráty koagulačních faktorů
- cílená léčba koncentráty koagulačních faktorů
(kterou lze v případě nutnosti kombinovat s podáváním plazmy 😊)

**Iniciální resuscitace
koagulace**

**Další (cílená) resuscitace
koagulace**

Iniciální resuscitace koagulace

Initial coagulation resuscitation

Recommendation 24 In the management of patients with expected or ongoing major bleeding, we recommend one of the following strategies:

- Plasma (fresh frozen plasma or cryoprecipitate-depleted plasma) in a ratio of at least 1:2 as needed. (Grade 1C)

• Cryoprecipitate and RBC according to Hb level. (Grade 1C)



10-40 minut dle typu vyšetřování koagulace

od záchytu krvácení
do prvních výsledků

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Critical Care

RESEARCH

Open Access

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

Rolf Rossaint¹, Benji Bouillon², Vladimir Cerny^{3,4,5,6}, Timothy J. Coats⁷, Jacques Duranteau⁸, Enrique Fernández-Mondéjar⁹, Daniela Filipesco¹⁰, Beverley J. Hunt¹¹, Radko Komadina¹², Giuseppe Nardi¹³, Edmund A. M. Neugebauer¹⁴, Yves Otter¹⁵, Louis Rader¹⁶, Arthur Schultz¹⁷, Jean-Louis Vincent¹⁸ and Donat R. Spahn¹⁹

Iniciální resuscitace koagulace

RESULTS

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.

RESEARCH

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

André Bouillon¹, Boris Bouillon¹, Mathieu Carlier^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,568,569,570,571,572,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588,589,590,591,592,593,594,595,596,597,598,599,600,601,602,603,604,605,606,607,608,609,610,611,612,613,614,615,616,617,618,619,620,621,622,623,624,625,626,627,628,629,630,631,632,633,634,635,636,637,638,639,640,641,642,643,644,645,646,647,648,649,650,651,652,653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668,669,670,671,672,673,674,675,676,677,678,679,680,681,682,683,684,685,686,687,688,689,690,691,692,693,694,695,696,697,698,699,700,701,702,703,704,705,706,707,708,709,710,711,712,713,714,715,716,717,718,719,720,721,722,723,724,725,726,727,728,729,730,731,732,733,734,735,736,737,738,739,740,741,742,743,744,745,746,747,748,749,750,751,752,753,754,755,756,757,758,759,760,761,762,763,764,765,766,767,768,769,770,771,772,773,774,775,776,777,778,779,780,781,782,783,784,785,786,787,788,789,790,791,792,793,794,795,796,797,798,799,800,801,802,803,804,805,806,807,808,809,810,811,812,813,814,815,816,817,818,819,820,821,822,823,824,825,826,827,828,829,830,831,832,833,834,835,836,837,838,839,840,841,842,843,844,845,846,847,848,849,850,851,852,853,854,855,856,857,858,859,860,861,862,863,864,865,866,867,868,869,870,871,872,873,874,875,876,877,878,879,880,881,882,883,884,885,886,887,888,889,890,891,892,893,894,895,896,897,898,899,900,901,902,903,904,905,906,907,908,909,910,911,912,913,914,915,916,917,918,919,920,921,922,923,924,925,926,927,928,929,930,931,932,933,934,935,936,937,938,939,940,941,942,943,944,945,946,947,948,949,950,951,952,953,954,955,956,957,958,959,960,961,962,963,964,965,966,967,968,969,970,971,972,973,974,975,976,977,978,979,980,981,982,983,984,985,986,987,988,989,990,991,992,993,994,995,996,997,998,999,1000,1001,1002,1003,1004,1005,1006,1007,1008,1009,1010,1011,1012,1013,1014,1015,1016,1017,1018,1019,1020,1021,1022,1023,1024,1025,1026,1027,1028,1029,1030,1031,1032,1033,1034,1035,1036,1037,1038,1039,1040,1041,1042,1043,1044,1045,1046,1047,1048,1049,1050,1051,1052,1053,1054,1055,1056,1057,1058,1059,1060,1061,1062,1063,1064,1065,1066,1067,1068,1069,1070,1071,1072,1073,1074,1075,1076,1077,1078,1079,1080,1081,1082,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1109,1110,1111,1112,1113,1114,1115,1116,1117,1118,1119,1120,1121,1122,1123,1124,1125,1126,1127,1128,1129,1130,1131,1132,1133,1134,1135,1136,1137,1138,1139,1140,1141,1142,1143,1144,1145,1146,1147,1148,1149,1150,1151,1152,1153,1154,1155,1156,1157,1158,1159,1160,1161,1162,1163,1164,1165,1166,1167,1168,1169,1170,1171,1172,1173,1174,1175,1176,1177,1178,1179,1180,1181,1182,1183,1184,1185,1186,1187,1188,1189,1190,1191,1192,1193,1194,1195,1196,1197,1198,1199,1200,1201,1202,1203,1204,1205,1206,1207,1208,1209,1210,1211,1212,1213,1214,1215,1216,1217,1218,1219,122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Další resuscitace koagulace

cílená dle výsledků

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 anti-coagulants. (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)

A = viskolelastické metody

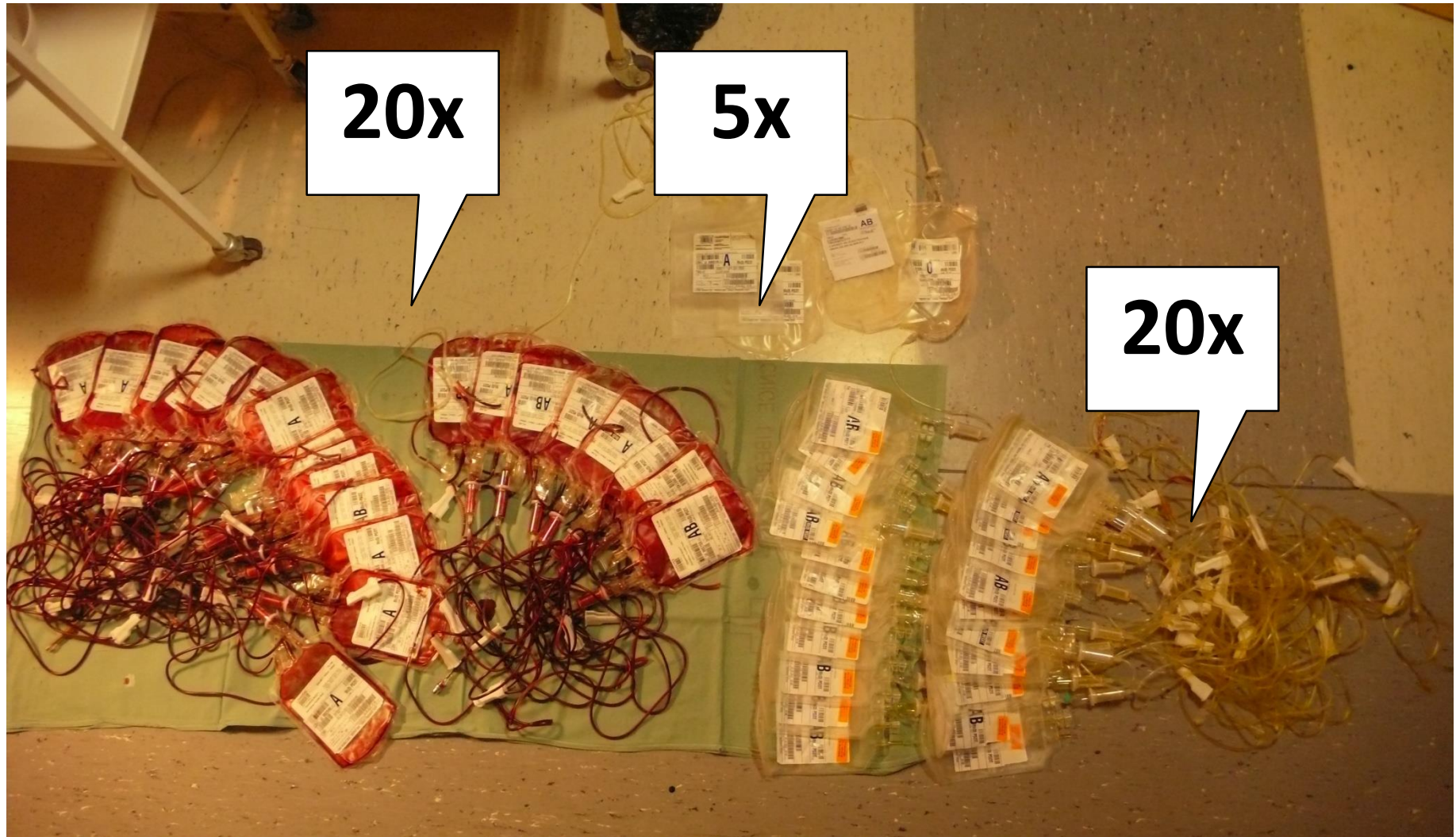
B = koncentráty koagulačních faktorů

A + B =

**rychlejší výsledky
časnější terapie**



**4 EBR : 4 FFP : 1 t.d. trombo
a fibrinogen**



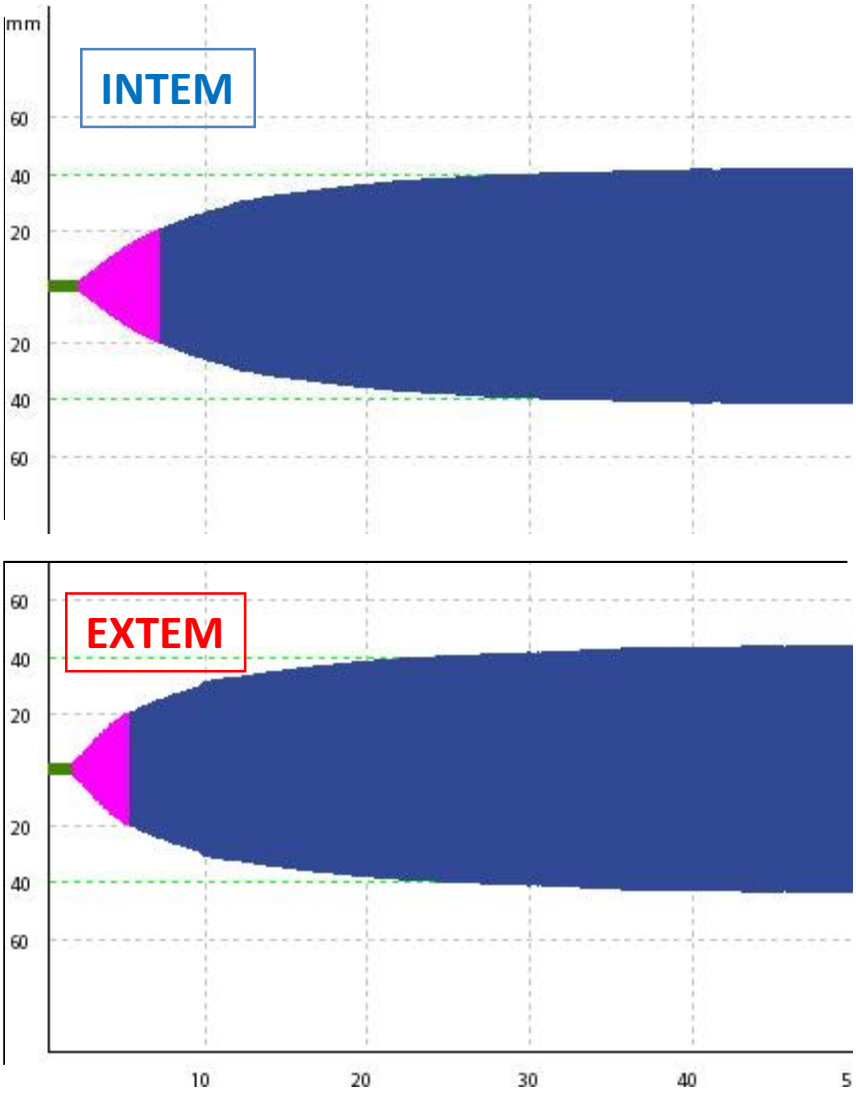


2008 2009 2010 2011 2012 2013 2014

„retrokazuistika“

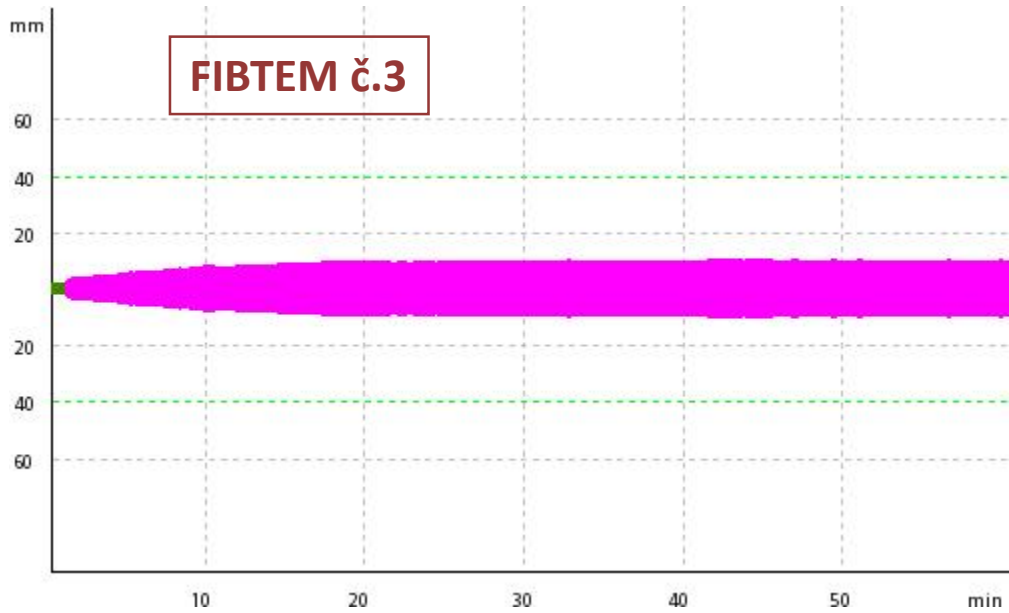
- **Žena, 21 let**
- **Havarovala jako spolujezdec na motocyklu ve vysoké rychlosti - srážka s osobním automobilem**
- **Polytrauma**

Kazuistika - ROTEM



1 θ'	ExTEG	2 θ'	InTEG
St. : 10h45	St. : 10h45	St. : 10h45	St. : 10h45
Run : 87.8'	Run : 87.8'	Run : 87.4'	Run : 87.4'
MCF : 58mm	MCF : 58mm	MCF : 60mm	MCF : 60mm
CT : 44s	CT : 44s	CT : 99s	CT : 99s
CFT : 96s	CFT : 96s	CFT : 87s	CFT : 87s
AS : 41mm	AS : 41mm	AS : 43mm	AS : 43mm

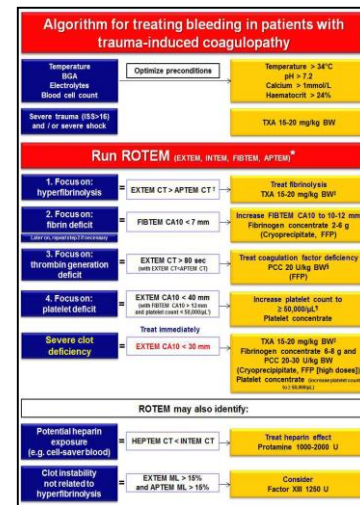
3 θ'	ApTEG	4 θ'	FibTEG
St. : 10h46	St. : 10h46	St. : 10h46	St. : 10h46
Run : 87.1'	Run : 87.1'	Run : 86.6'	Run : 86.6'
MCF : 57mm	MCF : 57mm	MCF : 15mm	MCF : 15mm
CT : 33s	CT : 33s	CT : 62s	CT : 62s
CFT : 92s	CFT : 92s		
AS : 40mm	AS : 40mm	AS : 9mm	AS : 9mm



„retrokazuistika“

- Žena, 21 let
- Havarovala jako spolujezdec na motocyklu ve vysoké rychlosti - srážka s osobním automobilem
- Polytrauma
- Celkem podáno:
EBR 16 MP 15 Fb 6g TB 3 TU 1500 j. PCC
EBR : MP : Fb : TB „4 : 4 : 2 : 1“

**Proč podávat na ROTEM křivku
plazmu??**



2008 2009 2010 2011 2012 2013 2014

- **První výsledky jsme prezentovali 2014**
- **Báli jsme se ukamenování....**
- **Ted' už je situace jiná...**

čas



- **Mám čas...čekám na ROTEM
(a léčím dle ROTEM: fibrinogen,PCC)**
- **Nemám čas...začnu co
nejdříve...fibrinogen**

čas



- **PRBC z lednice na urgentu**
- **Fibrinogen...trvá 8 minut rozpuštění**
- **FFP – mám rozmraženou (kdo má??)
(nemám rozmraženou20 minut ...30 minut...)**
- **Mezitím výsledek ROTEM podávám PCC**

Závěr:

Měl bych (a chci) zvolit co nejrychlejší postup....

- **Nejdříve je dostupný fibrinogen (a PRBC)**
- **Stejně brzy je dostupné PCC (tč indikace při prodloužené iniciaci, při dostatku zkušeností s ROTEM lze jako **rescue** podat naslepo)**

Proč podávat na ROTEM křivku plazmu??

Plazmy

- **Plazmy jsou dostupně později**
- **Potřebuji je ještě?**
- **Pravděpodobně ne**
- **Již mám výsledek ROTEM a u většiny pacientů mám dohrazenou koagulopatii a zastavuji krvácení**

Plazmy

- **Léčím podle ROTEM a k tomu dávám plazmy podle masivního transfuzního protokolu ??**
- **A plazma je u většiny pacientů “navíc”**
- **Indikace plazmy je korekce koagulopatie**

studie

- **Většina “ normální provoz” kontra masivní transfuzní protokol**
- **Data se zemí z horší dostupností především fibrinogenu a ROTEM**
- **i RETIC v našeho pohledu “neakceptovatelný” (nemohu znovu vstoupit do řeky bez fibrinogenu, pokud na ROTEM vidím deficit) – ale samozřejmě potřebná studie**

IN GOD WE TRUST



**ALL OTHERS MUST
SHOW DATA**



ALE

Terapie život ohrožujícího krvácení

Pacient dostal od příjmu do definitivní zástavy krvácení **28 hodin po příjmu** 14.8.2017 v 22 hodin celkem:

54 TU erytrocytů (PRBC)

58 TU plazmy

1:1

12 TD trombocytů (z toho 7x nákup z jiné nemocnice)

1:1:1 (4:4:1)

33 g fibrinogenu

7200 u.i. koncentráту protrombinového komplexu (**PCC**)

9 mg rFVIIa (před poslední embolizací po optimalizaci podmínek)

6 g kyseliny tranexamové

90 ml CaCl₂ 10%

Hrazení probíhalo dle klinického stavu, výsledků ROTEM a hematologických vyšetření.

Indikace plazmy

- **Těžký** hemorhagický šok, který nepůjde vyřešit **rychle**
- Protrahované krvácení s masivními převody PRBC a suspekci na **deficit** faktorů, které nejsem schopna hradit koncentráty koagulačních faktorů
- Prodloužení CT v INTEM izolované ??

Indikace plazmy

- **Indikace plazmy při ztrátě 1,5 – 2 násobku tělesného objemu krve**
- **Obtížně měřitelné ztráty u většiny krvácení (traumata)**
- **Záleží na rychlosti krvácení a “presumpci zástavy krvácení”**

Objednání plazmy: naše praxe

- **Pokles Hb vstupně**
- **Oběhová nestabilita**
- **Rozsah krváčení – FAST,...**
- **Nemožnost odebrat vzorek**
- **Objednám plazmu – až přinesou uvidím
(podám x nepodám)**

Objednání plazmy: naše praxe

- **Protrahované krvácení –
-nutné převody více než 15 -20 PRBC**
- **Po 8 PRBC stanovují FXIII**

výsledek

- **Podání většího množství plazmy méně pacientům**

2 principy

A = viskolelastické metody

B = koncentráty koagulačních faktorů

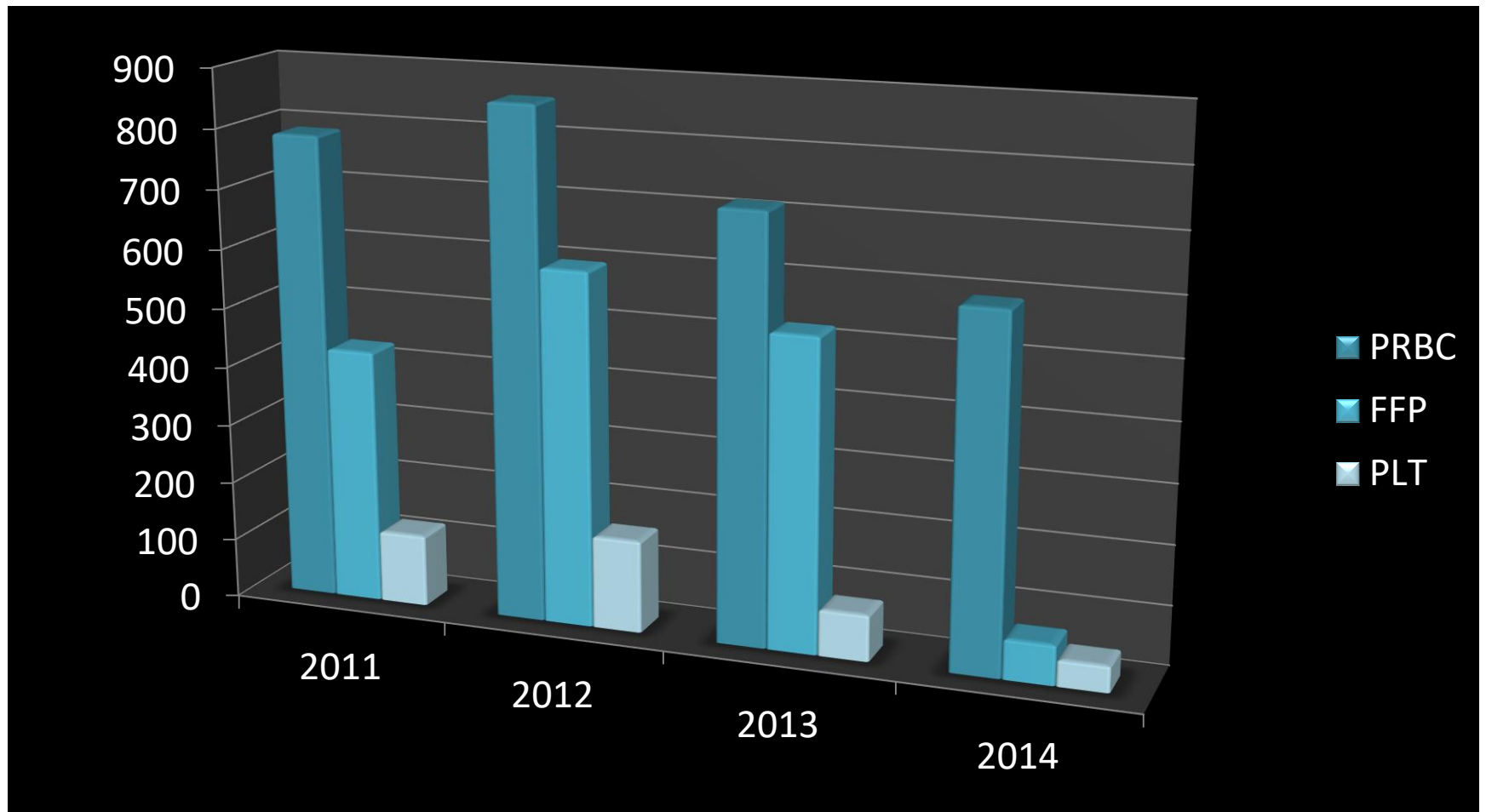
A + B =

**rychlejší výsledky
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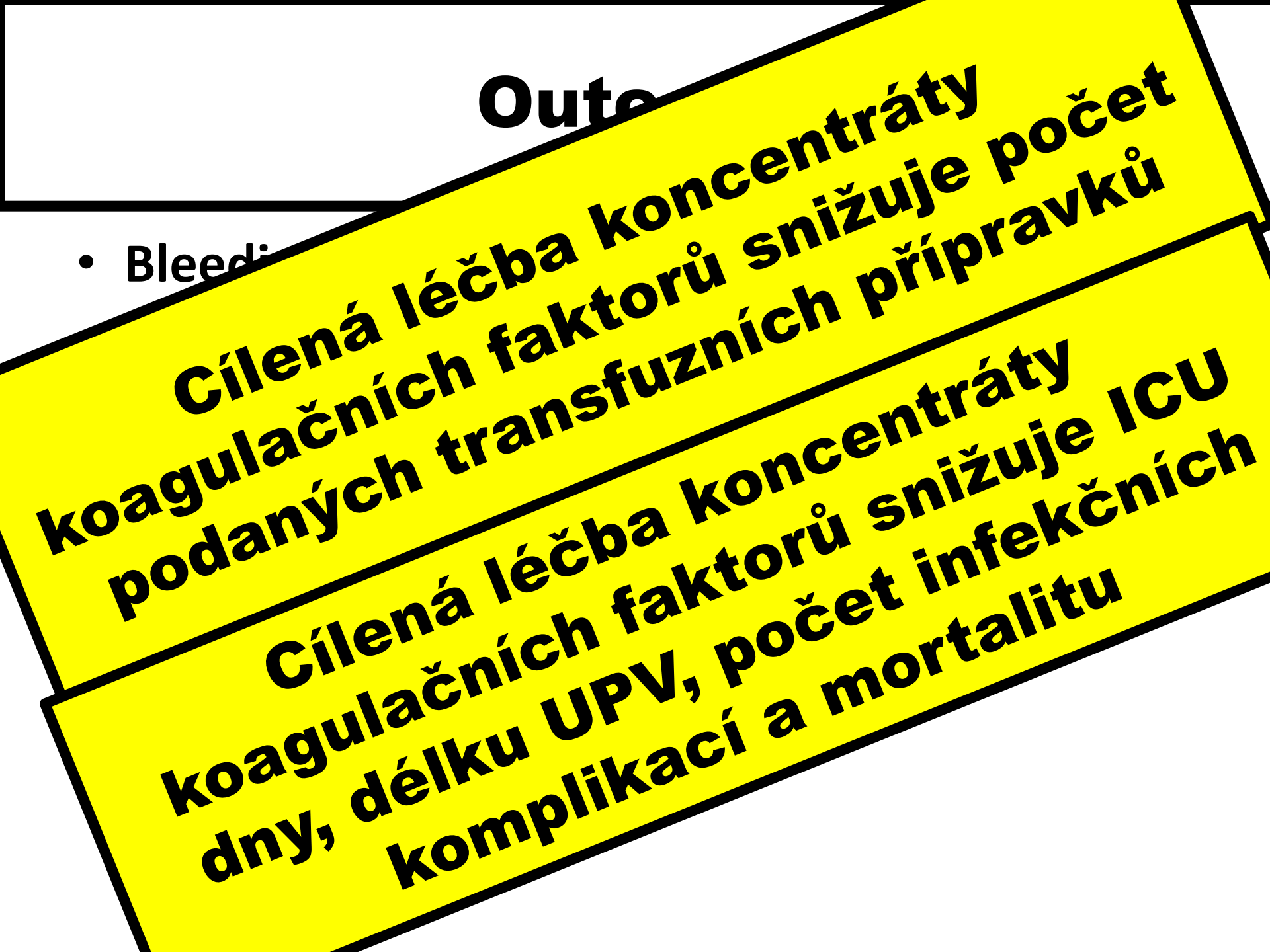
- “Pokud nezkusíš, neuvěříš”
- Při **razantní iniciální léčbě** koncentráty koagulačních faktorů je nižší spotřeba PRBC**pacienti méně krvácí**.....odpadá podíl koagulopatie na míře krvácení
- Pokles FFP vychází z metodiky
- Pokles trombo je podmíněn i vztahem fibrinogen x trombo
- Pokles PRBC ale znamená **menší krvácení**

Transfusion requirements



Out

- Bleeding



Děkuji za pozornost

