Coagulação e transfusão no peri-operatório

DR. ALEXANDRE TERUYA

- Riscos transfusionais
- Transplante hepático
- Coagulação
- Exames laboratoriais
- Condutas
- Drogas pró coagulantes

Reações Transfusionais

• Morrer atingido por meteorito	1/100 bilhões
• Ser atingido por avião em terra	1/25 milhões
• Morrer em acidente de avião	1/4,2 milhões
• Contaminação HCV/HIV p/ transf	1/1,5 milhão
• Ser atingido por um raio	1/919.000
• Morrer praticando canoagem	1/100.000
• Morrer pelo uso de anticoncepcional	1/50.000
• Morrer jogando futebol	1/25.000
• Receber transfusão incompatível	1/25.000
• Morrer de leucemia	1/12.000
• Morrer por complicações da gravidez	1/4.200
• Bater o carro (São Paulo)	1/710
• Casamento acabar em divórcio	1/2,5

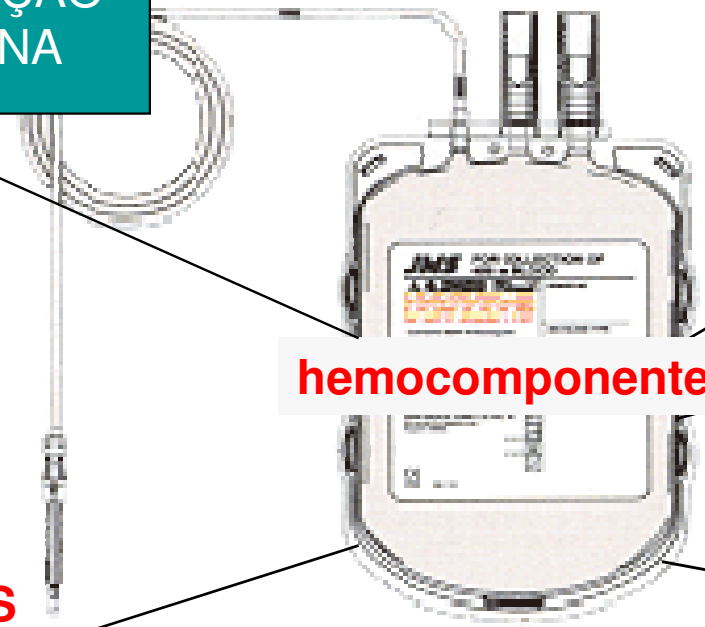
Reações Transfusionais

BACTÉRIAS

CONTAMINAÇÃO BACTERIANA

LEUCÓCITOS

REAÇÃO FEBRIL NÃO HEMOLÍTICA



hemocomponentes

PROTEÍNAS

REAÇÃO ALÉRGICA

ANTICORPOS

TRALI

LINFÓCITOS

DOENÇA ENXERTO *VS* HOSPEDEIRO

The Journal of TRAUMA® Injury, Infection, and Critical Care

J Trauma. 2006;60:S46–S50.

Risks of Fresh Frozen Plasma and Platelets

Sheila MacLennan, MBBS, FRCP, FRCPath and Lorna M. Williamson, BSc, MD, FRCP, FRCPath

TRALI

TACO

ALI

Bacterial contamination

Sepsis

Original Research

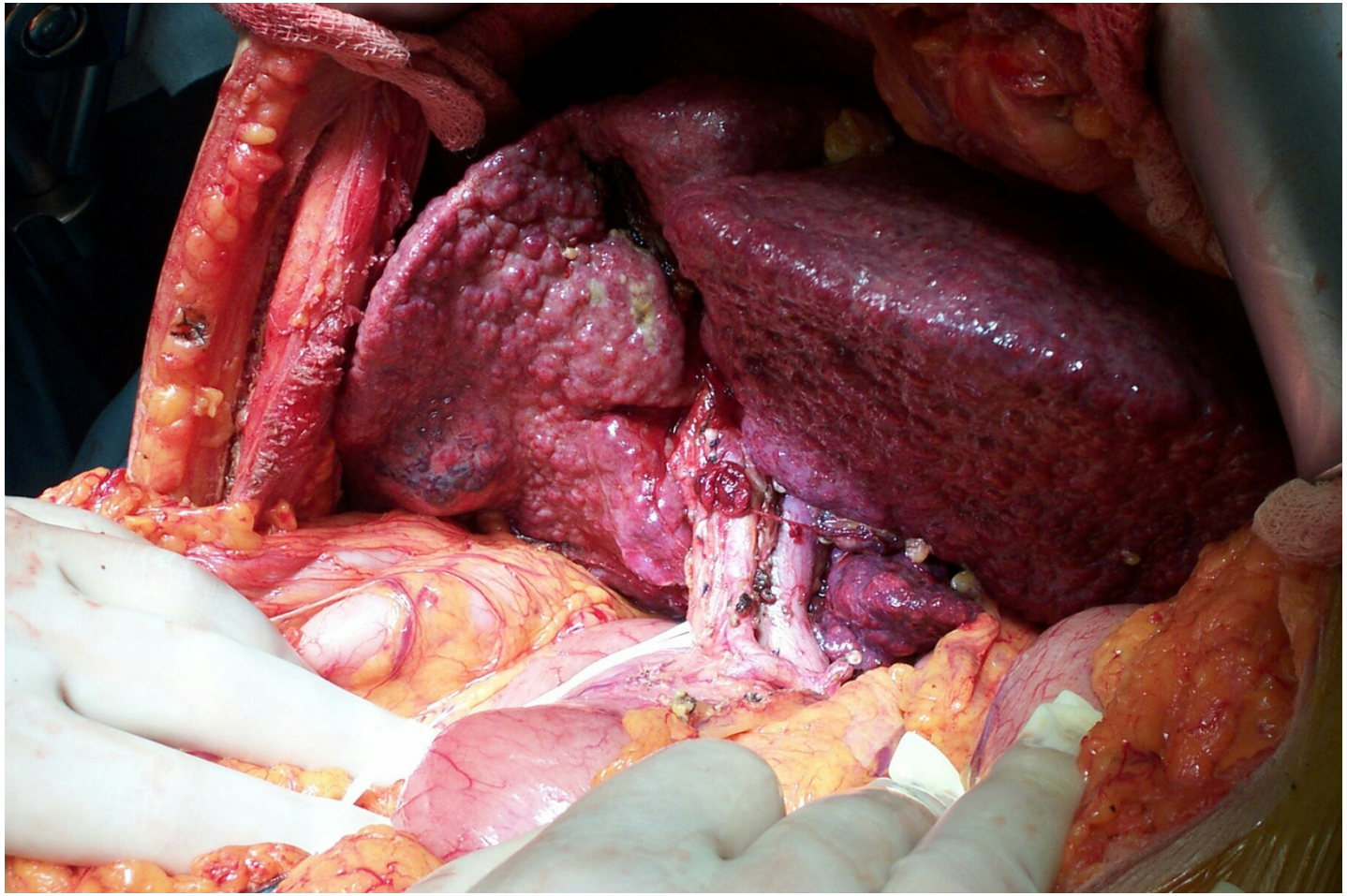
CRITICAL CARE MEDICINE

(CHEST 2007; 131:1308–1314)

Fresh-Frozen Plasma and Platelet Transfusions Are Associated With Development of Acute Lung Injury in Critically Ill Medical Patients*

Hasrat Khan, MD; Jon Belsher, MD; Murat Yilmaz, MD; Bekele Afessa, MD, FCCP; Jeffrey L. Winters, MD; S. Breandan Moore, MD; Rolf D. Hubmayr, MD, FCCP; and Ognjen Gajic, MD, FCCP

Transplante Hepático



Casuística Hepato

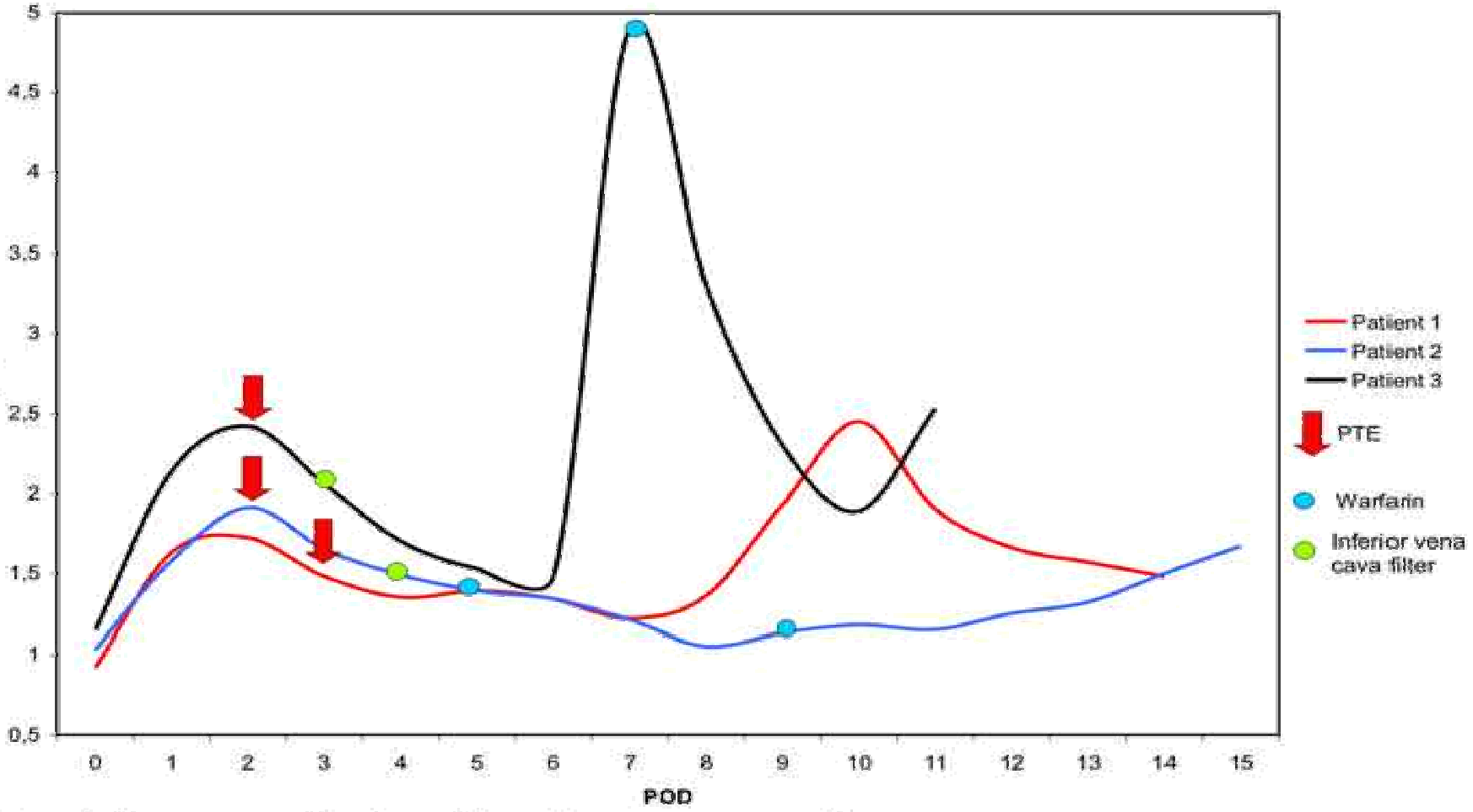
- Total - 180
- 2006 - 42
- 2007 - 60
- 2008 - 78

Fatores coagulantes sintetizados pelo fígado

- Fatores pró-coagulantes
  - Fatores II, VII, IX, X (dependentes de vitamina K)
  - Fatores V, VIII, XI, fibrinogênio
  - (Fatores VIII e vWF também são sintetizados extra-hepaticamente)

- Fatores anticoagulantes
  - Antitrombina, proteína C, proteína S

PULMONARY EMBOLISM IN DONORS UNDERGOING RIGHT LOBE HEPATECTOMY FOR LIVING DONOR TRANSPLANTATION



Teruya, A. *ASA Annual Meeting Abastracts* 2006

Terapia transfusional

- 13 transplantes – **32** ui CH

  Dzik, WH. *Arch Surg* 1985;120(8)

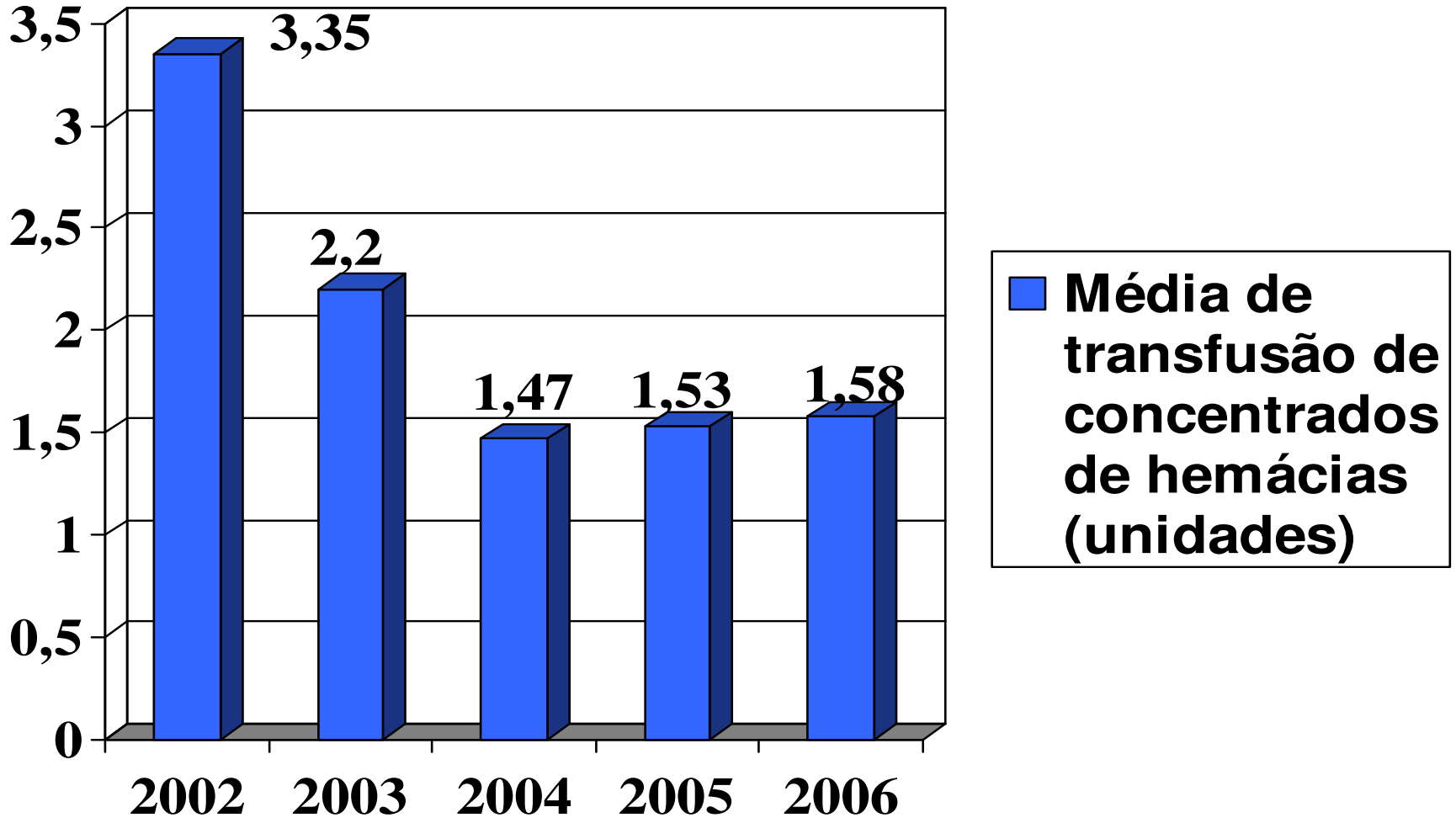
- 636 transplantes – **19** ui CH

  Lewis, JH. *Transfusion* 1987;27(3)

- 37 transplantes – **24,5** ui CH

  Farrar, RP. *Transfusion* 1988;28(5)

Perioperative care of liver transplant patients in Brazil



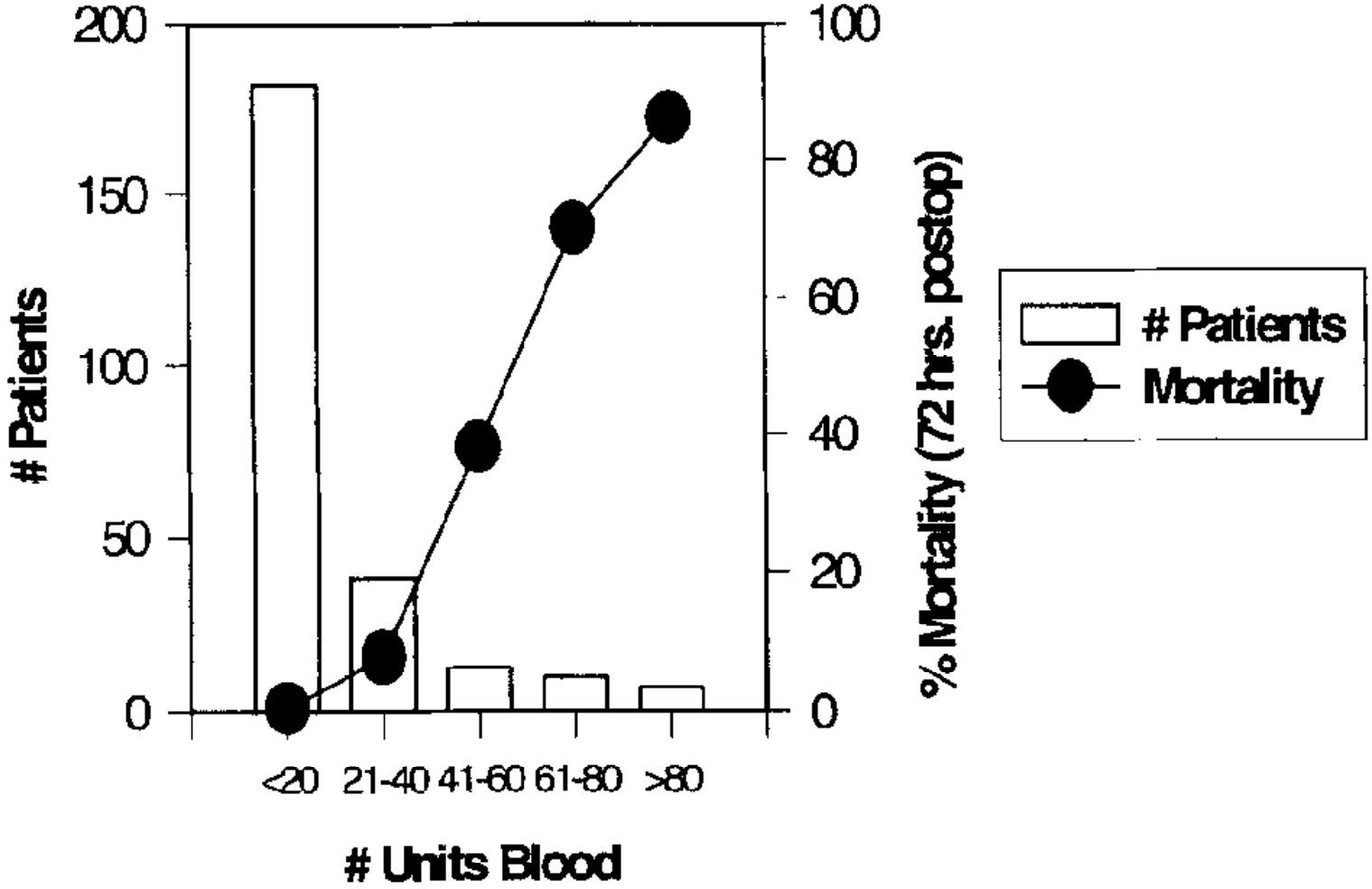
Takaoka, F. *Intern Anesthesiol Clin* 2006; 44(4): 111-119

Redução na transfusão de hemocomponentes. Benefícios clínicos

- ↓ morbi-mortalidade (infecção, TRALI, hipervolemia)
- ↓ índice de rejeição
- ↓ tempo de ventilação mecânica
- ↓ permanência na UTI
- ↓ tempo de internação

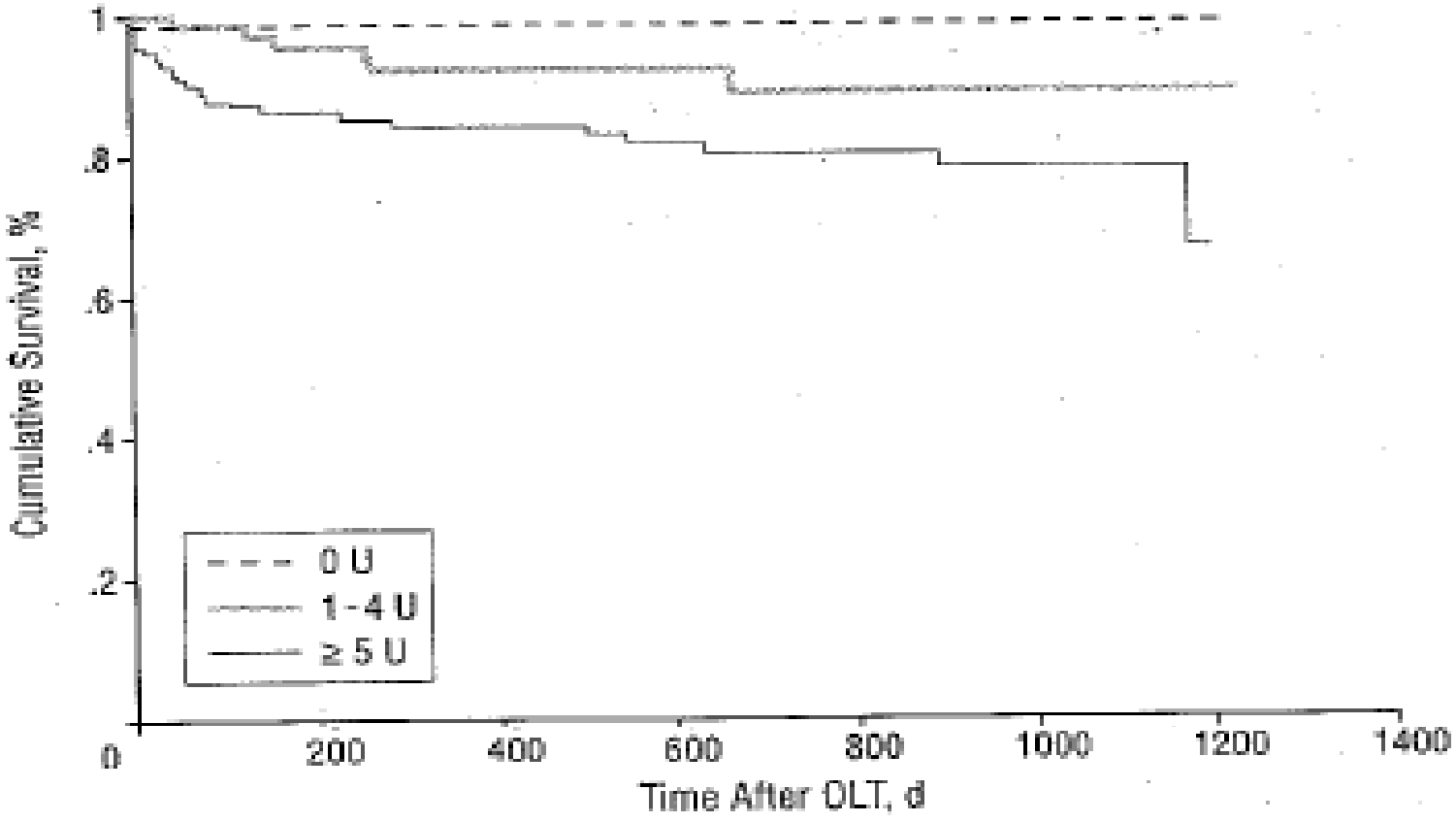
Massicotte L. *Anesth Analg* 2004; 98: 1245-51

Total Blood Transfusion and Mortality after Orthotopic Liver Transplantation



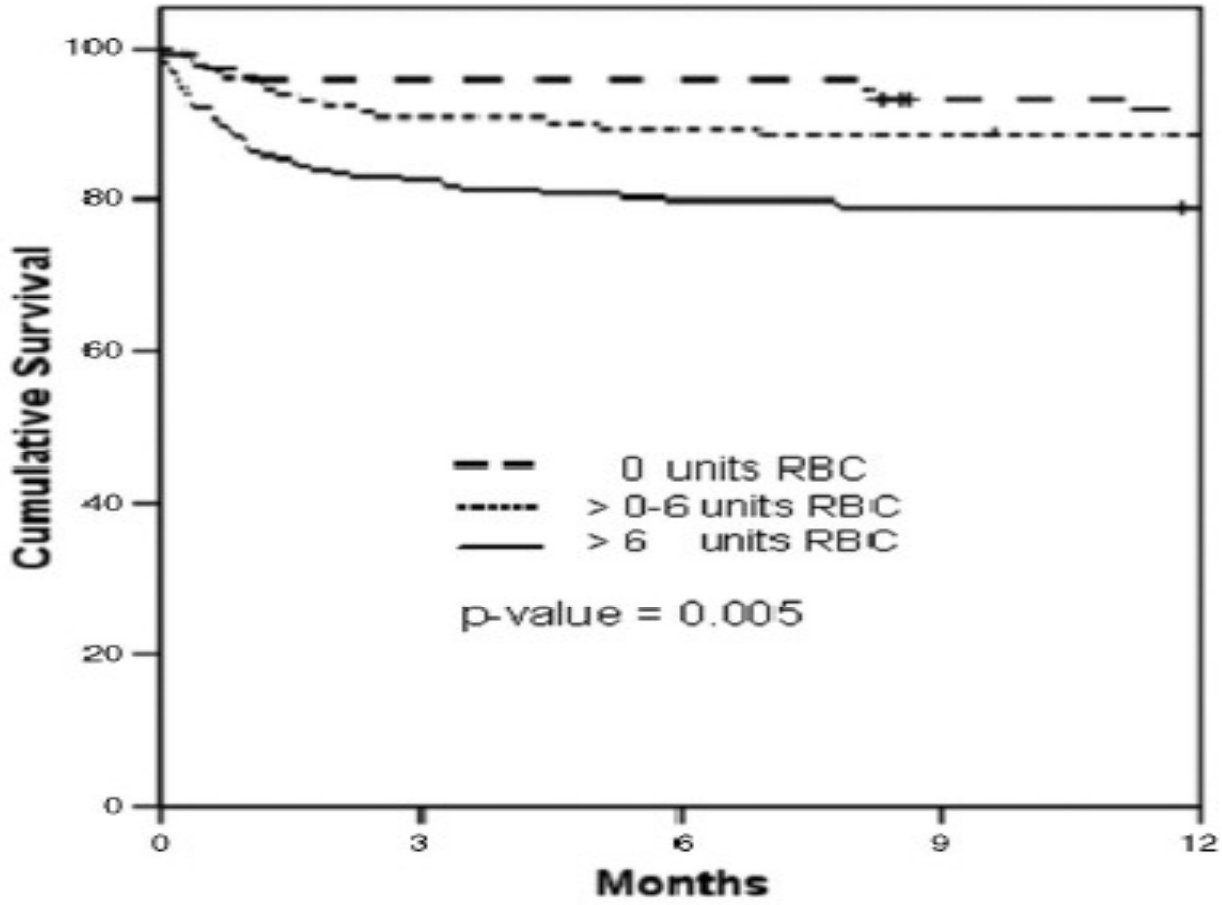
Schroeder, RA. *Anesthesiol* 1999; 91:329-30

Sobrevida relacionada à transfusão de concentrados hemácias



Cacciarelli, CV. *Arch Surg*, 1999; 134: 25- 29

The Impact of Intraoperative Transfusion of Platelets and Red Blood Cells on Survival After Liver Transplantation



Boer, MT. *Anesth Analg* 2008;106:32–44

Diminuição da utilização de hemocomponentes

- Indicação precoce do TOF
- Preservação do enxerto
- Técnica cirúrgica
- Técnica anestésica (hipotermia, acidose, cálcio)
- Hematologia

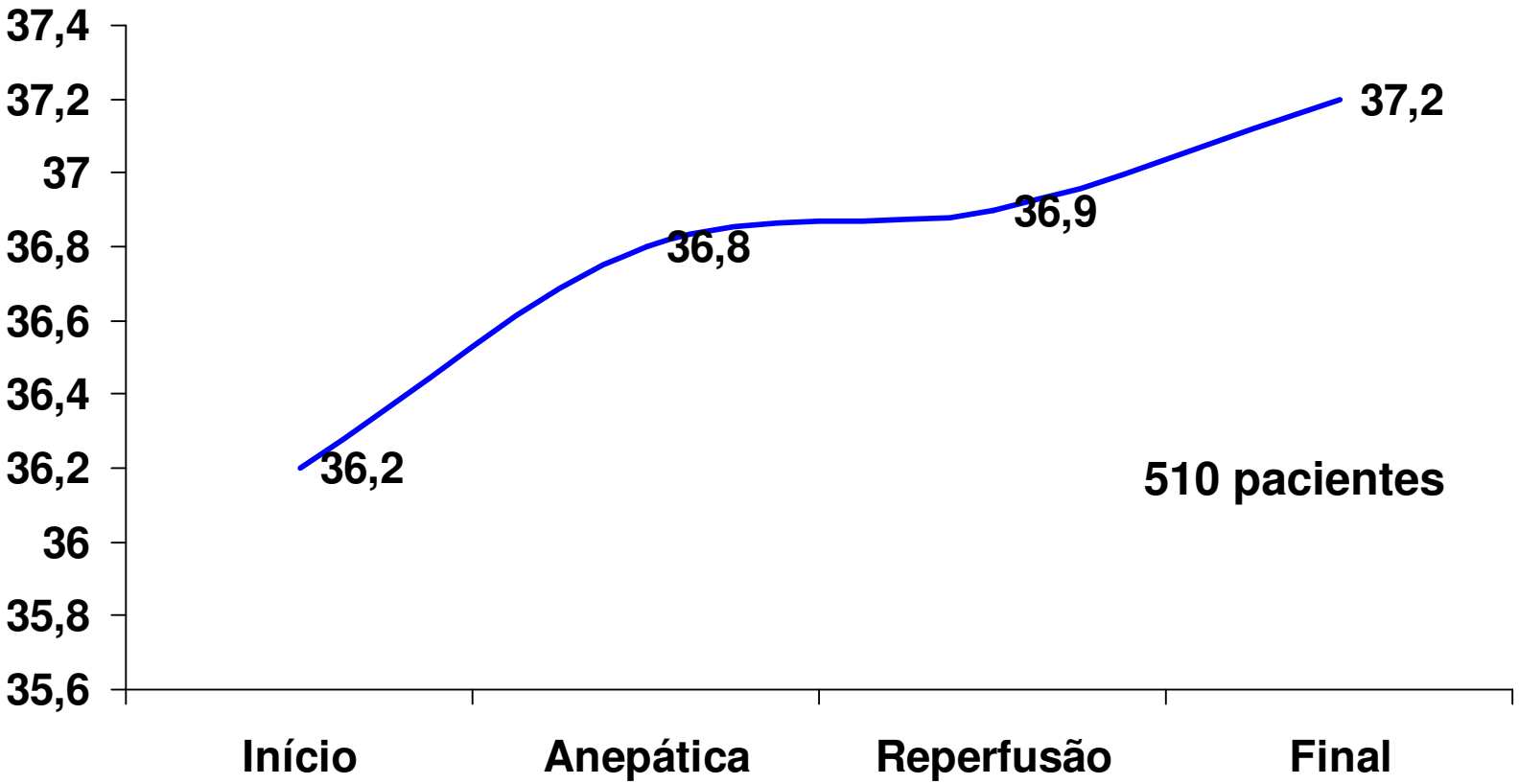
Cell saver

Drogas antifibrinolíticas

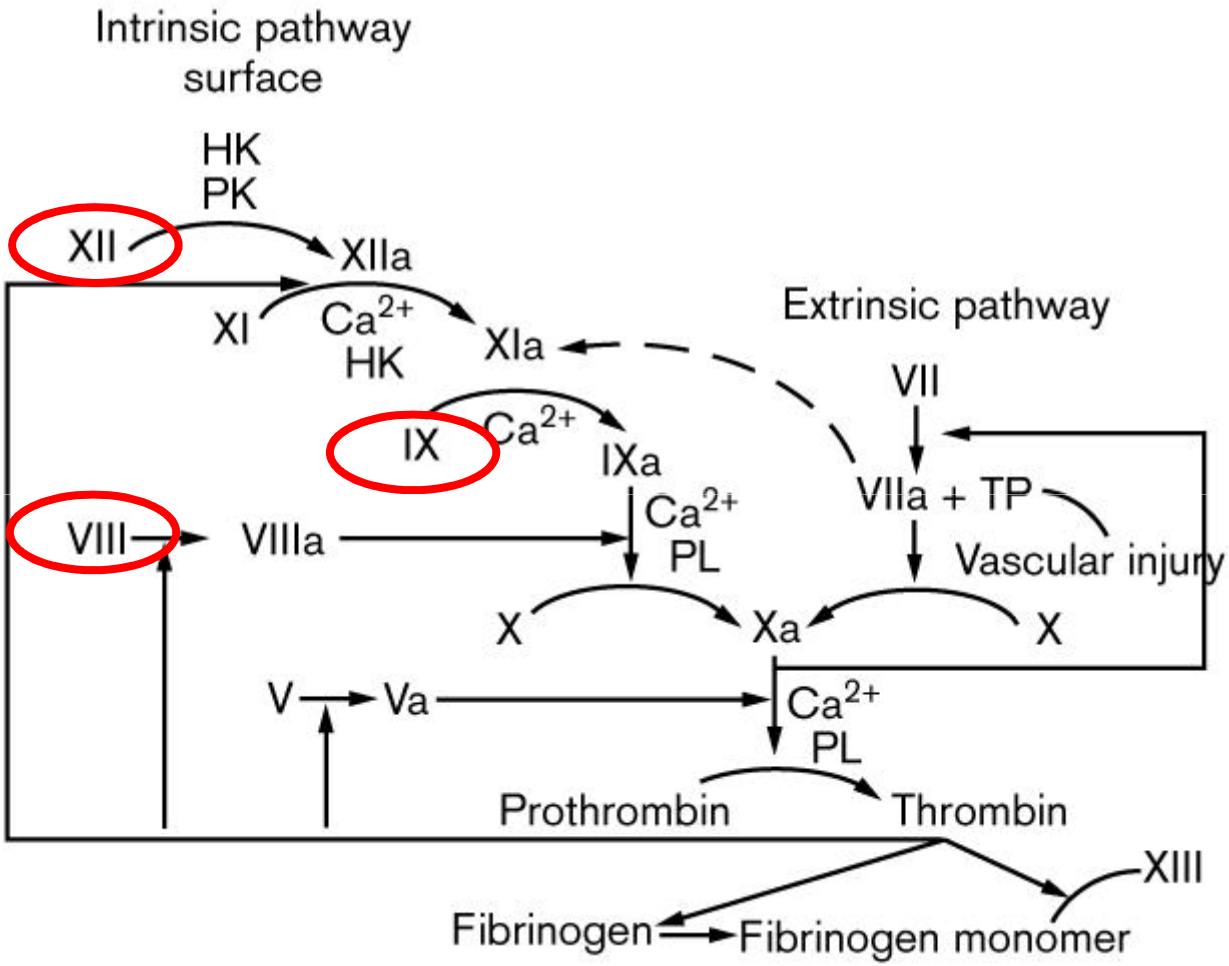
Drogas pró coagulantes

Teruya, A. *Liver transplant* 2004; 10(6): 146
Ozier,Y. *Curr Opin Organ Transplant* 2008; 13: 304

Temperatura



Cascata da coagulação



David EW. *Science* 1964; 145:1310–1312
Rott, H. *Curr Opin Anaesthesiol* 2004; 17:159–163

Modelo celular da coagulação

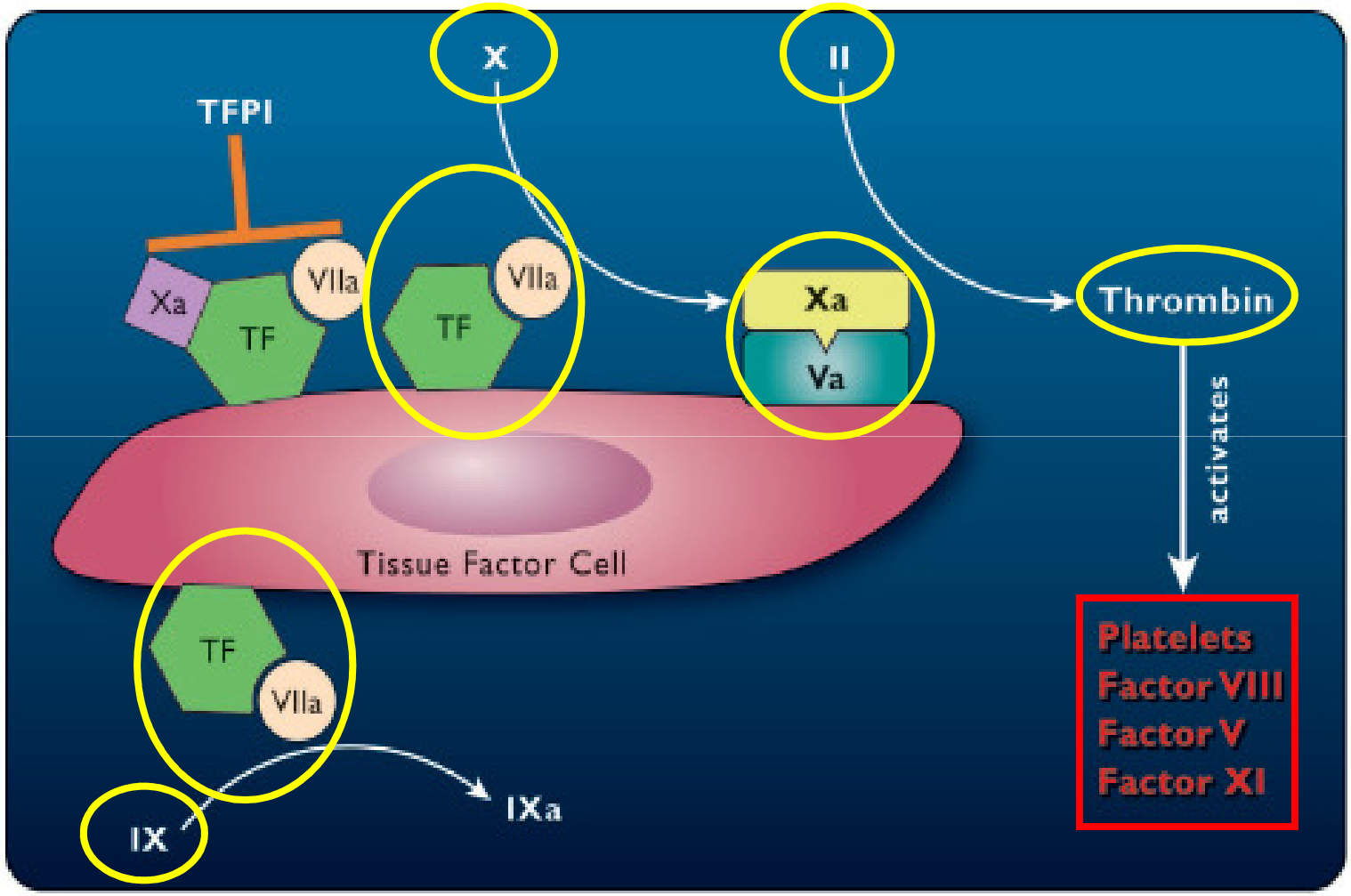
- Iniciação – fator tecidual (fibroblastos, macrófagos, endotélio) e FVIIa

- Amplificação – plaquetas e fatores da coagulação

- Propagação – explosão de trombina

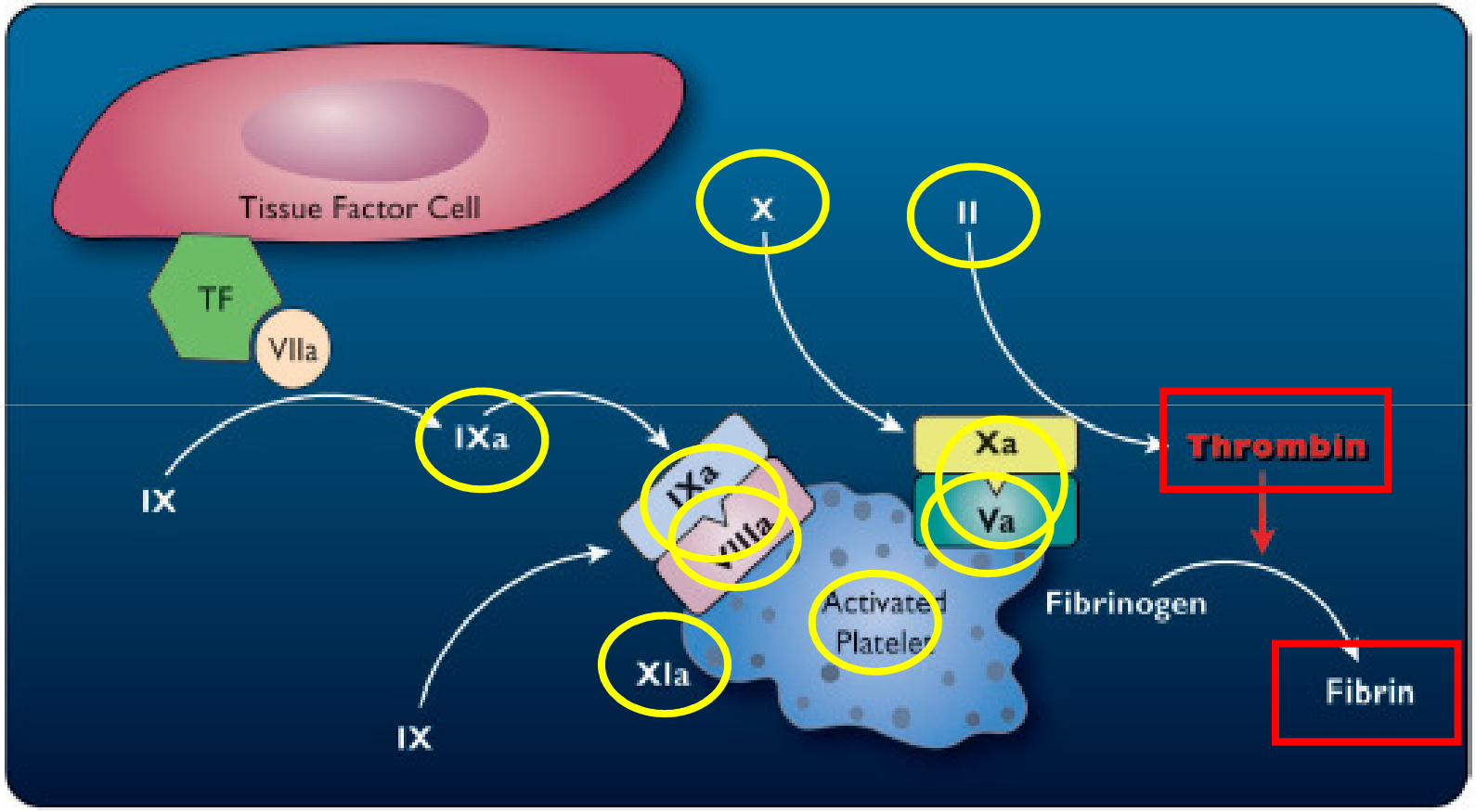
Roberts, HR. *Haemophilia* 1998; 4:331–4

Iniciação



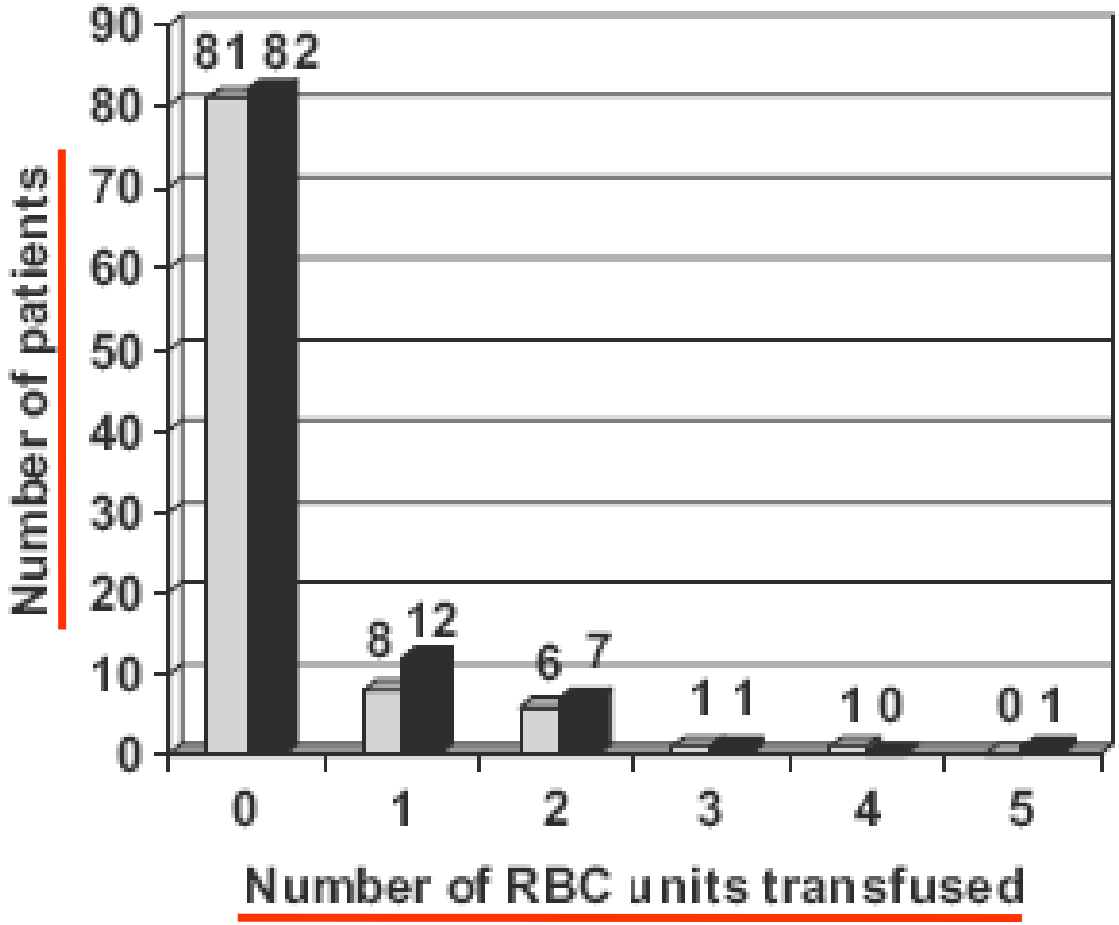
Weiskopf, RB. *Anesthesiol* 2004; 100:722–30

Amplificação e Propagação



Weiskopf, RB. *Anesthesiol* 2004; 100:722–30

Coagulation Defects Do Not Predict Blood Product Requirements During Liver Transplantation



200 pacientes

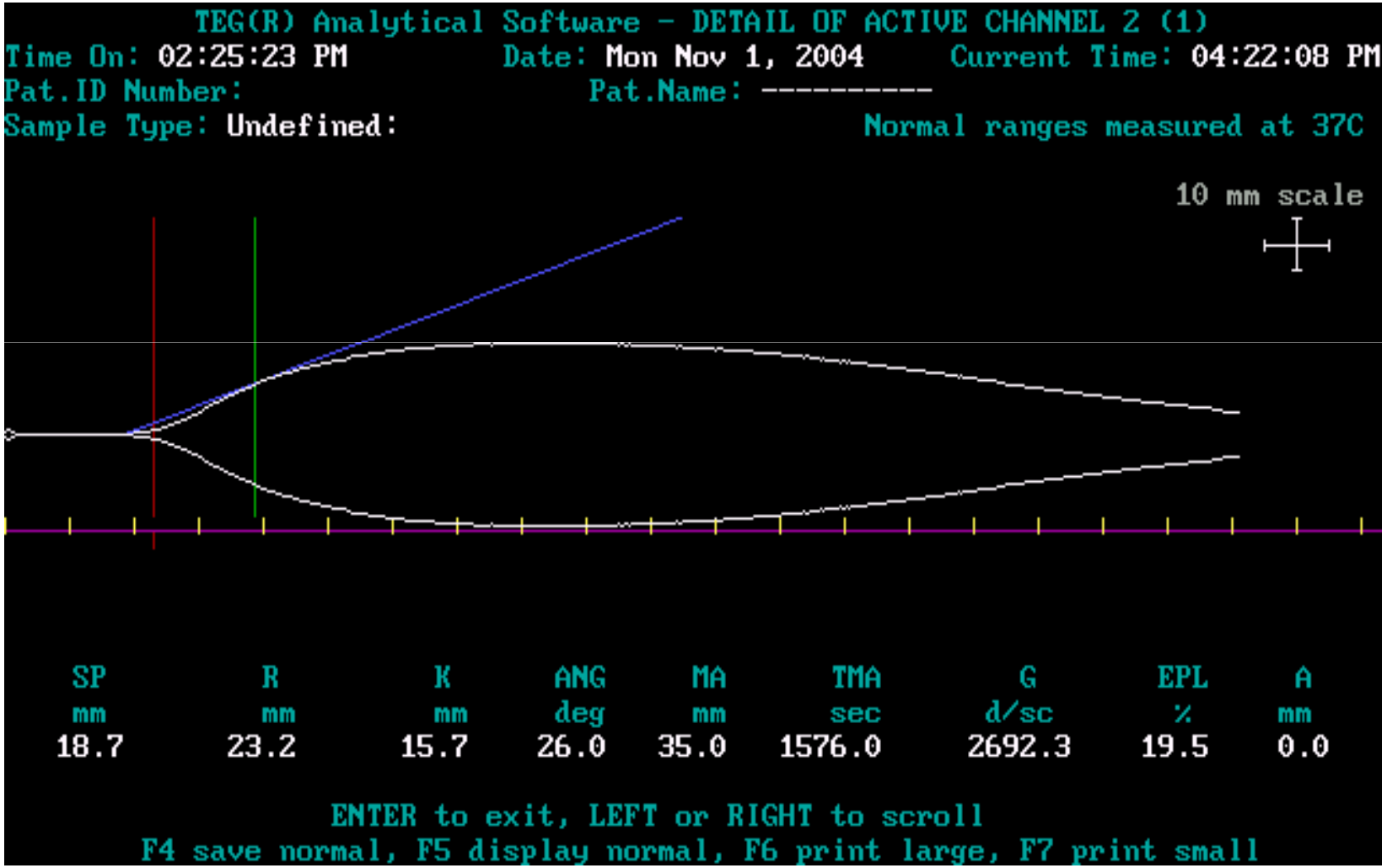
INR: less than 1.5

INR: 1.5 or more

Massicotte, L. *Transplant* 2008;85: 956–962

Tromboelastógrafo

Fibrinólise



Tratamento

Practice Guidelines for Perioperative Blood Transfusion and Adjuvant Therapies

Nuttall, GA. *Anesthesiol* 2006; 105:198–208

	n	Percent Responding to Each Item				
		Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
3. Intraoperative and postoperative management						
assess the presence of excessive microvascular bleeding			42.3	3.8	0.0	0.0
Periodically communicate with the surgical team to assess the presence of excessive microvascular bleeding	26	50.0*	38.5	7.7	3.8	0.0
Continuous monitoring for inadequate perfusion and oxygenation	26	57.7*	38.5	3.8	0.0	0.0
Usually administer red blood cells when the hemoglobin level is less than 6 g/dl	26	61.5*	30.8	3.8	3.8	0.0
Red blood cells are usually unnecessary when the hemoglobin level is greater than 10 g/dl	26	61.5*	34.6	3.8	0.0	0.0
Use normovolemic hemodilution or acute normovolemic hemodilution to reduce transfusion requirements when autologous blood is required	26	15.4	38.5*	30.8	11.5	3.8
In a bleeding patient, administer platelets when the platelet count is less than 50,000 cells/mm^3	26	42.3	34.6*	7.7	15.4	0.0
In a bleeding patient, administer FFP when INR (PT) or aPTT is elevated	26	11.5	69.2*	0.0	19.2	0.0
In a bleeding patient, administer cryoprecipitate when fibrinogen concentrations are < 80 mg/dl	26	26.9	65.4*	3.8	3.8	0.0
When excessive microvascular bleeding (coagulopathy) occurs, administer:						
Desmopressin (DDAVP)	25	4.0	36.0	40.0*	16.0	4.0
Fibrin glue	25	20.0	40.0*	28.0	12.0	0.0
Thrombin gel	23	17.4	34.8*	34.8	13.0	0.0
Recombinant activated factor VII is an appropriate rescue drug when traditional, well-tested options have been exhausted	26	23.1	42.3*	34.6	0.0	0.0
To monitor for transfusion reactions:						
Periodically check for signs and symptoms	26	69.2*	30.8	0.0	0.0	0.0
Assess urine output and color	26	42.3	46.2*	7.7	3.8	0.0
Assess peak airway pressure	26	30.8	38.5*	26.9	3.8	0.0

Caso 1

- Extubação em SO
- 1 dia na UTI
- Sem transfusão de hemocomponentes na internação

Caso 1

- Masc , 46a, hemocromatose
- Trombose Veia Porta
- Tx fígado, Doador falecido

	Pré-op	Intra-op	UTI	PO1	PO2	PO3
TP%	**37**	**32**	**26**	**45**	**62**	
Fibrinogenio	78	77				
Plaquetas	**21mil**		**31mil**	**22mil**	**17mil**	**19mil**
Hb	14,6	13,4	14,1	11,6	10,5	10,3
Ht	40,3	41,2	39,3	32,3	29,5	28,8

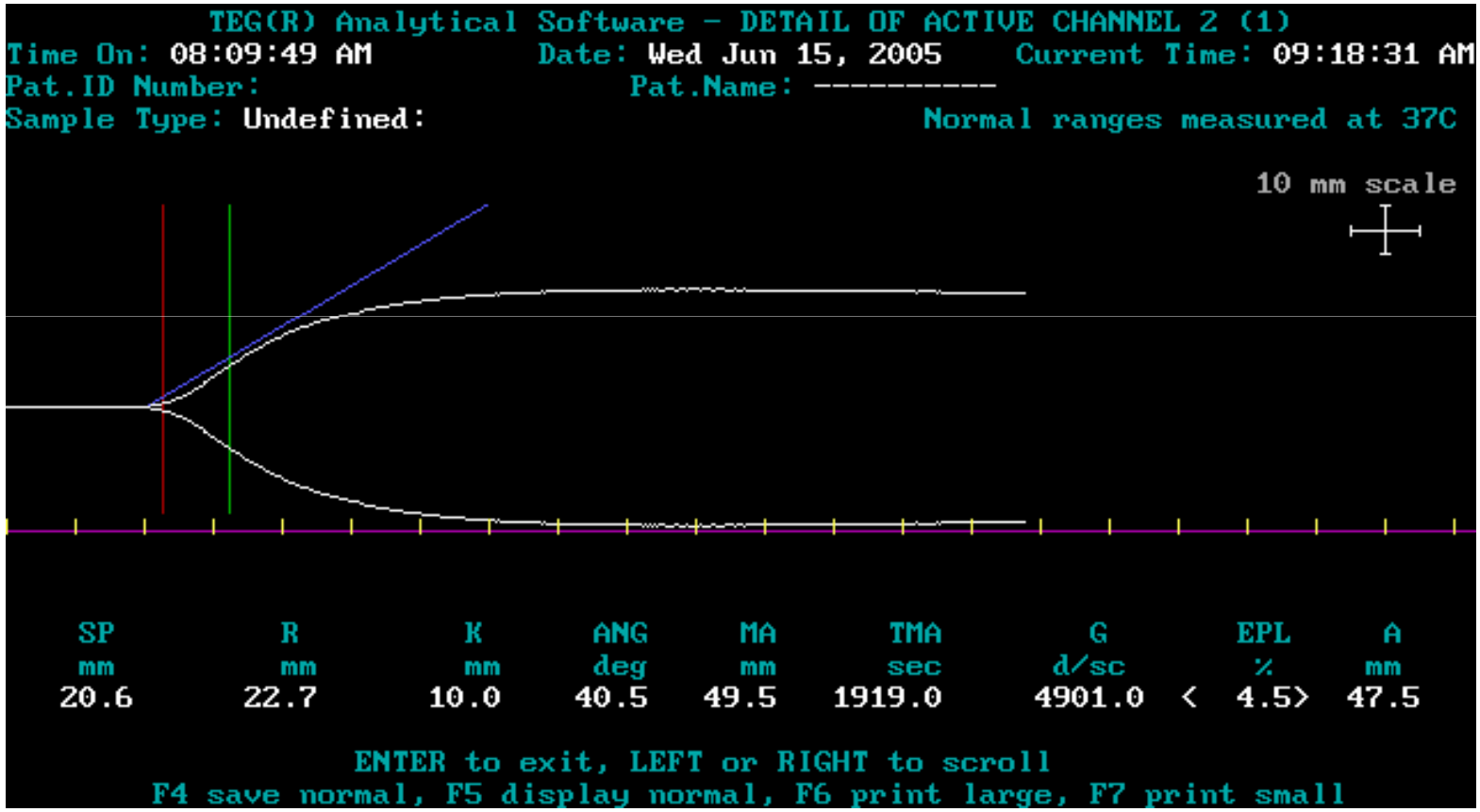
Caso 2

- Masculino, 61 anos
- Cirrose alcoólica, Child C, Meld 16
- Encefalopatia grau II recente, ascite volumosa.
- Exames pré-op:

Hb 10,3; Ht 29; INR 1,2; Fibrinogênio 184;
Plaquetas 41.000; Uréia 46; Creatinina 0,7;
Transfusão intra-op: **CH 1, PFC 0, Plaq 0**

- Extubação na SO.
- Alta no 20º PO sem outras intercorrências
- TEG no início da cirurgia

Caso 2


TEG(R) Analytical Software - DETAIL OF ACTIVE CHANNEL 2 (1)
Time On: 08:09:49 AM
Date: Wed Jun 15, 2005
Current Time: 09:18:31 AM
Pat.ID Number:
Pat.Name: ----------
Sample Type: Undefined:
Normal ranges measured at 37C
10 mm scale
SP mm 20.6
R mm 22.7
K mm 10.0
ANG deg 40.5
MA mm 49.5
TMA sec 1919.0
G d/sc 4901.0
EPL % < 4.5>
A mm 47.5
ENTER to exit, LEFT or RIGHT to scroll
F4 save normal, F5 display normal, F6 print large, F7 print small

Caso 3

- Masculino, 43 anos
- Cirrose alcoólica, Child B, Meld 11
- Sem cirurgia abdominal prévia
- Encefalopatia hepática, HDA
- Veia porta pérvia
- Pré operatório: Hb 13,4; HT 39,1%; INR 1,32; **Plaquetas 23.000;** Uréia 30; Creatinina 0,9; Na 139; K 4,1; BT 1,6

Caso 3

- CH 2 unidades
- PFC 0 unidades
- Crio 0 unidades
- Plaquetas 0 unidades

Preoperative Characteristics and Intraoperative Transfusion and Vasopressor Requirements in Patients With Low Vs. High MELD Scores

- Universidade Califórnia
- 01 jan- 31 dez de 2004
- 124 pacientes adultos, prospectivo
- Grupo 1: MELD ≤ 30 (73 pacientes)
- Grupo 2: MELD > 30 (51 pacientes)
- Transfusão de hemocomponentes

Xia, VW. *Liver Transplant* 2006; 12:614- 620

Preoperative Characteristics and Intraoperative Transfusion and Vasopressor Requirements in Patients With Low Vs. High MELD Scores

TABLE 2. Requirements of Transfusion in Different Periods During Liver Transplant Surgery (Units)

	Low MELD group (n = 73)	High MELD group (n = 51)	*P* values
RBC			
Prereperfusion	6.85 ± 5.94	9.85 ± 6.21	0.009
Postreperfusion	3.55 ± 3.55	5.83 ± 6.19	0.012
Total	10.62 ± 8.13	15.86 ± 9.56	0.001
Platelets			
Prereperfusion	0.23 ± 0.49	0.52 ± 0.55	0.004
Postreperfusion	0.61 ± 0.65	0.76 ± 0.64	NS
Total	0.86 ± 0.90	1.33 ± 0.89	0.004
Cryoprecipitate			
Prereperfusion	0.17 ± 0.41	0.41 ± 0.54	0.006
Postreperfusion	0.35 ± 0.51	0.59 ± 0.72	0.036
Total	0.52 ± 0.77	1.06 ± 0.95	0.001
Antifibrinolytics (n =)	40 (54.8)	39 (76.5)	0.014

NOTE: Data are presented as means ± SD or n (%).
Abbreviations: RBC, packed red blood cells; FFP, fresh frozen plasma; NS, not significant.

Xia, VW. *Liver Transplant* 2006; 12:614- 620

Preoperative Characteristics and Intraoperative Transfusion and Vasopressor Requirements in Patients With Low Vs. High MELD Scores

MELD

TABLE 4. Requirements of Total Transfusion in 5 Groups (Units)

6-20 → 36-40

scores	6-20	21-25	26-30	31-35	36-40	r_s	*P* values
Patients (n)	25	24	24	23	28		
RBC	10.6 ± 8.4	9.7 ± 6.4	11.5 ± 9.5	14.1 ± 7.5	17.3 ± 10.9	0.29	0.001
Platelets	0.7 ± 0.7	1.0 ± 1.0	0.9 ± 0.9	1.3 ± 0.8	1.4 ± 1.0	0.26	0.004
Cryoprecipitate	0.6 ± 0.7	0.5 ± 0.7	0.5 ± 0.9	1.0 ± 0.8	1.1 ± 1.0	0.26	0.004

NOTE: Data are presented as mean ± SD.

Abbreviations: r_s, Spearman's rank correlation coefficient; RBC, packed red blood cells; FFP, fresh frozen plasma.

Xia, VW. *Liver Transplant* 2006; 12:614- 620

Pharmacokinetics of Beriplex in healthy volunteers

- Fatores pró coagulantes:
  - II, VII, IX e X
- Componentes antitrombóticos:
  - Proteína C e S, antitrombina III e heparina
- Derivado do plasma humano pasteurizado e nanofiltrado
- Reversão de anticoagulação

Ostermann, H. *Thromb Haemost* 2007; 98: 790- 797

Caso 1- CCP

- MDA, 55a, fem, VHB e VHC, **Child C, O-**
- Ascite refratária, HDA, encefalopatia
- **Retransplante (disfunção primária)**
- Exames pré operatórios:

  Hb= 10,4, Ht = 30,7, **INR=1,51, Plaquetas = 35000**
- **Beriplex (25ui/ kg)**
- Transfusão intraoperatória:

  CH= 3u

Caso 2- CCP

- CBSF, 28a, fem, cirrose biliar, HCC, Child B, A+
- Ascite refratária, HDA, encefalopatia
- **Colecistectomia convencional**
- **Trombose Veia Porta**
- Exames pré operatórios:

  Hb= 11,1, Ht = 31,7, **INR=1,59, Plaquetas = 35000**
- **Beriplex (30ui/ kg)**
- Transfusão intraoperatória:

  CH= 2u