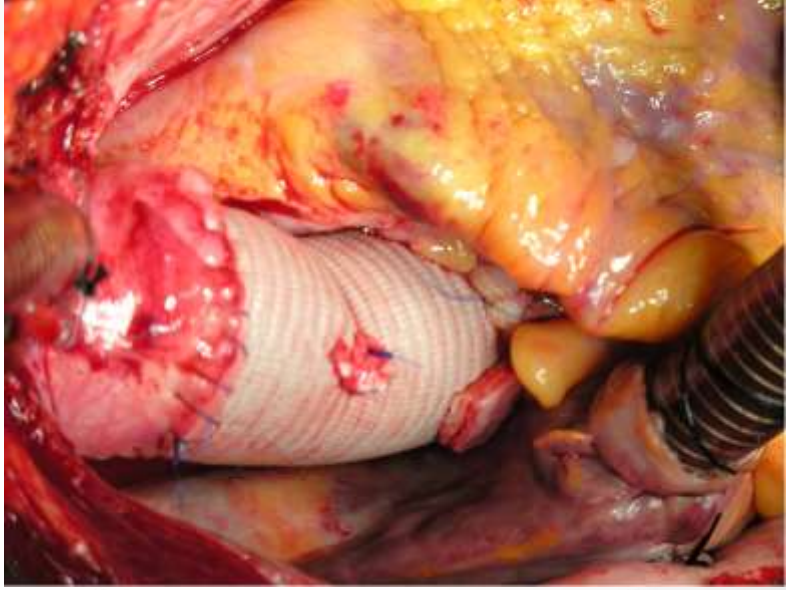
Kanamamak için Fibrinojen kullanalım mı?

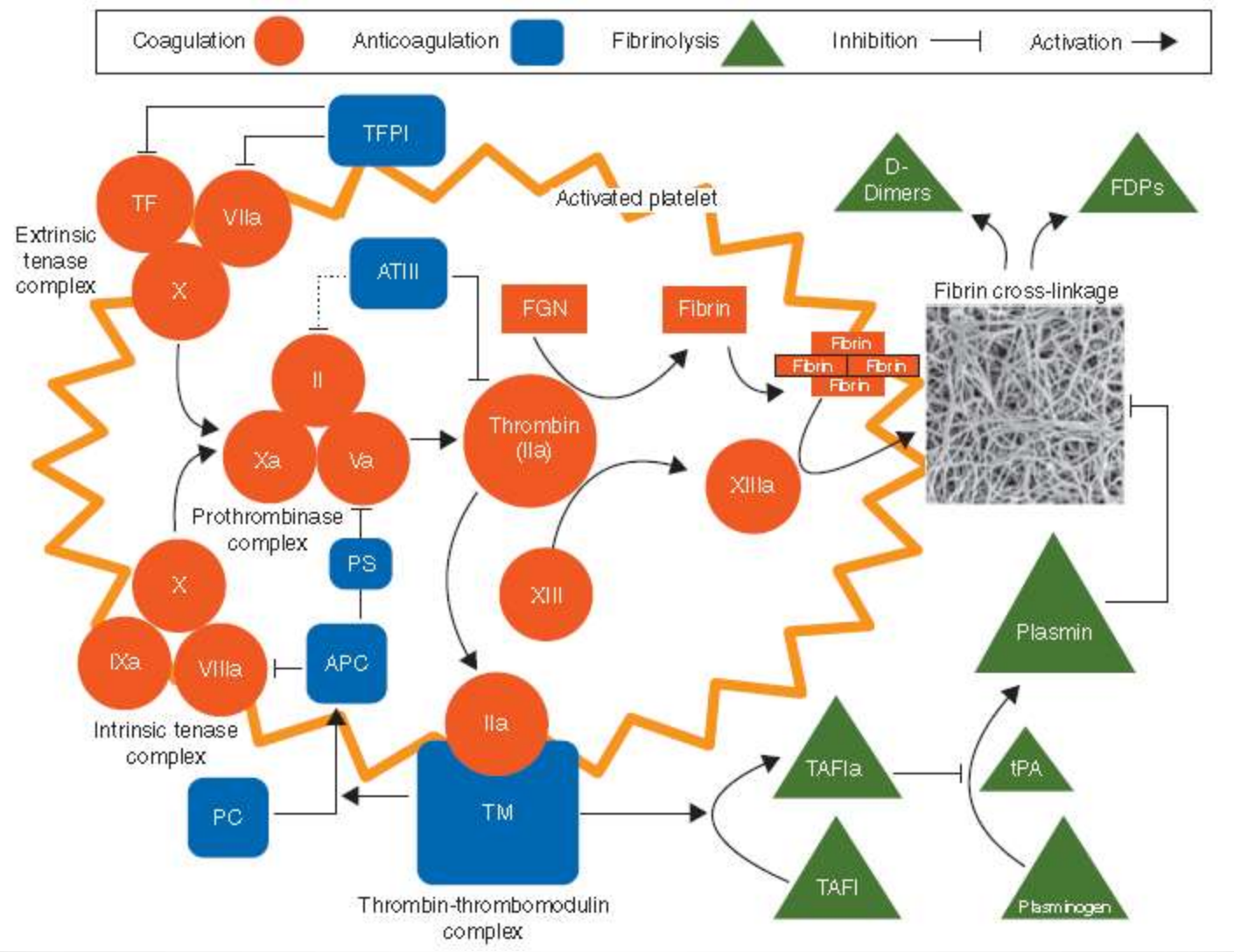
Dr. Onat BERMEDE

Ankara Üniversitesi Tıp Fakültesi
Anesteziyoloji ve Reanimasyon AD



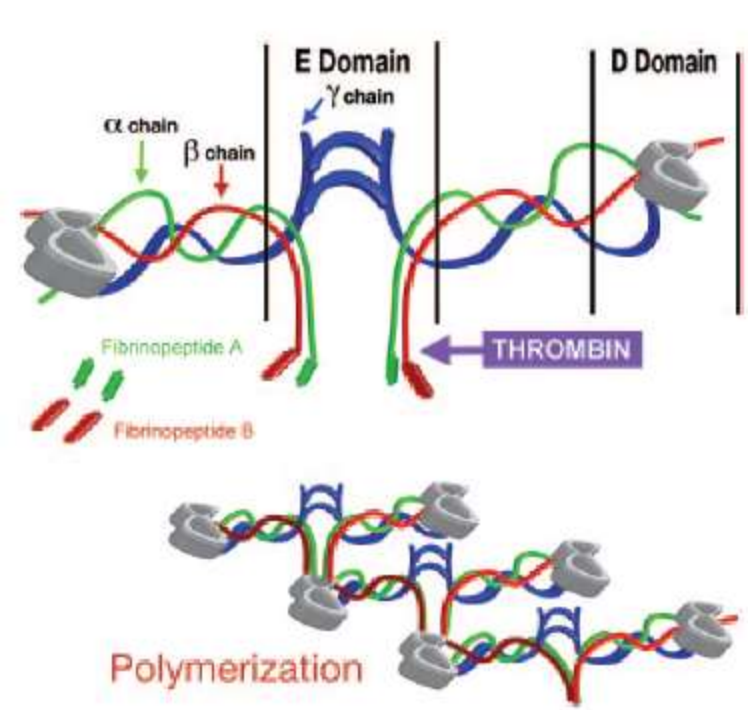
- 62 y, 110 kg erkek
- Aort kapak korunarak tübüler gref
- Statin + β bloker
- Sorunsuz cerrahi sonrası heparin nö
- Ampirik 4Ü TDP ve 2Ü trombosit
- YBÜ'de
  - Vücut ısısı 36,4°C,
  - Hemodinami stabil
- ACT 120 sn; Plt 115.000; INR 1,3; Fib
- 150 mL/sa kanama

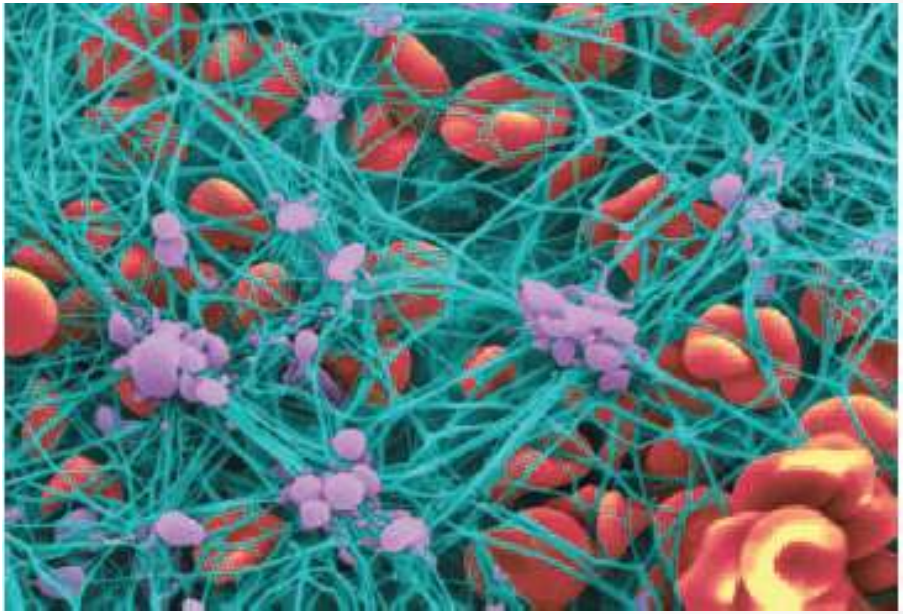
Koagülasyon



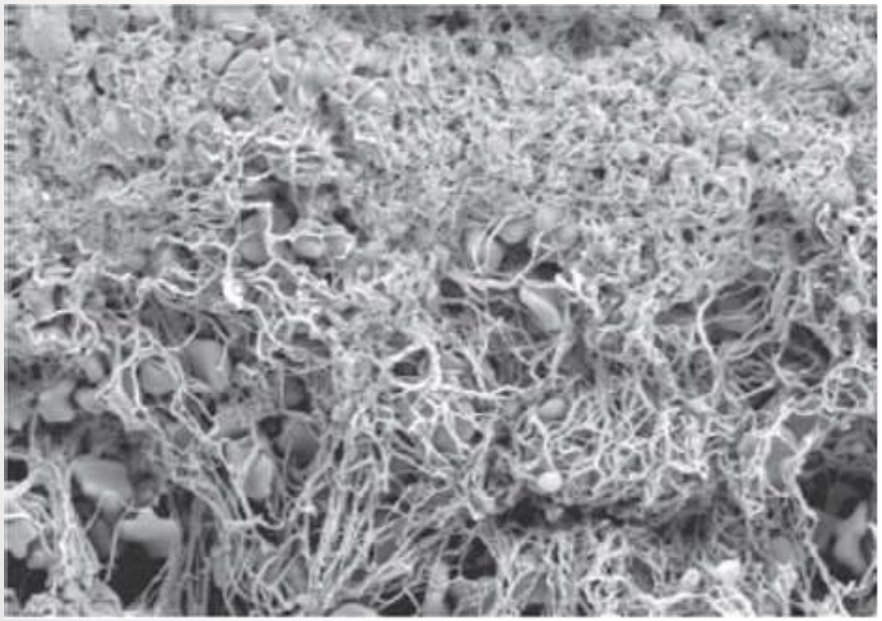
Ghadimi K, Levy JH, Welsby IJ. British Journal of Anaesthesia 2016; 117: 18-30

Fibrin tıkacı

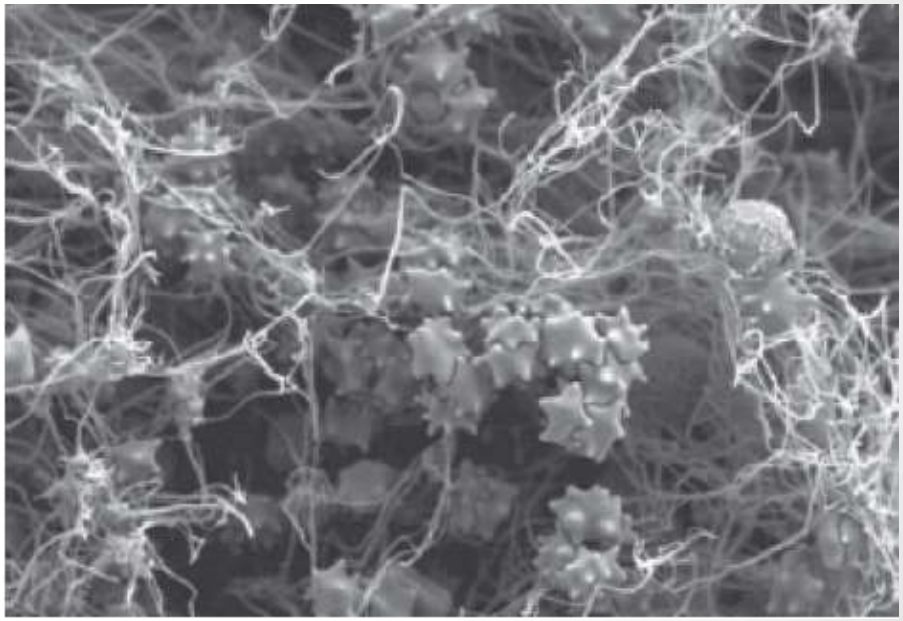




Fibrin tıkacı



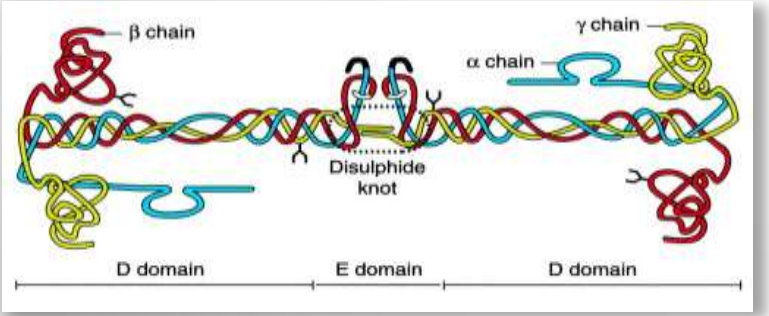
NORMAL



HEMODİLÜSYON

Fibrinojen

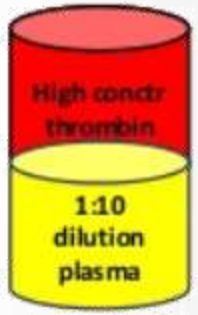
- Karaciğerde sentezlenerek dolaşıma verilen büyük bir glikoprotein
  - Kan plazmasındaki normal konsantrasyonu **2.0 - 4.0g/L**
- Koagülasyon sisteminin ana bileşeni
  - Hem primer hem de sekonder hemostazda rol oynar
- Fibrinojen (FI) her yarısında disülfid bağlarla birleşmiş üç polipeptid zinciri (Aα, Bβ ve γ) içeren bir dimer şeklindedir



Sorensen B et al. 2012; Mosesson MW et al. 2005; Sorensen B et al. 2010; Levy JH et al. 2012.

Ölçüm

- **Clauss testi**
  - Fibrinojen için geçerli altın standart test
  - İşlevsel fibrinojen düzeyini ölçer
  - Pıhtılaşma zamanı, örnekteki fibrinojen miktarı ile ters orantılıdır
  - Zayıf fibrin formasyonunu saptayabilir
  - Kanayan hastalarda fibrin yıkım ürünleri yükseldiğinde ve kolloidlerin varlığı, fibrinojen düzeylerini olduğundan fazla gösterebilir
- **PT ve aPTT**
  - Fibrinojen yetmezliği tanısında önerilmezler
  - Diğer koagülopatilerde de uzar
  - Fibrinojen düzeylerini saptayamaz ve fibrinojen yetmezliğinin tanısında önerilmez



POC

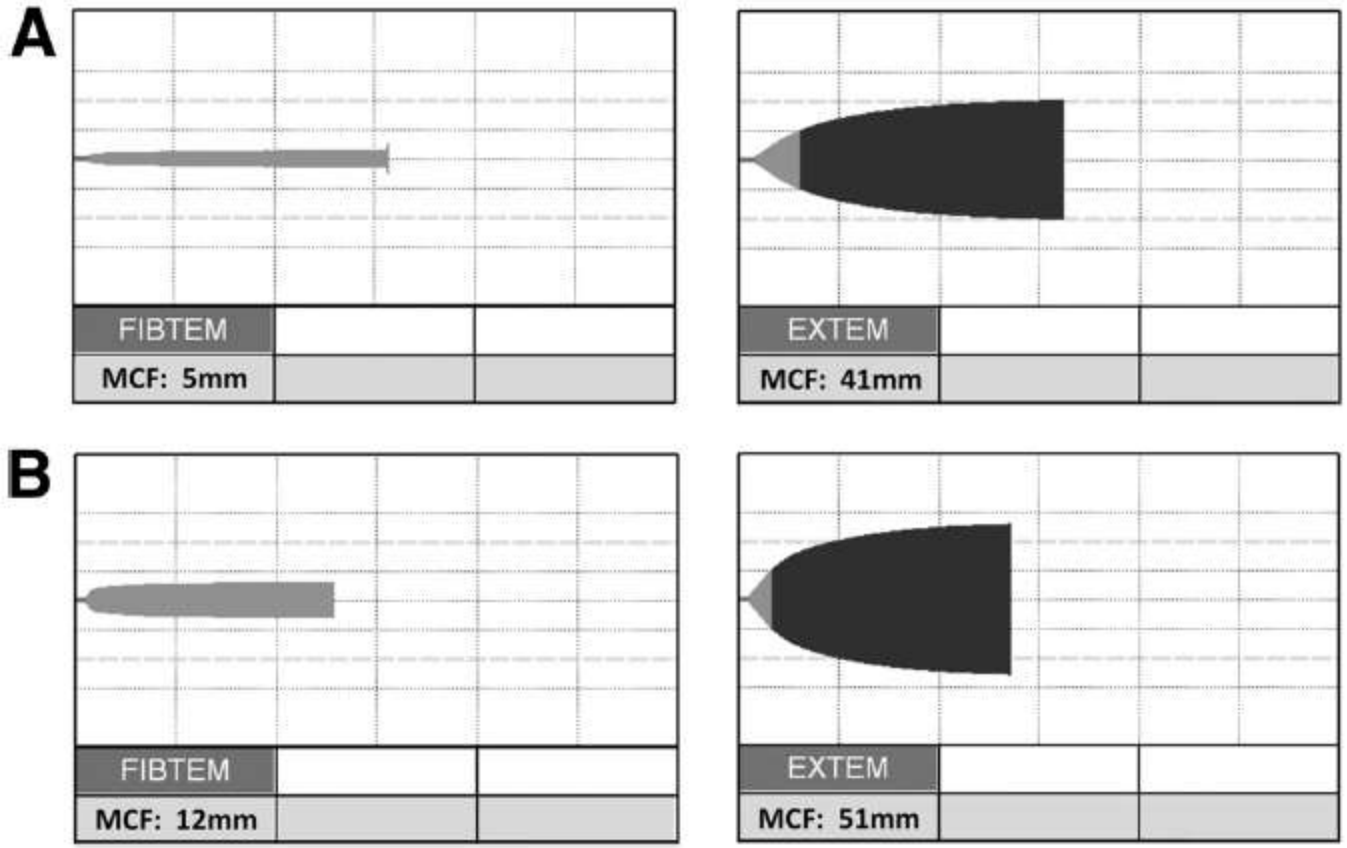


Fig 3. ROTEM traces for case 1 during surgery for type-IV thoracoabdominal aortic aneurysm repair. (A) FIBTEM and EXTEM results from a blood sample taken at 12:10 during surgery indicate a low plasma fibrinogen concentration. (B) FIBTEM and EXTEM results from a blood sample taken at 14:12 during surgery indicate that the fibrinogen concentration has been corrected. In addition to fibrinogen concentrate, 1 unit of platelets was administered between these time points. MCF, maximum clot firmness.

Morrison GA, et al. Journal of Cardiothoracic and Vascular Anesthesia 2012;26;654-659

Tedavi

	Kriyopresipitat	Taze donmuş plazma	Fibrinojen konsantresi
Kullanım	AB ülkelerinin çoğunda kullanılmaz; UK ve ABD'de konjenital fibrinojen yetmezlikleri için kullanılır	Pek çok ülkede şiddetli fibrinojen yetmezliklerinde yetersiz bir tedavi olarak kabul edilir	Pek çok ülkede standart tedavidir. Akut kanama epizotlarında tedavide ve proflaktik olarak düzenli şekilde kullanılır
Standardize fibrinojen içeriği	Yok	Yok	Var
Virüs inaktivasyonu, ör; pastörizasyon	Her zaman değil	Her zaman değil	Evet
Advers reaksiyon riski ör. TRALI	Evet	Evet	Sınırlı
Eritme (infüzyona başlamada gecikme nedeni)	Evet	Evet	Yok
Kan uyumu	Evet	Evet	Hayır
Prion uzaklaştırılma kapasitesi	Yok	Yok	Var
İnfüze edilecek hacim	Orta	Büyük	Küçük
Diğer riskler	Hiperkoagülabilite (yüksek FVIII miktarına bağlı, tromboz	Hipervolemi	*Olası tromboz – 22 yılda 9 olgu

Hangi ürün?

Patient Information		Hamostatic Agent				
Body weight (kg)	85	Concentration of FIB in haemostic agent / volume per unit				
Haematocrit (%)	25	Fresh Frozen Plasma (g/l)	2.3	in	250	ml
Plasma volume (ml)	3485	Cryoprecipitate (g/l)	12.0	in	12.5	ml
Blood volume (ml)	4647	Fibrinogen concentrate (g/l)	20.0	in	50	ml

Baseline Fibrinogen FIB (g/l) 0.8

Target Fibrinogen FIB (g/l) 1.7

Calculated amount of haemostatic agent (Dose calculation)

	FFP	Cryo	Fibrinogen concentrate
Amount (units)	28	33	5
Volume (ml)	7000	412.5	250
Resultant FIB level (g/l)	1.70	1.71	1.78

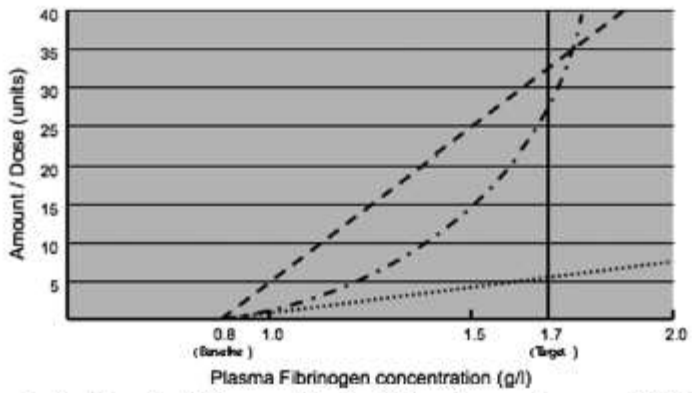


Figure 3. Fibrinogen concentration/dose simulation according to Görlinger (personal communication) and Collins et al.[45] To increase the plasma fibrinogen concentration from 0.8 g/L (baseline) to the target level of 1.7 (g/L), 28 U of FFP (7,000 mL) or 33 U of cryoprecipitate (412.5 mL) or 5 U of fibrinogen concentrate (250 mL) is necessary. Cryo, cryoprecipitate; FIB, fibrinogen.

$$\text{Fibrinojen dozu (mg/kg vücut ağırlığı)} = \frac{\text{Hedef düzey g/l) – ölçülen düzey}}{0{,}017(\text{g/l her mg/kg vücut ağırlığı})}$$

70 kg hasta, plazma fibrinojen düzey 0.5 g /l
Hedef fibrinojen düzeyi 1 g/l

Hedef düzey

Ölçülen düzey

$$\text{Fibrinojen dozu (mg/kg vücut ağırlığı)} = \frac{1 \text{ g/l} - 0{,}5 \text{ g/l}}{0{,}017(\text{g/l her mg/kg vücut ağırlığı})}$$

$$\text{Fibrinojen dozu (mg/kg vücut ağırlığı)} = \frac{0{,}5}{0{,}017}$$

Doz ortalaması= 29.41 mg/kg

- **Doz = 70 (kg) X 29.41 (mg/kg) = 2058 mg olacaktır**
- **Sonuç olarak, 2 g fibrinojene gerek vardır**

Pozoloji

Clinical setting	Trigger for administering fibrinogen concentrate	Fibrinogen dose
Cardiac surgery	Using conventional laboratory measures: <200 mg/dL (<2 g/L)	25 mg/kg
	<150 mg/dL (<1.5 g/L)	50 mg/kg
	Using POC: EXTEM A10 <40 mm and FIBTEM A10 <8 mm	25 mg/kg
	EXTEM A10 <40 mm and FIBTEM A10 <6 mm	50 mg/kg
	EXTEM A10 <40 mm and FIBTEM A10 <4 mm	75 mg/kg
	EXTEM A10 <30 mm and FIBTEM A10 <4 mm	75 mg/kg + 2 PC + 0.4 μg/kg DDAVP
Trauma	FIBTEM CA10 <7 mm	2-6 g
	EXTEM CA10 <30 mm	6-8 g and PCC 20-30 U/kg BW
Liver transplantation	Massive diffuse bleeding and EXTEM MCF <25 mm	Fibrinogen concentrate,* PC and PCC
	EXTEM MCF <35 mm and FIBTEM MCF <8 mm	25 mg/kg (or cryoprecipitate); 50 mg/kg if FIBTEM MCF <4 mm
	EXTEM MCF <45 mm and FIBTEM MCF <8 mm	25 mg/kg (or cryoprecipitate); 50 mg/kg if FIBTEM MCF <4 mm

Weber CF, Zacharowski K, Meybohm P, et al. Hemotherapy algorithms for coagulopathic cardiac surgery patients. Clin Lab 2014; 60(6):1059-1063.

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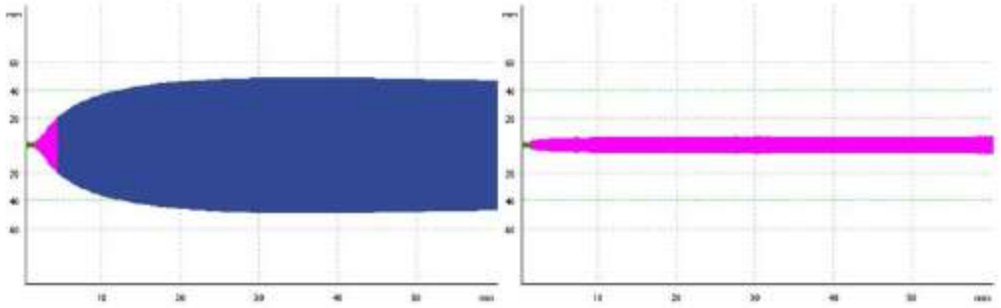
Point-of-care haemostasis and coagulation monitoring in cardiac surgery at IRCCS Policlinico San Donato

Ekaterina Baryshnikova and Marco Ranucci*

European Heart Journal Supplements (2016) 18 (Supplement E), E42–E48

EXTEM



CT 78 s
MCF 49 mm *

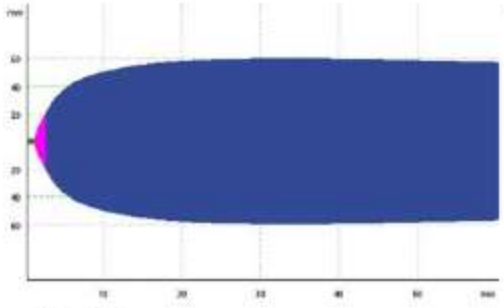
FIBTEM

MCF 5 mm *

+ FIBRINOGEN

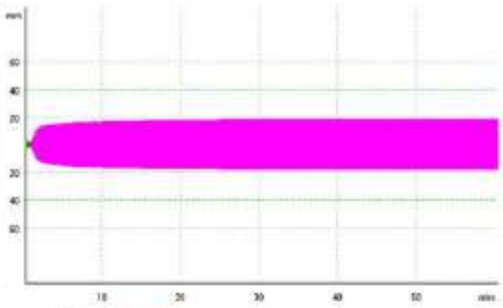
$$\frac{[22\ (\text{target}) - \textit{MCF FIBTEM}]^{*}\textit{kg}}{140}$$

EXTEM



CT 62 s
MCF 60 mm

FIBTEM

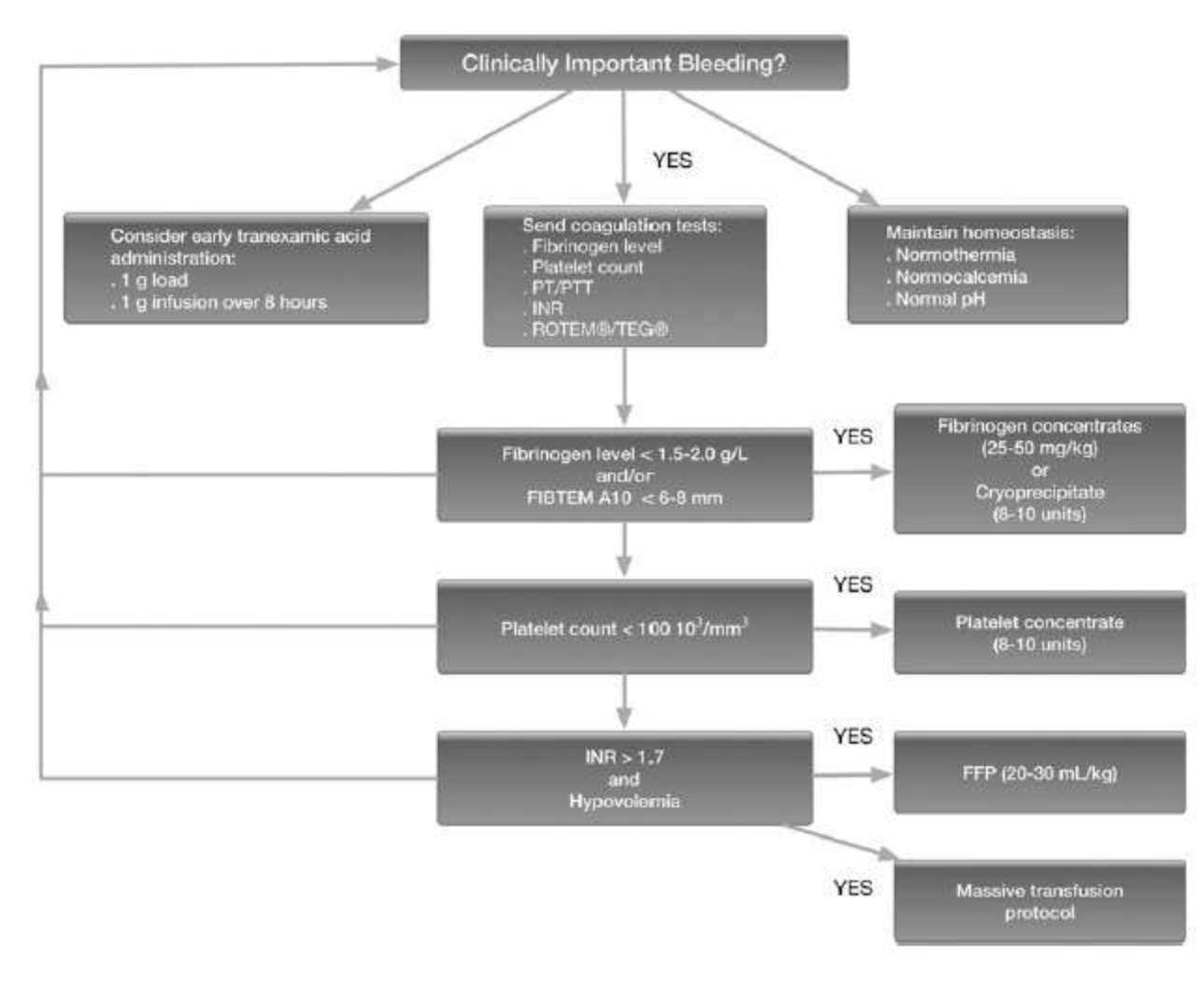


MCF 18 mm

How I use fibrinogen replacement therapy in acquired bleeding

Jerrold H. Levy[1,2] and Lawrence T. Goodnough[3,4]

[1]Department of Anesthesiology and [2]Department of Surgery, Duke University School of Medicine, Durham, NC; and [3]Department of Pathology and [4]Department of Medicine, Stanford University, Stanford, CA



Jerrold H. Levy et al. Blood. 2015;125(9):1387-1393

EJA

Eur J Anaesthesiol 2017; **34**:332–395

GUIDELINES

Management of severe perioperative bleeding: guidelines from the European Society of Anaesthesiology

First update 2016

Sibylle A. Kozek-Langenecker, Aamer B. Ahmed, Arash Afshari, Pierre Albaladejo, Cesar Aldecoa, Guidrius Barauskas, Edoardo De Robertis, David Faraoni, Daniela C. Filipescu, Dietmar Fries, Thorsten Haas, Matthias Jacob, Marcus D. Lancé, Juan V.L. Pitarch, Susan Mallett, Jens Meier, Zsolt L. Molnar, Niels Rahe-Meyer, Charles M. Samama, Jakob Stensballe, Philippe J.F. Van der Linden, Anne J. Wikkelsø, Patrick Wouters, Piet Wyffels and Kai Zacharowski

1.7. General coagulation management

Fibrinogen concentration of less than 1.5 to 2 g l^{-1} is considered as hypofibrinogenaemia in acquired coagulopathy and is associated with increased bleeding risk. C

We suggest an initial fibrinogen concentrate dose of 25 to 50 mg kg^{-1}. 2C

We recommend treatment of hypofibrinogenaemia in bleeding patients. 1C

In cases wherein fibrinogen concentrate is not available we suggest cryoprecipitate at an initial dose of 4 to 6 ml kg^{-1}. 2C

Plasma transfusion alone is not sufficient to correct hypofibrinogenaemia. C

In complex cardiovascular surgery, we recommend fibrinogen concentrate infusion guided by VHA monitoring to reduce perioperative blood loss. 1B

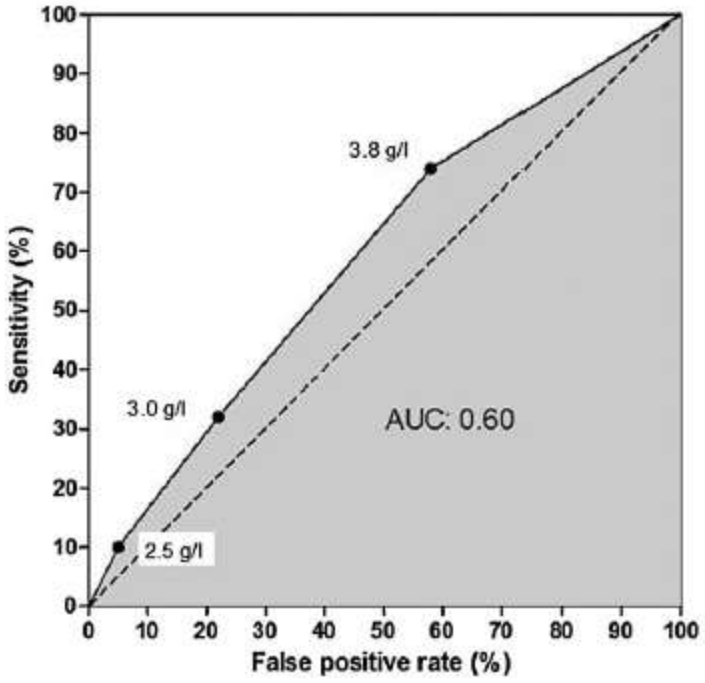
Pre-operative fibrinogen supplementation in cardiac surgery patients: an evaluation of different trigger values

M. Ranucci[1], A. Jeppsson[2,3] and E. Baryshnikova[1]

[1]Department of Cardiothoracic Anesthesia and Intensive Care, IRCCS Policlinico San Donato, San Donato Milanese (Milan), Italy
[2]Department of Molecular and Clinical Medicine, Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
[3]Department of Cardiothoracic Surgery, Sahlgrenska University Hospital, Gothenburg, Sweden

Results: At all the three cutoff values, pre-operative fibrinogen levels had an excellent negative predictive value, ranging from 86% to 100%. Conversely, the positive predictive value was poor at all the cutoff levels: 12% (3.8 g/l), 14% (3.0 g/l), and 19% (2.5 g/l). Overall, the accuracy of pre-operative fibrinogen levels for the prediction of SB was poor. A strategy based on pre-operative fibrinogen supplementation would lead to inappropriate treatment in > 80% of the treated patients. Overall, a trigger value of 3.8 g/l would result in an inappropriate treatment in 52% of the patients, of 3.0 g/l in 20% of the patients, and of 2.5 g/l in 4% of the patients.

Conclusion: Correction of pre-operative fibrinogen levels below 3.8 g/l would lead to an excessive rate of inappropriate interventions. Values below 2.5 g/l could be considered.



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*]

suscitation as more information becomes available from laboratory or point-of-care tests, the treatments being administered are modified and management switches to becoming goal-directed. If no information is available initially, it is reasonable to presume that the severely injured patient is coagulopathic and initiate "best guess" treatment. During further resuscitation, a goal-directed approach is appropriate.

Clinicians need to be aware of the time lag between a sample being taken and the result being available, but should not delay treatment while waiting for a result. Delays in coagulation results represent a much greater challenge in the absence of point-of-care testing. Lack of awareness of the dynamic status of the patient's condition can lead to treatment that is always "behind the curve". To avoid this hazard, patient treatment should be determined by a combination of the test results and the clinician's judgement about how the patient's coagulation status may have changed since the test was taken. The specific goals for treatment are explored in the fol-

normalise these parameters.

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)

Rationale

Fibrinogen is the final component in the coagulation cascade, the ligand for platelet aggregation and therefore key to effective coagulation and platelet function [280, 420]

Practice Guidelines for Perioperative Blood Management

*An Updated Report by the American Society of Anesthesiologists Task Force on Perioperative Blood Management**

Treatments for Hypofibrinogenemia:

Literature Findings: The literature is insufficient to evaluate the intraoperative or postoperative transfusion of cryoprecipitate to manage hypofibrinogenemia. RCTs comparing fibrinogen concentrate with placebo report a lower volume of RBC transfusion and a reduced frequency of patients transfused when fibrinogen concentrate is administered intraoperatively *(Category A2-B evidence)*.[276,277]

Anesthesiology 2015; 122: 241-275

Fibrinogen concentrate administration attributes to significant reductions of blood loss and transfusion requirements in thoracic aortic repair

Koji Yamamoto[1*], Akihiko Usui[2] and Junki Takamatsu[3]

Yamamoto et al. Journal of Cardiothoracic Surgery 2014, 9:90
http://www.cardiothoracicsurgery.org/content/9/1/90

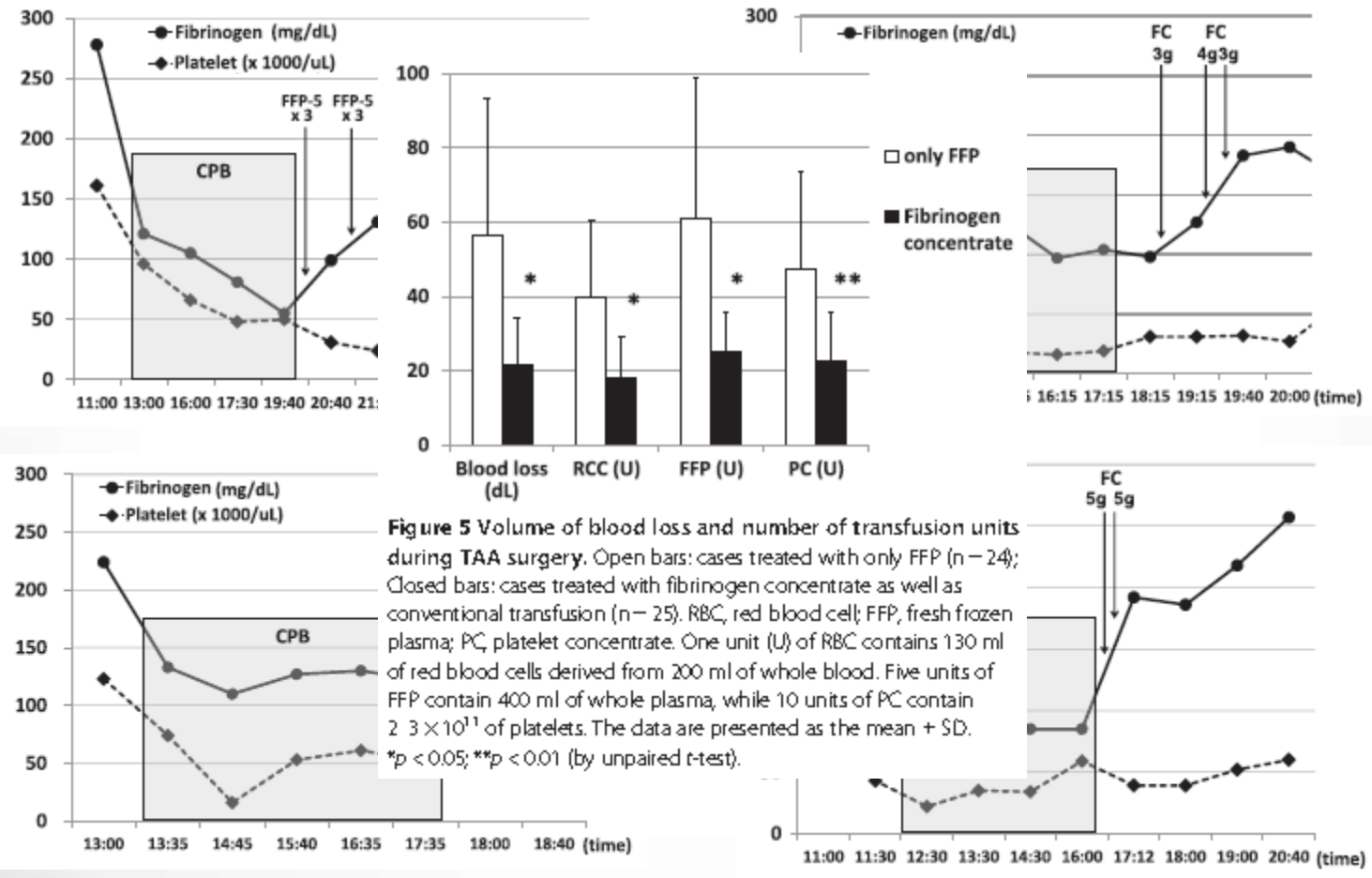


Figure 5 Volume of blood loss and number of transfusion units during TAA surgery. Open bars: cases treated with only FFP (n = 24); Closed bars: cases treated with fibrinogen concentrate as well as conventional transfusion (n = 25). RBC, red blood cell; FFP, fresh frozen plasma; PC, platelet concentrate. One unit (U) of RBC contains 130 ml of red blood cells derived from 200 ml of whole blood. Five units of FFP contain 400 ml of whole plasma, while 10 units of PC contain 2.3×10^{11} of platelets. The data are presented as the mean + SD. *$p < 0.05$; **$p < 0.01$ (by unpaired t-test).

Efficacy and Safety of Fibrinogen Concentrate in Surgical Patients: A Meta-Analysis of Randomized Controlled Trials

Evgeny Fominskiy, MD, PhD,*† Valeriy A. Nepomniashchikh, MD, PhD,† Vladimir V. Lomivorotov, MD, PhD,† Fabrizio Monaco, MD,* Chiara Vitiello, MD,* Alberto Zangrillo, MD,*‡ and Giovanni Landoni, MD*‡

Journal of Cardiothoracic and Vascular Anesthesia, Vol 30, No 5 (October), 2016: pp 1196–1204

Measurements and Main Results: The primary outcome was all-cause mortality. Pooled risk ratios and mean differences (MDs) were computed with either fixed-effects or random-effects models. The study included 14 RCTs comprising 1,035 patients; the majority of patients underwent cardiac surgery. All-cause mortality was lower in the fibrinogen group (4/432 [0.9%] v 15/430 [3.5%]; risk ratio 0.26; 95%

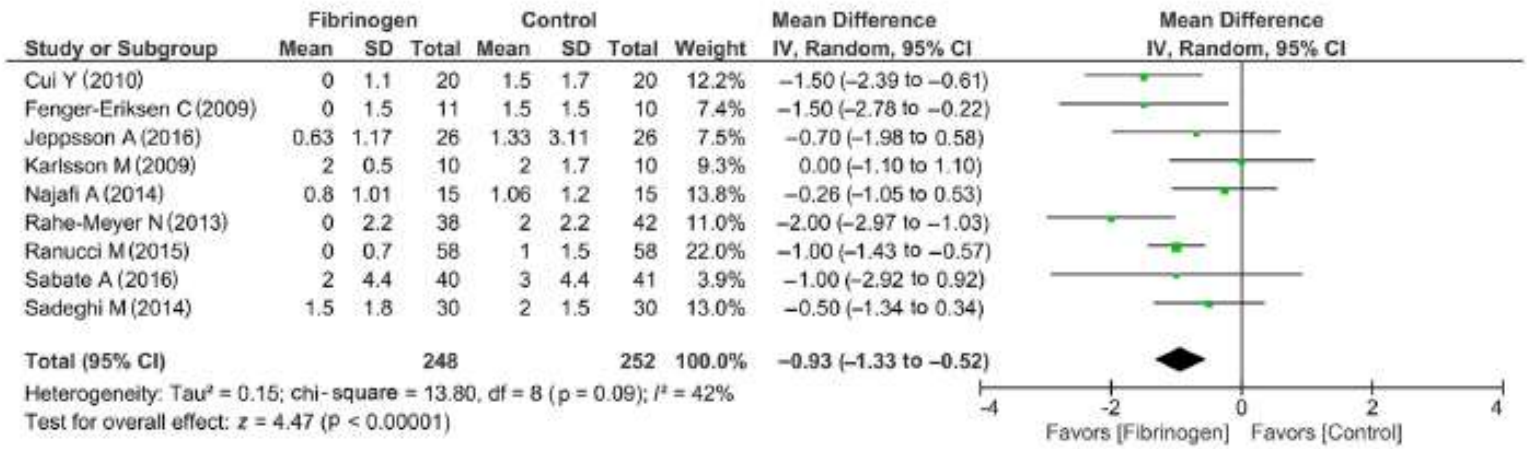


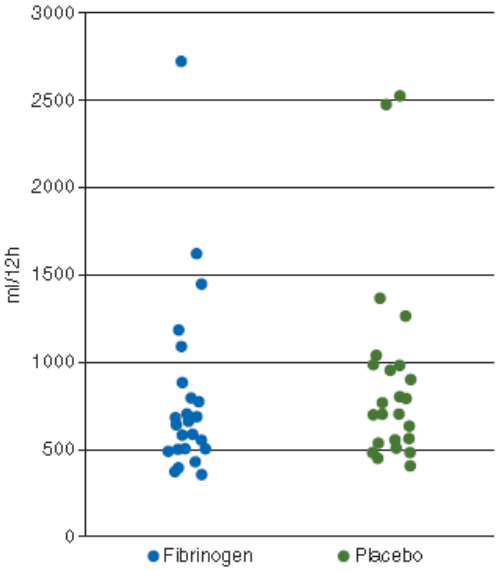
Fig 4. Forest plot for the number of red blood cells units transfused.

Madem bu kadar iyi profilaktik versek?

Preoperative supplementation with fibrinogen concentrate in cardiac surgery: A randomized controlled study

A. Jeppsson[1,2,*], K. Wal , L. Thimour-Bergström[1] and M. Karlsson[4]

[1]Department of Cardiothoracic S al, Gothenburg, Sweden, [2]Department of Molecular and Clinical Medici Academy, University of Gothenburg, Gothenburg, Sweden, [3]Departme Eastern Hospital, Gothenburg, Sweden, and [4]Department of Medicine, Sl



Results: Median postoperative bleedi he fibrinogen and placebo groups [650 (25/75th percentile 500–835) ml compared wit . of transfused subjects (33 vs 29%, P=0.76), number of perioperative transfusions 3), P=0.76) and haemoglobin concentration 24 h after surgery (107 (SD 11) vs 100 (12) g nt between the fibrinogen and placebo group, respectively.

Conclusions: Preoperative supplementation with 2 g fibrinogen concentrate did not significantly influence postoperative bleeding, in coronary artery bypass grafting patients without documented hypofibrinogenaemia.

Clinical trial registration. NCT00968045.

Fibrinogen Concentrate Therapy in Complex Cardiac Surgery

Süleyman Bilecen, MD,*† Linda M. Peelen, PhD,†‡ Cor J. Kalkman, MD, PhD,†
Alexander J. Spanjersberg, MD,* Karel G.M. Moons, PhD,†‡ and Arno P. Nierich, MD, PhD*

Objectives: **Fibrinogen concentrate increasingly is used to treat coagulopathic bleeding in cardiac surgery although its effectiveness and safety have not been shown. The authors conducted a cohort study to quantify the effects of fibrinogen concentrate on postoperative blood loss and transfusion and the occurrence of adverse clinical events in complex cardiac surgery patients.**

Design: **A cohort analysis using prospectively collected data.**

Setting: **A teaching hospital.**

1.02 (0.91-1.14) and an odds ratio of 1.14 (0.83-1.56), respectively. For the risk of 30-day mortality, myocardial infarction, cerebrovascular accident/transient ischemic attack, renal insufficiency/failure, total infections, and prolonged mechanical ventilation the adjusted odds ratios were 0.96 (0.48-1.92), 1.10 (0.53-2.27), 1.16 (0.50-2.72), 0.62 (0.29-1.32), 1.18 (0.72-1.95), and 1.44 (0.83-2.49), respectively.

Conclusions: **Fibrinogen concentrate infusion during surgery did not reduce postoperative blood loss and transfusion, and no increased risk for clinical adverse events was**

Postoperative blood loss and need for transfusion (ICU)			
Blood loss ICU mL, median, (IQR 25th, 75th)	670 (420, 1,080)	560 (400, 850)	<0.01
Number of patients transfused during ICU stay with (%)			
RBC	124 (47)	313 (39)	0.02
FFP	62 (24)	98 (12)	<0.01
Platelets	50 (19)	81 (10)	<0.01
Any blood product	144 (55)	351 (43)	<0.01
Adverse clinical events (%)			
30-day mortality	18 (7)	33 (4)	0.07
Myocardial infarction	14 (5)	30 (4)	0.25
CVA/TIA	11 (4)	20 (3)	0.15
Renal insufficiency/failure	13 (5)	38 (5)	0.87
Total infections	29 (11)	74 (9)	0.37
Prolonged mechanical ventilation	52 (20)	45 (6)	<0.01

NOTE. $p < 0.05$ is considered a significant difference between groups.
Abbreviation: IQR, interquartile range.

JAMA | Original Investigation

Effect of Fibrinogen Concentrate on Intraoperative Blood Loss Among Patients With Intraoperative Bleeding During High-Risk Cardiac Surgery

A Randomized Clinical Trial

Süleyman Bilecen, MD; Joris A. H. de Groot, PhD; Cor J. Kalkman, MD, PhD; Alexander J. Spanjersberg, MD; George J. Brandon Bravo Bruinsma, MD, PhD; Karel G. M. Moons, PhD; Arno P. Nierich, MD, PhD

JAMA. 2017;317(7):738-747. doi:10.1001/jama.2016.21037

	Median (IQR), mL			
	Fibrinogen (n = 58)	Control (n = 57)	Absolute Difference (95% CI)	P Value
Primary Outcome				
Blood loss between intervention and chest closure	50 (29-100)	70 (33-145)	20 (−13 to 35)[a]	.19
Secondary or Exploratory Outcome				
No. of patients	58	59		
Blood loss in the ICU/time interval starting from admission				
0-1 h	70 (35-130)	90 (46-149)		
>1-3 h	80 (50-156)	110 (40-220)		
>3-6 h	100 (54-169)	110 (60-208)		
>6-12 h	110 (80-160)	125 (83-224)		
>12-24 h	130 (80-180)	160 (90-270)		
Cumulative 24-h blood loss	570 (390-730)	690 (400-1090)	120 (−45 to 355)[a]	.047[b]

Effects of Fibrinogen Concentrate as First-line Therapy during Major Aortic Replacement Surgery

A Randomized, Placebo-controlled Trial

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Dirk S. Schmidt, Ph.D.,§ Dietrich Knoerzer, Ph.D.,§ Gerald Hochleitner,‖
Benny Sørensen, M.D., Ph.D.,# Christian Hagl, M.D.,** Maximilian Pichlmaier, M.D.**

Conclusions: Hemostatic therapy with fibrinogen concentrate in patients undergoing aortic surgery significantly reduced the transfusion of allogeneic blood products. Larger multicenter studies are necessary to confirm the role of fibrinogen concentrate in the management of perioperative bleeding in patients with life-threatening coagulopathy.

						Value
avoidance of allogeneic blood components, n (%)	29	13 (45%)	32	0 (0%)	NC	<0.001
Units of packed red blood cells (erythrocytes), median (IQR)	29	0 (0–3)	32	2 (2–5)	−2 (−2 to 0)	0.007
Units of FFP, median (IQR)	29	0 (0–4)	32	8 (4–10)	−5 (−8 to −4)	<0.001
Units of platelet concentrate, median (IQR)‡	29	0 (0–2)	32	4 (2–5)	−2 (−3 to −2)	<0.001

Anesthesiology 2013

Randomized evaluation of fibrinogen *vs* placebo in complex cardiovascular surgery (REPLACE): a double-blind phase III study of haemostatic therapy

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British Journal of Anaesthesia, 117 (1): 41–51 (2016)

Methods: Patients undergoing elective aortic surgery requiring cardiopulmonary bypass were randomly assigned to receive FCH or placebo. Study medication was administered to patients with a 5 min bleeding mass of 60–250 g after separation from bypass and surgical haemostasis. A standardized algorithm for allogeneic blood product transfusion was followed if bleeding continued after study medication.

Results: 519 patients from 34 centres were randomized, of whom 152 (29%) met inclusion criteria for study medication. Median (IQR) pretreatment 5 min bleeding mass was 107 (76–138) and 91 (71–112) g in the FCH and placebo groups, respectively (P=0.13). More allogeneic blood product units were administered during the first 24 h after FCH, 5.0 (2.0–11.0), when compared with placebo, 3.0 (0.0–7.0), P=0.026. Fewer patients avoided transfusion in the FCH group (15.4%) compared with placebo (28.4%), P=0.047. The FCH immediately increased plasma fibrinogen concentration and fibrin-based clot strength. Adverse event rates were comparable in each group.

Conclusions: Human fibrinogen concentrate was associated with increased allogeneic blood product transfusion, an unexpected finding contrary to previous studies. Human fibrinogen concentrate may not be effective in this setting when administered according to 5-minute bleeding mass. Low bleeding rates and normal-range plasma fibrinogen concentrations before study medication, and variability in adherence to the complex transfusion algorithm, may have contributed to these results.

Clinical trial registration: ClinicalTrials.gov identifier no. NCT01475669; EudraCT trial no. 2011-002685-20.

Randomized, Double-Blinded, Placebo-Controlled Trial of Fibrinogen Concentrate Supplementation After Complex Cardiac Surgery

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Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01471730. **(*J Am Heart Assoc.* 2015;4: e002066 doi: 10.1161/JAHA.115.002066)**

Methods and Results—This was a single-center, prospective, randomized, placebo-controlled, double-blinded study. One-hundred sixteen patients undergoing heart surgery with an expected cardiopulmonary bypass duration >90 minutes were admitted to the study. Patients in the treatment arm received fibrinogen concentrate after protamine administration; patients in the control arm received saline solution. In case of ongoing bleeding, patients in the treatment arm could receive prothrombin complex concentrates (PCCs) and those in the control arm saline solution. The primary endpoint was avoidance of any allogeneic blood product. Patients in the treatment arm had a significantly lower rate of any allogeneic blood products transfusion (odds ratio, 0.40; 95% confidence interval, 0.19 to 0.84, P=0.015). The total amount of packed red cells and FFP units transfused was significantly lower in the treatment arm. Postoperative bleeding was significantly (P=0.042) less in the treatment arm (median, 300 mL; interquartile range, 200 to 400 mL) than in the control arm (median, 355 mL; interquartile range, 250 to 600 mL).

Conclusions—Fibrinogen concentrate limits postoperative bleeding after complex heart surgery, leading to a significant reduction in allogeneic blood products transfusions. No safety issues were raised.

The effectiveness of 10 years of interventions to control postoperative bleeding in adult cardiac surgery

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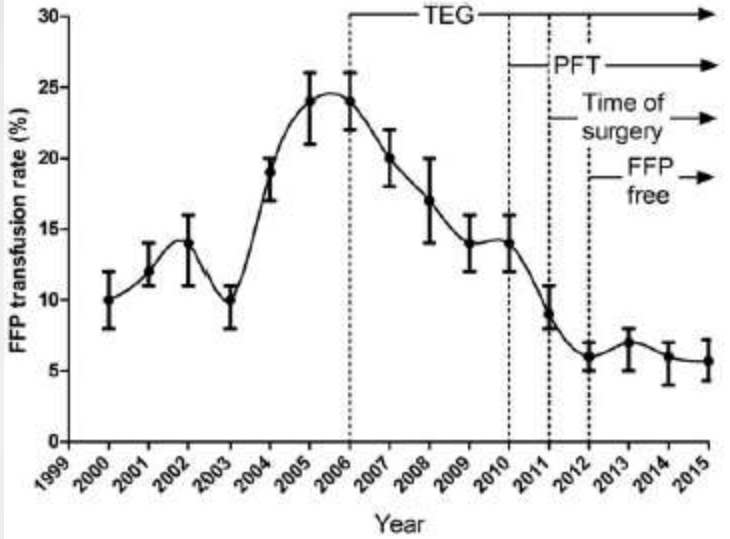
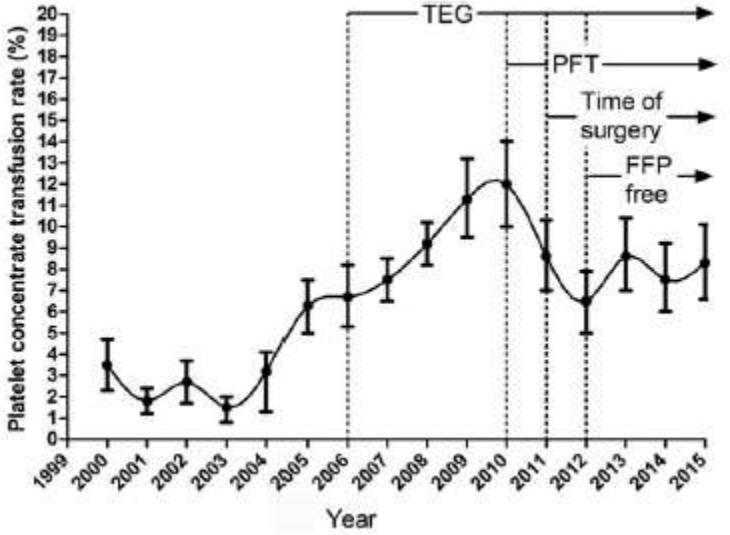
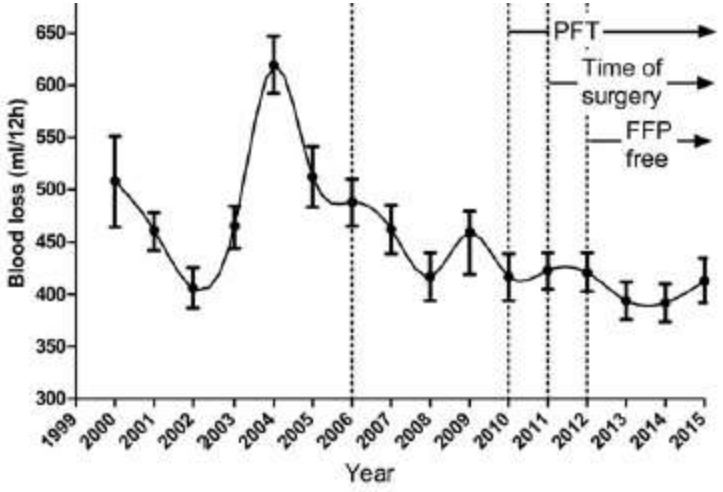
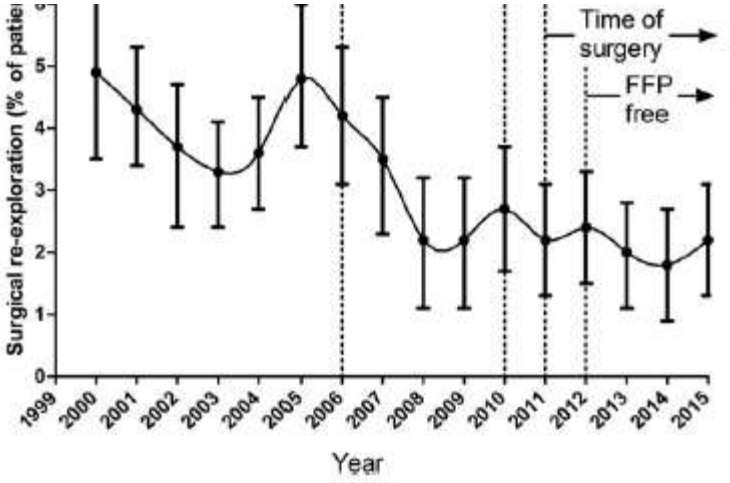
Interactive CardioVascular and Thoracic Surgery 24 (2017) 196–202
doi:10.1093/icvts/ivw339 Advance Access publication 17 October 2016









Evaluation of clinical practice in perioperative patient blood management

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British Journal of Anaesthesia, 117 (5): 610–6 (2016)

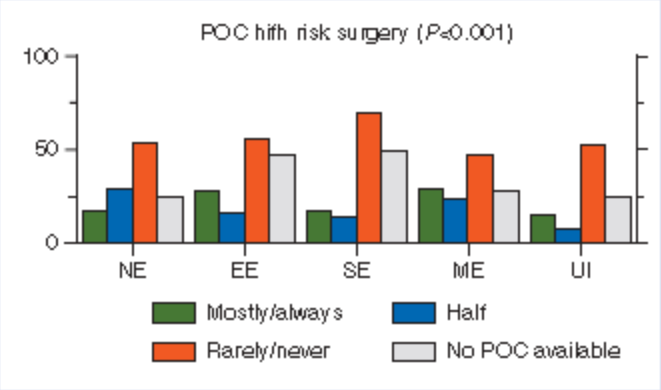

Fig 5 Likert scales depicting the use and availability of point-of-care (POC) monitoring devices during high risk surgery in Europe according to geographic regions. *P* value indicates differences between regions. NE - northern Europe, EE - eastern Europe, SE - southern Europe, ME - middle Europe, UI - United Kingdom and Ireland.

Table 2 Availability of point of care coagulation monitoring devices. Multiple selections were permitted

Device	n	(%)
ROTEM®	255	(36.1)
TEG®	138	(19.5)
PFA 100®	111	(15.7)
Multiplate®	109	(15.4)
SpHb®	74	(10.5)
VerifyNow®	31	(4.4)
Hemocue®	10	(1.4)
None	288	(41)

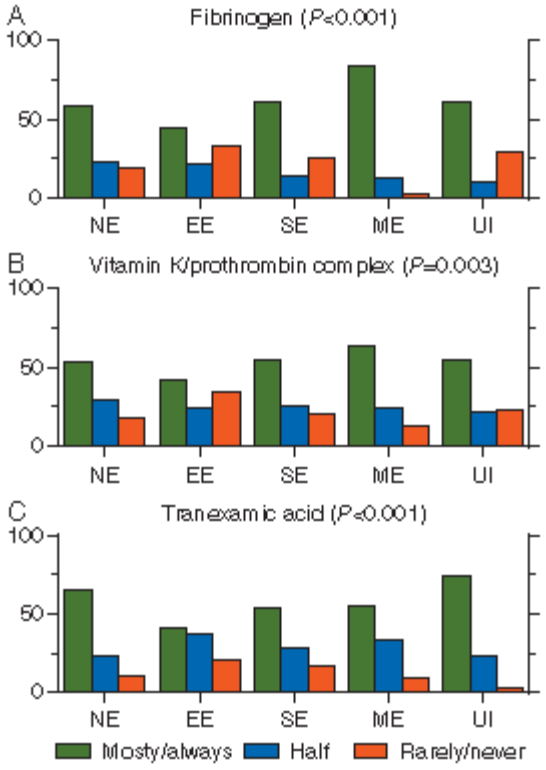

Fig 4 Likert scales depicting European regional distributions of targeted use of (A) fibrinogen, (B) vitamin K or prothrombin complex, and (C) tranexamic acid. *P* values indicate differences between regions. NE - northern Europe, EE - eastern Europe, SE - southern Europe, ME - middle Europe, UI - United Kingdom and Ireland.

Sonuç

- Kardiyak cerrahi sırasında kanama multifaktoriyeldir
- Kanayan hastada çoklu tedaviler değerlendirilmelidir
- Fibrinojen seviyelerinin kontrolü gözden kaçmamalıdır
- POC testleri günlük pratiğe sokulmalıdır
- Tedavi bireyselleştirilmelidir.
- Sonuçlara göre farklı prohemostatik ajanlar kullanılabilir.

TEŞEKKÜRLER…