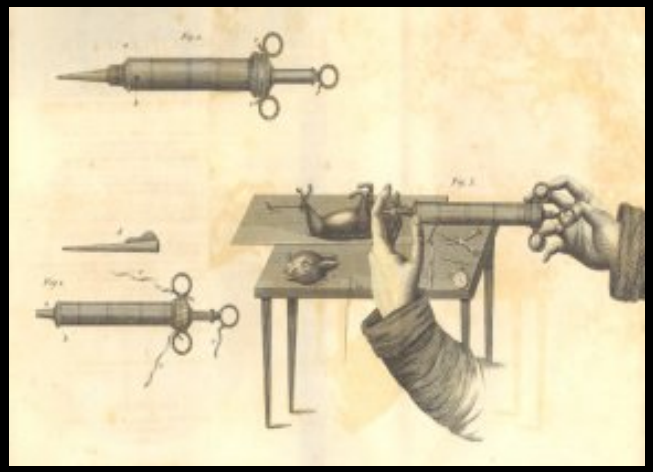
GEÇMİŞTEN GÜNÜMÜZE
PERFÜZYON TEKNOLOJİSİ

Dr. Serdar Günaydın
Kırıkkale Üniversitesi Tıp Fakültesi
Kalp Damar Cerrahisi A.D.

Akış Planı

- Tarihçe
- Değişen Hasta Profili
- Inflamatuar Yanıt ve Anti-inflamatuar Stratejiler
- Değişen Kan Koruma Konseptleri ve Yöntemleri
- Monitörizasyon Yöntemlerindeki Yenilikler
- Modüler KPB
- Gelecek

Julien Jean Cesar LeGallios



(1770 – 1814)

“If one could substitute for the heart
a kind of injection…of arterial blood, either natural or artificially made…
one would succeed
easily in maintaining alive indefinitely any part of the body whatsoever.”

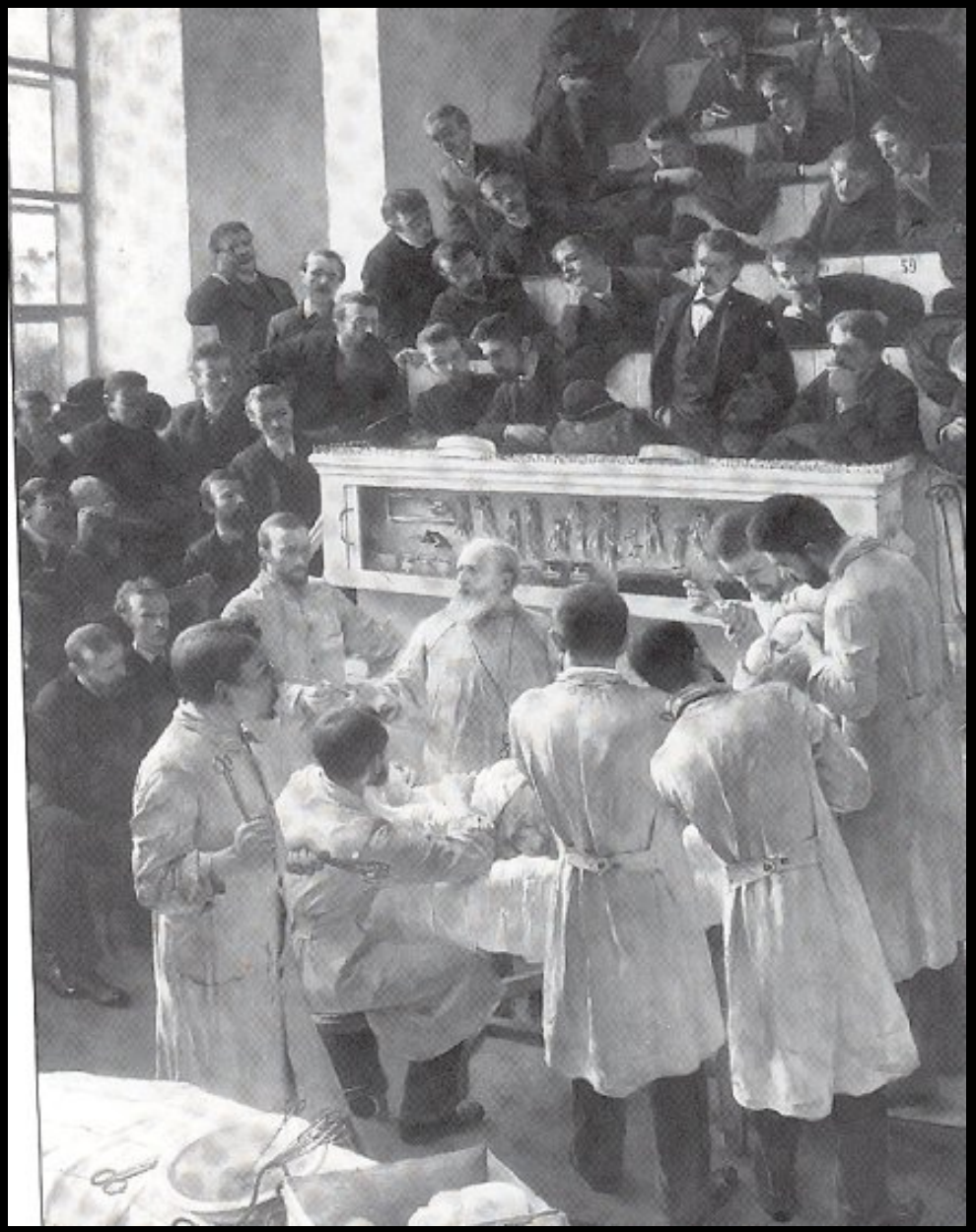
LeGallois 1812

Eğer günün birinde bir araştırmacı kalbi bir enjeksiyon…doğal ya da yapay bir arteriyel kan ile değiştirebilirse..
O zaman insanlar sonsuza kadar yaşamlarını sürdürebilme şansını yakalayabilir

THEODUR BILROTH 1880

"Any Man Who Would Attempt To Operate On The Heart Should Lose The Esteem Of His Colleagues"

"Kalp üzerinde ameliyat yapmaya yeltenecek herhangi biri meslektaşlarına karşı onurunu kaybetmeye mahkumdur"



“Surgery Of The Heart Had Probably Reached The Lımıts Of Nature, No New Method Or Dıscovery Could Attend A Wound To The Heart”

Stephen Paget

1896

Kalp Cerrahisi muhtemelen doğayı zorlayabilecek son sınırına artık ulaşmıştır, hiçbir yeni yöntem veya buluş kalpteki bir yaralanmayı tedavi etmeye yetemez

KISA TARİHÇE

- **1934- Michael Debakey**

Roller Pompayı Bir Perfüzyon Cihazı Olarak Tanımladı

- **1940- W.G. Bigelow- Hipotermi**
- **John H. Gibbon Jr.**
  - √ **1931- Kalp-akciğer Makinesi Fikrini Geliştirdi**
  - √ **1937 -Kalp Akciğer Makinesinin İlk Başarılı Kullanımı**

Kalp Akciğer Makinesiyle Erken Cerrahi

C. Dennis	1952	2/2	Ex
J.Gibbon	1953	5/6	Ex
J.Helmsworth	1953	1/1	Ex
D.Dodrill	1953	2/2	Ex
G.Clowes	1953	2/2	Ex
W.Mustard	53/54	5/5	Ex
		17/18	94.5%


6

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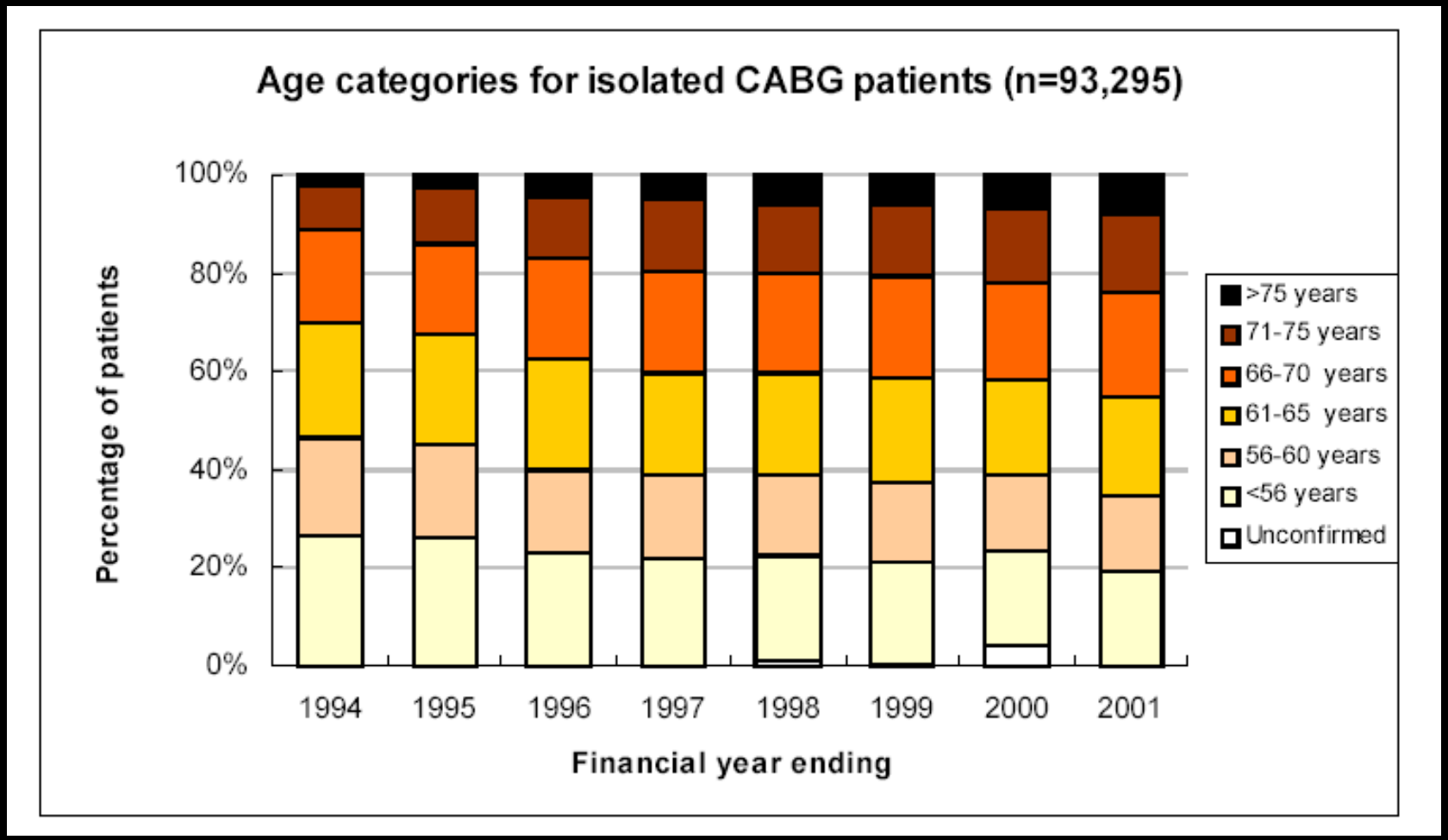
KALP CERRAHİSİNDE ZORLAŞAN HASTA PROFİLİ



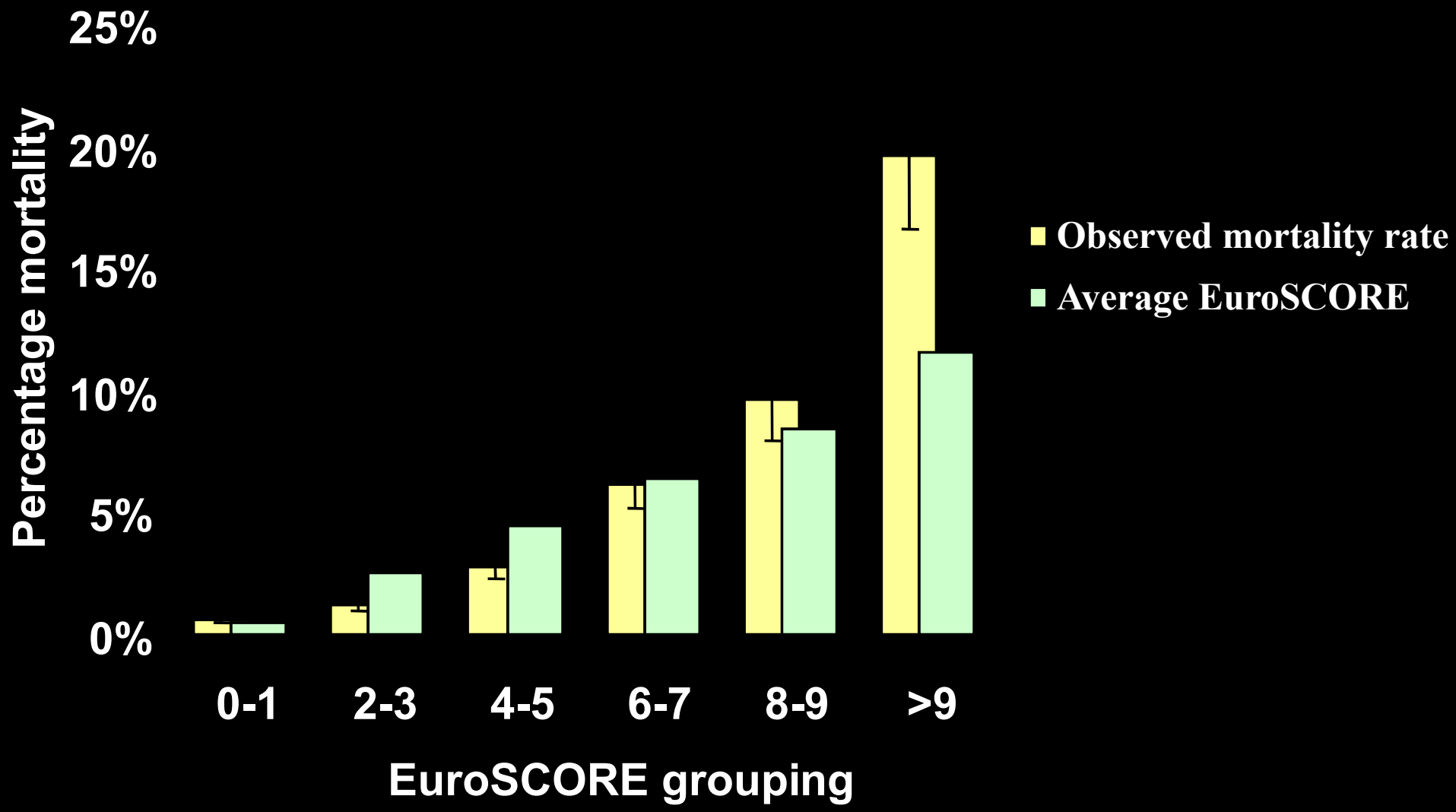
EuroSCORE

PARAMETRELER	SKOR
Yaş (yıl)	1[a]
Kadın	1
KOAH	1
Ekstrakardiyak arteriopati (carotid occlusion >50%, claudication)	2
Nörolojik disfonksiyon	2
Geçirilmiş Cerrahi	3
Serum creatinine >200 µmol/L	2
Kritik preoperatif Durum[b]	3
Unstable angina	2
Sol ventriküler Disfonksiyon	
EF 30-50%	1
EF<30	3
Yeni MI (<90gün)	2
Pulmoner Hipertansiyon (Systolic PAP > 60 mmHg)	2
Acil	2
Eşlik Eden Cerrahi	2

a 60 yaşından sonra her 5 yıla puan

b VT, VF, masaj, preoperatif solunum desteği, preoperatif inotropik destek, IABP, preoperatif ABY (anuria or oliguria < 10 mL/h)

EUROSCORE VE MORTALİTE (N=25,404)

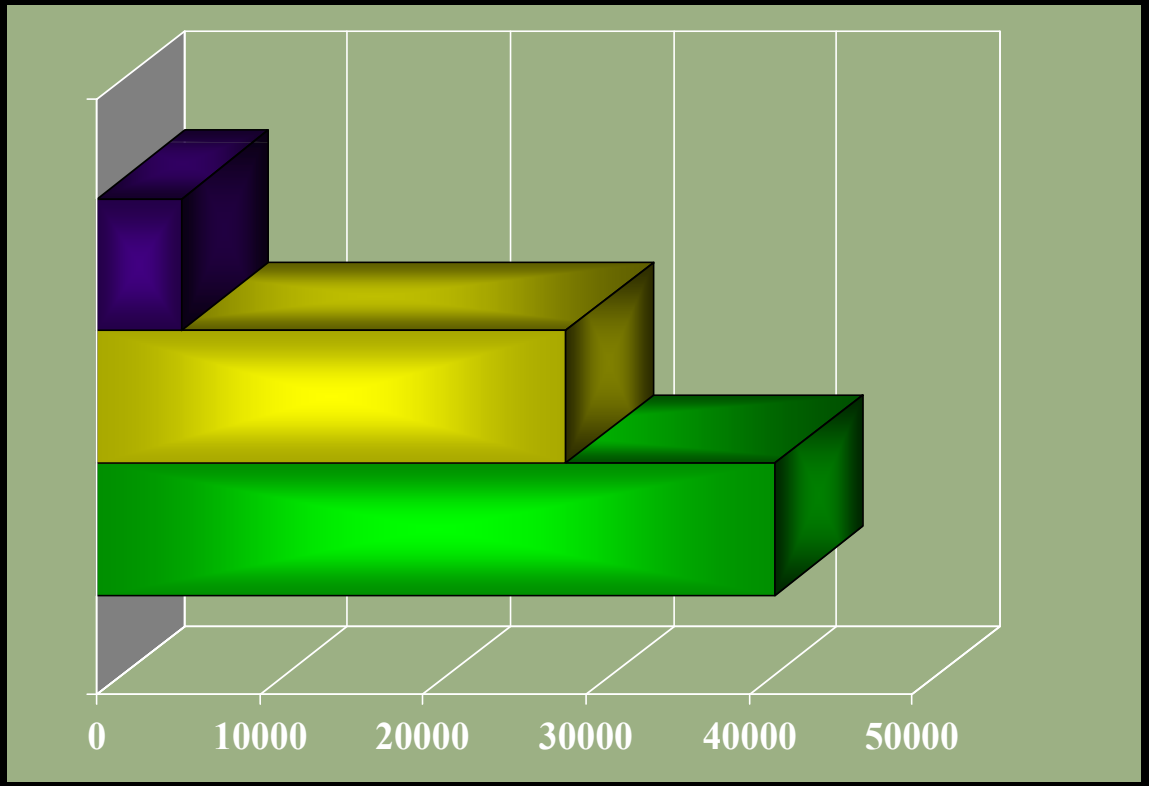


EN SIK KARŞILAŞILAN 3 KOMPLİKASYON

3. LV disfonksiyonu

2. ARDS

1. Mediastinit



Eklenen Giderler ($)

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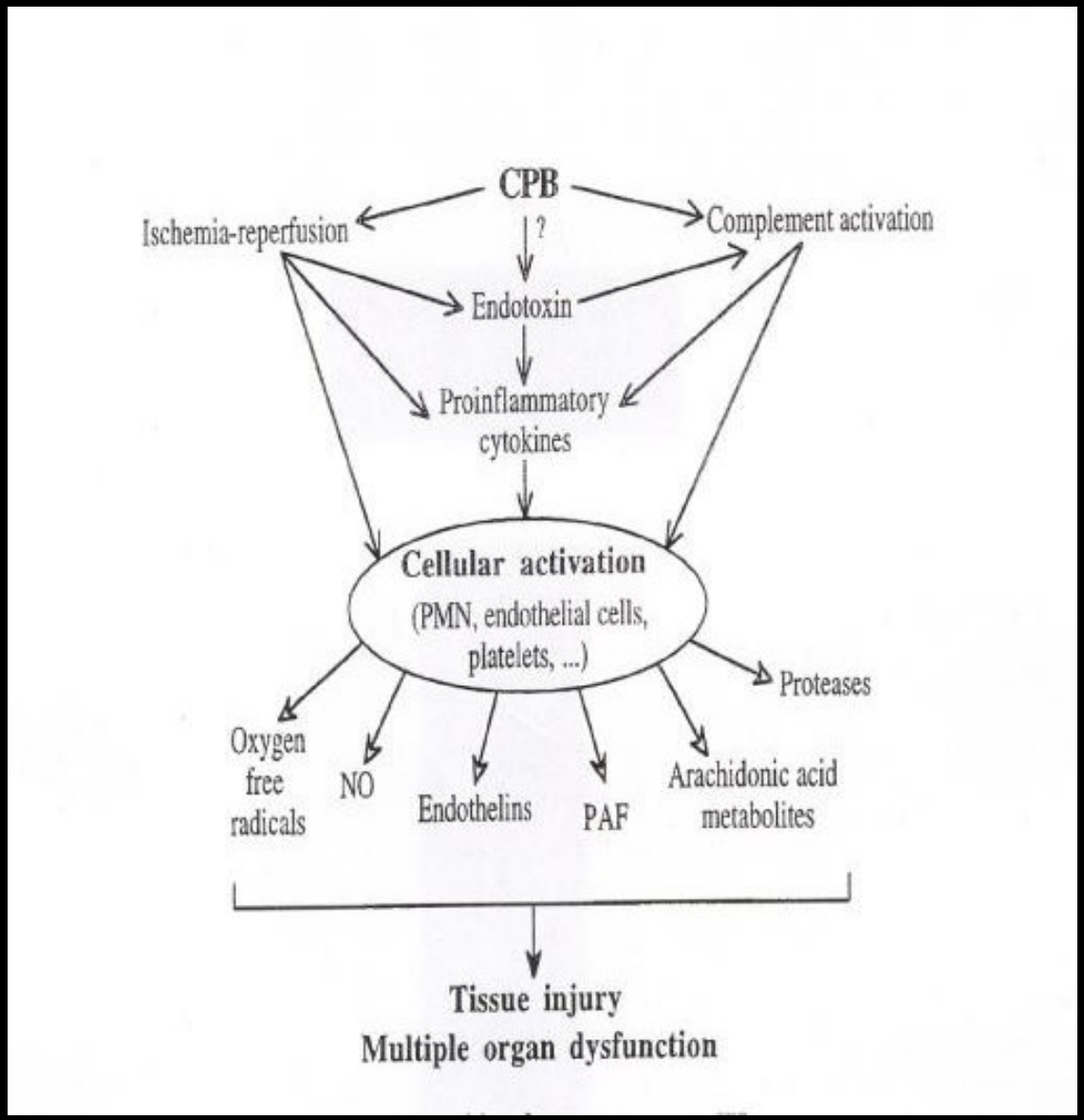
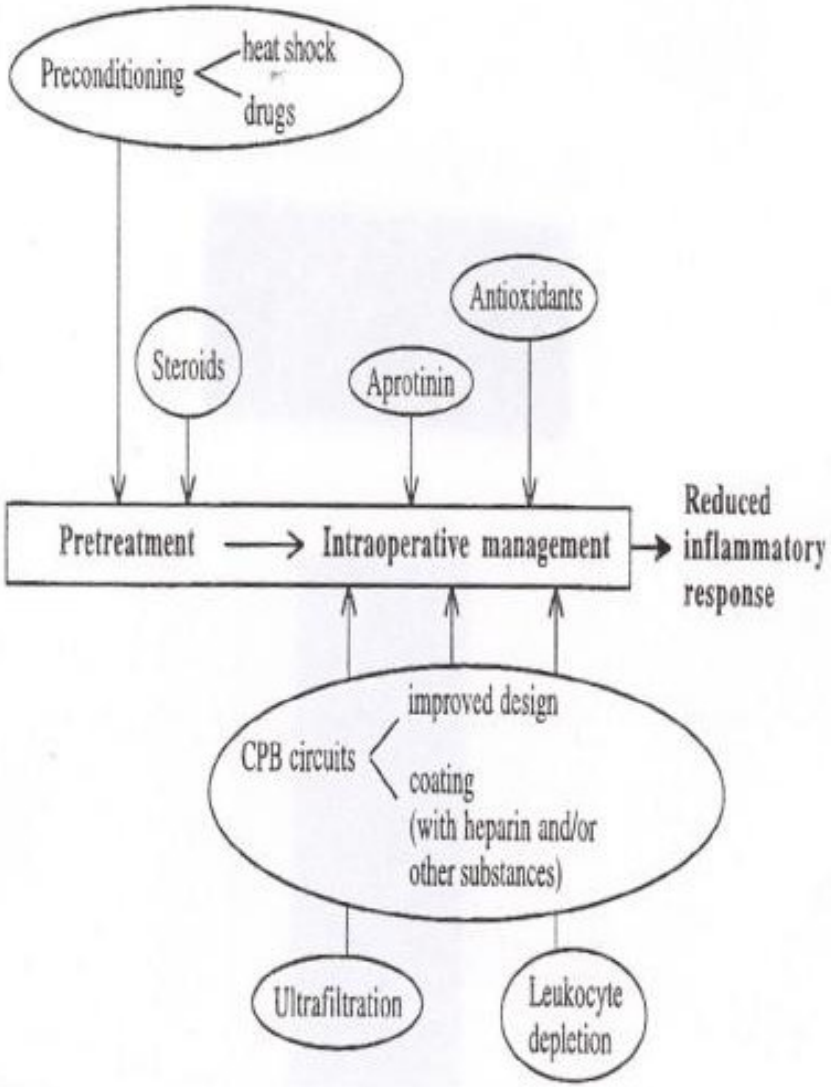
SIRS



- Kanın yabancı yüzeylerle teması
- Iskemi-Reperfüzyon
- Endotoksemi
- Operatif Travma



FARMAKOLOJİK

- Steroid
- Aprotinin ??
- Antioksidanlar
- Pexelizumab ??

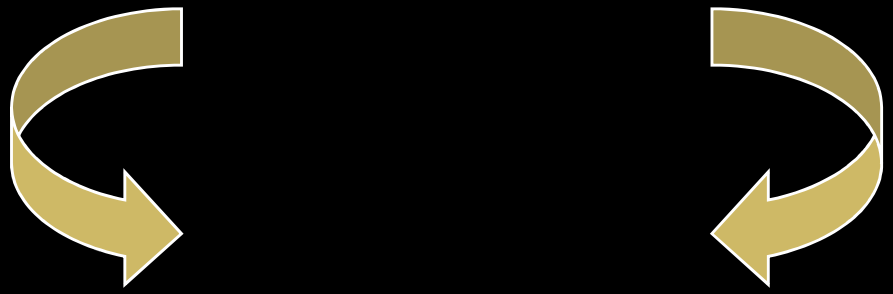
MODIFIKASYON TEKNİKLERİ & MEKANİK CİHAZLAR

- Yüzey Kaplama
- Mini-Devreler
- Lökosit deplesyonu
- Lokosit/Sitokin Deaktivasyonu
- Adsorpsiyon
- Ultrafiltrasyon
- Alternatif önkoşullama (adenozin, potasyum kanal açıcılar)
- Isı şoku (42°C kan kardiyoplejisi-15 dk ön-tedavi-Antioksidan ısı şok proteini)

TEKNİK MODİFİKASYON VE CİHAZLAR

- Yüzey kaplı sistemler
- Lökosit filtrasyonu
- Lokosit Deaktivasyonu
- Mini-Devreler
- Adsorpsiyon Teknolojileri
- Biosensör Teknolojileri

YÜZEY KAPLI SİSTEMLER



HEPARIN POLİMER

POLİMER TABANLI HEPARIN BAĞLI

YÜZEY KAPLAMA

YAYINLAR

Original article

FIC Federazione Italiana di Cardiologia
Italian Federation of Cardiology

JECT. 2010;42:286–292
The Journal of ExtraCorporeal Technology

Hyaluronan Based Heparin Free Coated Open and Closed Extracorporeal Circuits for High Risk Coronary Revascularization

Serdar Gunaydin, MD;* Halil Ibrahim Ucar, MD;† Tanzer Serter, MD;†
Kevin McCusker, CCP, PhD;‡ Gokhan Ozcelik, BSc;† Nevriye Salman, MD;†
Ali Cem Yorgancioglu, MD†

**University of Kirikkale-Turkey, Ankara, Turkey; †Medicana Hospital Ankara-Turkey, Ankara, Turkey; and ‡Portsmouth Regional Hospital, Portsmouth, New Hampshire*

Presented at 48th International Conference of the American Society of ExtraCorporeal Technology, Reno, Nevada, April 28th–May 1st, 2010.

controls (Vision HFO, Gish, USA). In the study group, half of the patients ($n = 25$) received low-systemic heparin

tolerated. *J Cardiovasc Med* 10:135–142 © 2009 Italian Federation of Cardiology.

(T3), after protamine sulfate reversal (T4), and on the first postoperative day (T5). Protein electrophoresis was performed at T1 and T5. Blood cell adhesion and aggregation on fibers were analyzed with optical microscopy, and desorbed protein was evaluated quantitatively by a spectrophotometer using samples obtained when the oxygenators were dismantled after cardiopulmonary bypass.

Results. Platelet counts in group 1 demonstrated sig-

respectively.

Conclusions. Poly(2-methoxyethylacrylate)–coated oxygenators reduce platelet adhesion, platelet aggregation and protein adsorption. This surface provides a better perioperative clinical status through platelet-, albumin-, and fibrinogen-sparing effects.

(Ann Thorac Surg 2002;74:819–24)

TEKNİK MODİFİKASYON VE CİHAZLAR

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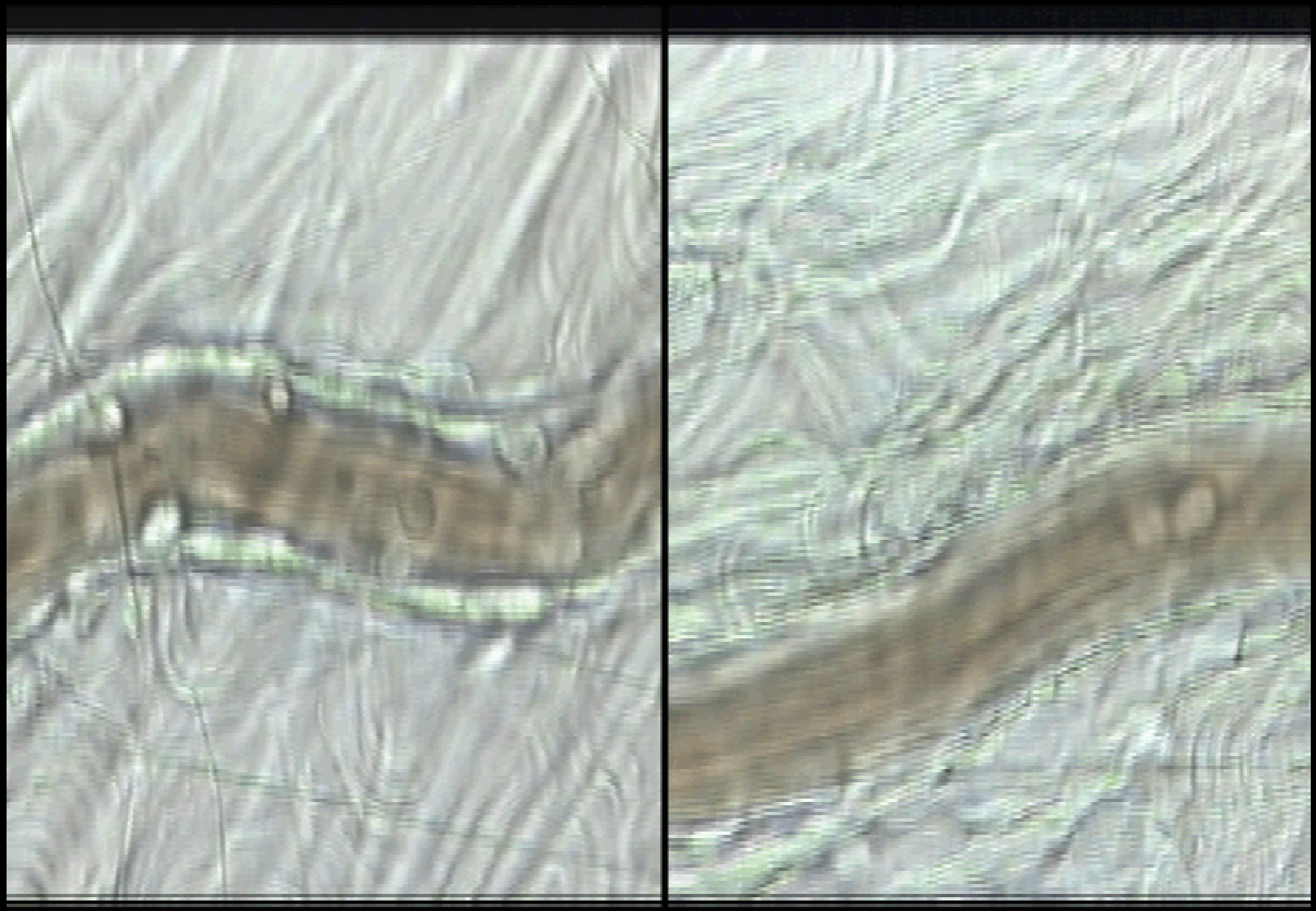
LÖKOSİT FİLTRASYONU

- Sistemik arteriyel devreden lökosit deplesyonu
- Kardiyoplejiden lökosit deplesyonu
- Rezervuar kanının (salvaged blood) lökosit deplesyonu
- Allogenik transfüzyon ürünlerinin lökodeplesyonu

ETKİ MEKANİZMASI

- Lökosit aktivasyonunun baskılanması ve lökosit-endoteliyal hücre adhezyonu
- Lökositlerin dokulara transmigrasyonu
- (Reperfüzyon esnasında lökositlerin %75'i akciğer yatağında sekestre olmaktadır
- DEAEMA (Dietil aminoetil metakrilat) kaplamasıyla oluşturulan elektriksel akım farkı



LÖKOFİLTRELER

LeukoGuard-6® Arteriyel Filtre

- 220 mL prime volüm
- 6 L/dak akımlara uygun
- 40 µm filtre

Kan Kardiyoplejisi Filtreleri BC1B & BC2

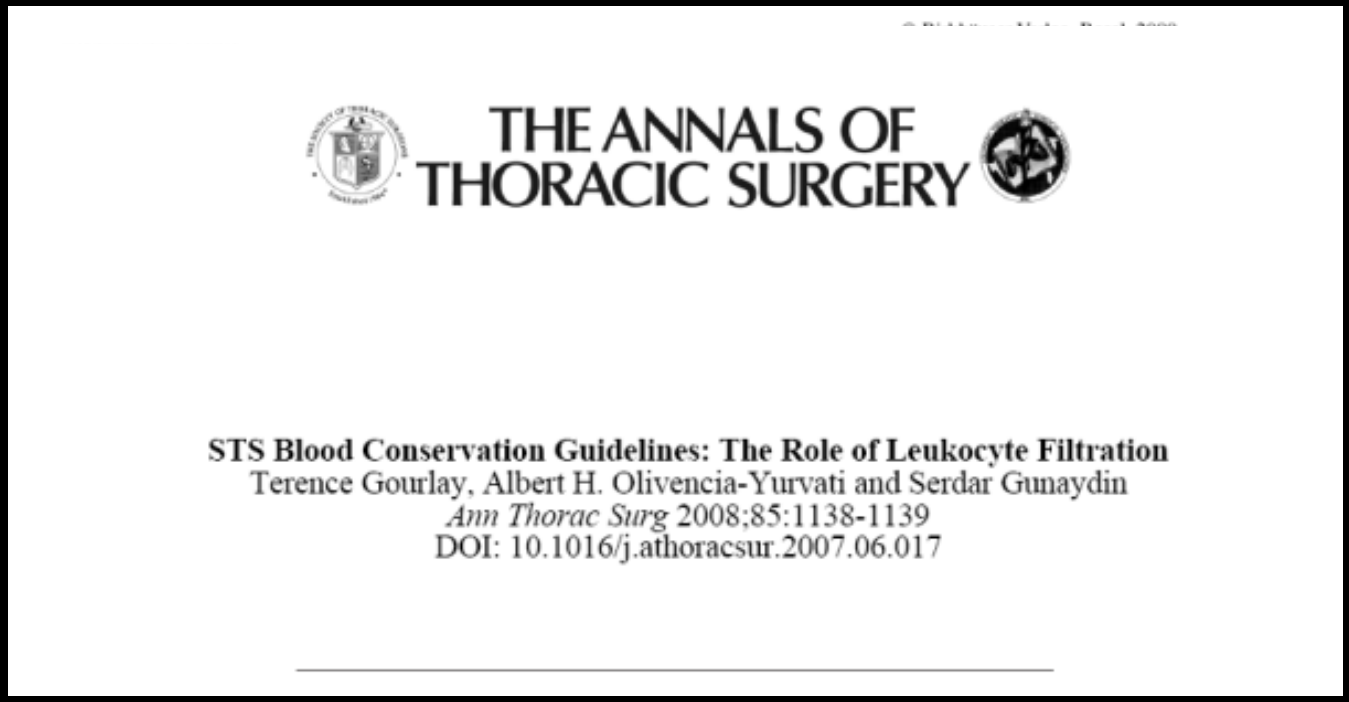
- 95 mL prime volüm
- 350-500 mL/dak akımlara uygun
- 40 µm filtre

STRATEJİK LÖKOSİT FİLTRASYONU

- Sistemik filtre (LGB) X-klemp açılmazdan 30 dak önce yerleştirilir
- Oksijenatörün outletiyle arteriyel filtre arasındaki 18 inch lik kısım çıkarılarak filtre konur
- Oksijenatörün kardiyopleji hattı BC1B filtresi ile değiştirilir
- Hava çıkarma için ekstra resirkülasyon hatları konulur
- Kardiyopleji filtresi sadece son dozda devreye sokulur

LOKOSİT FİLTRASYONU

YAYINLAR



THE ANNALS OF THORACIC SURGERY

STS Blood Conservation Guidelines: The Role of Leukocyte Filtration

Terence Gourlay, Albert H. Olivencia-Yurvati and Serdar Gunaydin

Ann Thorac Surg 2008;85:1138-1139

DOI: 10.1016/j.athoracsur.2007.06.017

TEKNİK MODİFİKASYON VE CİHAZLAR

- Yüzey kaplı sistemler
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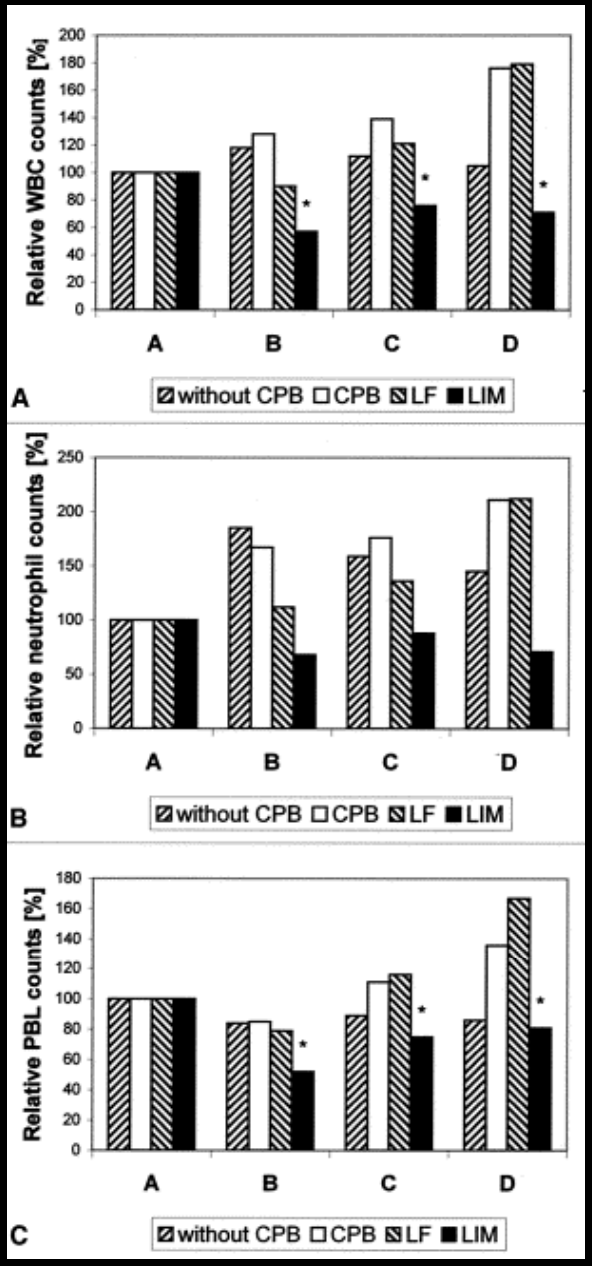
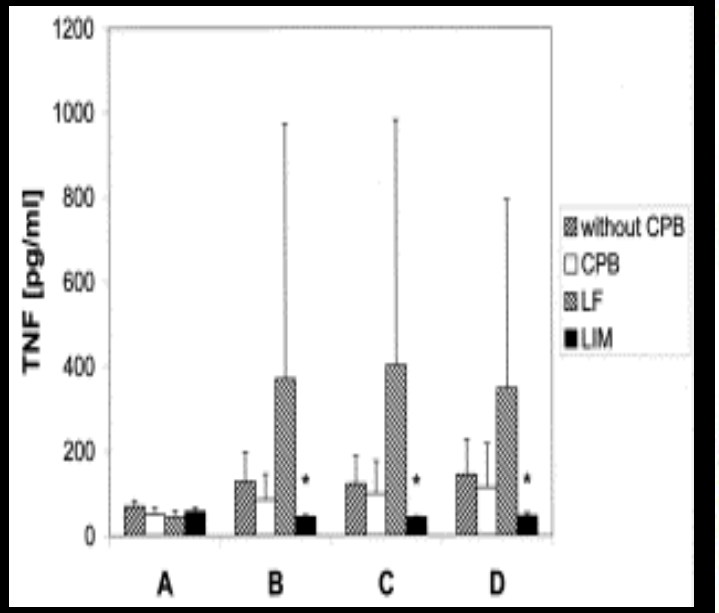
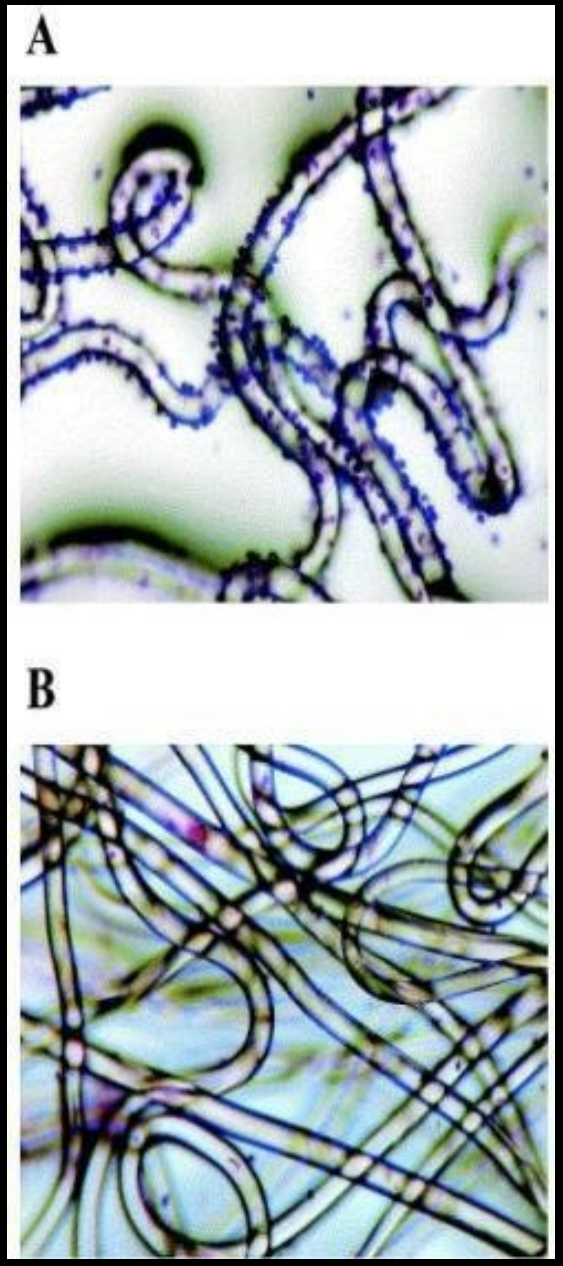
THE LEUKOCYTE INHIBITION MODULE (LIM)

- Fas (CD95; APO-1) kovalent olarak bağlayarak hızlı nötrofil hiperaktivasyonunu önleyen poliüretan bir matrikstir

- İmmunomodülatör antikorların sistemik uygulamalarına alternatif olarak daha az toksisite ve allerjik reaksiyon hedefler


Relative WBC counts [%]
200
180
160
140
120
100
80
60
40
20
0
A
B
C
D
*
A
without CPB
CPB
LF
LIM
Relative neutrophil counts [%]
250
200
150
100
50
0
A
B
C
D
*
B
without CPB
CPB
LF
LIM
Relative PBL counts [%]
180
160
140
120
100
80
60
40
20
0
A
B
C
D
*
C
without CPB
CPB
LF
LIM


TNF [pg/ml]
1200
1000
800
600
400
200
0
A
B
C
D
*
without CPB
CPB
LF
LIM


A
B

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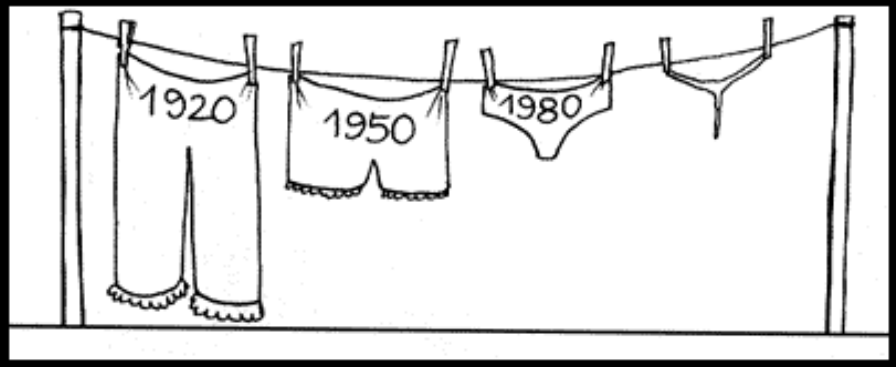
MİNİ-DEVRELER



- Hemodilüsyon
- Hemofiltrasyon
- Devre yüzey alanı
- Makaslama kuvvetleri, staz ve türbülans
- Statik priming volume: 700 mL
- Maksimum akım hızı : 8LPM
- RAP (Hızlı Otolog Prime)
- Mikrokardiyopleji
- Kaplamalı devreler
- Konvansiyonel sisteme hızla dönüş

SORUNLAR

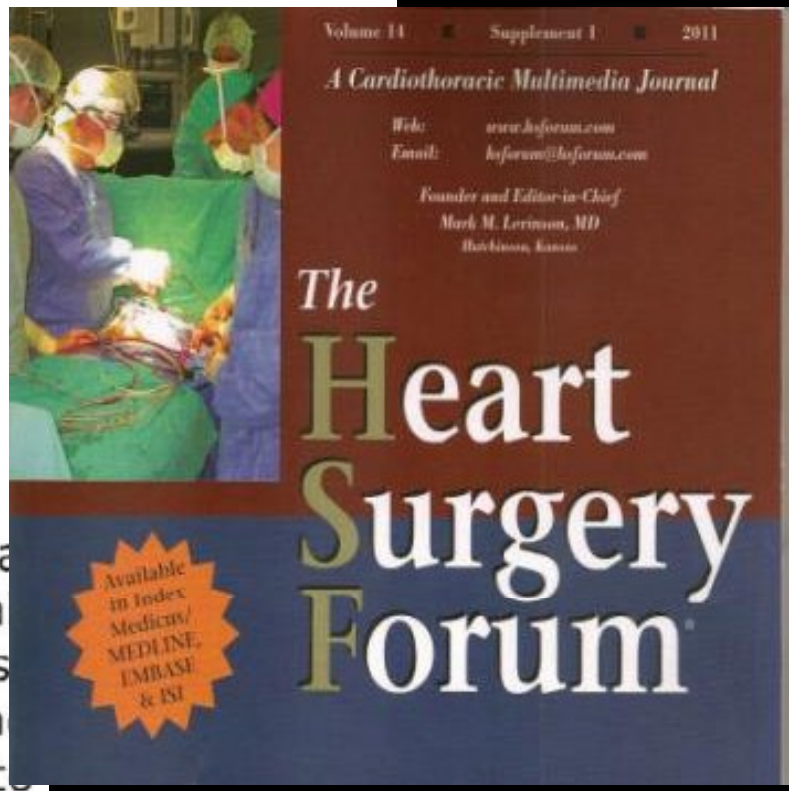
- Ekip konsesusu
- Teknik ve deneyim ?
- Venöz Emboli
- Bilimsel veri ?
- Konvansiyonel sisteme dönüş ?

MİNİ KPB
YAYINLAR

OP-164 CORONARY REVASCULARIZATION WITH MINIMIZED EXTRACORPOREAL CIRCULATION VERSUS OFF PUMP AND CONVENTIONAL CIRCUITS IN HIGH RISK PATIENTS

S. Gunaydin[1], H. I. Ucar[2], T. Serter[2], E. Boysan[1], B. Daglar[3], A. C. Yorgancioglu[2]
[1]University of Kirikkale, Turkey
[2]Medicana International Hospital, Turkey
[3]Abant Izzet Baysal University, Bolu, Turkey

OBJECTIVE: The best approach to surgica myocardial revascularization remains controversia We evaluated the minimized cardiopulmonary bypas (mini-CPB) versus off-pump (OPCAB) an conventional control (C-CPB) with respect t systemic inflammatory response, myocardial protection, perioperative regional cerebral oxygen saturation (rSO2), air handling and clinical outcome in Euroscore 6+ patients undergoing coronary revascularization (CABG).



Multinational- Multicenter RocSafeRx Study

ROCsafeRX

(Comparative Study of a New Minimized Perfusion Circuit versus Standard Perfusion Circuit)

Protocol Number T205E3

Principal Investigators: **Dr. Wolfgang Harringer,**
Dr. Aschraf El-Essawi
Klinikum Braunschweig;
Department of CardiothoracicSurgery,
Braunschweig, Germany:

Principal Co-Investigators: D**r. Tomas Hajek**
Dr. Jiri Skorpil
Department of
Cardiac Surgery,
University Hospital Pilsen,
Czech Republic

Sponsor:
Terumo Europe N.V., Leuven, Belgium
Terumo Europe, Cardiovascular Systems, Eschborn, Germany

Minimized Cardiopulmonary Bypass: Technologies and Applications

Editors: Gourlay & Gunaydin

Woodhead Publishing Ltd. , Cambridge, UK

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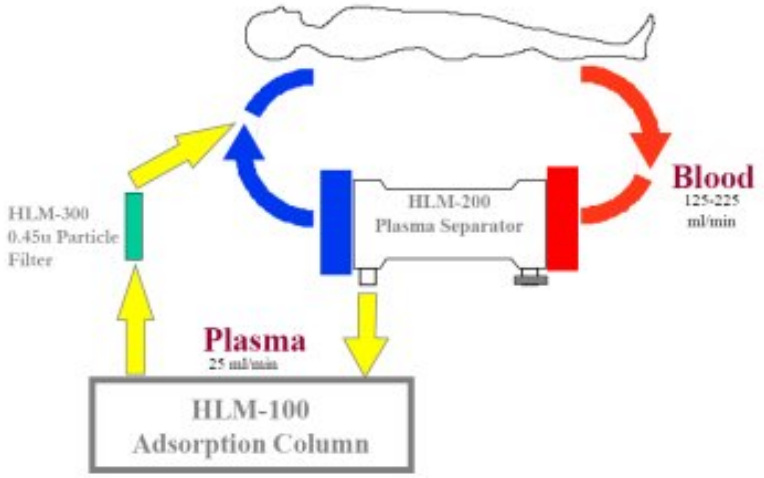
ADSORPSİYON TEKNOLOJİLERİ

Cytokine Adsorption	TNF-α (ng/g)	IL-1 (ng/g)	IL-8 (ng/g)	IL-6 (ng/g)
Adsorbent #1	176	60	69	324
Adsorbent #2	395	235	725	168
Adsorbent #3	71	320	100	168

HLM-100: 35g #1, 35g #2, 100g #3

Toxin Adsorption (percent reduction from spiked elevated levels)	Bilirubin 24%	Creatinine 86%	BUN 21%	Acetaminophen 75%

I.M.P.A.C.T. SYSTEM™
Detoxification Circuit



Pre-Treatment

Post-Treatment

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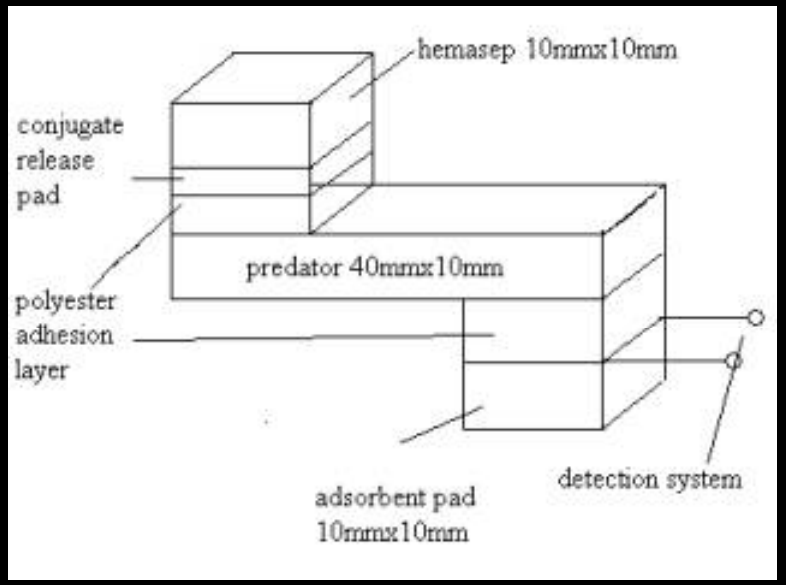
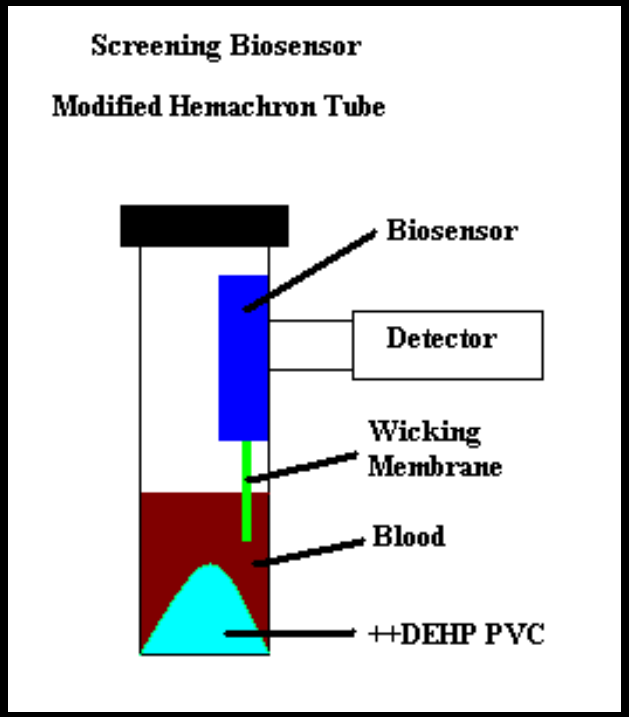
Biosensor Design

The Modified Hemochron Tube Screening Biosensor





IL6, FXIIa and Troponin I

Ouzmah Shafique, IC BSc Project

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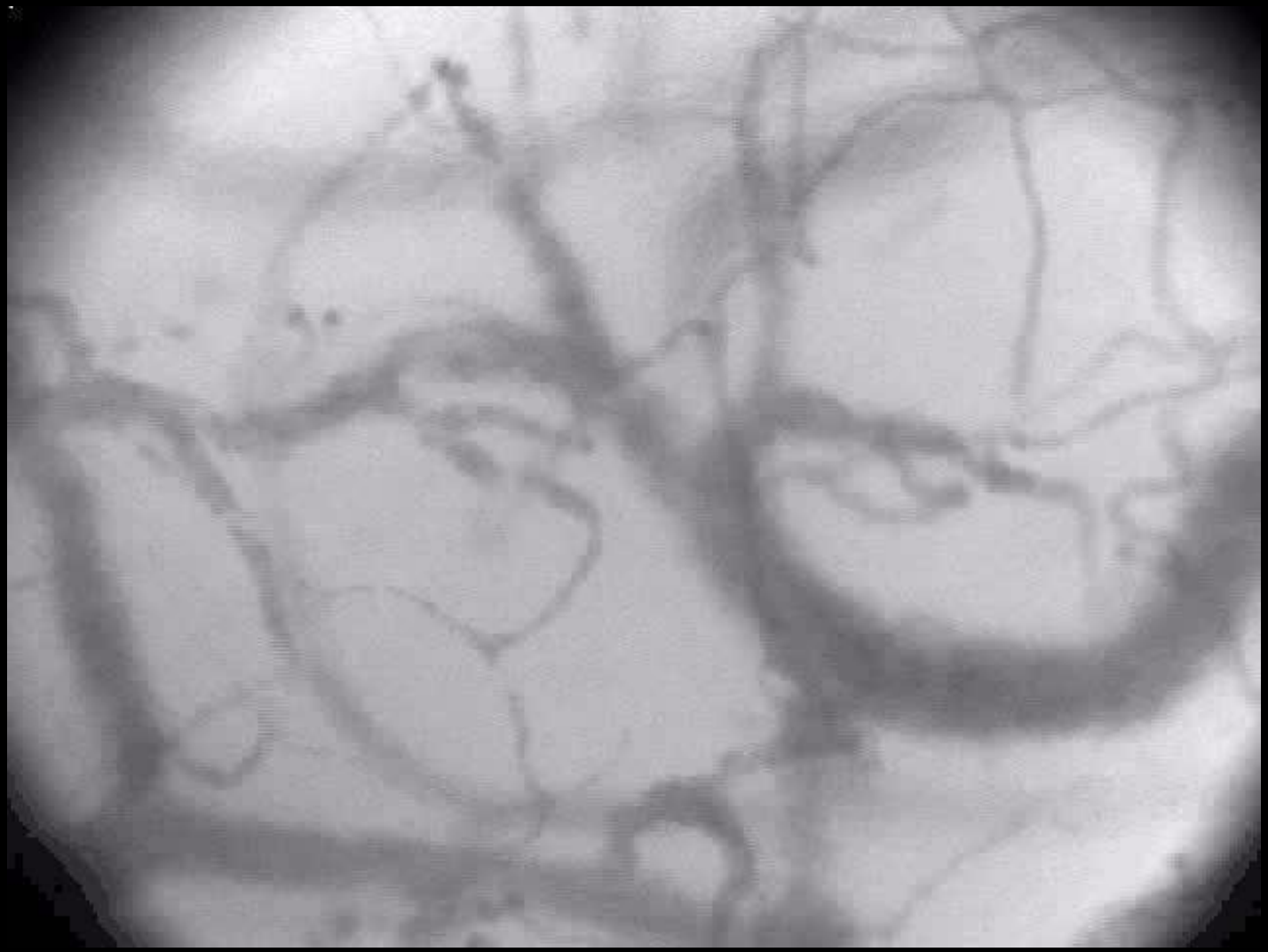
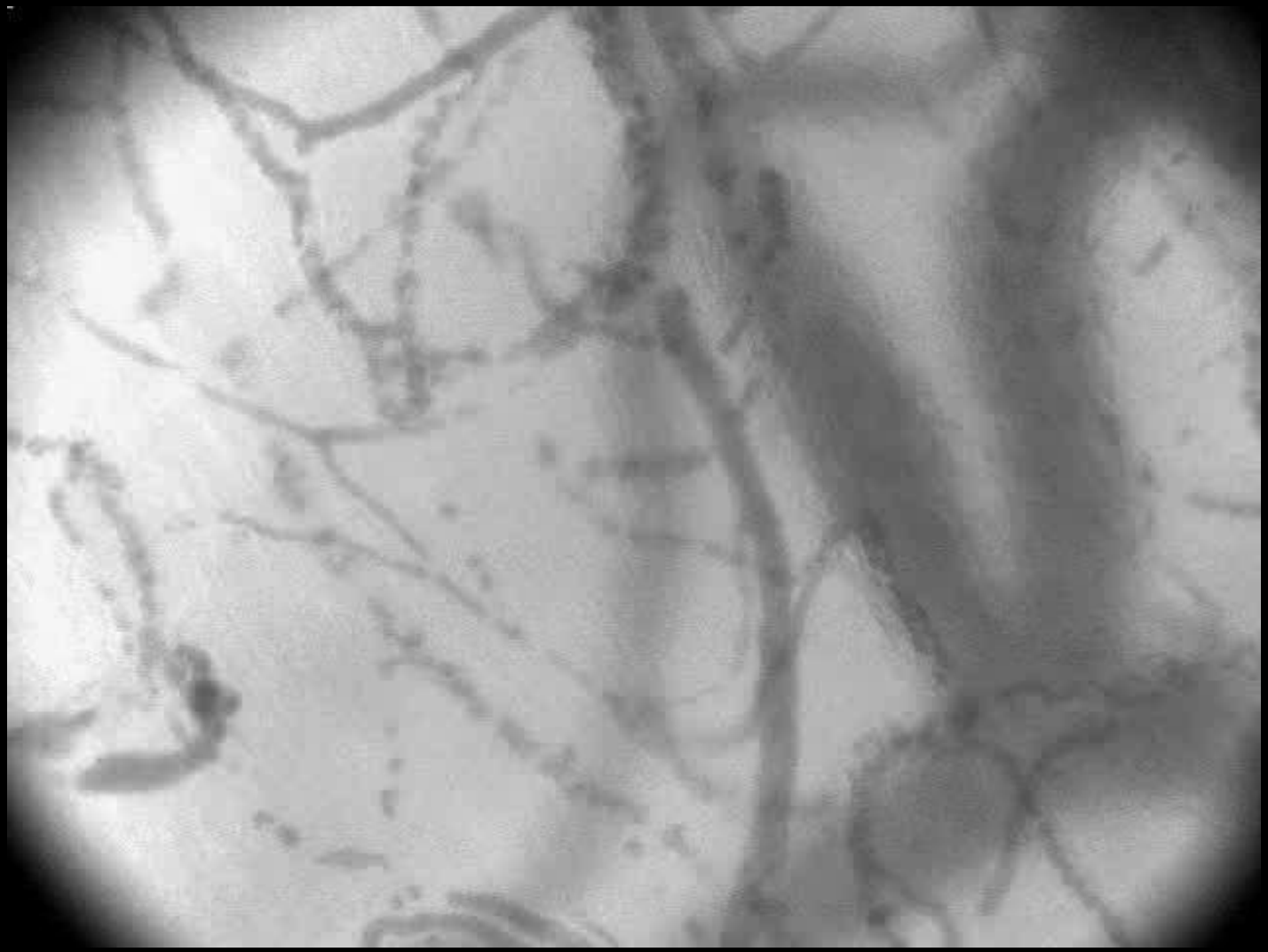
KAN TRANSFÜZYONU
Global Değerlendirme

- >82,000,000 ünite/yıl (dünyada)
- A.B.D. ~12,500,000 ünite eritrosit süspansiyonu
- Her 25 saniyede bir ünite!

WHO 2003

AJANLAR	YAKLAŞIK MALİYET	TÜRKİYE
EACA (Amicar)	$30.00 /olgu	
Tranexemic acid	$25.00 /olgu	60 YTL/olgu
Aprotinin (Trasylol)	$1200.00 /olgu	47 YTL/500.000 Ü
Erythropoietin (Procrit)	$130.00 / 20,000-ünite doz	
Homolog banka Kanı	$210.00 /ünite	93.2 YTL
Preoperatif Bağış	$340.00 /ünite	
Trombosit (aferez))	$600.00 /6 ünite	260 YTL /4 Ü
TDP	$55.00 /ünite	44.5 YTL
Cryoprecipitate	$53.00 /10 ünite	
Kan İrradiasyonu	$16.00 /torba	
CMV	$25.00 /torba	





2011 Update to The Society of Thoracic Surgeons and the Society of Cardiovascular Anesthesiologists Blood Conservation Clinical Practice Guidelines*

The Society of Thoracic Surgeons Blood Conservation Guideline Task Force:
Victor A. Ferraris, MD, PhD (Chair), Jeremiah R. Brown, PhD, George J. Despotis, MD, John W. Hammon, MD, T. Brett Reece, MD, Sibu P. Saha, MD, MBA, Howard K. Song, MD, PhD, and Ellen R. Clough, PhD

The Society of Cardiovascular Anesthesiologists Special Task Force on Blood Transfusion:
Linda J. Shore-Lesserson, MD, Lawrence T. Goodnough, MD, C. David Mazer, MD, Aryeh Shander, MD, Mark Stafford-Smith, MD, and Jonathan Waters, MD

The International Consortium for Evidence Based Perfusion:
Robert A. Baker, PhD, Dip Perf, CCP (Aus), Timothy A. Dickinson, MS, Daniel J. FitzGerald, CCP, LP, Donald S. Likosky, PhD, and Kenneth G. Shann, CCP

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Table 1. Classification Scheme Used to Summarize Clinical Recommendations[a]

	Class I	Class IIa	Class IIb	Class III
Estimate of certainty (precision) of treatment effect	Benefit >>> Risk Procedure/treatment SHOULD be performed/administered.	Benefit >> Risk: additional studies with focused objectives needed. IT IS REASONABLE to perform procedure/ administer treatment.	Benefit ≥ Risk: additional studies with broad objectives needed; additional registry data would be helpful. IT IS NOT UNREASONABLE to perform procedure/administer treatment	Risk ≥ Benefit: no additional studies needed. Procedure/treatment should NOT be performed/ administered AS IT IS NOT HELPFUL AND MAY BE HARMFUL.
Level A Multiple (3–5) population risk strata evaluated General consistency of direction and magnitude of effect	Recommendation that procedure or treatment is useful/effective Sufficient evidence from multiple randomized trials or meta-analyses	Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from multiple randomized trials or meta-analyses	Recommendation's usefulness/efficacy less well established Greater conflicting evidence from multiple randomized trials or meta-analyses	Recommendation that procedure or treatment not useful/effective and may be harmful Sufficient evidence from multiple randomized trials or meta-analyses
Level B Limited (2–3) population risk strata evaluated	Recommendation that procedure or treatment is useful/effective Limited evidence from single randomized trial or nonrandomized studies	Recommendation in favor of treatment or procedure being useful/effective Some conflicting evidence from single randomized trial or nonrandomized studies	Recommendation's usefulness/efficacy less well established Greater conflicting evidence from single ran domized trial or nonrandomized studies	Recommendation that procedure or treatment not useful/effective and may be harmful Limited evidence from single randomized trial or nonrandomized studies
Level C Very limited (1–2) population risk strata evaluated	Recommendation that procedure or treatment is useful/effective Only expert opinion, case studies, or standard-of-care	Recommendation in favor of treatment or procedure being useful/effective Only diverging expert opinion, case studies, or standard-of-care	Recommendation's usefulness/efficacy less well established Only expert opinion, case studies, or standard-of-care	Recommendation that procedure or treatment not useful/effective and may be harmful Only expert opinion, case studies, or standard-of-care

[a] Taken from the the AHA/ACC Manual for Guideline Writing Committees at http://circ.ahajournals.org/manual/manual_llssap6.shtml.

Erişkinlerde Banka Kanı Transfüzyon Kriterleri

- KPB-<6 g/dL
- Hb < 7 g/dL (>65y, KOAH)
- Stabil hastalar Hb: 7-10 g/dL ???
- Akut Kan Kayıpları (1500 mL, %30)
- Kontrol Edilemeyen Ciddi Kanamalar

Blood salvage interventions			
Expanded use of blood salvage using centrifugation to include patients with known malignancy who require cardiac procedures	IIb (B)	15	• Should be either I or IIa because of efficacy in noncardiac operations.
Pump salvage of residual blood in CPB circuit	IIa (C)	16	• Should be Class I based on consensus.
Centrifugation of pump-salvaged blood, instead of direct infusion, is reasonable for minimizing post CPB allogeneic RBC transfusion	IIb (B)	13	• Should be Class IIa based on evidence.
Minimally invasive procedures			
Use of TEVAR to manage thoracic aorta disease.	I (B)	16	• Should be IIa since no RCTs.
OPCABG to reduce blood transfusion during coronary revascularization.	IIa (A)	17	
Perfusion interventions			
Microplegia to minimize volume of crystalloid cardioplegia and reduce hemodilution.	IIb (B)	16	• Microplegia has minimal effect on blood usage.
Alternate nonheparin anticoagulation in ECMO patients with HIT to reduce platelet consumption.	I (C)	15	• Should expand to include all groups not just ECMO. • Not sure that this should be level I (no reason given).
Minicircuits (reduced priming volume and circuit volume) to reduce hemodilution.	I (A)	16	• Interpretation of data suggests Class IIb not I.
Augmented venous drainage.	IIb (C)	16	• Evidence too sparse and a recommendation should not be made.
Biocompatible CPB circuits to limit hemostatic activation and limit inflammatory response.	IIb (A)	16	• This recommendation seems based on the opinion of Ranucci and colleagues. I suggest recommendation be "Without other measures of blood conservation, biocompatible surface coatings have little clinical benefit." Class IIa Level A
Modified ultrafiltration at the end of CPB.	I (A)	16	• Evidence only supports Class IIa.
Conventional or zero-balance ultrafiltration during CPB.	IIb (A)	16	• Should be Class III—no evidence of benefit.
Leukocyte filters used in the CPB circuit.	III (B)	13	• Recommendation based on limited evidence.
Topical hemostatic agents			
Topical agents that provide anastomotic sealing or compression.	IIb (C)	17	
Topical antifibrinolytic solutions for wound irrigation after CPB.	IIa (B)	17	
Management of blood resources			
Creation of multidisciplinary surgical teams for blood management.	IIa (B)	17	

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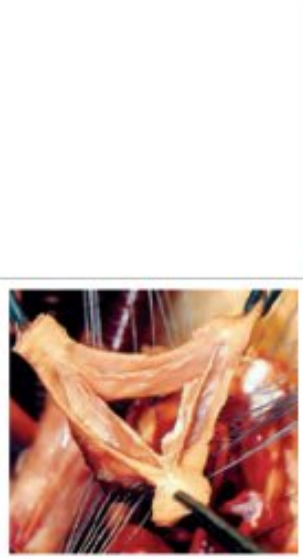

Impact of Combining Perioperative Blood Conservation Strategies in Coronary Revascularization: Role of Nonautologous Red Blood Cell Transfusion and Surface-Coated Extracorporeal Circuits

S. Gunaydin[1], K. McCusker[2], T. Sari[3], Y. Zorlutuna[3]
[1]University of Kirikkale, Beysukent-Ankara, Turkey;
[2]New York Medical College, New York, NY;
[3]Bayindir Hospital, Ankara, Turkey

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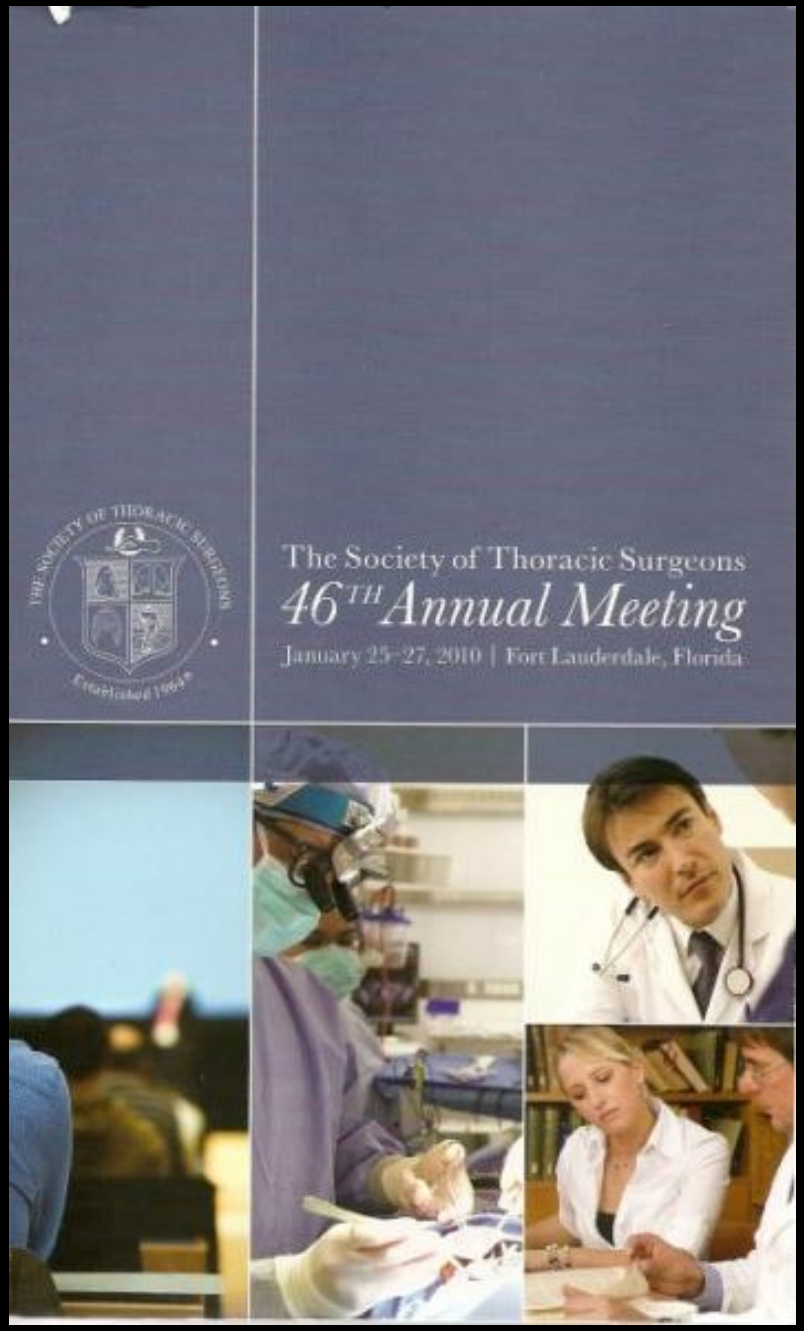

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Perioperative Blood Conservation Strategies in Pediatric Patients Undergoing Open Heart Surgery: Impact of Nonautologous Blood Transfusion and Surface Coated Extracorporeal Circuits

S. Gunaydin[1], K. McCusker[2], V. Vijay[3]
[1]University of Kirikkale, Ankara, Turkey; [2]Portsmouth Regional Hospital, Portsmouth, NH; [3]Hudson Cardiothoracic Surgeons, New York, NY

Purpose: Blood transfusion in adults is associated with increased mortality and morbidity after cardiac operations. The aim of this study was to explore the relative clinical and biomaterial effects of blood transfusion (Tx) and surface coated circuitry on perioperative outcome in pediatric patients undergoing surgery with cardiopulmonary bypass (CPB).

Methods: Over a 6-month period, 80 consecutive patients, weighing 5-10 kg, underwent surgery with CPB in a tertiary pediatric cardiac center. Patients were prospectively randomized to four equal groups (N=20): Group 1- Tx-free procedures on low prime surface-coated circuitry (FX05, Terumo); Group 2- Procedures requiring Tx on coated circuitry; Group 3- Tx-free procedures with standard identical uncoated circuitry, Group 4 (Control): Procedures requiring Tx on uncoated circuitry. Tx criteria were hematocrit <20%, mixed venous oxygen saturation <70%, regional cerebral oxygenation (rSO2) <50%, and plasma lactate level >4.0 mmol/L during CPB. Serum lactate, interleukin-6 (IL-6) and TNF-alpha levels were measured. CD11b/CD18 expressions were determined by flow cytometry. Blood samples were collected at baseline (T1); at the end of the CPB (T2) and 24 h (T3), postoperatively. rSO2 desaturation risk score (Invos, Somanetics) was calculated by multiplying rSO2 below 50% by time (sec). Blood cell adhesion on circuit fibers was analyzed by scanning electron microscopy. Desorbed protein amount on fibers (microalbumin) was evaluated by spectrophotometer.

Results: Perioperative data are demonstrated in Table. There was a significant positive correlation between hospital stay and the amount of transfused blood (r=0.74).

Conclusions: Allogenic blood Tx amplifies CPB related inflammatory response and increases the surface protein adsorption on circuits. It is feasible to do congenital procedures safely without Tx for patients weighing more than 5 kg by using combined blood management strategies.

Perioperative Outcome

Group 1 (Tx-free, coated)				
Group 2 (Tx + coated)				
Group 3 (Tx-free + uncoated)				
Control (Tx + uncoated)				

*p<0.05 vs. control

Perioperative Blood Conservation Strategies In Pediatric Patients Undergoing Open Heart Surgery: Impact of Nonautologous Blood Transfusion And Surface Coated Extracorporeal Circuits

Serdar Gunaydin[1], Kevin McCusker[2], Venkataramana Vijay[3]

University of Kirikkale-Turkey[1], Portsmouth Regional Hospital, NH[2], Hudson Cardiothoracic Surgeons, NY[3]

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Introduction

- Despite the recent introduction of a number of technical and pharmacologic blood conservation measures, bleeding and allogenic transfusion remain persistent problems in open heart surgical procedures
- Activation of platelets and the blood coagulation cascade occurs from interaction of the circulating blood with the synthetic surfaces of the heart-lung machine. Coating of the oxygenator and of the bypass circuit minimizes this activation process and ultimately may improve blood conservation after cardiac procedures
- The aim of this study was to explore the relative clinical and biomaterial effects of blood transfusion (Tx) and surface coated circuitry on perioperative outcome in pediatric population undergoing cardiac surgery with cardiopulmonary bypass (CPB)

Objective

- To determine and compare the effects of Tx and use of coated circuits on the inflammatory response and protein adsorption of the circuit surface during CPB in pediatric patients
- A comprehensive multimodality blood conservation program applied algorithmically on the basis of;
  - bleeding
  - inflammatory response and
  - protein preservation would provide a maximum, cost-effective, and safe reduction in perioperative outcome

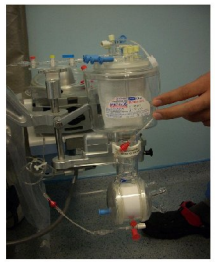
Blood Management Strategies

- Low prime circuit with integrated arterial filter: Target Hct 25-30% Total prime : 220-250 cc (Standard Circuit-Total prime : 450 -550cc)
- Reduced tubing to the oxygenators using the smaller 3/16 to ¼ tubing
- Reduced circuit length and prime volume by using the smallest oxygenator with an integrated arterial line filter
- Reduced circuit size by pole-mounting roller head pumps on its heart-lung machine
- Switched to a 1:4 cardioplegia ratio

Table 1. Perioperative Outcome

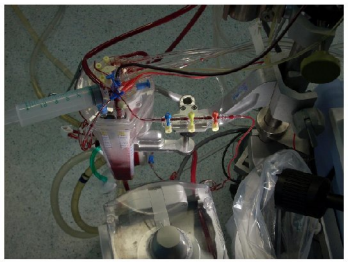
	Respiratory Support (h)	CD11b/CD18 at T2 (%)	rSO2 desat >6000 (yes vs no) (%)	Microalbumin on fibers (mg/dL)
Group 1 (Tx-free+Coated)	11.4±6*	12±4*	15.7±9*	1.8±0.05*
Group 2 (Tx+Coated)	17.2±6	19±6	19.4±11	2.2±0.06*
Group 3 (Tx-free + Uncoated)	14.5±7	15.2±6*	18.2±10	3.1±0.08
Control (Tx+Uncoated)	19.8±7	25±8	26.8±11	3.6±0.09

*p:<0.05 vs control (transfusion-uncoated)

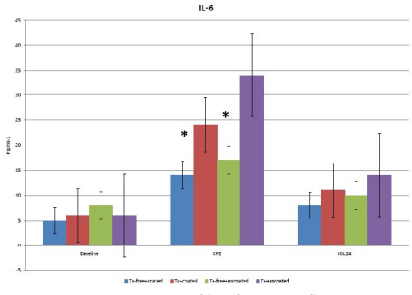


Low prime oxygenator

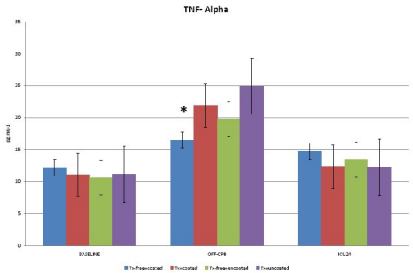
Condensed circuit



Less hemodilution



*:<0.05 vs. control (transfusion-uncoated)



Methods

- Over a 6-month period, 80 consecutive patients, weighing >10 kg, underwent heart surgery with CPB in a tertiary pediatric cardiac center. Patients were prospectively randomized to four equal groups (n=20):
- Group 1- Tx-free procedures on low prime surface-coated condensed circuitry with integrated arterial filter (FX05, Terumo)
- Group 2- Procedures requiring Tx on coated circuitry
- Group 3- Tx-free procedures with standard identical uncoated circuitry (D902, Sorin)
- Group 4- (Control)- Procedures requiring Tx on uncoated circuitry

✓Tx criteria: Hematocrit < 20%, mixed venous oxygen saturation < 70%, regional cerebral oxygenation (rSO2) < 50%, and plasma lactate level > 4.0 mmol/L during CPB
✓Serum lactate, interleukin-6 (IL-6), TNF-alpha and CKMB levels were measured
✓CD11b/CD18 expressions were determined by flow cytometry
✓Blood samples were collected at baseline (T1); at the end of the CPB (T2) and 24 h (T3), postoperatively
✓rSO2 desaturation risk score (Invos, Somanetics) was calculated by multiplying rSO2 below 50% by time (sec)
✓Blood cell adhesion on circuit fibers was analyzed by scanning electron microscopy
✓Desorbed protein amount on fibers (microalbumin) was evaluated by spectrophotometer

Conclusions

- Allogenic red cell transfusion enhances inflammatory response during CPB; coated circuit systems have a limiting effect on this inflammatory reaction
- New generation of low prime condensed circuits with integrated arterial filter causes much less hemodilution via less priming volume
- The combination of transfusion and not using a coated system has the highest risk of increased inflammatory response. This result may explain the key link between transfusion and adverse outcome with poor long-term survival in pediatric cardiac surgery
- Expanding our understanding of the immunomodulatory effects of stored blood cells may lead to more selective and effective use of blood transfusion which can help decreasing deleterious perioperative adverse events in pediatric cases

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Authors have no financial or regulatory disclosure

Perfusion

Perioperative blood conservation strategies in pediatric patients undergoing open-heart surgery: impact of non-autologous blood transfusion and surface-coated extracorporeal circuits

Perfusion
XX(X) 1–7

DOI: 10.1177/0267659111398701
prf.sagepub.com
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Serdar Gunaydin[1], Kevin McCusker[2], Venkatramana Vijay[3]

Abstract

Background: The aim of this study was to explore the relative clinical and biomaterial effects of blood transfusions (Tx) and novel low-prime, surface-coated circuitry on perioperative outcome in a pediatric population undergoing cardiac surgery with cardiopulmonary bypass (CPB).

Methods: Over a 12-month period, 80 patients weighing >10 kg undergoing ventricular septal defect (VSD) repair with CPB were prospectively randomized into two groups according to the type of CBP circuit used, then each randomized group was enrolled into two groups again, according to the need for transfusion (N=20): Group 1- Tx-free procedures on low-prime, surface-coated extracorporeal circuitry (FX05, Terumo); Group 2- procedures requiring Tx on coated circuitry; Group 3- Tx-free procedures with standard uncoated circuitry (D902, Sorin); Group 4 (Control)- procedures requiring Tx on uncoated circuitry. Blood samples were collected at baseline (T1), at the end of the CPB (T2) and 24 h (T3) postoperatively. rSO_2 desaturation risk score >6000 (Invos, Somanetics) was calculated by multiplying rSO_2 < 50% by time.

Results: IL-6 levels (pg/ml) were significantly lower in Groups 1 and 3 versus control at T2 (13±4; 17±5 versus 33±8; $p<0.05$). CD11b/CD18 levels (%) were significantly lower in Group 1 (12±4) versus control (25±8) at T2 ($p<0.05$). Respiratory support time (h) was significantly less in Group 1 (11.4±6) versus control (19.8±7) ($p<0.05$). rSO_2 desaturation risk >6000 (%) was 15.7±9 in Group 1 and 26.8±11 in control ($p<0.05$).

Conclusion: Allogenic Tx amplifies the CPB-related inflammatory response. It is feasible to do congenital procedures safely without Tx for patients weighing >10 kg by using combined blood management strategies.

Keywords

cardiopulmonary bypass; congenital heart defects; blood transfusion-autologous; blood preservation; oxygenators-membrane.

The Prescriptive Oxygenation Concept

Prescriptive oxygenation is an approach to meet the patient's oxygenation and blood management needs more precisely. The concept is aiming to reduce priming volume of the extracorporeal perfusion circuit, to maintain higher intraoperative haematocrits and to avoid blood transfusion. The prescriptive oxygenation concept comprises the following strategies:

- Use of oxygenators with fully integrated arterial filter to eliminate/reduce priming volume of the arterial filter.
- Selection of the right size oxygenator/reservoir combination and tubing diameter to reduce total circuit priming volume and foreign surface area.
- Use of retrograde autologous priming (RAP) technique to eliminate a part of the crystalloid priming solution from the extracorporeal circuit.

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MİKROPLEJİ


QMPS
SET
HI arrest deliv conc
in mEq/L
REFILL
PURGE
ZERO
VOL
HOLD VOL
VTBD
MENU
FLOW MODE
PRIME
VENT
PRESSURE
SYSTEM


QMPS

The International Journal of Artificial Organs / Vol. 32 / no. 11, 2009 / pp. 802-810

Artificial Heart and Cardiac Assist Devices

Clinical and biomaterial evaluation of a new condensed dual-function extracorporeal circuit in reoperation for coronary artery bypass surgery

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[1]Department of Cardiovascular Surgery, University of Kirikkale, Kirikkale - Turkey
[2]Portsmouth Regional Hospital, NH - USA
[3]State University of New York, Brooklyn, New York, NY - USA

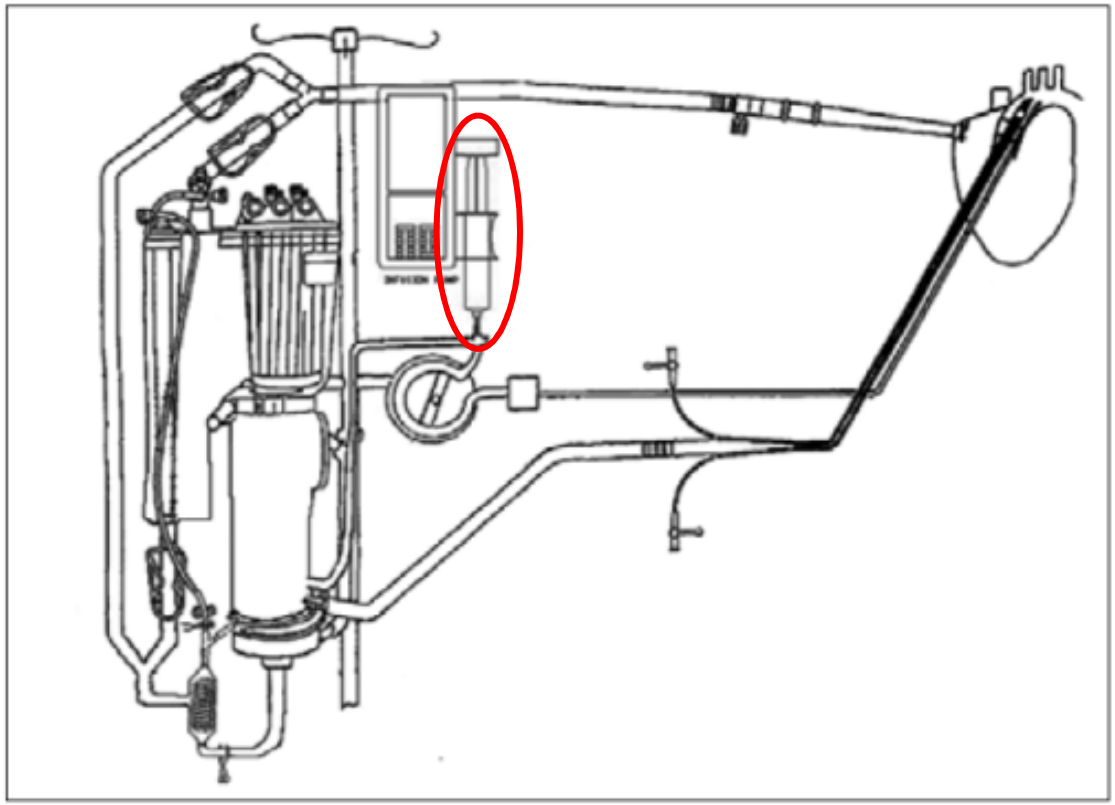

Fig. 1 - *Schematic representation of the no condensed circuit. Condensed, dual-fun tion, open/closed configuration circuit us components that are tip-to-tip coated w polymethoxyethylacrylate (PMEA), shorten tubing, and a priming volume under 800 m It includes a centrifugal pump and a veno air removal device with an incorporated shu which bypasses the reservoir for closed co figuration. CPB was instituted either on op configuration, with a hard-shell venous rese voir and cardiotomy; or closed configuratio with flexible venous reservoir. A condens cardioplegia circuit infused fluid into t blood pulled from the oxygenator.*

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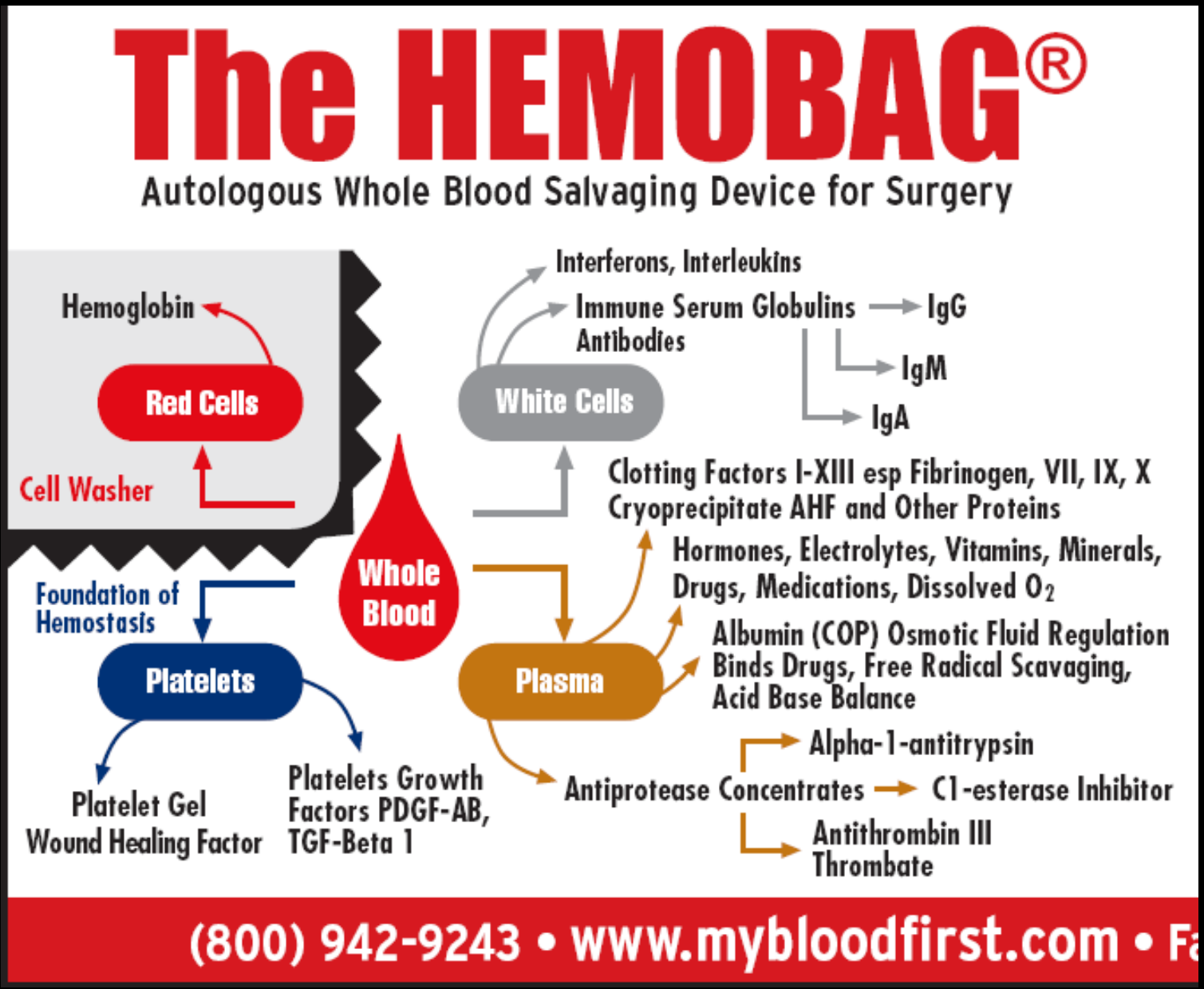
- Multidisipliner bir takım oluşturulması Iıa (B)

ARTIK KANIN RESİRKÜLASYONU



ARTIK KANIN RESİRKÜLASYONU

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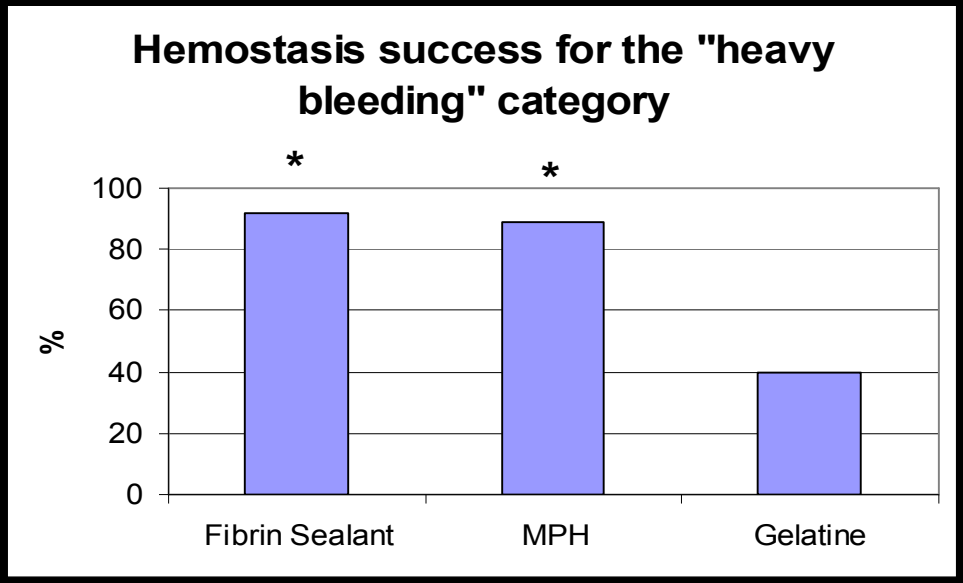
You are cordially invited to an Evening Reception with Serdar Gunaydin, MD and Kevin McCusker, PhD

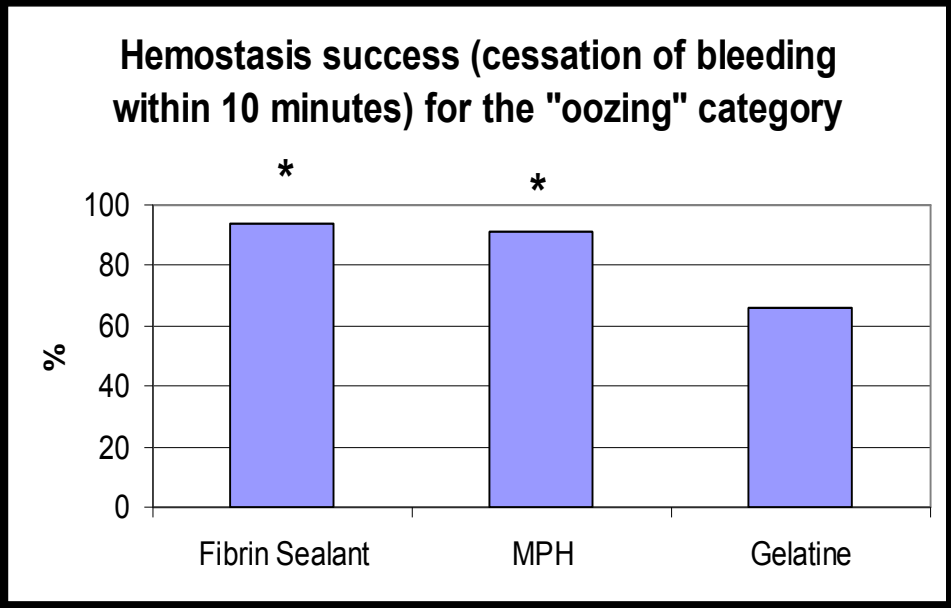
Date: Monday, January 28, 2008
Time: 5 P.M. - 7 P.M.
Place: Harbor Beach Marriott Resort & Spa
Meeting Area
3030 Holiday Drive
Fort Lauderdale, Florida 33316

The reception is hosted by Medafor, Inc.

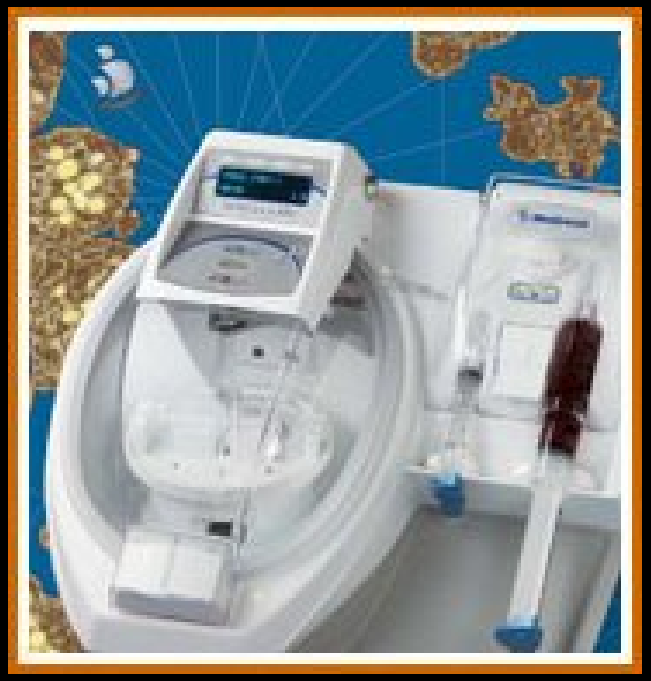
"Clinical Impact and Biomaterial Evaluation of Novel Hemostatic Polysaccharide Hemospheres in Cardiac Surgery."

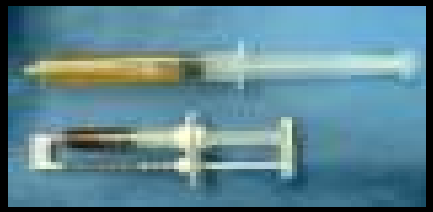






PLATELET GEL





Perfusion 2008; **23**: 179–186

Clinical impact and biomaterial evaluation of autologous platelet gel in cardiac surgery

S Gunaydin[1], K McCusker[2], T Sari[3], MA Onur[4], A Gurpinar[4], H Sevim[4], P Atasoy[1], C Yorgancioglu[4] and Y Zorlutuna[3]

[1]University of Kirikkale, Turkey; [2]New York Medical College, New York, USA; [3]Bayindir Hospital, Turkey; [4]Hacettepe University, Turkey

We compared the clinical efficacy of autologous platelet gel (APG) and gelatine (CONT), including biomaterial evaluation. In a prospective, randomized, controlled trial, 64 patients undergoing complex coronary artery bypass graft (CABG) surgery and/or aortic surgery, in

were 92% in APG and 45% in CONT ($p<0.01$). Contact of gelatine inhibited EC proliferation and APG increased cell cycling and EC quantity. Phagocytic capacity (PC) was significantly higher in the APG group ($p<0.001$). APG was significantly better than CONT with respect to hemostatic

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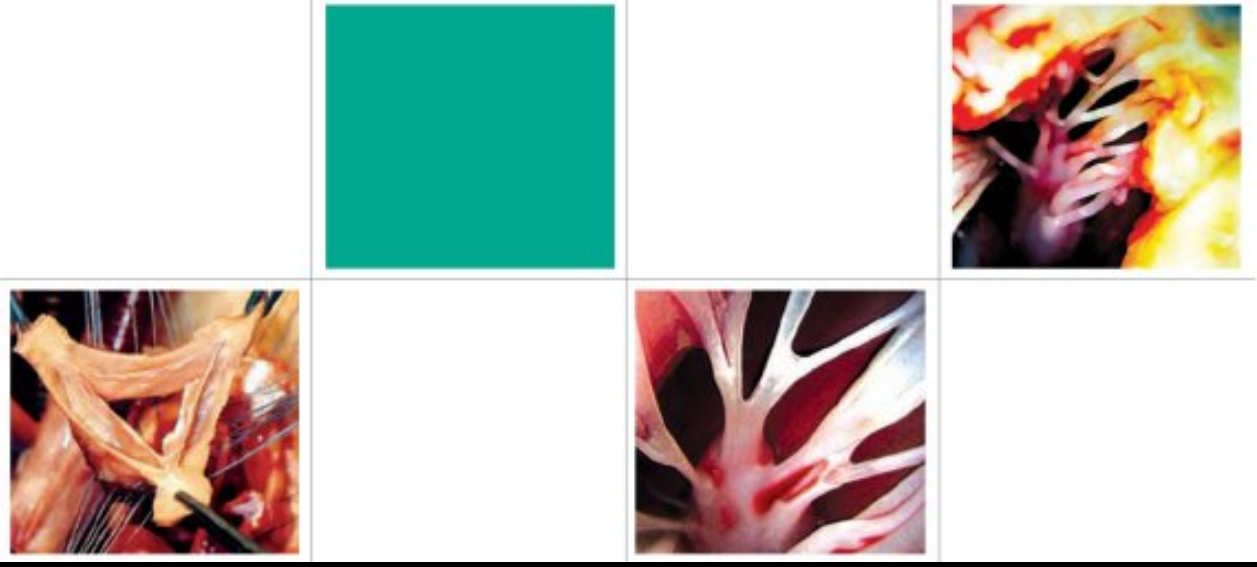

Autologous Platelet Gel for the Prevention of Sternal Wound Infection in Diabetic Patients Undergoing Bilateral Thoracic Artery Grafting

S. Gunaydin[1], K. McCusker[2], T. Sari[3], Y. Zorlutuna[3]

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[2]New York Medical College, New York, NY;

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Autologous Platelet Gel for the Prevention of Sternal Wound Infection in Diabetic Patients Undergoing Bilateral Thoracic Artery Grafting

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S. Gunaydin[1], K. McCusker[2], T. Sari[3], Y. Zorlutuna[3]

University of Kirikkale- Turkey[1], , New York Medical College[2], , Bayindir Hospital-Turkey[3]

Introduction

Bilateral internal thoracic artery (BITA) grafts have advantages, particularly in diabetics, but the perceived sternal complication rates have led surgeons to avoid them. Platelet gel (PG) may reduce patient susceptibility to infection through mechanisms related to combination of platelets, growth factors, white blood cell content and expedited wound healing

Preparation of PG

Application of PG

	Group 1 (N=97) (BITA + PG)	Group 2 (N=105) (SITA+PG)	Group 3 (N=102) (BITA)	Group 4 (N=115) (SITA)	p
Superficial Sternal Infection (%)	4.1*	1.9	8.8	4.3	<0.05 vs. Group 3
Deep Sternal Infection (%)	0*	0	2.9	1.7	<0.05 vs. Group 3
Sternal Dehiscence (%)	1*	1	5.8	3.4	<0.05 vs. Group 3
Hospital Stay (d)	7.2±1.3	6.9±1.4	11.3±2	8.1±1.8	NS
Period of treatment (d)	8.3±2.1*	8±2.3γ	16.8±4.1	14.2±3.6	*<0.05 vs. Group3 γ <0.05 vs. Group4
Mortality (%)	0	0	1.96	0.08	NS

Table : Perioperative follow-up

Objective

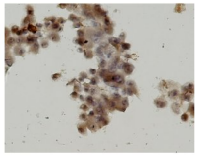
To evaluate the validity of intraoperative application of PG for the prevention of wound related complications in insulin dependent diabetes (IDDM)patients

Methods - Clinical

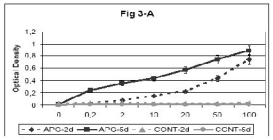
Over a three-year period, 419 patients undergoing coronary revascularization were randomly allocated into four groups

- Group 1: Patients with BITA grafts (N=97) having PG application (Harvest, USA)intraoperatively
- Group 2: Patients with single internal thoracic artery grafts (SITA) having PG application (N=105)
- Group 3:Patients with BITA grafts who did not receive PG, but otherwise received similar wound care (N=102)
- Group 4: Patients with SITA grafts having no intervention but otherwise received similar wound care (N=115)

•Endpoints were the difference in hospital stay and wound related complications within 6 weeks postoperatively



Endothelial cell culture (FVIII Staining)



MTS Bioassay for cell viability

Methods-Biomaterial

5 mm-ITA grafts were also harvested for endothelial and fibroblast cell culture for evaluation of PG on cytotoxicity, mechanisms on wound healing, resistance to infection and resorption-clearance time from the tissue.

Cytotoxicity and Effects on Wound Healing

Cytotoxic effects of PG were studied by MTS proliferation bioassay documenting cell viability after cell-mixture were co-cultured with PG for 48 h. Cultured cell quantity was measured after 48 h until the end of one week after being in contact with PG.

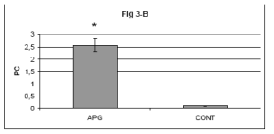
Resistance to Infection

Phagocytic capacity (PC) of cultivated cells was compared before and after contact with PG. Collected cells were investigated using monodisperse poly glycidil methacrylate (Poly GMA) microspheres. Baseline blood sample of PG was used as control. Microspheres were mixed with cultured cells with an amount of 200.000 cells/mm3 incubated at 37°C. Cellular phagocytosis rate of cells and the total internalized particle amount was reported. Samples were examined with an optical microscope to determine the number of cells phagocyting and the number of microspheres ingested per cell.

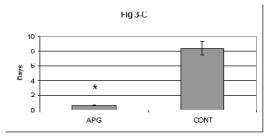
$$PC = \frac{\text{Number of cells with microsphere inside}}{\text{Total number of cells}}$$

Resorption

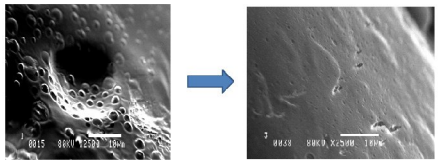
The cell cultures were observed by iodine testing until two weeks after being in contact with PG checking for the clearance of agents from the cell clusters.



Phagocytic capacity



Iodine test- Resorption rate



Resorption(PG)- Scannig E-Microscopy

Conclusion

Application of PG in IDDM patients undergoing cardiac surgery seems to confer a level of protection against infection via mechanisms of growth factors and increased phagocytic capacity

Authors have no financial or regulatory disclosure

Akış Planı

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- Değişen Hasta Profili
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- Gelecek

MONITORIZASYON YÖNTEMLERİNDEKİ YENİLİKLER

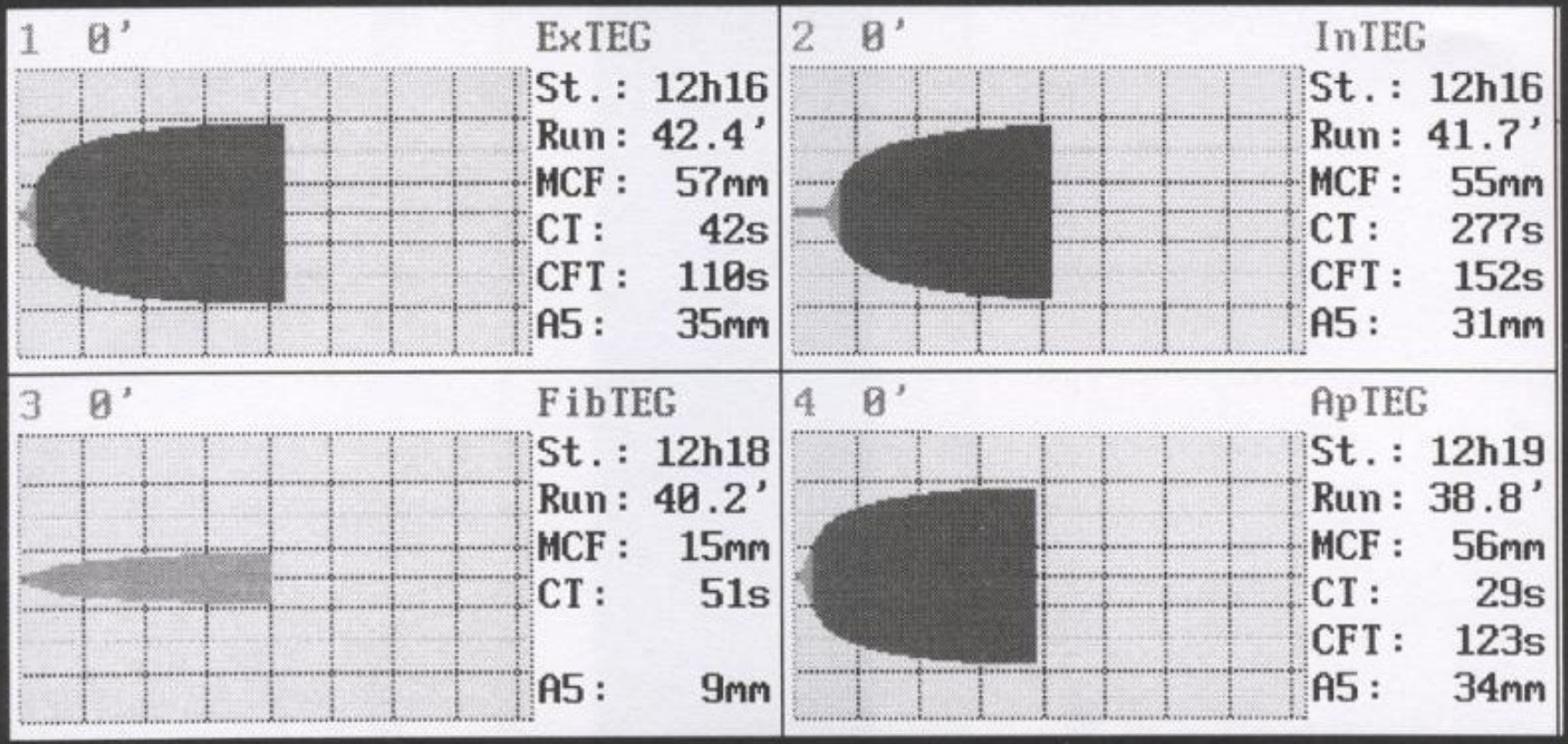
- Tromboelastografi
- Serebral Oksimetri
- In-line Kan Gazı Analizörleri
- Hava-Emboli Tayini
- Veri Depolama

TROMBOELASTOGRAFİ

- Defektif trombosit fonksiyonu
- Antikoagülan etkisi
- Pıhtılaşma faktör bozuklukları
- Hiperfibrinoliz
- Defektif fibrin polimerizasyonu

ExTEG: whole blood + tissue factor reagent (extrinsic activation): start of clot formation after < 1 minute → fast assessment of whole blood coagulation

InTEG: whole blood + contact activator reagent (intrinsic activation): assessment of clot formation and intrinsic coagulation pathway (heparin / factor deficiencies)



FibTEG: ExTEG + fibrinogen receptor antagonist → specific registration of fibrinogen status

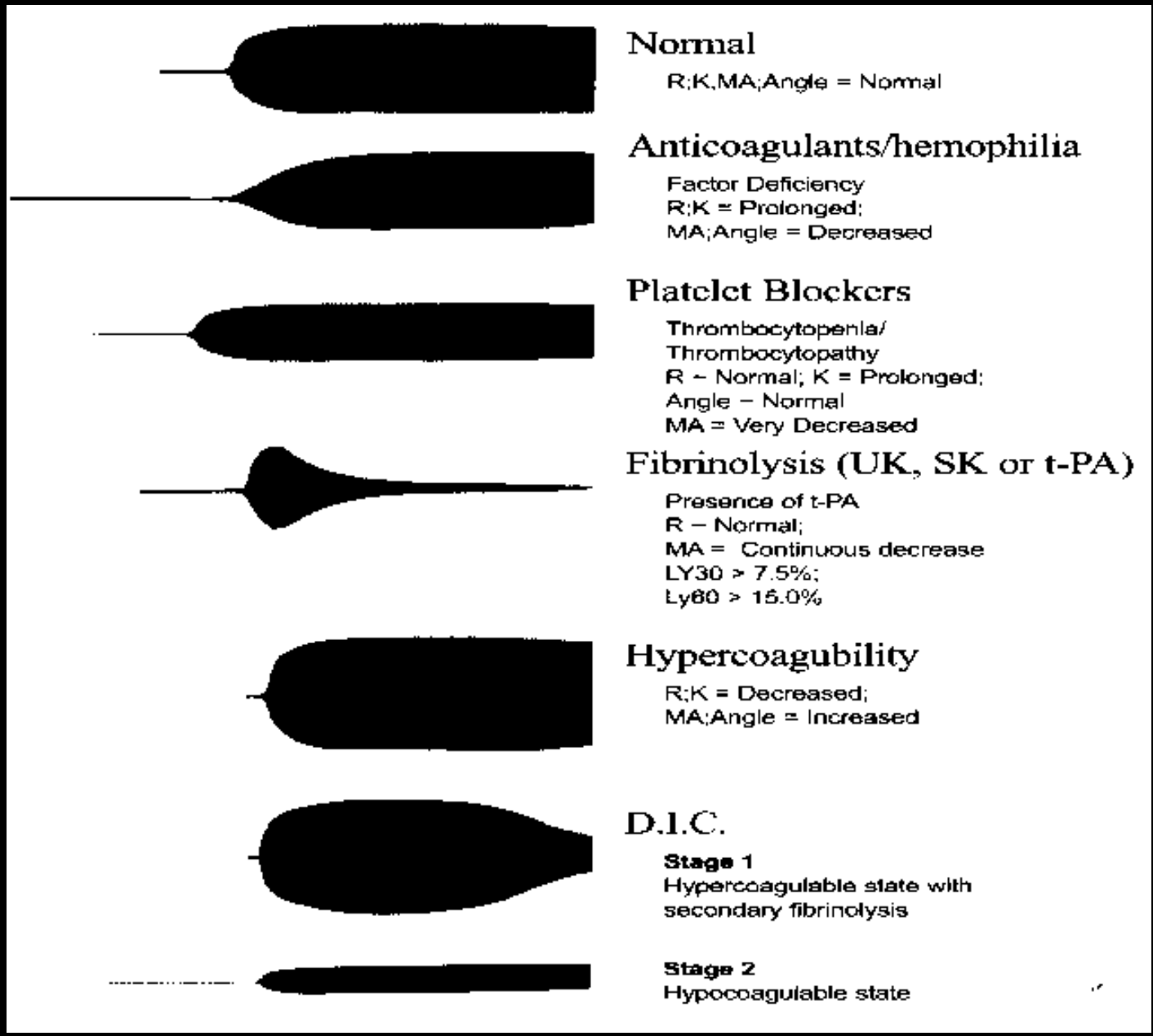
ApTEG: ExTEG + Aprotinin → in-vitro fibrinolysis inhibition

TROMBOELASTOGRAFİ

Kaolin-activated heparinase modified örneklemeler

- **Baseline (BL)**
- **Post-warm (PW)**
- **Post-protamine (PP) + kaolinle-aktive edilmiş düz örnek**
- **Kanama devam ediyorsa ek CITU örnekleri**

TROMBOELASTOGRAFİ



Normal

R;K,MA;Angle = Normal

Anticoagulants/hemophilia

Factor Deficiency
R;K = Prolonged;
MA;Angle = Decreased

Platelet Blockers

Thrombocytopenia/
Thrombocytopathy
R – Normal; K = Prolonged;
Angle – Normal
MA = Very Decreased

Fibrinolysis (UK, SK or t-PA)

Presence of t-PA
R – Normal;
MA = Continuous decrease
LY30 > 7.5%;
Ly60 > 15.0%

Hypercoagubility

R;K = Decreased;
MA;Angle = Increased

D.I.C.

Stage 1
Hypercoagulable state with
secondary fibrinolysis

Stage 2
Hypocoagulable state

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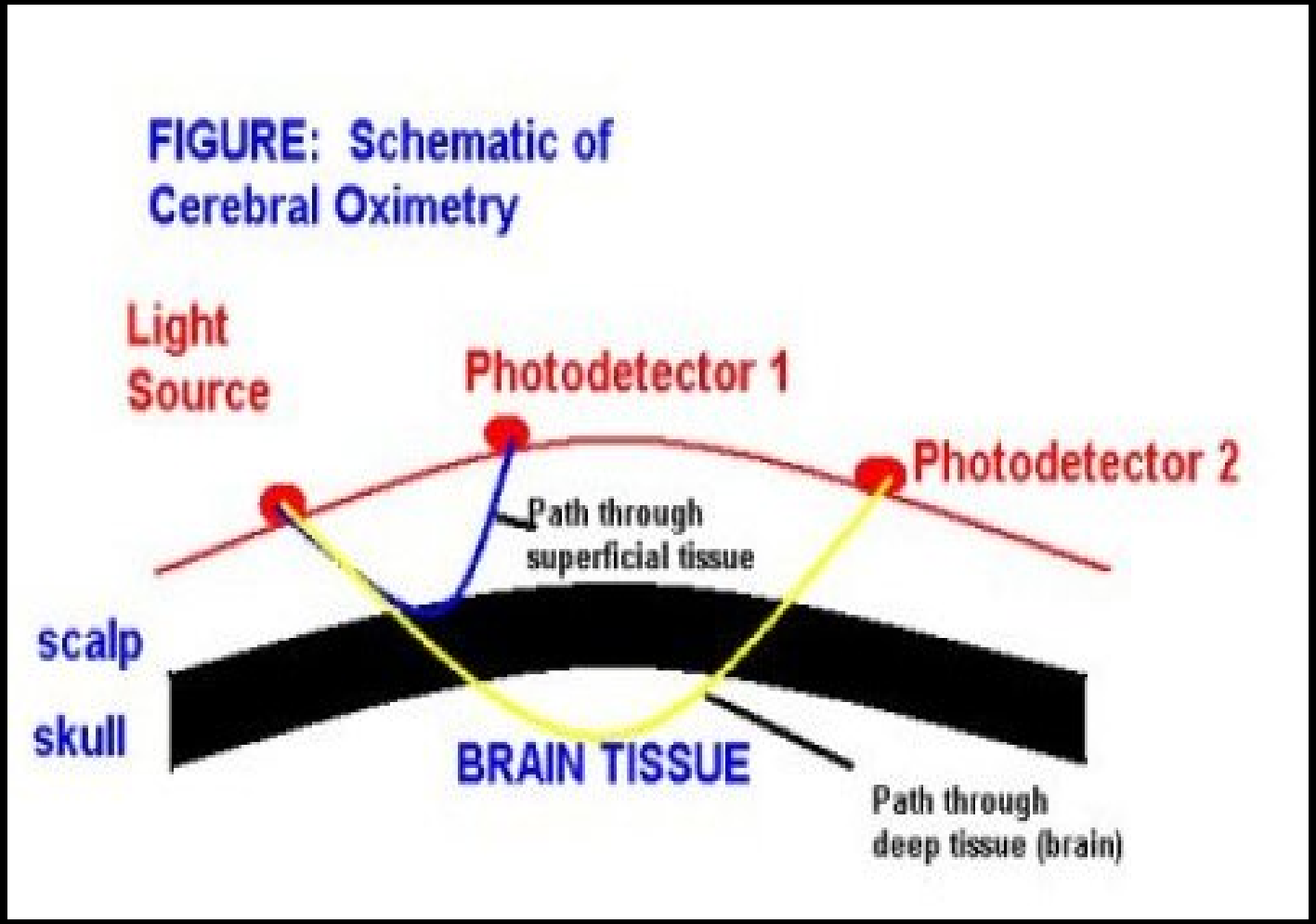
SEREBRAL OKSİMETRİ



SEREBRAL OKSİMETRİ

Perfusion 2006; **21**: 149–155

Influence of hematocrit and pump prime on cerebral oxygen saturation in on-pump coronary revascularization

Kevin McCusker[1], Anthony Chalafant[2], Gordon de Foe[3], Serdar Gunaydin[4] and Venkataramana Vijay[5]

[1]*Portsmouth Regional Hospital, NH, USA;*
[2]*Northeastern University, Boston, MA, USA;*
[3]*Dartmouth Medical Center, Lebanon, NH, USA;*
[4]*University of K. Kale, Turkey;*
[5]*Tarrytown, New York, USA*

MONITORIZASYON YÖNTEMLERİNDEKİ YENİLİKLER

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IN-LINE KAN ANALİZÖRLERİ

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INVITED EDITORIAL

AIR HANDLING AND CARDIAC SURGERY *EDAC® Quantifier Introduces New Concepts in Solving an Old Problem*

By Serdar Gunaydin, MD, PhD
Department Chair of Cardiovascular Surgery
University of K.Kale-Turkey

Although modern techniques of cardiopulmonary bypass (CPB) and better circuit designs have minimized the fatal cases of massive air embolism, recent investigations suggest that systemic air microembolization derived from extracorporeal sources still represents a common problem during conventional CPB. High numbers of air microemboli are one factor contributing to a reported 50-70% rate of cognitive deficits one week after CABG and 30% rate of long-term neuropsychologic impairment.

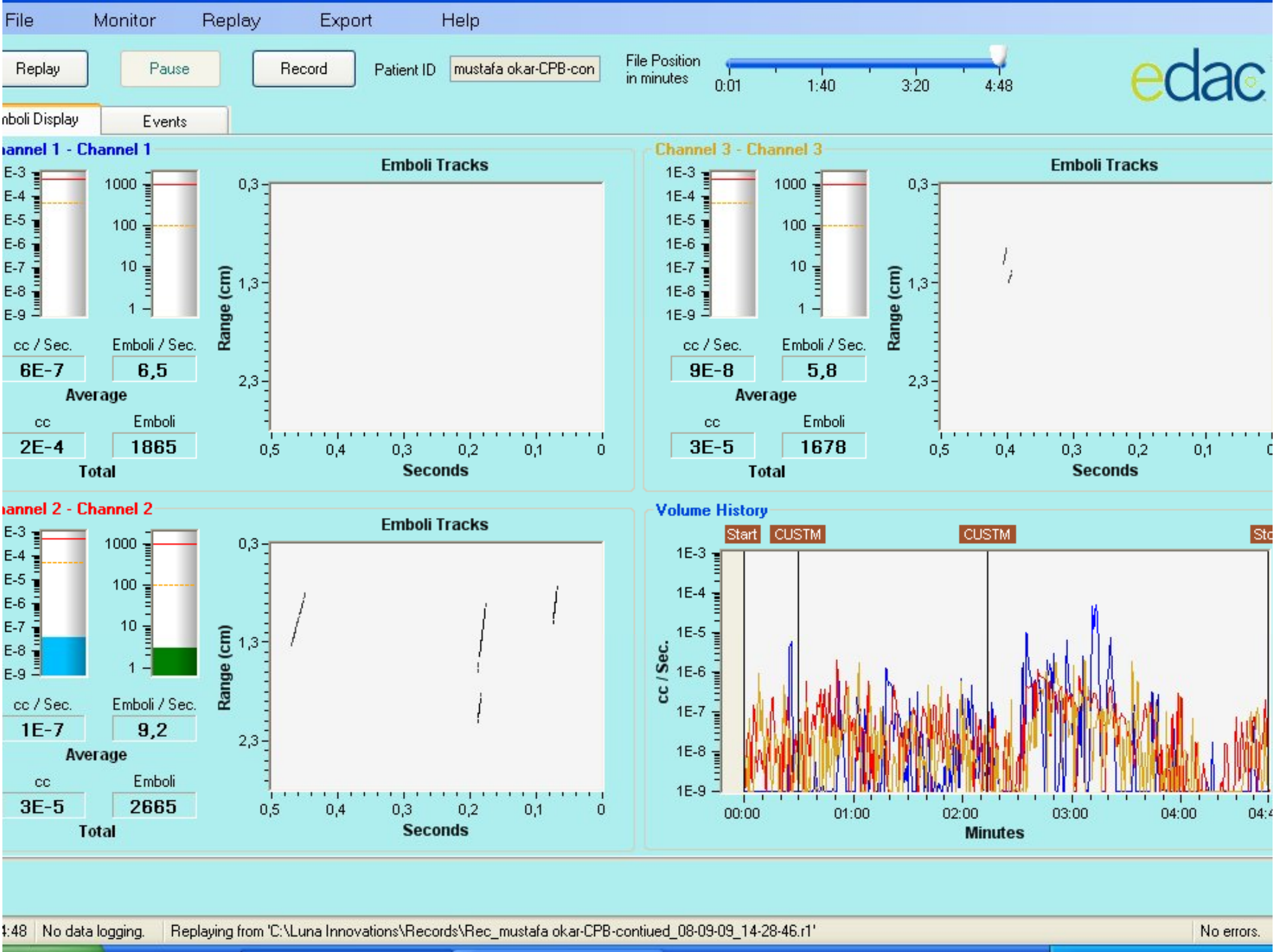
Four months ago, we integrated the EDAC® QUANTIFIER technology, developed by Luna Innovations, Inc., in our surgical practice and have found that this technology provides an amazing clinical picture of gaseous microemboli circulating within the extracorporeal circuitry. With the first five minutes of an uneventful conventional CPB, we documented a total of 2750 emboli (9.9 emboli.sec^{-1}) post arterial filter and 47 emboli in a few seconds (15.6 emboli.sec^{-1}) during blood sampling for blood gas analysis or drug administration.

While a number of factors, most notably transition from bubble

Serdar Gunaydin, MD, PhD

circuit. Disposable sterile connectors are inserted in the extracorporeal circuit tubing at up to three monitoring sites. The three-ultrasound channels standard with each unit allow for real time, simultaneous emboli detection at each connector. This allows locating the source of gaseous microemboli generated by the cardiopulmonary bypass machine or associated tubing. The unit has demonstrated count rates exceeding 1000 emboli per second, with diameters from 10 microns to the connector diameter, and with flow rates between 0.2 L/minute and 6.0 L/minute. The system performs reliably for a six-hour procedure in an operating room environment.

We have designed studies for the evaluation of air handling characteristics of minicircuits vs. conventional, open vs. closed circuits, pulsatile vs. non-pulsatile flow, comparison of characteristics of extracorporeal circuits from different manufacturers and air generation in various proce-


File
Monitor
Replay
Export
Help
Replay
Pause
Record
Patient ID
mustafa okar-CPB-con
File Position in minutes
0:01
1:40
3:20
4:48
edac
nboli Display
Events
annel 1 - Channel 1
E-3
E-4
E-5
E-6
E-7
E-8
E-9
1000
100
10
1
cc / Sec.
Emboli / Sec.
6E-7
6,5
Average
cc
Emboli
2E-4
1865
Total
Emboli Tracks
0,3
1,3
2,3
Range (cm)
0,5
0,4
0,3
0,2
0,1
0
Seconds
Channel 3 - Channel 3
1E-3
1E-4
1E-5
1E-6
1E-7
1E-8
1E-9
9E-8
5,8
3E-5
1678
annel 2 - Channel 2
1E-7
9,2
3E-5
2665
Volume History
Start
CUSTM
CUSTM
cc / Sec.
00:00
01:00
02:00
03:00
04:00
Minutes
4:48
No data logging.
Replaying from 'C:\Luna Innovations\Records\Rec_mustafa okar-CPB-contiued_08-09-09_14-28-46.r1'
No errors.

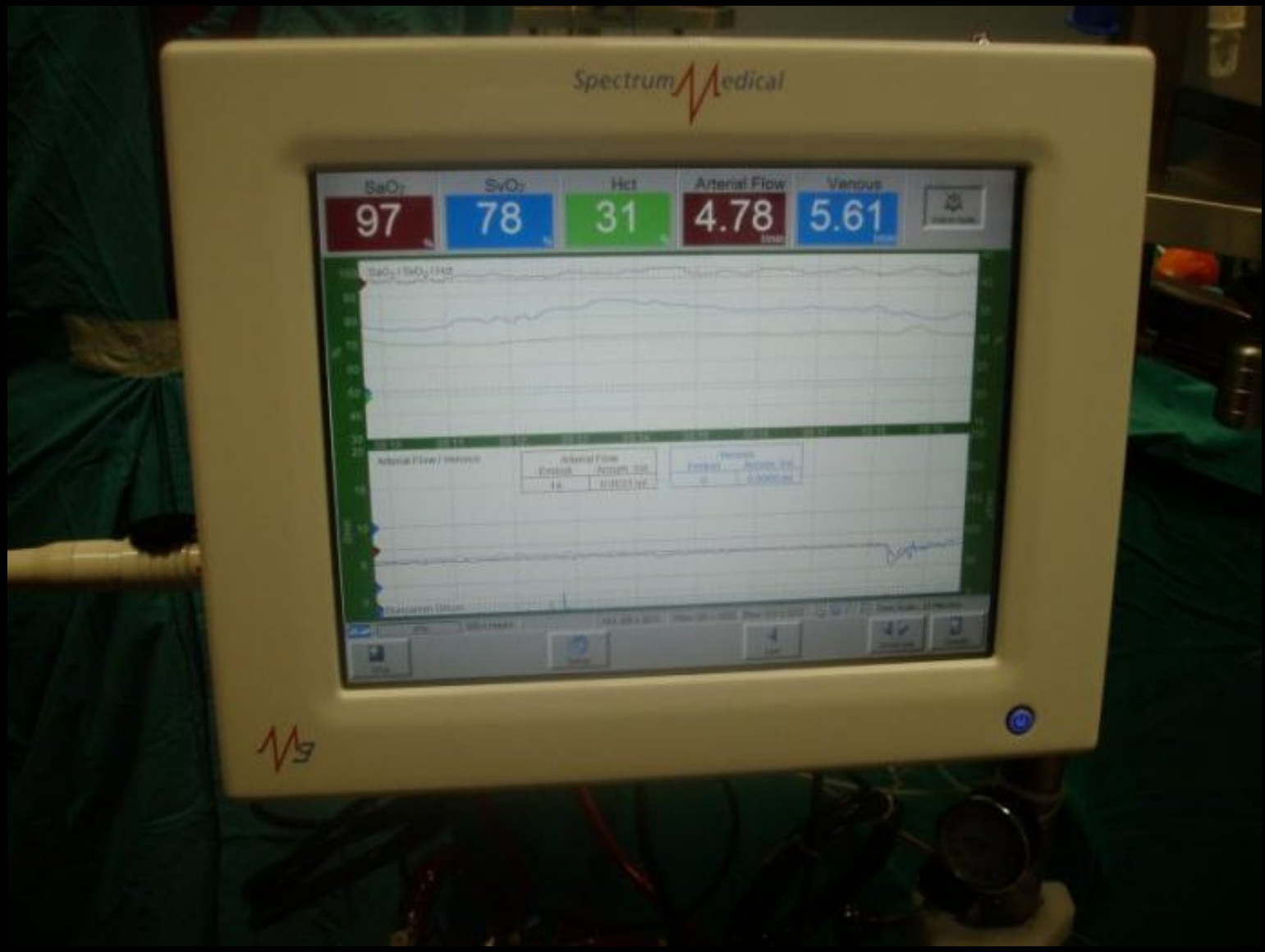
system real-time measurement of critical parameters

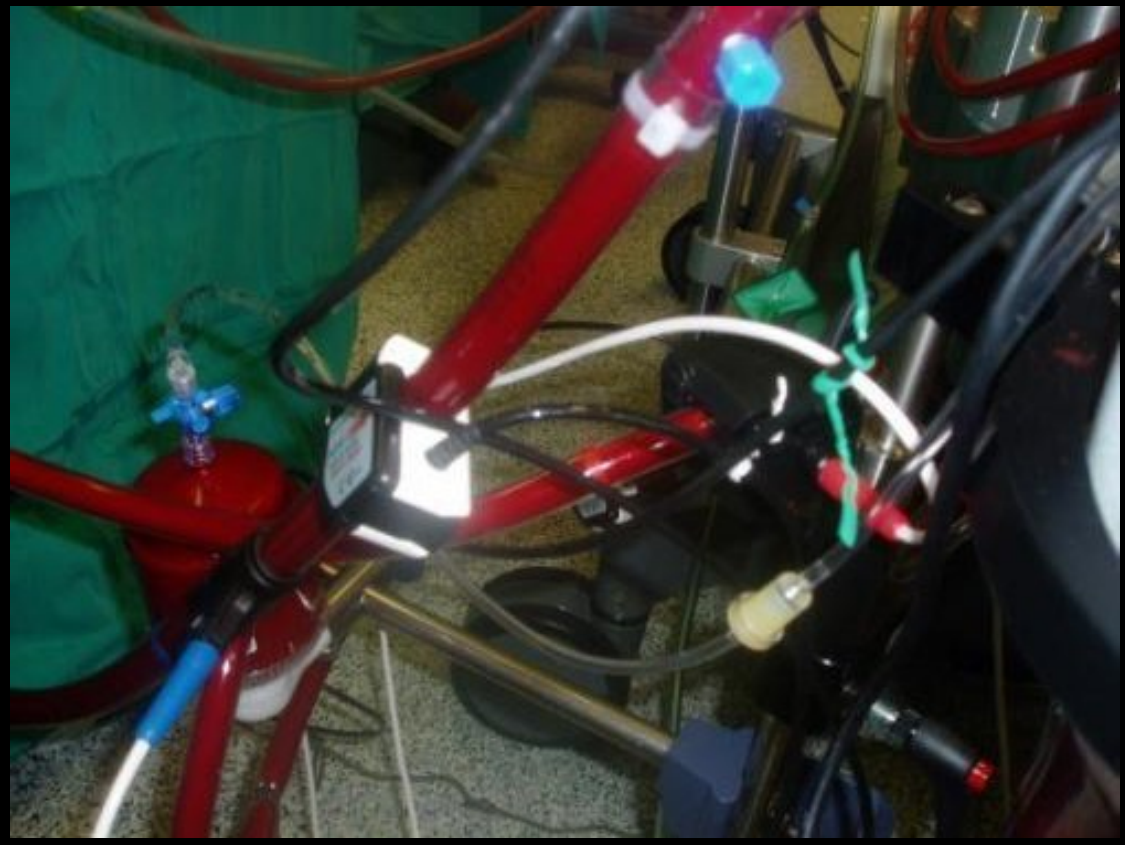
Spectrum Medical can rightly claim to be the world leader in the measurement of critical real-time parameters that initiate real-time interventions.

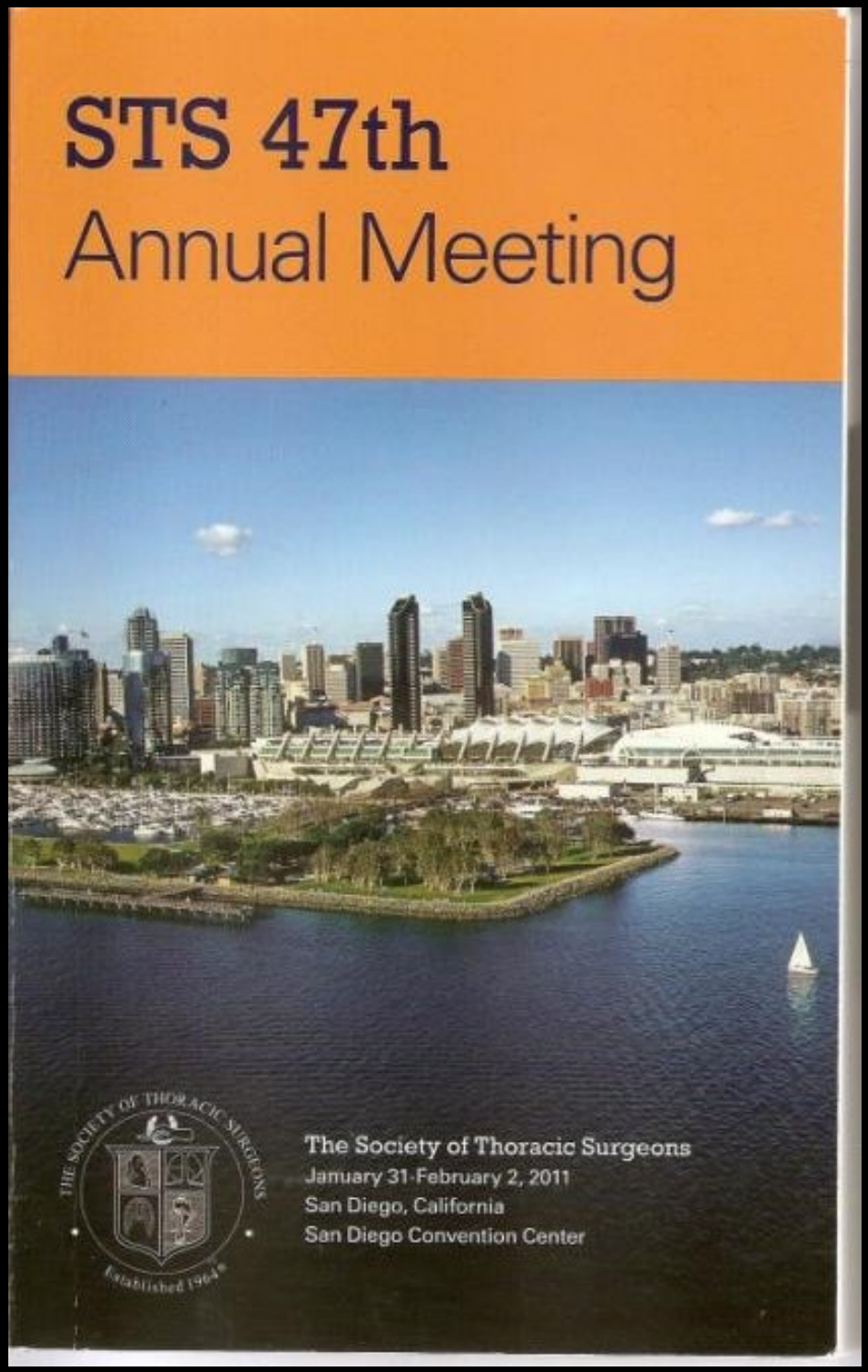
MONITOR SPECIFICATIONS

Model Code	SaO_2	SvO_2	Hct/Hb	Flow Channels	Emboli Detection
M2	✓	✓	✓	—	—
M3	✓	✓	✓	One	—
M3 TF	✓	✓	✓	Two	—
M3 TFE	✓	✓	✓	Two	✓

Note: The M3 TFE is a consumable cost / care option only.


Spectrum Medical
SaO2
97
SvO2
78
Hct
31
Arterial Flow
4.78
Venous
5.61





P14

Is Neurocognitive Decline Following Coronary Artery Bypass Grafting Dependent on the Intensity of Microemboli Related to Cardiopulmonary Bypass?

S. Gunaydin[1], U. Mungan[2], H. I. Ucar[3], T. Serter[3], K. McCusker[4], A. C. Yorgancioglu[3]
[1]University of Kirikkale, Beysukent-Ankara, Turkey; [2]Kirikkale Yuksek Ihtisas Hospital, Kirikkale, Turkey; [3]Medicana Hospital, Ankara, Turkey; [4]Portsmouth Regional Hospital, Portsmouth, NH

Purpose: This study aimed to determine whether there was any association between the intensity of intraoperative microembolic counts (GME) and neuropsychological testing within the context of systemic inflammatory response, myocardial protection and clinical outcome in high-risk patients undergoing CABG.

Methods: Over a two year period, GME activity was monitored in 259 Euroscore 6+ patients during cardiopulmonary bypass (CPB) with a conventional 32-micron arterial filter by non-invasive, real time ultrasonic device (Viper, Spectrum Medical). Serum interleukin-6, TNF-alpha and CKMB levels were measured. CD11b/CD18 expressions were determined by flow cytometry. Blood samples were collected at baseline (T1); at the end of the CPB (T2) and 24 h (T3) postoperatively. Cognitive tests; line bisection (visual-spatial attention), Stroop test (attention), finger tapping (fine motor movement), Rey Auditory Verbal Learning Test (immediate memory) were performed baseline, postoperative one month, six months and one year.

Results: The distribution of GME activity showed that there were three groups of patients: >500 total emboli (n = 82); 250 to 500 emboli (n = 79) and <250 emboli (n = 98) at detection level of 2% of circuit diameter on arterial + venous sides. Neurocognitive evaluation revealed 74% (n=61) disorder in >500 emboli group compared with 36 % (n=35) in <250 emboli group ($P<0.05$) in the first week which improved for 72% (n=44) patients for high emboli vs. 88%(n=31) for low emboli within 6 months($P<0.05$). Cognitive testing was normal for 93 % (n=51) patients in high emboli and 100% for low emboli at the end of first year. 21 of 29 patients with early postoperative neurological dysfunction were in the >500 emboli group.

Conclusions: Correlation between intraoperative GME intensity and neurocognitive tests suggests that the level of GME might have a role in determining psychological outcome after CABG with CPB and decline related to surgery is reversible.

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VERİ DEPOLAMA

TLink™ Data Management System

Key features

Data Collection & Clinical Use

- Easy to use touch screen
- Automatic data acquisition from devices
- User defined time interval for automatic data acquisition (pre-set time or on-demand)
- Customizable appearance on-case (unlimited viewing options)
- User defined multiple pump record templates
- User defined graphs - any combination of parameters
- Ability to edit data

Management of Data

- Query data within the program - no export of data required
- Export data in multiple file formats
- Clinical Activity Report (ABCP) generated
- Quality assurance tracking/reporting
- Data security - password protection
- Automatic database backup

The MAQUET OR-COMPUTER

Press Releases
Fact Sheets
Testimonies
Speeches

Return to List

For Immediate Release: Friday, January 07, 2011

Contact: CMS Office of Public Affairs
202-690-6145

MEDICARE PROPOSES NEW HOSPITAL VALUE-BASED PURCHASING PROGRAM

OVERVIEW: Today the Centers for Medicare & Medicaid Services (CMS) issued a proposed rule that would establish a hospital value-based purchasing program for acute care hospitals that are paid under the Medicare Inpatient Prospective Payment System (IPPS) for inpatient services furnished to Medicare beneficiaries. The new program, which was required by the Affordable Care Act of 2010, would provide value-based incentive payments to hospitals beginning in FY 2013, based on their achievement or improvement on a set of clinical and patient experience of care quality measures. The Hospital VBP program is designed to foster improved clinical outcomes for hospital patients as well as improve how patients experience inpatient care.

BACKGROUND: The hospital value-based purchasing program continues a longstanding effort by CMS to forge a closer link between Medicare's payment systems and improvement in health care quality, including the quality and safety of care provided in the inpatient hospital setting. In recent years, CMS has undertaken a number of initiatives, including demonstrations and quality reporting programs, to lay the foundation for rewarding health care providers and suppliers for the quality of care they provide by tying a portion of their Medicare payments to their performance on quality measures. The transition of these initiatives to value-based purchasing is intended to transform Medicare from a passive payer of claims based on volume of care to an active purchaser of care based on the quality of services its beneficiaries receive. The hospital value-based purchasing program is one of multiple reforms that are dramatically changing how Medicare pays hospitals. Other changes that will increasingly tie payments to how effectively hospitals deliver quality care for patients include incentives for implementing electronic health records, and payment adjustments based on hospitals rates of hospital-acquired conditions and rates of readmissions.

Since 2005, CMS has published information for consumers about the quality of hospital inpatient care through the Hospital Compare website at www.hospitalcompare.hhs.gov.

Akış Planı

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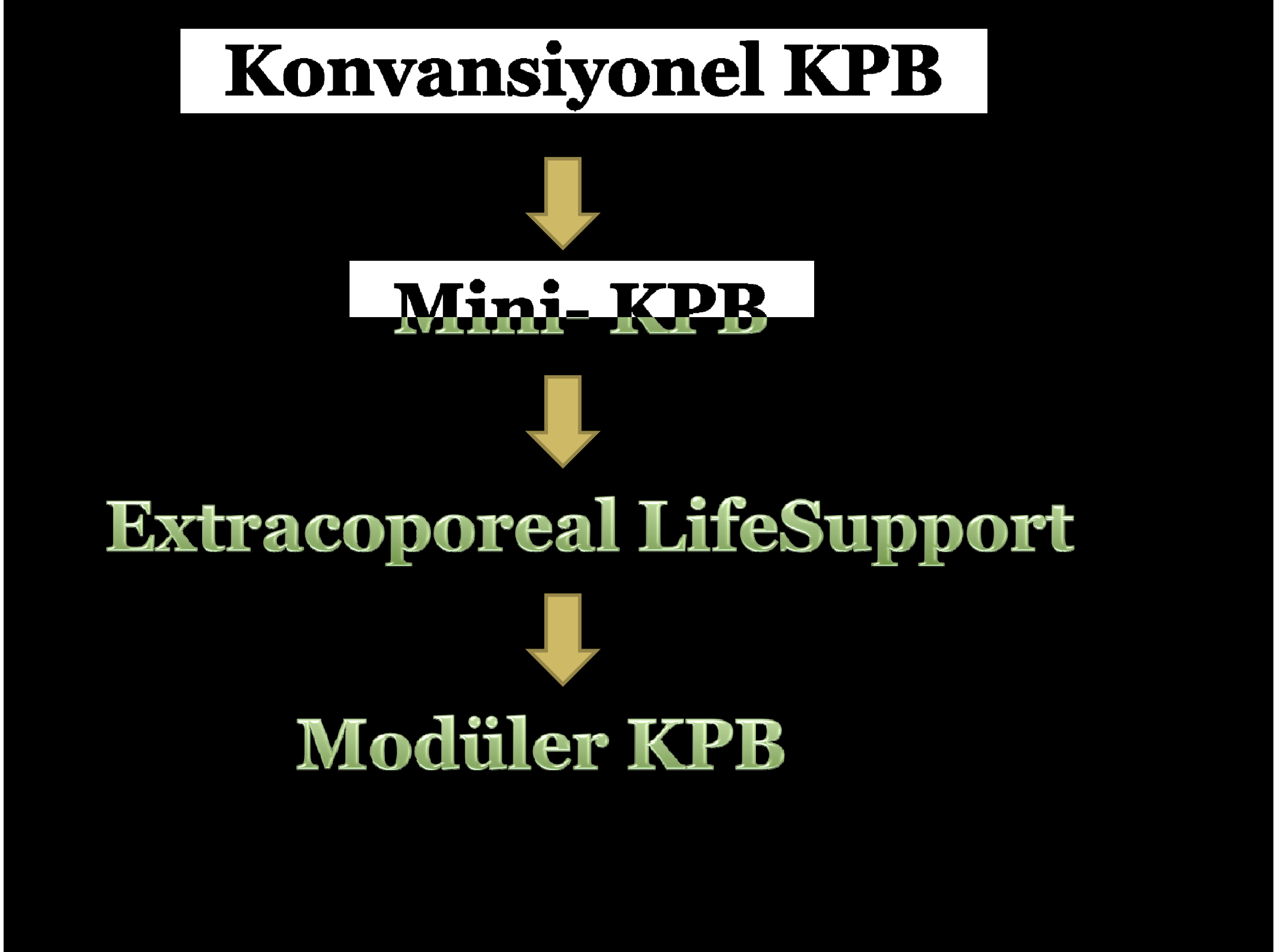

Konvansiyonel KPB
Mini- KPB
Extracoporeal LifeSupport
Modüler KPB

MODÜLER KPB

Ekstremite Perfüzyonu

Acil Servis Kullanımı

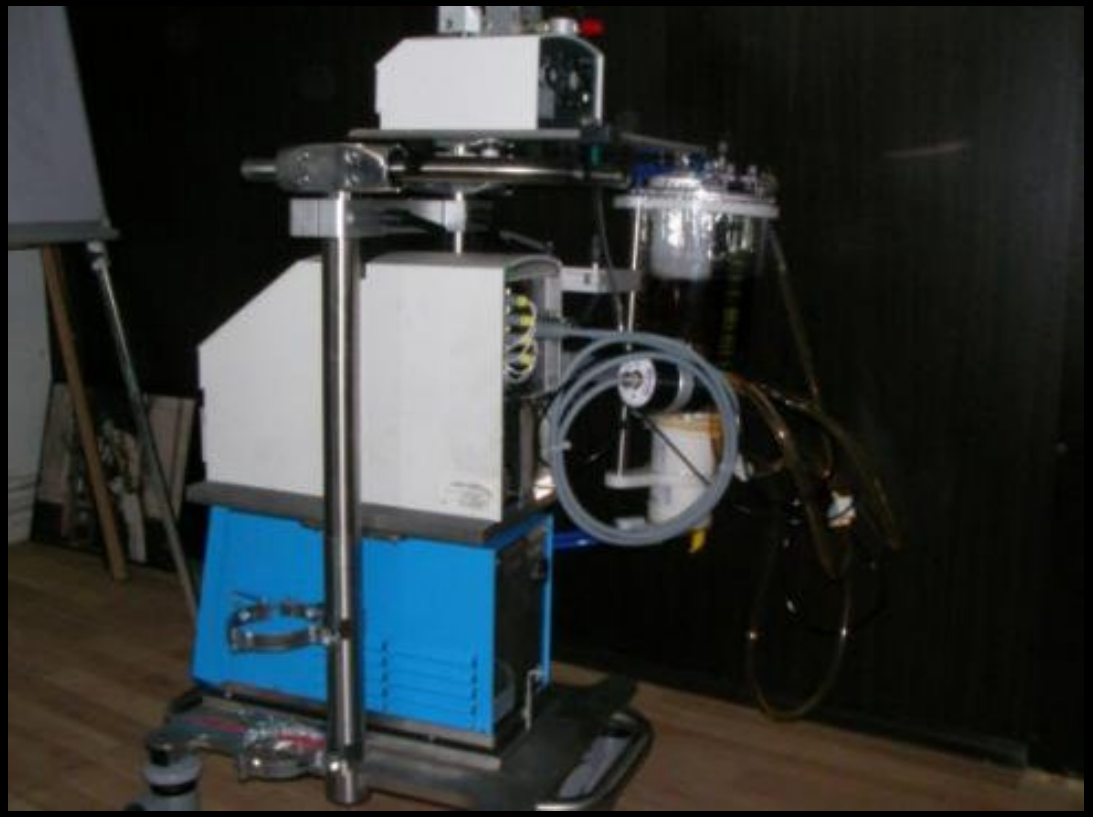
Perkutan Uygulamalar

Onkolojik Uygulamalar

Bridge to Therapy

Anjiyografi Lab

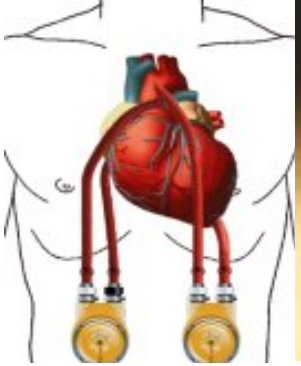
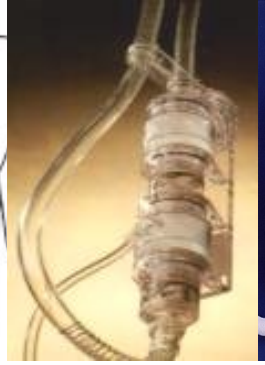
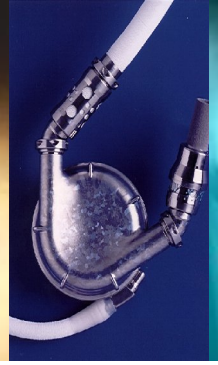
ECMO DEVRESİ

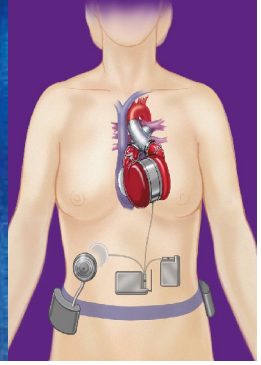


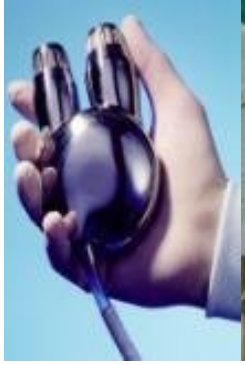
MAQUET
GETINGE GROUP

CARDIOHELP SYSTEM
DESIGNED TO SAVE LIVES

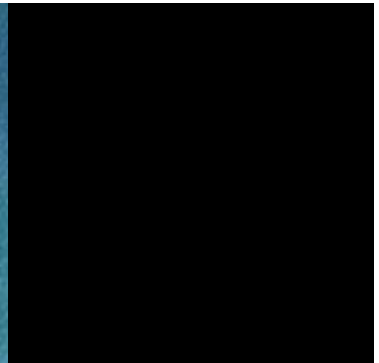
CARDIOVASCULAR

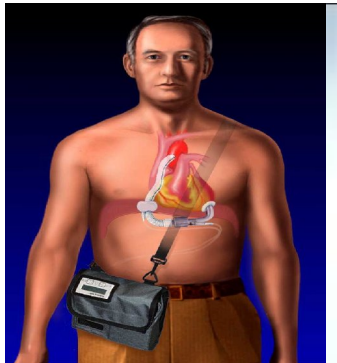








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TÜRKİYE

- Açık kalp cerrahisi paketi
- Fiyat etkinliğinin yeni sigorta sistemi ile önem kazanması *(ICU süresi, yatış süresi)*
- Kardiyolojik girişimlerin başarısı
- Periferik merkezlerin iyileşmesi ve büyük merkezlere akan kliniği ağır hastalar
- Kalp-akciğer nakilleri, ECMO, VAD, Konjenital uygulamalarındaki artış
- Üretici firmaların rutine dönen teknolojik yenilikleri ve ucuzlayan piyasa

EPILOG

KPB teknolojisindeki ilerlemeler sonucunda kendimizi bir anda etkinliği ispatlanmış, rahat, bilinen ve ek eğitim gerektirmeyen yöntemler ile daha etkin olması muhtemel ama önemli derecede çaba ve ekstra eğitim gerektirecek yeni yöntemler arasında tercih yapmak durumunda hissedeceğiz

Bütün gerçekler üç aşamadan geçer. Önce aşağılanır, sonra kesinlikle reddedilir, ama gün gelir vazgeçilmez olurlar...

Arthur Schopenhauer (1788-1860)

TEŞEKKÜRLER

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