



Neden Ototransfüzyon?

Homolog transfüzyon çok pahalı:

Eritrosit süspansiyonu: 217 TL (Kros hariç)
(Mart 2019)

01.01.2019 - 19.03.2019 ERİTROSİT_SÜSPANSİYONU İMHA MİKTARLARI

SN. NO	DR. KODU	DOKTOR ADI	İSTEK MİKTARI	İMHA MİKTARI
5			80	60
6			109	41
12			51	25
9			30	21
10			17	8
4			5	5
2			5	4
11			6	3
7			6	2
3			4	1

Kan Transfüzyon Komitesi

Türk Göğüs Kalp Damar Cerrahisi Dergisi 2017;25(1):22-28
http://dx.doi.org/doi: 10.5606/tgkdc.dergisi.2017.13205

The effect of acute normovolemic hemodilution on plasma fibrinogen level in coronary artery bypass grafting

Başar Erdivanlı,¹ Ahmet Şen,¹ Tolga Koyuncu,¹ Şaban Ergene,² Abdullah Özdemir,¹ Ersagun Tuğcuoğlu¹

Table 1. Preoperative clinical characteristics of the patients

Variables	Patients who have received ANH (n=49)			Patients who have not received ANH (n=52)			p
	n	%	Mean±SD	n	%	Mean±SD	
Age (year)	61	58.8	60.9±7.6	60	57.7	60.9±7.6	0.7
EuroSCORE II	1	4.0	1.5±0.7	1	4.0	1.5±0.7	0.66
Ejection fraction (%)	51	74.1	51.7±10.6	55	79.4	55.2±9.4	0.39
Hematocrit (g/dL)	40	54.2	40.5±2.4	40	54.2	40.8±2.4	0.22
Platelet count (1000/mm ³)	264	74	264±74	280	77	280±77	0.29
Plasma level of fibrinogen (mg/dL)	473	105	473±105	463	112	463±112	0.66

ANH: Acute normovolemic hemodilution; SD: Standard deviation; EuroSCORE: European System for Cardiac Operative Risk Evaluation

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Eritrosit süspansiyonu verilen hasta sayısı
Hasta başına verilen eritrosit süspansiyonu

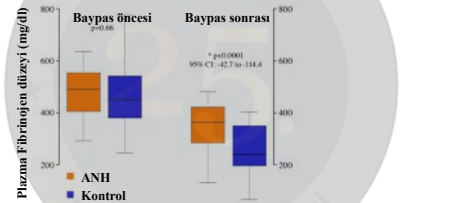
8/49 (%16)
0 (0-0 [0-3])

41/52 (%79)
2 (2-3 [0-8])

Türk Göğüs Kalp Damar Cerrahisi Dergisi 2017;25(1):22-28
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ANH Heparin Uygulamasında Fark Yaratıyor mu?

	ANH grubu (n = 81)	Kontrol grubu (n = 83)	p değeri
Yaş (yıl)	60.5 ± 9.8	63 ± 10.1	0.217
Kros klemp süresi (dk)	46.2 ± 19.9	51.7 ± 20.1	0.185
Pompa süresi (dk)	82.6 ± 26.5	85.5 ± 24.9	0.596

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Pompa süresi (dk)	82.6 ± 26.5	85.5 ± 24.9	0.596
Toplam heparin dozu (IU/kg)	403.3 ± 73.5	439.2 ± 106.9	0.045

1234

Hematokrit > %38
Kan kaybı beklenen
Kalp cerrahisi hastaları yarar görür.

The Efficacy and Utility of Acute Normovolemic Hemodilution.
Anesth Analg 2015;121(6):1412-4.

Hasta ve Kan Yönetimi

	PİLLAR ONE Optimize RBC Mass	PİLLAR TWO Minimise Blood Loss	PİLLAR THREE Manage Anaemia
PREOPERATIVE	Anemiyi tedavi et	Kan tetkiklerimi sınırla	patient's bleeding history & develop management plan estimate the patient's tolerance for blood loss optimize cardiopulmonary function
INTRAOPERATIVE	Hemodilüsyonu önle	Kanamayı ve Koagülopatiyi Sınırla	optimize cardiopulmonary function optimize ventilation & oxygenation restrictive transfusion strategies
POSTOPERATIVE	manage anaemia & iron deficiency manage medications & potential interactions	monitor & manage post-op bleeding keep patient warm minimise phlebotomy awareness of drug interactions & adverse events treat infections promptly	maximise oxygen delivery maximise oxygen use treat infections promptly tolerance of anaemia restrictive transfusion strategies

Adapted from: Spinelli D, Goodrough L. Approaches to blood management. Lancet 2013; 382:1045-55. Hoffman A, Farmer S, Towler SC. Strategies to prevent and reduce the use of blood products in elective orthopedic hip and knee arthroplasty. Can J Anaesth 2010; 57(8):743-749. Spinelli D. The efficacy and utility of patient blood management: an evidence based practice. Br J Anaesth 2013; 111:95-101.

Preoperatif Anemi



Preoperatif Anemi Saptanan Hastalarımız



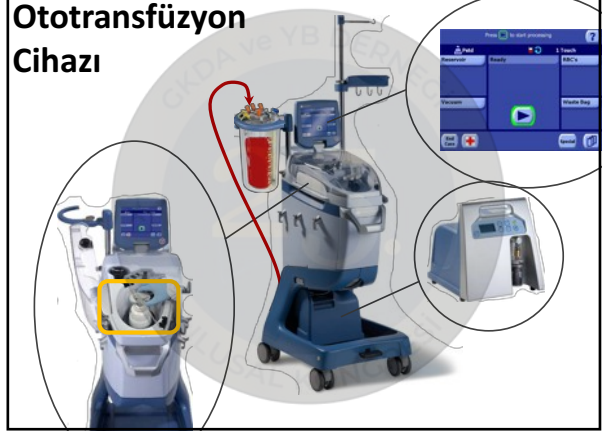
1234

Preoperatif anemiye bağlı **hemodilüsyon**
 Baypas devresi kaynaklı **hemodilüsyon**
 Akut normovolemik **hemodilüsyon**



Reassessing the risk of hemodilutional anemia: Some new pieces to an old puzzle.
 Can J Anesth 2010;57:779-91.

Ototransfüzyon Cihazı



Endikasyonlar ve Beklenen Yararlar

- ↓ **Kanamalı cerrahilerde allojenik kan kullanımı**
- ↑ Kan elde edilmesi (ANH'ye göre)
- ↓ Hazırlık süresi ve maliyet

Kontraendikasyonlar

Zararlı sıvı ve maddelerle karışmış kan:

Trombin/Fibrin yapıştırıcı içeren hemostatikler

Sement, antibiyotik irrigasyonu

Povidon iyodür

Bakteri

Kanser hücreleri

Ortopedi

Genel Cerrahi



- 2003: Cell salvage for minimising perioperative allogeneic blood tx
- 2006: Cell salvage for minimising perioperative allogeneic blood tx
- 2010: Cell salvage for minimising perioperative allogeneic blood tx



- 2015: Cell salvage in emergency trauma surgery
- > World J Surg 2006;30(6):1074-80. Intraoperative blood salvage in penetrating abdominal trauma: a randomised, controlled trial (n=44).

removes the heparin to insignificant levels during the wash cycle. The surgeons attempted to avoid suctioning blood that was grossly contaminated with faeces or other debris within the operative field and blood air interface was avoided when possible during aspiration to minimise fragmentation of red cells. Soaked laparotomy pads were placed in a bowl with a small quantity of warmed saline, gently agitated and the blood solution then aspirated. The aspirated and anticoagulation blood was macro-filtered and then pumped into a centrifuge bowl. This process

EJA

Eur J Anaesthesiol 2013; 30:270-382

GUIDELINES

Management of severe perioperative bleeding

Guidelines from the European Society of Anaesthesiology

6.3.4. Kardiyopulmoner bypass kullanılan

kalp cerrahilerinde kan kullanımını azaltmada yararlı olan ototransfüzyon setlerinin kullanımı önerilir. (1A)

7.3.4. Ototransfüzyon setleri maliyeti düşürebilir. (A)

EJA Eur J Anaesthesiol 2017; 34:332-395

GUIDELINES

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

7.4. Majör **kardiyak ve ortopedik** cerrahilerde kan kullanımını azaltmada yararlı olan ototransfüzyon setlerinin kullanımı önerilir. **(1B)**

8.3. Ototransfüzyon setleri maliyeti düşürebilir. (A)

Cochrane Database Syst Rev. Author manuscript; available in PMC 2014 September 15.

Published in final edited form as:
Cochrane Database Syst Rev. (4): CD001888. doi:10.1002/14651858.CD001888.pub4.

Cell salvage for minimising perioperative allogeneic blood transfusion

75 çalışma

- ↳ 36 ortopedik cerrahi
- ↳ 33 kardiyak cerrahi
- ↳ 6 vasküler cerrahi

-> Banka kanı kullanımında %21 azalma

1234

Derlemelerin sonuçları → Cihazların özellikleri

ANH ve Allojenik Kan Ne Kadar Fizyolojik?

	ANH Kanı (n = 10)
Bekleme süresi	166.7 ± 11.5 dk
pH	6.88 ± 0.13
pCO2 (mmHg)	85.6 ± 14.2
pO2 (mmHg)	122.7 ± 5.7
Hct (%)	33.9 ± 12.3
K (mmol/L)	2.43 ± 0.32
Na (mmol/L)	151.3 ± 7.6
Cl (mmol/L)	88 ± 12.1
Ca (mg/dL)	↓
Glukoz (mg/dL)	465.3 ± 99.3
Laktat (mmol/L)	1.8 ± 0.2
Bilirubin (mg/dL)	1.4 ± 0.5

ANH ve Allojenik Kan Ne Kadar Fizyolojik?

	ANH Kanı (n = 10)	Banka Kanı (n = 10)	p değeri
K (mmol/L)	2.43 ± 0.32	↓	
Na (mmol/L)	151.3 ± 7.6	105.5 ± 7.8	0.017
Cl (mmol/L)	88 ± 12.1	116.5 ± 0.7	0.055
Ca (mg/dL)	↓	↓	
Glukoz (mg/dL)	465.3 ± 99.3	306.5 ± 31.8	0.097
Laktat (mmol/L)	1.8 ± 0.2	20.5 ± 3.5	0.084
Bilirubin (mg/dL)	1.4 ± 0.5	1.7 ± 0.3	0.397

ANH ve Allojenik Kan Ne Kadar Fizyolojik?

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1. Ölçülemeyecek derecede düşük

- Paediatr Anaesth 2001;11(2):169-73. Acid-base, electrolyte and metabolite concentrations in packed red blood cells for major transfusion in infants.
-Free Radic Res 1994;21(3):135-46. Radiation damage to the erythrocyte membrane: the effects of medium and cell concentrations.

Ototransfüzyon Setleri Kompleman/Faktör/Proteinleri Temizleyebiliyor mu?

Shock 2000;13(1):29-33.

-> Banka kanında IL-8 ve PLA2 salınıyor.

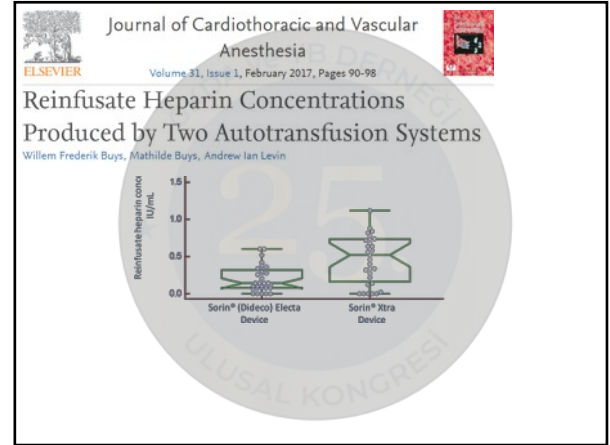
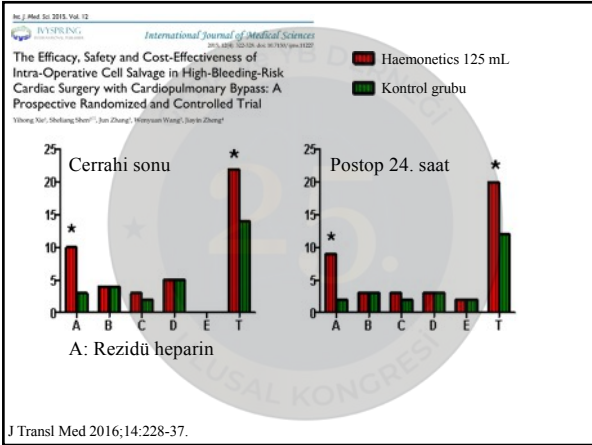
JAMA Surg 2018;153(9):826-33.

-> Perioperatif banka kanı kullanımı venöz tromboemboli için bir risk faktörüdür.

Blood Transfus 2011;9:139-47

-> Ototransfüzyon setleri vazoaktif ilaçları uzaklaştırıyor.

	Banka Kanı (n = 10)	Ototransfüzyonla Toplanan kan örneği
Bekleme süresi	12.5 ± 4.9 gün	2 saat
pH	6.49 ± 0.02	7.632
pCO2 (mmHg)	122 ± 5.7	↓
pO2 (mmHg)	54.6 ± 0.2	202
Hct (%)	62.4 ± 2.7	54.4
K (mmol/L)	↓	0.9
Na (mmol/L)	105.5 ± 7.8	144
Cl (mmol/L)	116.5 ± 0.7	147
Ca (mg/dL)	↓	0.3
Glukoz (mg/dL)	306.5 ± 31.8	30
Laktat (mmol/L)	20.5 ± 3.5	0.9
Bilirubin (mg/dL)	1.7 ± 0.3	2.7



BLOOD MANAGEMENT

Fat removal during cell salvage: a comparison of four different cell salvage devices
Timo E Seyfried,¹ Lilith Haas,¹ Michael Gruber,¹ Anita Breu,¹ Markus Loibl,² and Ernil Hansen¹

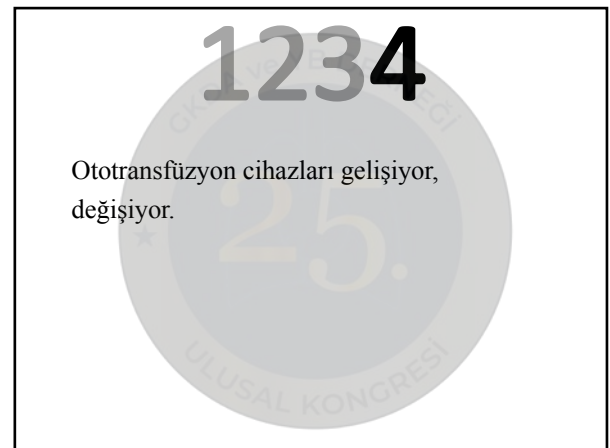
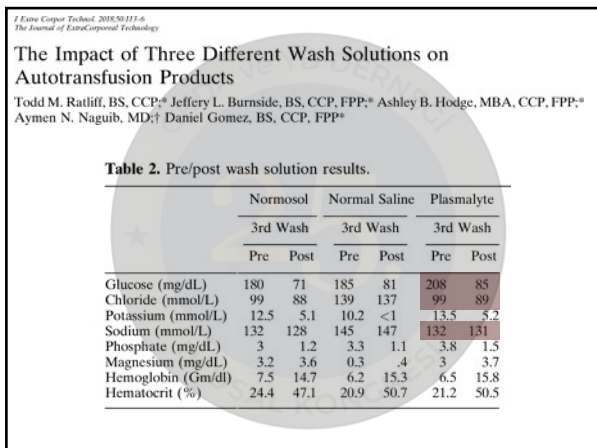
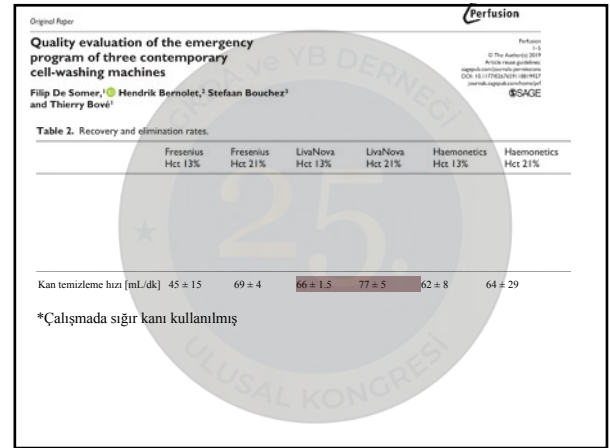
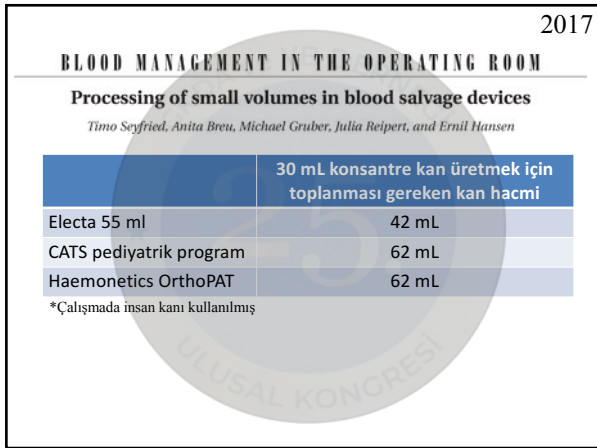
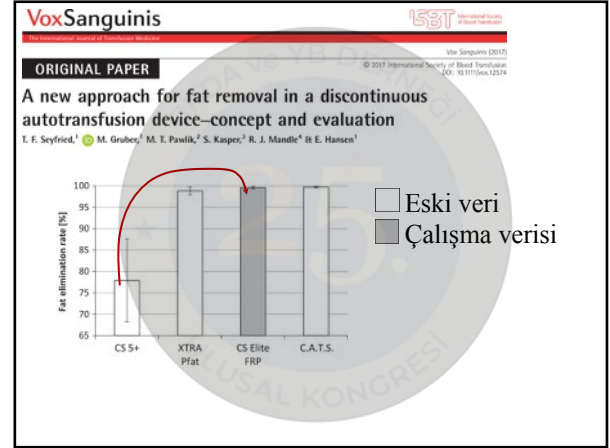
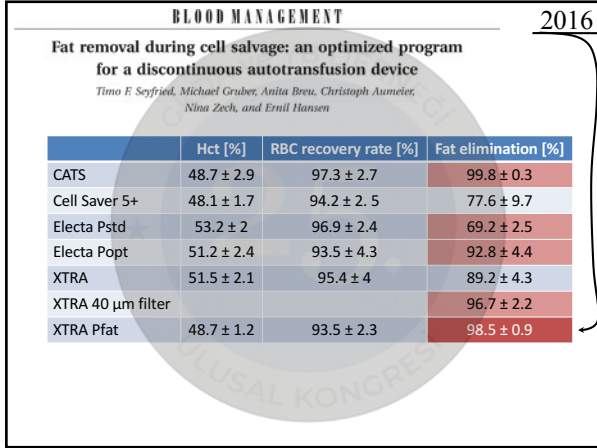
*Çalışmada insan yağı kullanılmış

*EH: Her üç firmayla anlaşmalı

BLOOD MANAGEMENT 2015

Fat removal during cell salvage: a comparison of four different cell salvage devices
Timo E Seyfried,¹ Lilith Haas,¹ Michael Gruber,¹ Anita Breu,¹ Markus Loibl,² and Ernil Hansen¹

	Hct [%]	RBC recovery rate [%]	Fat elimination [%]
CATS	48.7 ± 2.9	97.3 ± 2.7	99.8 ± 0.3
Cell Saver 5+	48.1 ± 1.7	94.2 ± 2.5	77.6 ± 9.7





Küçük hanımlar, küçük beyler..
Sizler hepimiz, geleceğin bir gülü, yıldızı, bir
bahtının aydınlığısınız.
Memleketi asıl aydınlığa boğacak olan
sizsiniz. Kendinizin ne kadar önemli, kıymetli
olduğunuzu düşünerek ona göre çalışınız.

H. Atatürk

ULUSAL KONGRE