KPB'de OPTİMAL ISI

İstanbul Üniversitesi
İSTANBUL TIP FAKÜLTESİ

188. yıl

Dr. Zevrin Sungur

AKIŞ

- **Fizyoloji**
- **Nasıl monitorize edelim?**
- **Hipotermi mi, normotermi mi?**
- **Diğer organlar**
- **Özel gruplar**

MSS ve Isı

- *fonksiyonel CMRO2* **serebral elektrofizyoloji**
- *yapısal CMRO2* **hücresel bütünlük**

- **Q10**

Nasıl monitorize edelim???

Ölçüm yerleri

- **Beyin ısısı *Juguler Bulbus***
- **Nazofarenks, özofagus, mesane, pulmoner arter**
- **Isının *dengelenmesi***

The Society of Thoracic Surgeons, The Society of Cardiovascular Anesthesiologists, and The American Society of ExtraCorporeal Technology: Clinical Practice Guidelines for Cardiopulmonary Bypass—Temperature Management During Cardiopulmonary Bypass

Richard Engelman, MD,* Robert A. Baker, PhD, CCP,† Donald S. Likosky, PhD,‡ Alina Grigore, MD,§ Timothy A. Dickinson, MS,¶ Linda Shore-Lesserson, MD,‖ and John W. Hammon, MD#

1. **Oksijenatörde arteriyel çıkış hattından ısı ölçümü (Klas I, C)**
2. **Arteriyel çıkış hattından ısı ölçümü serebral perfüzat ısısını düşük gösterebilir (Klas I, C)**
3. **PA veya nazofarenks kor ısısı için makul seçenekler (Klas IIa, C)**

JECT. 2015;47:145–154
The Journal of ExtraCorporeal Technology

Special Report

The Society of Thoracic Surgeons, The Society of Cardiovascular Anesthesiologists, and The American Society of ExtraCorporeal Technology: Clinical Practice Guidelines for Cardiopulmonary Bypass—Temperature Management during Cardiopulmonary Bypass

Richard Engelman, MD; Robert A. Baker, PhD, CCP; Donald S. Likosky, PhD; Alina Grigore, MD; Timothy A. Dickinson, MS; Linda Shore-Lesserson, MD; John W. Hammon, MD

1. **Isınma esnasında arteriyel çıkış ve venöz giriş arası ısı farkı en çok 10°C (Klas I, C)**
2. **Isınma hızı 0.5°C/dak üzerine çıkmamalı (Klas IIa, B)**
3. **KPB 'tan çıkarken sarteriyel çıkış ve venöz giriş arası ısı farkı ≤4°C (Klas IIa, B)**

KPB çıkış ısısı ???

HİPOTERMİ mi?
NORMOTERMİ mi?

Articles

Randomised trial of normothermic versus hypothermic coronary bypass surgery

*The Warm Heart Investigators**

Normotermik baypas hipotermik kadar güvenlidir

Prospective, Randomized Trial of Retrograde Warm Blood Cardioplegia: Myocardial Benefit and Neurologic Threat

Tomas D. Martin, MD, Joseph M. Craver, MD, John P. Gott, MD, William S. Weintraub, MD, James Ramsay, MD, Christine T. Mora, MD, and Robert A. Guyton, MD

Emory University School of Medicine, Atlanta, Georgia

Ilık kardiyopleji ve perfüzyon kalbi korur; ancak nörolojik olay sıklığı artar.

PRO AND CON

Lee A. Fleisher, MD
Bonnie L. Milas, MD
Section Editors

Pro: Hypothermic Cardiopulmonary Bypass Should Be Used Routinely

Philip E.F. Roman, MD, MPH, and Alina M. Grigore, MD, MHS, FASE

- **Hipotermi nöroprotektif etki belirlenmiş**
- **En ciddi risk *saldırgan* ısınma stratejileri**

Con: Cardiac Surgery Should Be Performed Under Warm Conditions

Prakash A. Patel, MD,* and Nimesh D. Desai, MD, PhD†

- **Hipotermi miyokard derlenmesine olumsuz etkili**
- **Hipotermi kadar güvenli ve daha hızlı**

arkus aorta cerrahisi

Core Review Article

A Core Review of Temperature Regimens and Neuroprotection During Cardiopulmonary Bypass: Does Rewarming Rate Matter?

Alina M. Grigore, MD, MHS, FASE*

Catherine Friederich Murray, BS†

Harish Ramakrishna, MD, FASE*

George Djaiani, MD, DEAA, FRCA, FRCPC‡

Despite a half century of research and the implementation of various risk-reduction strategies among clinicians and basic scientists, patients continue to experience strokes and cognitive dysfunction related to the use of cardiopulmonary bypass (CPB) for cardiac surgery. One strategy to reduce these detrimental effects has been the use of hypothermia. Although numerous studies have addressed the issue, the question of whether the use of hypothermia during CPB attenuates the impact of central nervous system consequences remains unresolved. However, data clearly demonstrate that hyperthermia is to be avoided in the perioperative period, necessitating careful rewarming strategies if hypothermia is used during CPB. Selecting and understanding the impact of the temperature-monitoring site is important to accurately estimate cerebral temperature and to avoid inadvertent surges in brain temperature. In this article, we review the literature regarding the impact of hypothermia and rewarming rates during cardiac surgery.

(Anesth Analg 2009;109:1741–51)

Hipertermi ilk 48 saatte bimodal
Isınma ≠ hipertermi

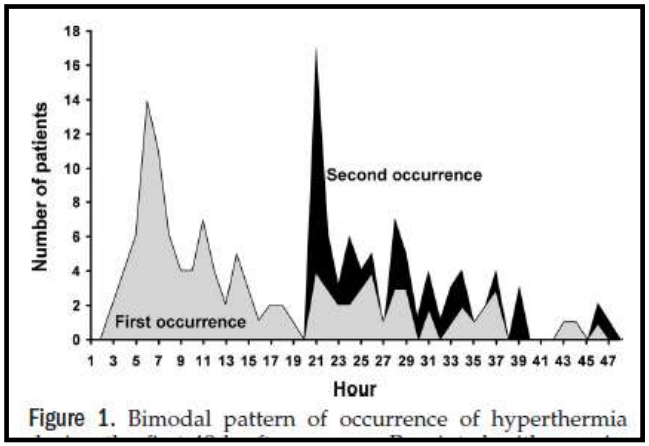

Figure 1. Bimodal pattern of occurrence of hyperthermia

Önemli olan hipotermi oluşumu değil hipertermiden kaçınma

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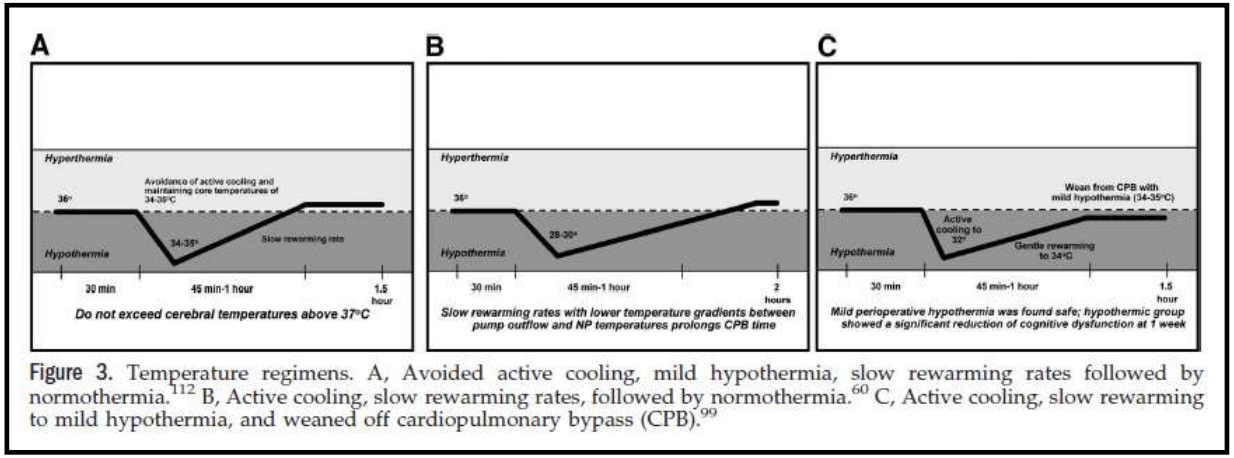


Figure 3. Temperature regimens. A, Avoided active cooling, mild hypothermia, slow rewarming rates followed by normothermia.[112] B, Active cooling, slow rewarming rates, followed by normothermia.[60] C, Active cooling, slow rewarming to mild hypothermia, and weaned off cardiopulmonary bypass (CPB).[99]

1. **Düşük riskli hastalar**
2. **Nörolojik komplikasyon riski yüksek hastalar**
3. **Nörolojik komplikasyon riski yüksek ve kısa KPB**

Cochrane Library

Cochrane Database of Systematic Reviews

Hypothermia to reduce neurological damage following coronary artery bypass surgery (Review)

Rees K, Beranek-Stanley M, Burke M, Ebrahim S

- **19 çalışma (hipo vs normo; hipo vs tepid; hipo/hafif hipo/normo/tepid)**
- **Nörolojik prognozda istatiksel fark yok**
- **Hipotermide düşük debi daha sık**

Hipotermide ölümcül olmayan inme daha az olma eğiliminde

Hipotermide inme dışı ölüm nedenleri daha fazla olma eğiliminde

SYSTEMATIC REVIEW

Cardiovascular Therapeutics

Benefits and Risks of Maintaining Normothermia during Cardiopulmonary Bypass in Adult Cardiac Surgery: A Systematic Review

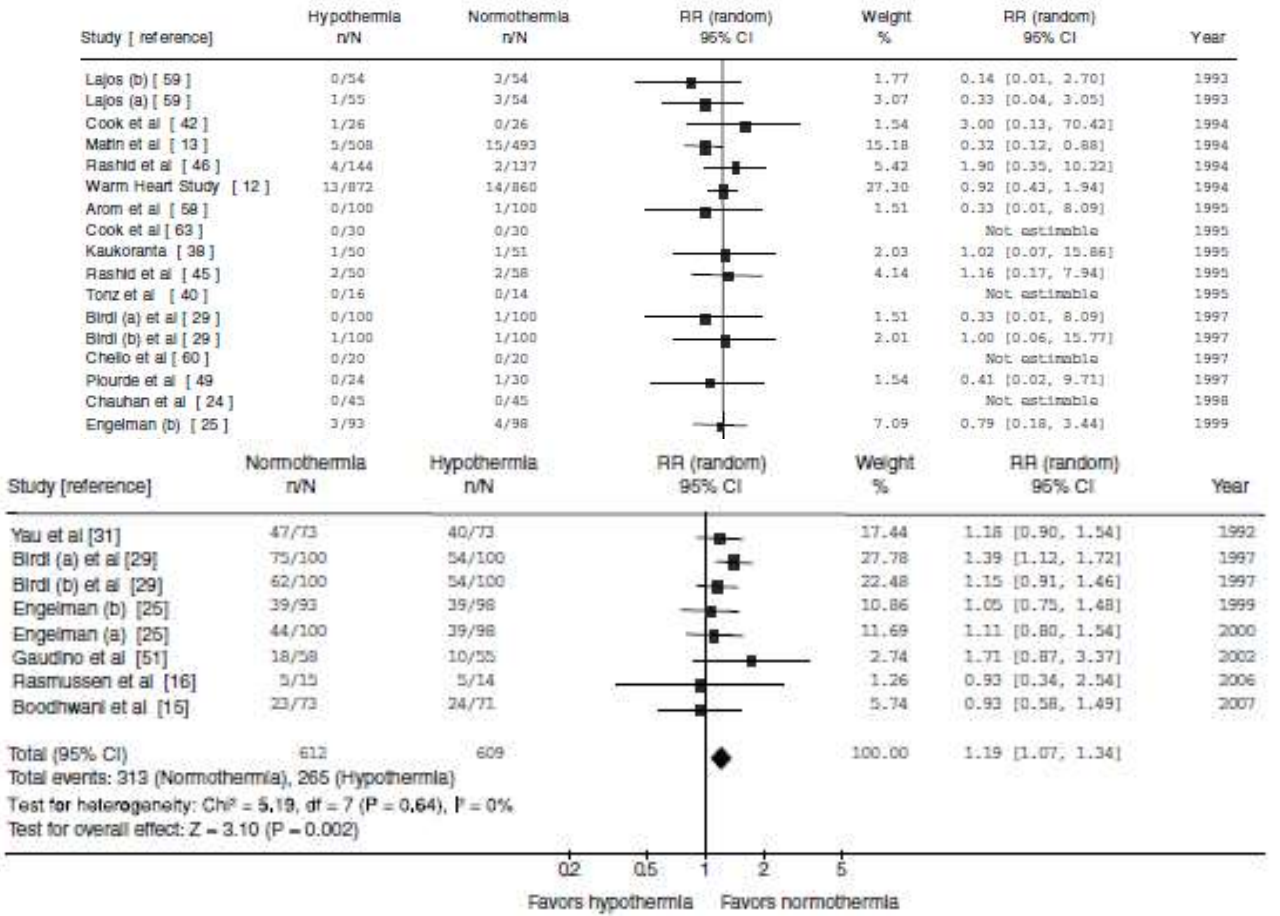
Kwok M. Ho[1] & Jen Aik Tan[2]

1 Intensive Care Specialist, Department of Intensive Care Medicine, Royal Perth Hospital, Perth, WA 6000, Australia; Clinical Associate Professor, School of Population Health, University of Western Australia, Perth, WA 6009, Australia
2 Intensive Care Unit Medical Officer, Department of Intensive Care Medicine, Royal Perth Hospital, Perth, WA 6000, Australia

Cardiovascular Therapeutics 29 (2011) 260–279

- **44 RKÇ; >6700 hasta**
- **Normo (>34) vs hipotermik (≤34°C)**

Koroner cerrahisi !



SYSTEMATIC REVIEW

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- **Normotermik hipotermik kadar güvenli, transfüzyon gereksinimini ↓**
- **inme ↔ hastaya ait faktörler**
- **embolizm düzeyi ≠ nörolojik akıbet**
- **hipotermi süresi!?**
- **ISINMA süreci!!!**

Diğer organlar???

Original Paper

Perfusion

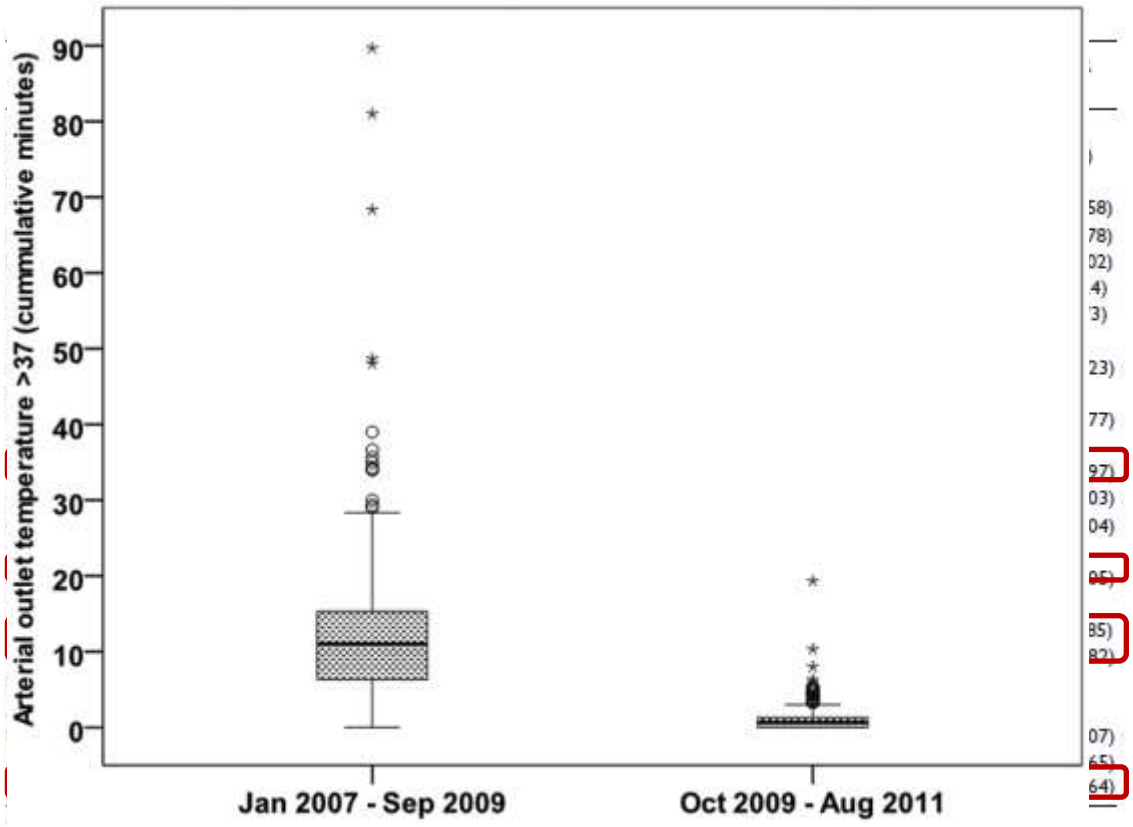
Perfusion
28(3) 223–231

DOI: 10.1177/0267659112472385
prf.sagepub.com
SAGE

Hyperthermic perfusion during cardiopulmonary bypass and postoperative temperature are independent predictors of acute kidney injury following cardiac surgery

RF Newland, PJ Tully and RA Baker

- ≅4000 hasta , KABG±kapak
- Hipertermik perfüzyon ve YB'a girişte hipertermi AKI için bağımsız risk faktörü
- Arteriyel hiperterminin ↓ ⇒ AKI sıklığı ↓



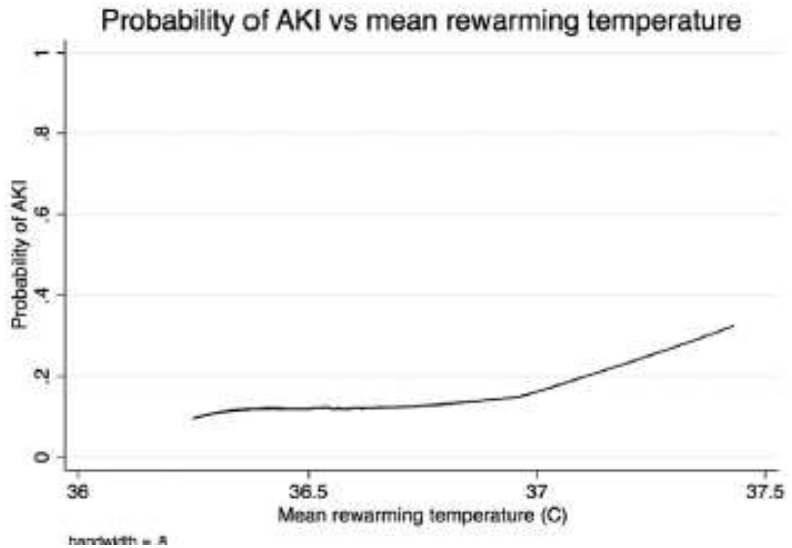
Rewarming Temperature During Cardiopulmonary Bypass and Acute Kidney Injury: A Multicenter Analysis

Richard F. Newland, BSc, Robert A. Baker, PhD, Annette L. Mazzone, BSc (Hons), Steven S. Quinn, PhD, and Derek P. Chew, MBBS, MPH; on behalf of the Perfusion Downunder Collaboration

Flinders Medical Centre and Flinders University, Bedford Park, South Australia, Australia

(Ann Thorac Surg 2016;■:■–■)

- **≅7000 hasta çok merkezli** (6000 vs 1000)
- **Hipertermik perfüzyon 10 dak uzaması AKI %40↑**



Özel hasta grupları

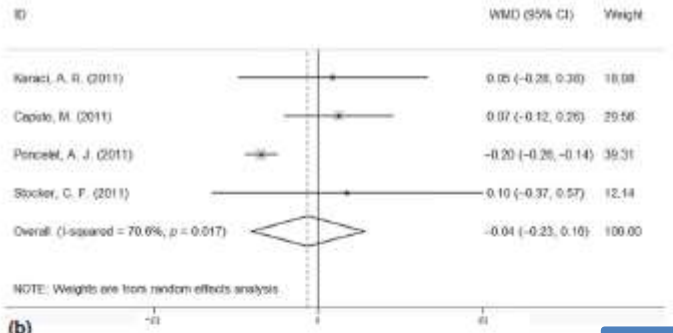
Pediatric Anesthesia

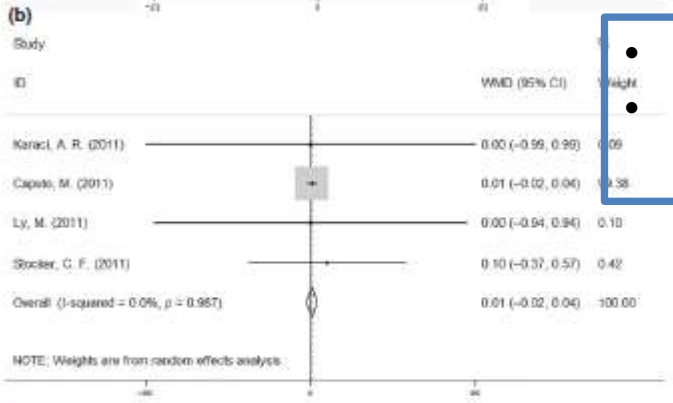
Pediatric Anesthesia ISSN 1155-5645

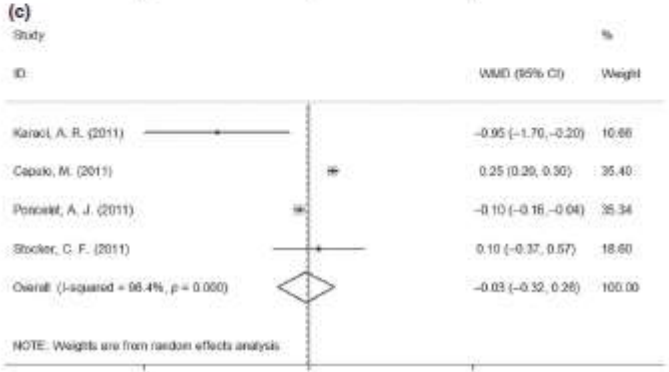
ORIGINAL ARTICLE

Systematic Review and Meta-Analysis of benefits and risks between normothermia and hypothermia during bypass in pediatric cardiac surgery

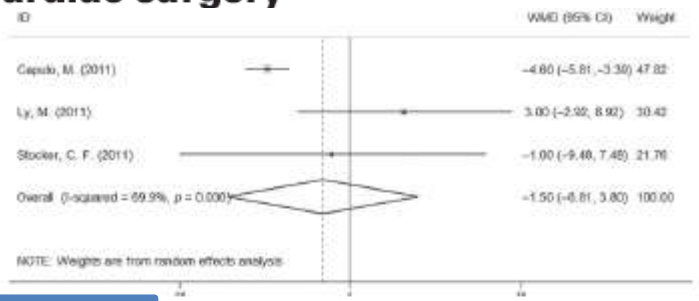
[1], Bingyang Ji[1], Jinping Liu[1], Guy

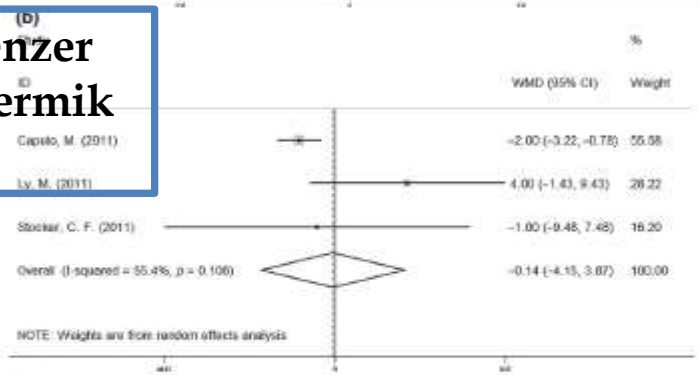


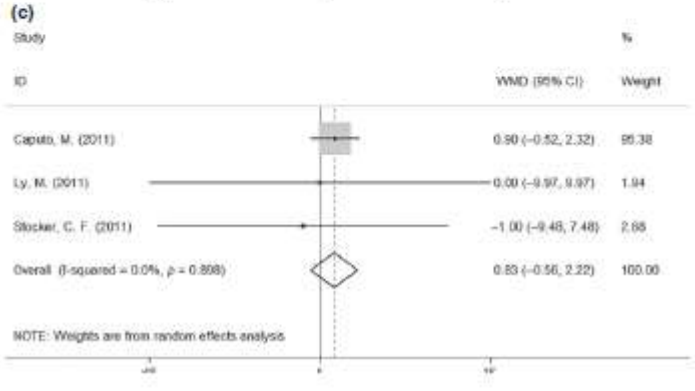




- KK, KPB süreleri benzer
- Normotermik hipotermik kadar güvenli







doi:10.1510/icvts.2010.250605

INTERACTIVE CARDIOVASCULAR AND THORACIC SURGERY

Interactive CardioVascular and Thoracic Surgery 12 (2011) 952–955

www.icvts.org

Institutional report - Vascular thoracic

Tepid hypothermic (32 °C) circulatory arrest for total aortic arch replacement: a paradigm shift from profound hypothermic surgery

Go Watanabe, Hiroshi Ohtake*, Shigeyuki Tomita, Shohjiro Yamaguchi, Keiichi Kimura, Noriyoshi Yashiki

Ilık hipotermi ile arest güvenli
Nörolojik komplikasyon ∅
Transfüzyon ↓

	Group C ($n=27$)	Group W ($n=23$)	P-value
Postoperative extubation (h)	88.1±116	23.5±28.9	0.000
Length of hospital stay (days)	41.7±23.1	28.2±10.4	0.015
Cerebral infarction (n)	5	0	0.030
Transient ischemic attack/delirium (n)	1	0	NS
Prolonged intubation >72 hours (n)	1		NS
Operating room extubation (n)		2	NS

European Journal of Cardio-Thoracic Surgery 45 (2014) 27–39
doi:10.1093/ejcts/ezt154 Advance Access publication 28 April 2013

REVIEW

Modern temperature management in aortic arch surgery: the dilemma of moderate hypothermia

Maximilian Luehr[a,*], Jean Bachet[b], Friedrich-Wilhelm Mohr[a] and Christian D. Etz[a]

Currently, many groups (including not only highly experienced centres of aortic surgery) are progressively moving towards the new perfusion strategy of SCP and more moderate LBCA [77]. This paradigm shift is encouraged—or even driven—by the promising results by aortic specialists who advocate the routine use of moderate-to-mild (28–35°C) hypothermia during aortic arch operations [5–7]. It is supposed—despite the absence of experimental proof suggesting the safety of this new concept—that moderate or even mild distal ischaemia should be safe and effective for a limited period of time (30–60 min) during standard cases of arch reconstruction (e.g. hemiarch replacement) [5, 7, 57]. Moreover, this concept is currently not only used in elective cases, in which it is legitimate to expect a short operation time, but has been proposed for use in the emergency repair of acute aortic dissection [54]. This radical change of tem-

SONUÇ 1

- **Serebral ısı için nazofarenks, PA ve arteriyel çıkış ısısı ölçülmeli**
- **Arteriyel çıkış ısısı < 37°C nörolojik ve diğer organ işlev bozuklukları açısından önemli**

SONUÇ 2

- **Normotermi geniş hasta ve cerrahi spektrumunda güvenli**
- **KPB'tan ayrılırken hedef ısı değeri değil ISINMA HIZI olmalı**
- **Postoperatif hipertermiden kaçınılmalı**

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