

# **Kısa Etkili Beta Blokaj Kalp Cerrahisinde Neden Önemlidir?**

**Dr. Bilge ÇELEBİOĞLU**

# **Esmolol hidroklorür**

- **Çok kısa etkili**
- **Beta-1 selektif blokür**  
**( kardiyoselektif )**
- **Eliminasyon yarı ömrü 9 dakika**
- **Yüksek dozlarda Beta-2 blokür**  
**( bronş ve damar kasları )**

# Esmolol

<b>Süre</b> dakika	<b>Yükleme</b> <i>dozu</i> ( 1 dk )		<b>İdame</b> <i>dozu</i> ( 4 dk )	
	mcg/kg/dk	mg/kg/dk	mcg/kg/dk	mg/kg/dk
<b>0 - 1</b>	<b>500</b>	<b>0.5</b>		
<b>1 - 5</b>			<b>50</b>	<b>0.05</b>
<b>5 - 6</b>	<b>500</b>	<b>0.5</b>		

**200 – 300 mcg/kg/dk ( 0.3 – 0.2 mg/kg/dk )**

# Esmolol

- **Supraventriküler taşikardi**
- **İntraoperatif – Postoperatif**  
**Taşikardi Hipertansiyon**
- **CPB sonrası aritmi**
- **Doz aşımı**
  - **Bradikardi**
  - **Bronkospazm**
  - **Semptomatik hipotansiyon**
  - **Kalp yetmezliği**

## Esmolol Reduces Perioperative Ischemia in Cardiac Surgery: A Meta-analysis of Randomized Controlled Studies

Alberto Zangrillo, MD, Stefano Turi, MD, Giuseppe Crescenzi, MD, Alessandro Oriani, MD,  
Francesco Distaso, MD, Fabrizio Monaco, MD, Elena Bignami, MD, and Giovanni Landoni, MD

**Objective:**  $\beta$ -Blockers were associated with a reduction of mortality and morbidity in noncardiac surgery until recently when the POISE trial showed that  $\beta$ -blockers could be harmful in the perioperative period because of hypotension and bradycardia. Esmolol is an ultra-short-acting  $\beta$ -blocker mostly used in emergency and high-risk patients. The authors performed a meta-analysis to evaluate the clinical effects of esmolol in cardiac surgery.

**Design:** Meta-analysis.

**Setting:** Hospitals.

**Participants:** A total of 778 patients from 20 randomized trials.

**Interventions:** None.

**Measurements and Main Result:** Three investigators independently searched BioMedCentral and PubMed. Inclusion criteria were random allocation to treatment and comparison of esmolol versus other drugs, placebo, or standard of care in cardiac surgery. Exclusion criteria were duplicate publications, nonhuman experimental studies, and no data on clinical out-

comes. The use of esmolol was associated with a significant reduction of myocardial ischemia episodes (15/122 [12.2%] in the esmolol group v 36/140 [25.7%] in the control arm, odds ratio [OR] = 0.42 [0.23-0.79],  $p = 0.007$ ) and development of arrhythmias after cardiopulmonary bypass (15/65 [23.07%] v 23/64 [35.9%], OR = 0.42 [0.18-1.01],  $p = 0.05$ ). The authors did not find a reduction in the use of inotropic drugs in esmolol-treated patients (29/153 [18.9%] v 48/146 [32.8%], OR = 0.43 [0.16-1.10],  $p = 0.08$ ). Esmolol-treated patients had more episodes of bradycardia (19/129 [14.72%] v 3/133 [2.25%], OR = 5.49 [2.21-13.62],  $p = 0.0002$ ) and hypotension (28/113 [24.77%] v 14/119 [11.76%], OR = 2.73 [0.83-9.04],  $p = 0.10$ ).

**Conclusions:** Esmolol reduces the incidence of myocardial ischemia and arrhythmias in cardiac surgery. An increase in bradycardia was noted as well.

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**KEY WORDS:** esmolol, cardiac surgery, cardiac anesthesia,  $\beta$ -blocker, cardiac protection, anesthesia

# **2006 – 2008 ( Nisan )**

## **306 sonuç – 30 araştırma**

- **Anahtar kelimeler**
  - **esmolol ve cerrahi**
- **Randomize çalışma**
- **Esmolol – kontrol / plasebo**
- **Kardiyak cerrahi hastaları**
- **Çalışma dışı bırakılma**
  - **Vaka takdimi ve hayvan deneyleri**

# Toplam 20 randomize çalışma

## 778 hasta

### 386 esmolol – 392 kontrol/plasebo

**Table 1. Randomized Controlled Studies Included in the Meta-analysis With the Number of Patients and Timing of the Study Drug Administration**

Authors	Journal	Year	Patients (Esmolol)	Patients (Controls)	Administration
Boldt J	Anesth Analg	2004	21	21	After anesthesia induction until the morning of the first postoperative day
Scorsin M	J Thorac Cardiovasc Surg	2003	23	18	After aortic cross-clamping
Deng YK	Circ J	2002	12	12	Before CPB
Balcetyte-Harris N	Ann Noninvasive Electrocardiol	2002	27	23	6-18 hours after surgery for up to 24 hours
Kurian SM	Anaesthesia	2001	34	38	Intensive care unit until 3 hours after extubation
Rinne T	Acta Anaesthesiol Scand	2000	20	20	During cardioplegia
Mooss AN	Am Heart J	2000	15	15	After diagnosis of atrial fibrillation in the postoperative period
Mehlhorn U	Eur J Cardiothorac Surg	2000	10	10	During cardioplegia
Chauhan S	Indian J Med Res	1999	30	30	During cardioplegia
Tempe D	Indian Heart J	1999	15	15	30-45 minutes after CPB
Mehlhorn U	Cardiovasc Surg	1999	30	30	During cardioplegia
Kuhn-Regnier F	Eur J Cardiothorac Surg	1999	30	30	During cardioplegia
Cork CR	Anesth Analg	1995	15	14	During CPB, up to 10 min after release of aortic cross-clamp
Cork CR	Anesth Analg	1995	16	14	Just before CPB, up to 10 min after release of aortic cross-clamp
Neustein SM	J Cardiothorac Vasc Anesth	1994	17	23	Before entering into the operating room
Reves JG	J Thorac Cardiovasc Surg	1990	16	14	Before induction of anesthesia
Harrison L	Anesthesiology	1987	15	15	Before induction of anesthesia
De Bruijn	Anesth Analg	1987	19	21	Before induction of anesthesia
Girare D	Anesthesiology	1986	11	9	Before induction of anesthesia
Newsome LR	Anesth Analg	1986	10	20	Before induction up to 5 min after sternotomy
TOTAL			386	392	

**Table 2. Details on the Type of Surgery and the Characteristics of the Treatment and Control Groups**

Author	Groups	Surgery	Treatment Group	Control Group
Boldt J	2	CABG	Esmolol and enoximone	Placebo
Scorsin M	2	Aortic stenosis	Esmolol in blood as cardioplegia	Potassium in blood as cardioplegia
Deng YK	2	Mitral valve replacement	Esmolol	Normothermia cardiopulmonary bypass
Balcetyte-Harris N	2	CABG	Esmolol	Oral $\beta$ -blockers
Kurian SM	2	CABG	Esmolol	Placebo
Rinne T	2	CABG	Esmolol addition to blood cardioplegia	Blood cardioplegia
Mooss AN	2	CABG/Valve Replacement	Esmolol	Diltiazem
Mehlhorn U	2	CABG	Esmolol addition to warm blood cardioplegia	Buckberg cardioplegia
Chauhan S	2	Off-pump CABG	Esmolol	Diltiazem
Tempe D	2	CABG	Esmolol	Placebo
Mehlhorn U	2	CABG	Esmolol addition to normothermic blood cardioplegia	Bretschneider cardioplegia
Kuhn-Regnier F	2	CABG	Normothermic blood enriched with esmolol as myocardial protection	Buckberg cardioplegia
Cork RC	2	CABG	Esmolol	Placebo
Cork RC	2	CABG/Valve replacement	Esmolol	Placebo
Neustein SM	2	CABG	Esmolol	Placebo
Revas JG	2	CABG	Esmolol	Placebo
Harrison L	2	CABG	Esmolol	Placebo
De Bruijn NP	2	CABG	Esmolol	Placebo
Girare D	2	CABG	Esmolol	Placebo
Newsome LR	3	CABG	Esmolol	Placebo Usual antihypertensive medication



# Esmolol

- **Anestezi indüksiyonu**
- **CPB öncesi**
- **Kardiyopleji solüsyonu ile**
- **Ekstübasyon**

**Tek doz bolus 500 mcg/kg**

**İnfüzyon 100 - 300 mcg/kg**

**( kalp hızı takibi )**

**Table 3. Drug Dosage**

Authors	Esmolol Dosage	Control Drug Dosage
Boldt J	0.5-mg/kg bolus, 2.5 $\mu$ g/kg/min ci	Placebo
Scorsin M	250-300 mg infused in 2-3 minutes	Potassium, 0.2 g/mL, at a total dose of 1.2 g
Deng YK	1-mg/kg bolus, ci to have heart rate between 30 and 50 beats/min	Placebo
Balcetyte-Harris N	0.5 mg/kg bolus, 0.05 $\mu$ g/kg/min ci	Oral $\beta$ -blockers (metoprolol 50 mg/d)
Kurian SM	500- $\mu$ g/kg bolus, ci to have hr between 55-60 bpm	Placebo
Rinne T	15 mg/min in cardioplegic solutions	Placebo
Mooss AN	500- $\mu$ g/kg bolus, 25-50 $\mu$ g/kg/min ci	Diltiazem, 0.25 mg/kg then 5 mg/h
Mehlhorn U	100-mg bolus, 15 mg/min ci	Placebo
Chauhan S	500- $\mu$ g/kg bolus, 100 $\mu$ g/kg/h ci	Diltiazem, 0.15 mg/kg then 5 mg/h
Tempe D	500- $\mu$ g/kg bolus, 100 $\mu$ g/kg/min ci	Placebo
Mehlhorn U	100-mg bolus, 15 mg/min ci	Placebo
Kuhn-Regnier F	100-mg bolus, 15 mg/min ci	Placebo
Cork CR	2-mg/kg bolus, 300 $\mu$ g/kg/min ci	Placebo
Cork CR	2-mg/kg bolus, 300 $\mu$ g/kg/min ci	Placebo
Neustein SM	1-mg/kg bolus, 100 $\mu$ g/kg/min ci	Placebo
Reves JG	80-mg bolus, 12 mg/min ci	Placebo
Harrison L	500 $\mu$ g/kg/min (4 min), 300 $\mu$ g/kg/min ci	Placebo
De Brujin NP	500 $\mu$ g/kg/min ci	Placebo
Girare D	500 $\mu$ g/kg/min (2 min), 200 $\mu$ g/kg/min ci	Placebo
Newsome LR	500 $\mu$ g/kg/min (2 min), 200 $\mu$ g/kg/min ci	Placebo

Abbreviation: ci, continuous infusion.

# Esmolol perioperatif Miyokardiyal İskemi oranını önemli derecede azaltır

Review: Esmolol in cardiac surgery (June 2008)  
 Comparison: 01 Esmolol versus control in cardiac surgery  
 Outcome: 08 Myocardial ischemia

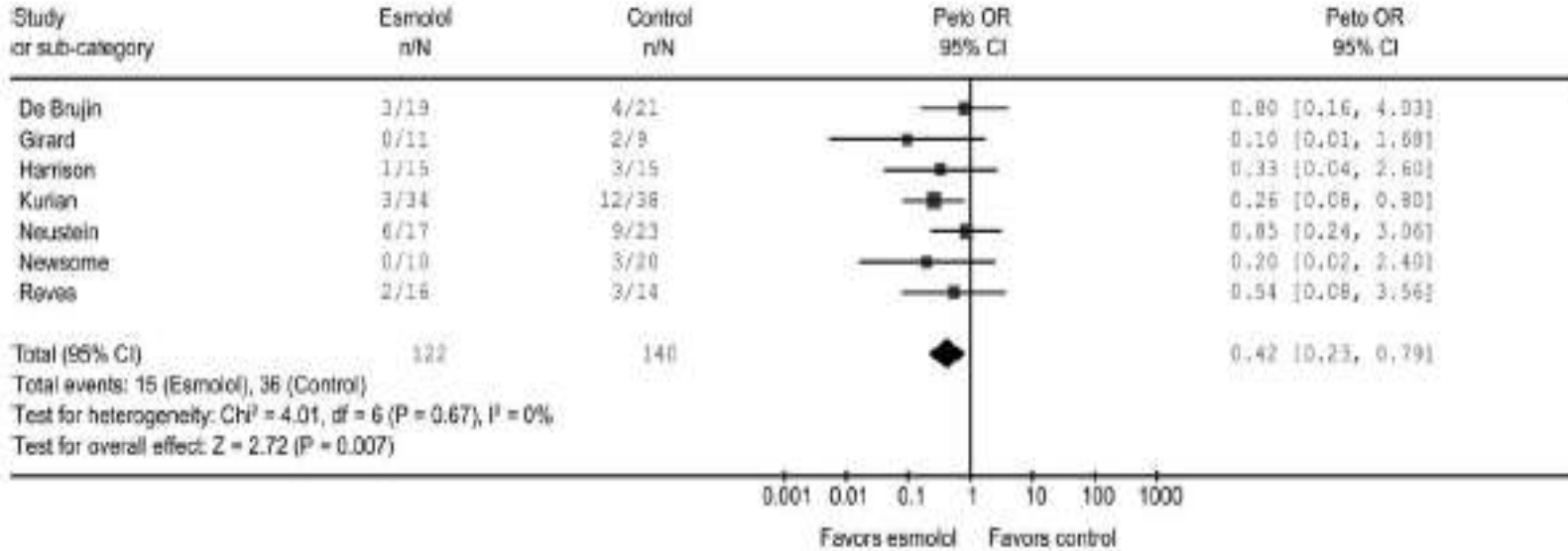


Fig 1. Pooled estimates of the risk for perioperative myocardial ischemia.

# Esmolol perioperatif dönemde inotropik ajan kullanımını azaltmaz

Review: Esmolol in cardiac surgery (June 2008)  
 Comparison: 01 Esmolol versus control in cardiac surgery  
 Outcome: 14 Any use of inotropic drugs

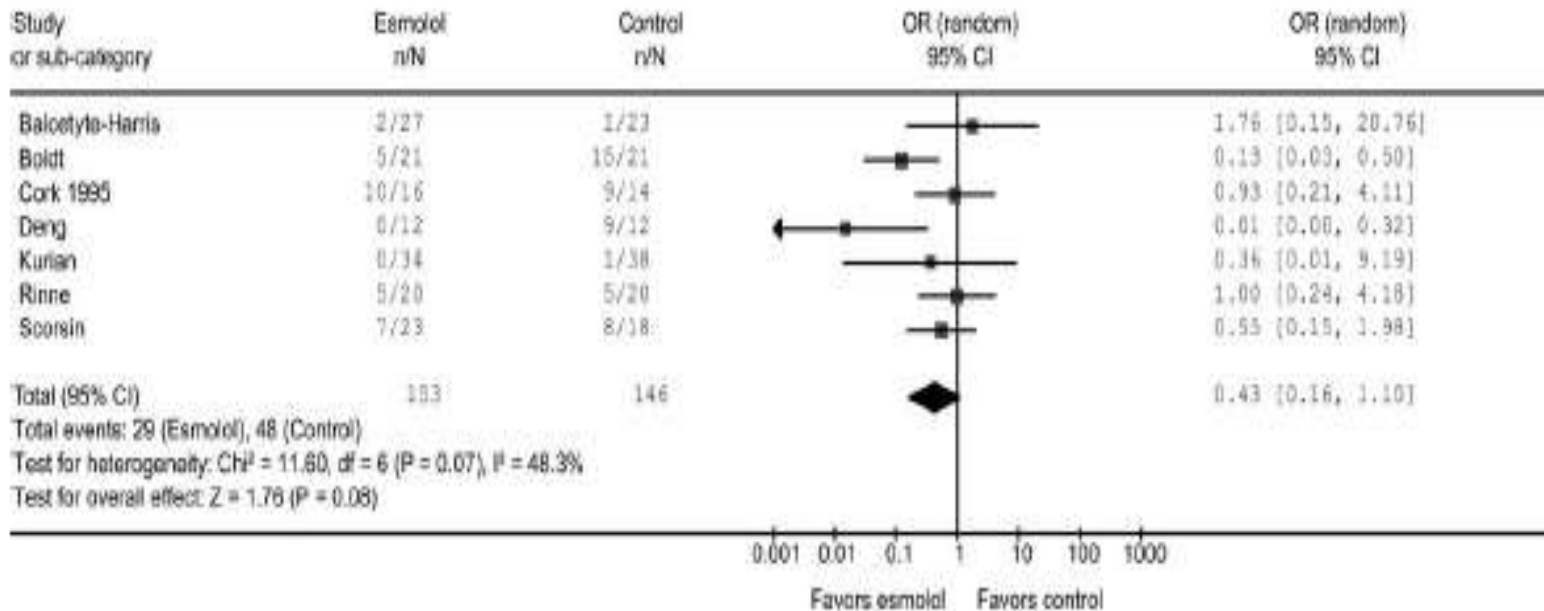


Fig 3. Pooled estimates of the use of perioperative inotropic drugs.

# Esmolol

- **Mortalite**
- **Miyokardiyal infarktüs**
- **İnme**

**önemli farklılık bulunamamıştır**

**(  $p=0.97$  ,  $p=0.77$  )**

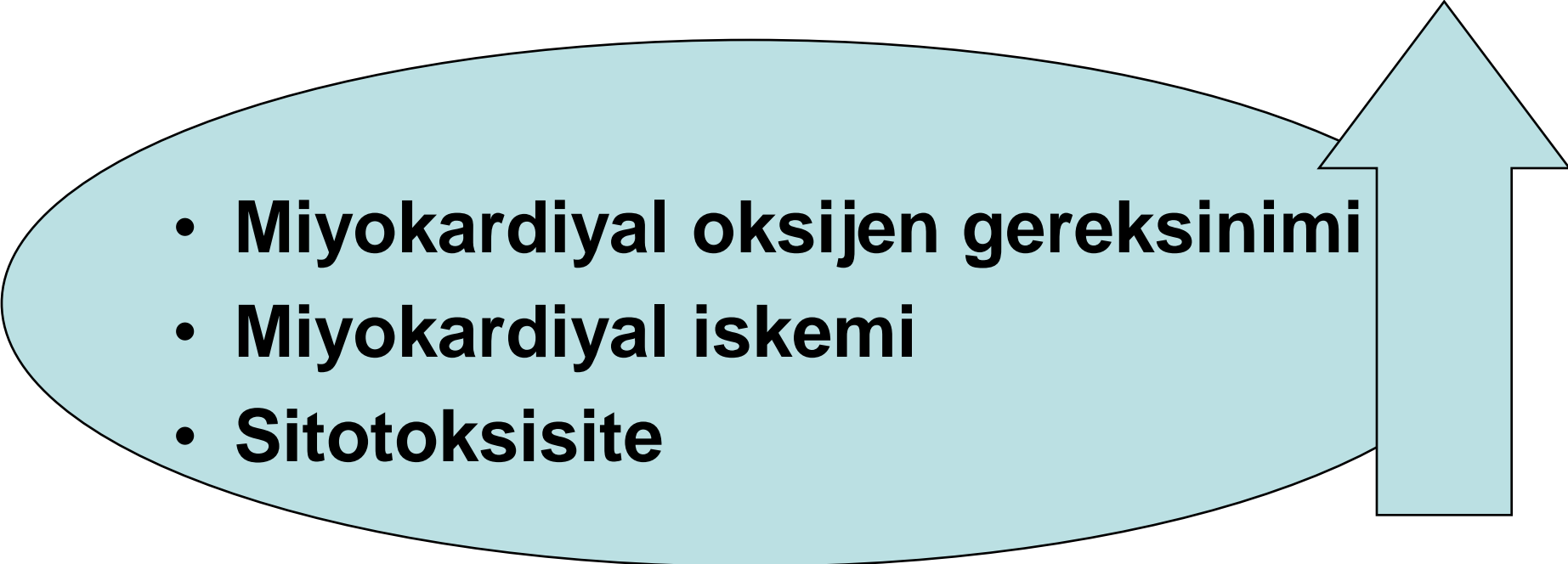
# Esmolol

## Yan etkiler

- **Hipotansiyon (p=0.10)**
- **Düşük kardiyak out-put sendromu (p=0.98)**
- **Bradikardi (p=0.0002)**  
**Atropin – PACE geri dönüşümlü**

# ARİTMI

- **Yüksek katekolamin konsantrasyonu**

- 
- **Miyokardiyal oksijen gereksinimi**
  - **Miyokardiyal iskemi**
  - **Sitotoksisite**

**Circulation 109:2469-2474; 2004**

# Esmolol

## CPB sonrası aritmi oluşumunu azaltır

Review: Esmolol in cardiac surgery (June 2008)  
Comparison: 01 Esmolol versus control in cardiac surgery  
Outcome: 02 Arrhythmias post-cardiopulmonary bypass

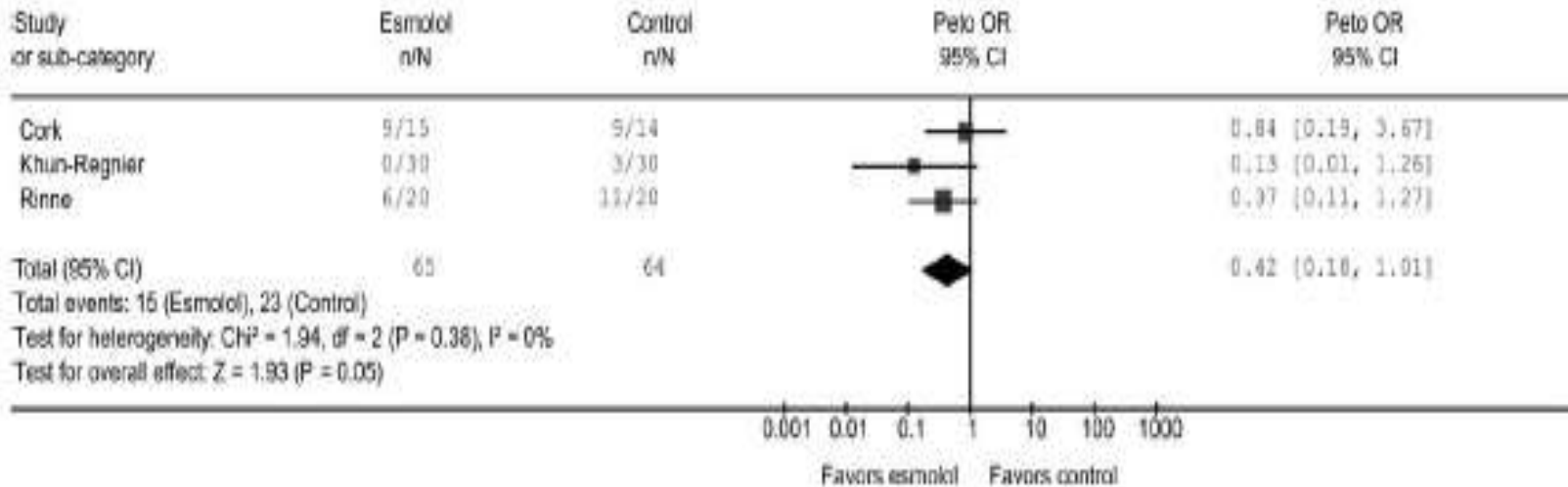


Fig 2. Pooled estimates of the incidence of arrhythmias after CPB.



**Minerva Anesthesiol. 2007 Jan-Feb;73(1-2):49-56.**

**Myocardial necrosis biomarkers after different cardiac surgical operations.**

**[Landoni G](#), [Pappalardo F](#), [Calabrò MG](#), [Boroli F](#), [Sottocorna O](#), [Aletti G](#), [Crescenzi G](#),  
[Zangrillo A](#).**

**Department of Cardiovascular Anesthesia, and Intensive Care, Vita-Salute University, IRCCS San Raffaele Hospital, Milan, Italy.**

**Anesth Analg. 2008 Apr;106(4):1039-48.**

**Does tight heart rate control improve beta-blocker efficacy? An updated analysis of the noncardiac surgical randomized trials.**

**[Beattie WS](#), [Wijeysundera DN](#), [Karkouti K](#), [McCluskey S](#), [Tait G](#).**

**Department of Anesthesia, Toronto General Hospital and University of Toronto, EN 3-450 200 Elizabeth St., Toronto, Ontario M5G 2C4, Canada. [scott.beattie@uhn.on.ca](mailto:scott.beattie@uhn.on.ca)**

**Comment in:**

**[Anesth Analg. 2008 Apr;106\(4\):1025-30.](#)**

**Taşikardi miyokardiyal iskemi oranını artırır**

# **Esmolol**

- **Hemodinamik stabilite**
- **Atrial fibrilasyon tedavisi**
- **Miyokardiyal koruma**

# Esmolol

- **ST segment deęişikliklerini düzenler**
- **Magnezyum ve Diltiazem oranla daha efektiftir**

Eur J Anaesthesiol. 2007 Oct;24(10):826-31.

The use of esmolol and magnesium to prevent haemodynamic responses to extubation after coronary artery grafting.

[Arar C](#), [Colak A](#), [Alagol A](#), [Uzer SS](#), [Ege T](#), [Turan N](#), [Duran E](#), [Pamukcu Z](#).

Trakya University Medical Faculty, Department of Anesthesiology, Edirne, Turkey.



Anaesthesia

Journal of the Association of Anaesthetists of Great Britain and Ireland

Anaesthesia, 2009, 64, pages 246–250

doi:10.1111/j.1365-2044.2008.05754.x

**The effect of esmolol on the QTc interval during induction of anaesthesia in patients with coronary artery disease**

F. Erdil,<sup>1</sup> S. Demirbilek,<sup>2</sup> Z. Begec,<sup>1</sup> E. Ozturk,<sup>1</sup> A. But<sup>2</sup> and M. Ozcan Ersoy<sup>3</sup>

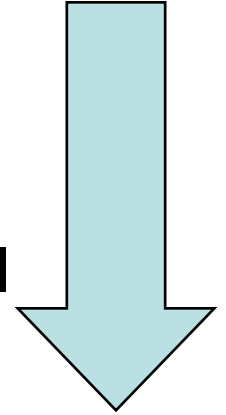
*1 Assistant Professor, 2 Associate Professor, 3 Professor, Department of Anaesthesiology and Reanimation, School of Medicine, Inonu University, Malatya, Turkey*

# Aortik klemp

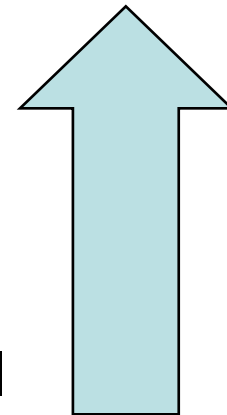
- Katekolamin düzeyi artar

## Esmolol

- İntraselüler lipaz aktivitesi
- Reperfüzyon sonrası yağ-asit hasarı
- Miyokardiyal metabolizma



- İskemik alan kan akımı
- Oksijen gereksinimi / kullanımı



*Journal of Cardiothoracic and Vascular Anesthesia, Vol 23, No 5 (October), 2009: pp 625-632*

**Esmolol**  
**Kardiyak cerrahide**  
**Aritmi ve İskemi**  
**oranını düşürür**

**Açık Kalp Cerrahisinde Kardiyoplejiye Eklenen Esmolol veya  
Glutamat-Aspartatın Miyokardiyal Koruma Üzerine Etkisi  
TARD 2006; 34(5):296-299**

**A. Heves Karagöz, Bilge Çelebioğlu, Ümit Duman\*, H. Oğuzalp,  
E. Arzu Köse, Meral Kanbak  
Hacettepe Üniversitesi Tıp Fakültesi, Anesteziyoloji ve  
Reanimasyon ve Kalp Damar Cerrahisi\* Anabilim Dalları,  
Ankara**

**ÖZET**

**Amaç:** Kardiyak cerrahi sırasında kullanılan esmololün miyokardı koruyucu etkisi gösterilmiştir. Bununla birlikte kan kardiyoplejisine glutamat-aspartat eklenmesinin miyokardiyal koruma üzerine etkisinden de söz edilmektedir. Biz bu çalışmada açık kalp cerrahisinde kan kardiyoplejisine eklenen esmolol ve glutamat-aspartatın miyokardı koruyucu etkisini karşılaştırmayı amaçladık.

**Gereç ve Yöntem:** Açık kalp cerrahisi planlanan ASA III 45 hasta çalışmaya dahil edildi. Hastalar kardiyoplejiye eklenen ve bolus olarak verilen Esmolol (Grup E), Glutamat-aspartat (Grup GA), Salin (Grup C) olarak rasgele 3 gruba ayrıldı. İndüksiyon sonrası (t1), cerrahi sonrası (t2) ve cerrahiden sonra 24. saatte, kardiyak output (CO), kardiyak index (CI), troponin T (TT) ve kreatinin kinaz MB (CK) değerleri kaydedildi.

**Bulgular:** Grup C'de inotropik ajan gereksinimi diğer gruplara göre daha çoktu. Grup C'deki CO değerleri düşerken, cerrahiden sonra Grup E'de CO değerleri yüksekti ( $p < 0.05$ ). Gruplar arasında CK değerleri bakımından bütün zamanlarda fark görülmezken, cerrahi sonrası bütün hastalarda CK-t3 ve TT-t3 değerleri yükseldi. Cerrahi süresince TT-t2 değerleri Grup C'de diğer gruplardan anlamlı olarak yüksekti.

**Sonuç:** Açık kalp cerrahisinde, kan kardiyoplejisine bolus olarak eklenen glutamat-aspartat ve esmolol miyokardiyal korumada avantaj sağlamaktadır.

**Anahtar kelimeler:** Glutamat, aspartat, esmolol, miyokardiyal koruma

## **Esmolol cardioplegia: the cellular mechanism of diastolic arrest**

**Hazem B. Fallouh<sup>1</sup>, Sonya C. Bardswell<sup>2</sup>, Linda M. McLatchie<sup>2</sup>, Michael J. Shattock<sup>2</sup>, David J. Chambers<sup>1</sup>, and Jonathan C. Kentish<sup>2\*</sup>**

<sup>1</sup>Cardiac Surgical Research, The Rayne Institute (King's College London), St Thomas' Hospital, London, UK; and <sup>2</sup>Cardiovascular Division, King's College London British Heart Foundation Centre, Rayne Institute, St Thomas' Hospital, London SE1 7EH, UK

- **Ca – Na kanal blokürü**
- **Membran potansiyelini istirahat değerlerinde korur ( -50 mV)**
- **Polarize arrest**
- **Minimal miyokardiyal kontraksiyon**
- **(-) inotropik etkisi geri dönüşlüdür**
- **Hiperkalemik kardiyoplejiye alternatif**

Esmolol before 80 min of cardiac arrest with oxygenated cold blood cardioplegia alleviates systolic dysfunction.  
An experimental study in pigs<sup>☆</sup>

Tord Fannelop<sup>a,c,\*</sup>, Geir Olav Dahle<sup>a</sup>, Knut Matre<sup>b</sup>, Christian Arvei Moen<sup>b</sup>,  
Arve Mongstad<sup>c</sup>, Finn Eliassen<sup>c</sup>, Leidulf Segadal<sup>a,c</sup>, Ketil Grong<sup>a</sup>

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<sup>b</sup>Institute of Medicine, University of Bergen, Haukeland University Hospital, N-5021 Bergen, Norway

<sup>c</sup>Section of Cardiothoracic Surgery, Department of Heart Disease, Haukeland University Hospital, N-5021 Bergen, Norway

- Yüksek katekolamin düzeyleri  
β-adrenerjik desensitizasyon yapar
- Oksijen metabolizmasını dengeler
- CPB sonrası ilk 3 saatte sistolik disfonksiyon geriler
- CI ve EF değişmez



## Acute beta-adrenoceptor blockade improves efficacy of ibutilide in conversion of atrial fibrillation with a rapid ventricular rate

Nikolaos Fragakis\*, Athanasios Bikias, Ioannis Delithanasis, Melania Konstantinidou, Nikolaos Liakopoulos, Miltiadis Kozirakis, and George Katsaris

2nd Cardiology Department, General Hospital G. Papanikolaou, Exochi, Thessaloniki, Greece

- 90 hasta AF
- Esmolol + Ibutilide  
0.5 mg/kg – 0.05 mg/kg/dk + 1 mg/2saat
- Ibutilide  
Na – K kanalları ile aksiyon potansiyeli süresini uzatır  
1 mg/kg/10 dk ( gerektiğinde tekrar)

## Acute beta-adrenoceptor blockade improves efficacy of ibutilide in conversion of atrial fibrillation with a rapid ventricular rate

Nikolaos Fragakis\*, Athanasios Bikias, Ioannis Delithanasis, Melania Konstantinidou, Nikolaos Liakopoulos, Miltiadis Kozirakis, and George Katsaris

\*2nd Cardiology Department, General Hospital G. Papanikolaou, Exochi, Thessaloniki, Greece

- Esmolol + IB SR %67
  - IB SR %46
  - Esmolol + IB - Tekrar AF
  - IB 2 Tekrar AF
  - Esmolol + IB 15.50 10 dk SR
  - IB 31.67 21dk SR
- Esmolol+IB AF döndürülmesinde efektif kombinasyon sağlar**

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**ORIGINAL ARTICLE**

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**PREOPERATIVE BETA-BLOCKER USE REDUCES ATRIAL FIBRILLATION IN OFF-PUMP CORONARY BYPASS SURGERY**

YILDIRIM IMREN,\* ARIEL A. BENSON,\* HAKAN ZOR,† IRFAN TASOGLU,† EMRAH EREREN,† VOLKAN SINCI,†  
LEVENT GOKGOZ† AND VELIT HALIT†

*\*Division of Cardiothoracic Surgery, Columbia University Medical Center – New York Presbyterian Hospital, New York, NY, USA; and †Cardiovascular Surgery Department, Gazi University Medical Faculty, Ankara, Turkey*

- **OPCABG % 8-37 AF**
- **78 hasta ( Grup 1 = 41 Grup 2 = 37)**
- **Preop 50 mg Metoprolol+Perop Esmolol**
- **Perop Esmolol**  
**50 – 300 mcg/kg/dk**  
**proksimal anastomoz**

## ORIGINAL ARTICLE

## PREOPERATIVE BETA-BLOCKER USE REDUCES ATRIAL FIBRILLATION IN OFF-PUMP CORONARY BYPASS SURGERY

YILDIRIM IMREN,\* ARIEL A. BENSON,\* HAKAN ZOR,† IRFAN TASOGLU,† EMRAH EREREN,† VOLKAN SINCI,†  
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- **Postop inotropik ajan % 11 – 14**

Table 3. Atrial fibrillation variables between groups

Event	Study	Control
AF (n)	3	8
AF (%)	8.8	21.6*
Intraoperative AF	0	2
AF duration (days)	2.3 ± 1.3	2.4 ± 1.2**

\* $P = 0.033$ , \*\* $P = 0.7$ , AF, atrial fibrillation.

- **Beta-adrenerjik blokaj tedavisi AF ve beraberindeki komplikasyonları önler**

J Thorac Cardiovasc Surg. 2008 Aug;136(2):321-8.

The safety, efficacy, and pharmacokinetics of esmolol for blood pressure control immediately after repair of coarctation of the aorta in infants and children: a multicenter, double-blind, randomized trial.

Tabbutt S, Nicolson SC, Adamson PC, Zhang X, Hoffman ML, Wells W, Backer CL, McGowan FX, Tweddell JS, Bokesch P, Schreiner M.

Cardiac Intensive Care Unit, Children's Hospital of Philadelphia, Philadelphia, PA 19104, USA.

Interact Cardiovasc Thorac Surg. 2003 Jun;2(2):111-5.

Comparison of sodium nitroprusside versus esmolol for the treatment of hypertension following repair of coarctation of the aorta.

Dittrich S, Germanakis J, Dittrich H, Daehnert I, Ewert P, Alexi-Meskishvili V, Vogel M, Lange PE.

Department of Congenital Heart Disease, Deutsches Herzzentrum Berlin, Berlin, Germany.

Pediatr Cardiol. 2006 Jul-Aug;27(4):420-7.

The pharmacokinetics of esmolol in pediatric subjects with supraventricular arrhythmias.  
Adamson PC, Rhodes LA, Saul JP, Dick M 2nd, Epstein MR, Moate P, Boston R, Schreiner MS.  
Division of Clinical Pharmacology and Therapeutics, The Children's Hospital of Philadelphia, ARC 916, 3615 Civic Center Blvd, Philadelphia, PA 19104, USA.

Pediatr Cardiol. 2006 Jul-Aug;27(4):460-4.

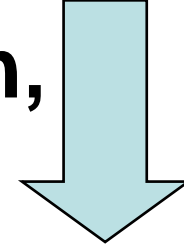
Esmolol-assisted balloon and stent angioplasty for aortic coarctation.

Sivaprakasam MC, Veldtman GR, Salmon AP, Cope R, Pierce T, Vettukattil JJ.

Department of Paediatric Cardiology, Wessex Cardiothoracic Centre, Southampton University Hospital, NHS Trust, Southampton, SO16 6YD, UK.

# Esmolol

- < 6 yaş, 2.5 < kg, N=118 125-500 mcg/kg/5dk
- SKB düşürmek amaçlı kullanımı emniyetlidir
- Renin, Angiotensin II, Epinefrin, Norepinefrin 1-17 saat
- Perkütan girişimlerde de emniyetle kullanılabilir
- Çocuklardaki SVT tedavisinde farmakokinetik etkisi adullere benzer



## Review Article

### $\beta$ -BLOCKERS IN SEPSIS: REEXAMINING THE EVIDENCE

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**ABSTRACT**—Sepsis remains the leading cause for noncardiac intensive care unit deaths in the United States. Despite recent advances in the treatment of this devastating condition, mortality and morbidity remain unacceptably high. Sepsis is characterized by a multitude of pathophysiological changes that include inflammation, metabolic derangements, hemodynamic alterations, and multiorgan dysfunction. Unfortunately, several studies of treatment modalities aimed at correcting one or more of the underlying derangements have led to disappointing results. New treatment modalities are needed.  $\beta$ -Receptor blockers have long been used for a variety of conditions such as coronary artery disease, congestive heart failure, and arterial hypertension. Recent data suggest that  $\beta$ -blocker effects on metabolism, glucose homeostasis, cytokine expression, and myocardial function may be beneficial in the setting of sepsis. Although treating a potentially hypotensive condition with a drug with antihypertensive properties may initially seem counterintuitive, the metabolic and immunomodulatory properties of  $\beta$ -blockers may be of benefit. It is the purpose of this review to discuss the effects of  $\beta$ -blockers on the following: (1) metabolism, (2) glucose regulation, (3) the inflammatory response, (4) cardiac function, and (5) mortality in sepsis.

**KEYWORDS**—Propranolol, esmolol, LPS, shock,  $\beta$ -adrenergic receptor, endotoxin, cytokines

# Esmolol

- **Glikoneogenezisi etkilemez**
- **Glikoz oksidasyonunu düşürür**
- **TNF yapımını azaltır**
- **KH ve CO azaltır**
- **Ekstremitte ve Hepatik kan akımını değiştirmez**
- **Sistemik hipoperfüzyon olmaksızın MI riskini azaltır**





# **Hypertensive Emergency in Aortic Dissection and Thoracic Aortic Aneurysm**

## **A review of Management**

**Prateek K. Gupta, Himani Gupta and Ali Khoynzhad**

**Division of Cardiothoracic and Vascular Surgery, Creighton University Medical Center, Omaha, NE 68131, USA**

**Pharmaceuticals 2:66-76;2009**

- **Ölüm 7.1 milyon / yıl**
- **SKB ve DKB artışı, Organ hasarı**
- **Hipertansif kriz %1**
- **İdeal ajan**
  - **Renal kan akımı**
  - **Glomerüler filtrasyon hızı**
  - **İlaç etkileşimi, Komorbit etki**
  - **Hızlı etki, Kolay titrasyon**

# **Akut Aort Disseksiyonunda Tedavi**

- **Anamnez**
- **IV yol ( 2adet kalın )**
- **Oksijen maskesi**
- **Monitörizasyon ( EKG, AG, İdrar sondası )**
- **CBC, Biyokimya, Koagülasyon parametreleri, CK, Troponin, d-dimer**
- **10 ünite KAN**
- **Arter kanülasyonu**
- **CTA, TEEcho, MRA, IV Ultrasonografi, Aortagrafi**

# **Akut Aort Disseksiyonunda Tedavi**

## **Medikal tedavi**

- **Beta-blokür**

**Labetalol ( 15 mg bolus + 5 mg/saat )**

**Nikardipin ( 5 mg/saat )**

**Esmolol 0.5 mg/kg bolus + 10-20 mcg/kg/dk**

**Diltiazem 0.25 mg/kg bolus + 5 mg/saat**

- **KH 60 atım/dk**

- **SKB 100 mmHg**

- **Morfin**

- **Entübasyon, Mekanik ventilasyon, IV mai desteği, Cerrahi**

# Hypertensive Emergency in Aortic Dissection and Thoracic Aortic Aneurysm

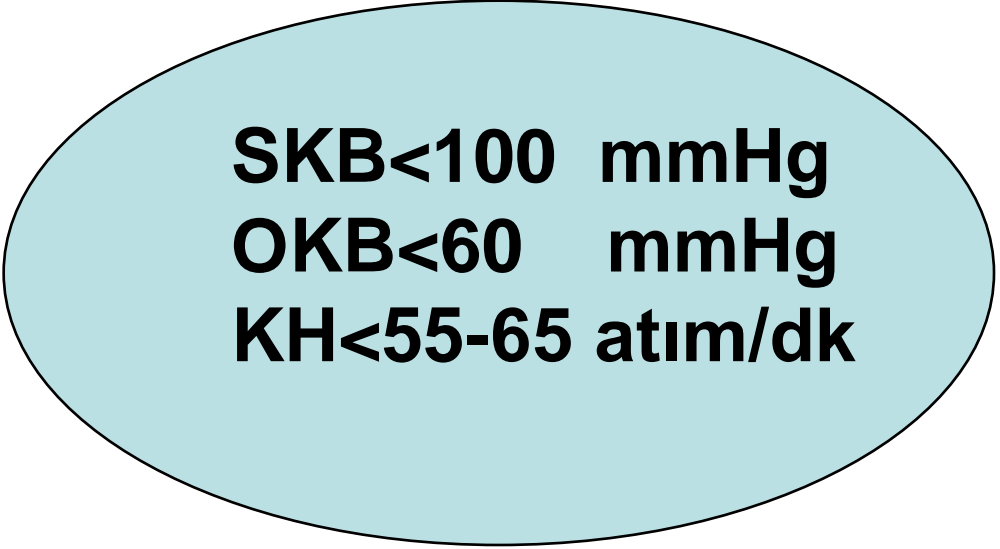
## A review of Management

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Pharmaceuticals 2:66-76;2009

- **Nitroprussid**
- **Nitrogliserin**
- **Nikardipin**
- **Klevidipin**
- **Fenoldopam**
- **Beta-blokürler**
  - **ESMOLOL**



**SKB < 100 mmHg**  
**OKB < 60 mmHg**  
**KH < 55-65 atım/dk**

**50-100 mcg/kg bolus 50 mcg/kg/dk infüzyon**

**Am J Emerg Med. 2009 Mar;27(3):373.**

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**University Hospital of Wales, Cardiff, United Kingdom. Am J Cardiol.**

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**Cardiology Department, University Hospital of Heraklion, Crete, Greece.**

**Drugs Aging. 2006;23(8):673-80.**

**Intravenous esmolol is well tolerated in elderly patients with heart failure in the early phase of non-ST elevation myocardial infarction.**

**Koutouzis M, Nikolidakis S, Grigoriadis A, Koutsogeorgis D, Kyriakides**

**Second Department of Cardiology, Red Cross General Hospital, Athens, Greece.**

# Esmolol

- **Akut koroner sendrom-kardiyojenik şok hallerinde Sol ventrikül çıkışındaki obstrüksiyonu ve mitral regürjitasyonu geriletir**
- **İdyopatik dilate kardiyomiyopati mikrovasküler fonksiyonları ve koroner kan akımını artırır prognoz iyileşir**
- **> 75 > yaş, non-ST MI, CI, PCWP farksızdır yaşlı hastalar iyi tolerasyon gösterir**

# **Kısa etkili Beta-blokürler**

- **Miyokardiyal oksijen ihtiyacı azalır**
- **Kalbin iş yükü azalır**
- **Uzayan Diastol süresi ile Subendokardiyal perfüzyon artar**
- **Kardiyak kontraktilite artar**
- **Aritmi potansiyeli geriler**
- **Miyokardiyal iskemi azalır**
- **Mortalite azalır**



# SONUÇ

**Yeni ve cevapsız sorular karşısında elimizdeki bilgiler değerlendirilerek yapılacak yeni araştırmalarla komplike bir bilmece çözer gibi konulara zamanla ışık tutulacaktır.**