Возможность применения Бревиблока в рутинной практике.

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Нормальная физиология

β_3 — находятся в жировой ткани. Стимуляция этих рецепторов усиливает липолиз и приводит к выделению энергии, а также к повышению теплопродукции.

Нормальная физиология

β_2 — локализуются в бронхиолах, стимуляция вызывает расширение бронхиол и снятие бронхоспазма. Эти же рецепторы находятся на клетках печени, воздействие на них гормона вызывает гликогенолиз и выход глюкозы в кровь.

Нормальная физиология

β_1 — локализуются в сердце, стимуляция приводит к увеличению частоты (положительный хронотропный эффект) и силы сердечных сокращений, (положительный инотропный эффект) кроме того, приводит к повышению потребности миокарда в кислороде и повышению артериального давления. Также локализуются в почках, являясь рецепторами юкстагломерулярного аппарата, агонисты увеличивают выделение ренина.

Бета 1 блокаторы

Уменьшают частоту (отрицательный хронотропный эффект) и силу сердечных сокращений, (отрицательный инотропный эффект). Снижают потребность миокарда в кислороде и артериальное давление. Уменьшают концентрацию ренина в крови.

Бревиблок *(эсмолол)*

Кардиоселективный бета1-адреноблокатор.

При в/в введении связывается с белками на 55%, в эритроцитах быстро гидролизуется эстеразами до свободного кислого метаболита (активность составляет 1/1500 от таковой эсмолола) и метанола. T1/2 — 9 мин

Показания

Некомпенсаторная синусовая тахикардия,
суправентрикулярная тахикардия и
тахиаритмия (включая фибрилляцию и
трепетание предсердий),
инфаркт миокарда,
нестабильная стенокардия,
тиреотоксический криз,
феохромоцитома (с альфаадреноблокаторами),
артериальная гипертензия.

Противопоказания

**Гиперчувствительность,
синусовая брадикардия (менее 45 уд./мин),
кардиогенный шок,
AV блокада II–III степени,
выраженная сердечная недостаточность,
синдром слабости синусного узла,
синоатриальная блокада,
артериальная гипотензия (сАД ниже 90 мм рт. ст., дАД ниже 50 мм рт. ст.),
кровотечение, гиповолемия.**

Ограничения к применению

Бронхиальная астма,
эмфизема,
хронический обструктивный бронхит,
застойная сердечная недостаточность,
сахарный диабет,
нарушение функции почек,
беременность, кормление грудью,
детский и пожилой возраст.

Официальные схемы титрования

С «пошаговыми» нагрузочными дозами

Время (мин)	В/в болюс (мкг/кг/мин)	В/в инфузия (мкг/кг/мин)
0 – 1 мин	500	
2-5 мин		50
6 мин	500	
7-10 мин		100
11 мин	500	
12-15 мин		150
16 мин	500	
17 мин- далее		200

Без «пошаговых» нагрузочных доз

Время (мин)	В/в болюс (мкг/кг)	В/в инфузия (мкг/кг/мин)
0 – 0,5	80	
1-5		150
6 - 9		200
10 - 13		250
14 - 17		300

Побочные действия

Гипотензия
Брадикардия

Реальные схемы титрования

Тахикардия более 130 уд/мин

Время (мин)	Болюс (мг)
Болюс	10
2-3 мин	
Болюс	10
1-2 мин	
Болюс	20
1-2 мин	
Инфузия	0,05 мг/кг/мин

Тахикардия менее 130 уд/мин

Время (мин)	Болюс (мг)
Болюс	2
2 мин	
Болюс	4
1-2 мин	
Болюс	8
1-2 мин	
Болюс	16
Инфузия	0,025 мг/кг/мин

Фармакология

Диалог:

Вы бревиблок делали?

Да. Два раза. Но он не работает!

Как так?

Через 5 мин. все опять начинается!

Если бревиблок работает и нет побочных явлений начинайте инфузию до достижения необходимого эффекта!

Практическое применение

Алгоритм лечения тахикардии (с пульсом)

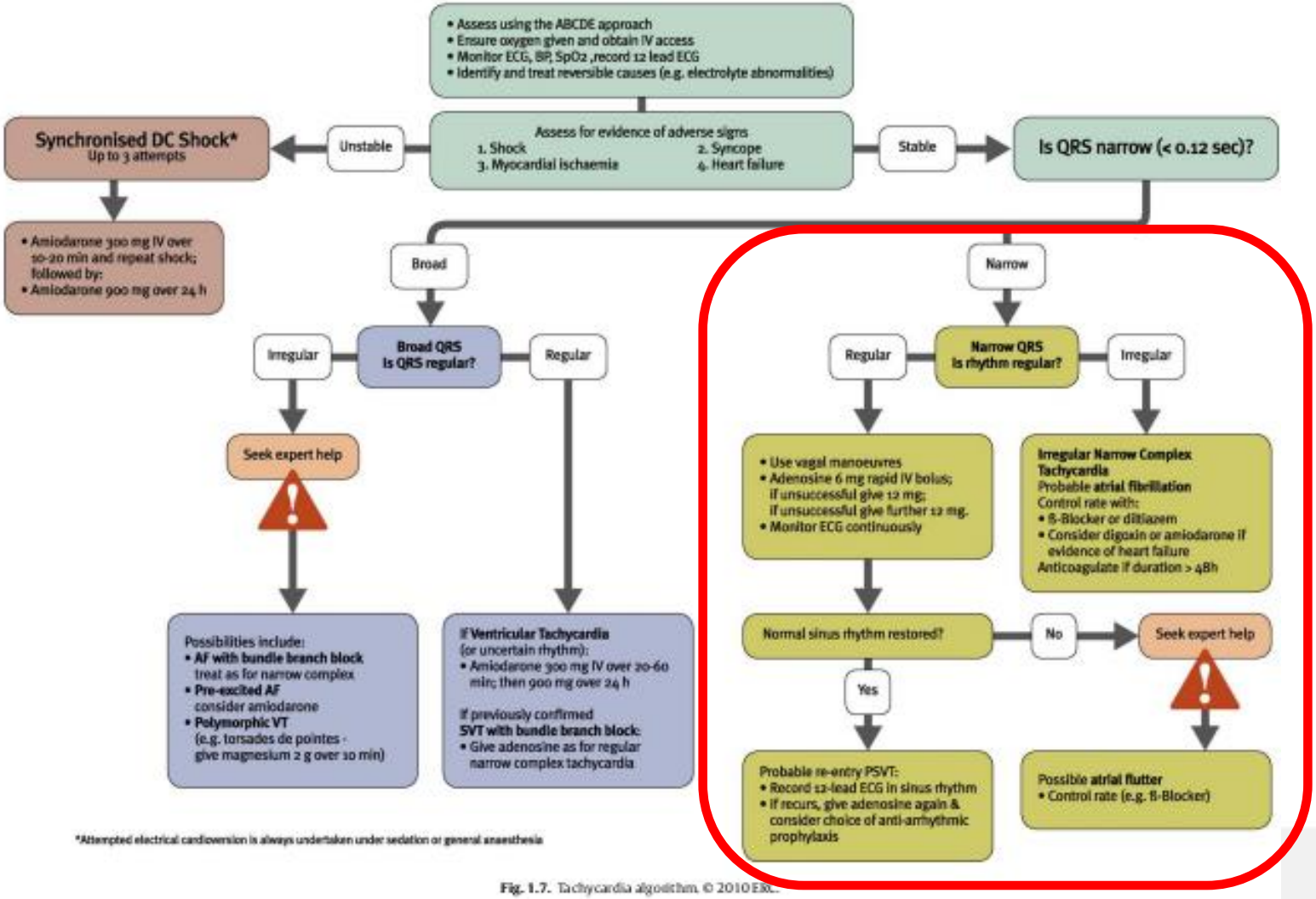


Fig. 1.7. Tachycardia algorithm. © 2010 ERC.

Практическое применение

Узкий QRS (<0,12 сек)

РЕГУЛЯРНЫЙ РИТМ

Применить
Вагус – маневр
Аденозин
6мг; 12мг; 12мг
Мониторинг ЭКГ

Нормальный синусовый ритм

НЕТ

ПОМОЩЬ СПЕЦИАЛИСТА!

Возможно трепетание предсердий.
Контроль ЧСС:
β-блокаторы

ДА

Возможно – пароксизмальная наджелудочковая тахикардия
ЭКГ в 12 отведениях при нормальном синусовом ритме
При повторном возникновении – аденозин и подбор антиаритмической терапии

НЕРЕГУЛЯРНЫЙ РИТМ

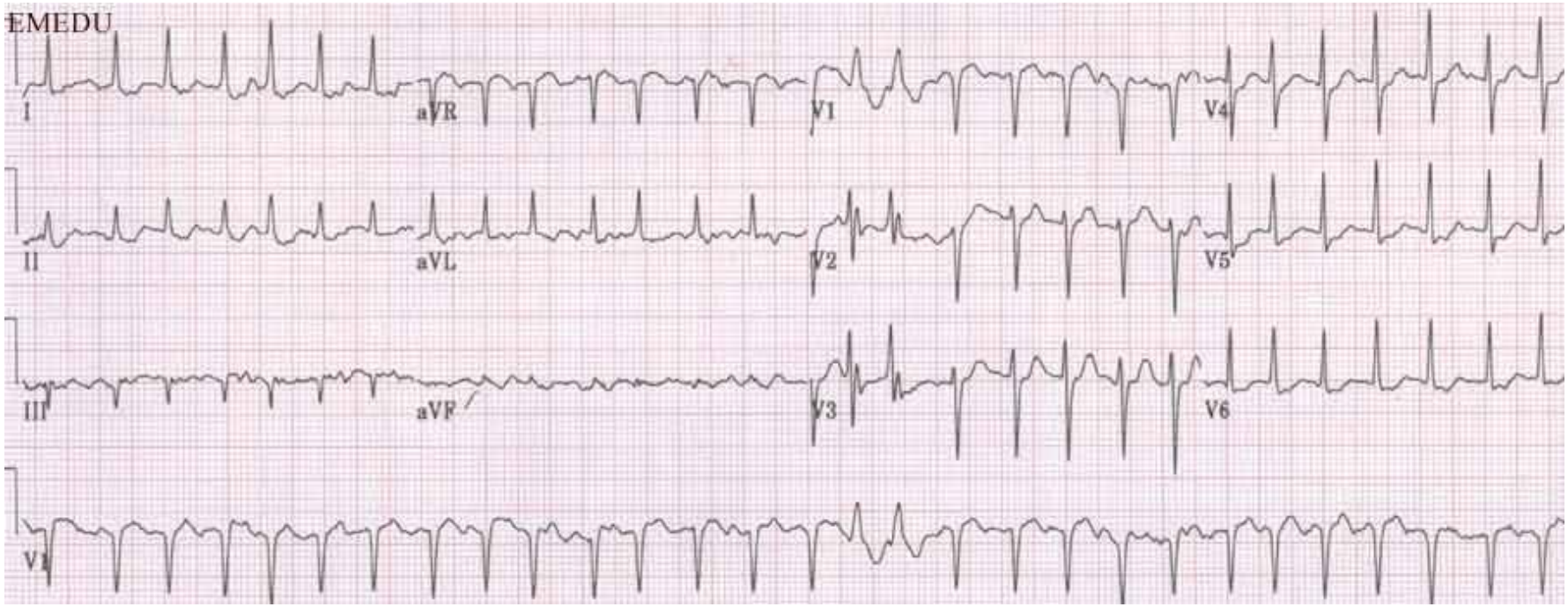
Возможно фибрилляция предсердий.
Контроль ЧСС: β-блокаторы или дилтиазем.
Если есть признаки сердечной недостаточности: дигоксин или амиодарон.
Антикоагулянты при длительности >48 ч

Практическое применение

При случайной передозировке кардиотоников

Практическое применение

В случае гипотонии на фоне выраженной тахикардии



Практическое применение

При Сепсисе

Zhonghua Wei Zhong Bing Ji Jiu Yi Xue. 2015 Sep;27(9):759-63.

[Esmolol improves clinical outcome and tissue oxygen metabolism in patients with septic shock through controlling heart rate].

[Article in Chinese]
Xingiang L, Weiping H, Miaoyun W, Wenxin Z, Wengiang J, Shenglong C, Juhao Z, Hongki Z.

Abstract

OBJECTIVE: To investigate whether esmolol could improve clinical outcome and tissue oxygen metabolism by controlling heart rate (HR) in patients with septic shock.

METHODS: A single-center double-blinded randomized controlled trial was conducted. The patients suffering from septic shock received 6-hour early goal directed herapy (EGDT) with pulmonary artery wedge pressure ≥ 12 mmHg (1 mmHg = 0.133 kPa) or central venous pressure CVP) ≥ 12 mmHg requiring norepinephrine to maintain mean arterial pressure (MAP) ≥ 65 mmHg and HR ≥ 95 bpm admitted to intensive care unit (ICU) of Guangdong General Hospital from September 2013 to September 2014 were enrolled. They were randomly divided into esmolol group and control group by computer-based random number generator. All patients received conventional basic treatment, while those in the esmolol group received in addition persistent esmolol infusion by micro pump with dosage of 0.05 mg · kg(-1) · min(-1) with the dosage adjusted to maintain HR lower than 100 bpm within 24 hours. The patients in control group did not receive drug intervention for HR. The primary end-points consisted of length of stay in ICU and 28-day mortality. The secondary end-points included hemodynamic parameters [HR, MAP, CVP, cardiac index (CI), stroke volume index (SVI), systemic vascular resistance index (SVRI)] and tissue oxygen metabolism parameters [central venous oxygen saturation (ScvO2), lactate level (Lac)] before and 24, 48, 72 hours after the treatment.

RESULTS: A total of 48 patients with septic shock were enrolled with 24 patients in esmolol group and 24 in control group. (1) The primary end-points: compared with control group, the length of stay in the ICU in the esmolol group was significantly shortened (days: 13.75 ± 8.68 vs. 21.70 ± 6.06, t = 3.680, P = 0.001), and 28-day mortality was significantly lowered [25.0% (6/24) vs. 62.5% (15/24), $\chi 2$ = 6.857, P = 0.009]. (2) The secondary end-points: there were no significant difference in the hemodynamic and tissue metabolism parameters before treatment between two groups. No significant difference was found between before and after treatment of all above parameters in control group. HR and Lac in the esmolol group were obviously declined, SVI, SVRI, SCvO2 were gradually increased, but no significant difference in MAP, CVP, and CI was found. Compared with the control group, HR in the esomolol group was significantly lowered (bpm: 84.4 ± 3.5 vs. 111.2 ± 7.2, P < 0.01), SVRI and ScvO2 were significantly increased from 24 hours [SVRI (kPa · s · L(-1) ·m(-2)): 137.9 ± 1.6 vs. 126.9 ± 1.3, ScvO2: 0.652 ± 0.017 vs. 0.620 ± 0.017, both P < 0.01]; SVI was significantly increased (mL/m2: 39.9 ± 2.2 vs. 36.8 ± 1.7, P < 0.01) and Lac level significantly declined from 48 hours (mmol/L: 2.8 ± 0.3 vs. 3.4 ± 0.3, P < 0.01).

CONCLUSION: The results demonstrate that HR controlled by a titrated esmolol infusion given to septic shock patients was associated with an improvement in tissue metabolism, reduction in the length of ICU stay and lowering of 28-day mortality.

Практическое применение

Как адьювант для обезболивания

J Anesth. 2015 Dec;29(6):934-43. doi: 10.1007/s00540-015-2041-9. Epub 2015 Jul 10.

Beta-adrenergic antagonists during general anesthesia reduced postoperative pain: a systematic review and a meta-analysis of randomized controlled trials.

Härkänen L[1,2], Halonen J[2], Selander T[3], Kokki H[4].

⊕ Author information

Abstract

We have performed a systematic literature review and a meta-analysis investigating the effect of beta-adrenergic antagonist on perioperative pain in randomized clinical trials (RCTs). The search included the CENTRAL, CINAHL, EMBASE, and MEDLINE databases (from inception to 10 February 2015). From the retrieved full texts, we hand-searched the references and PubMed related citations. A total of 11 RCTs consisting data of 701 adult patients were eligible for this systematic review. Esmolol was evaluated in ten trials and propranolol in one. Esmolol decreased the need for rescue analgesics by 32-50%; $p < 0.05$ ($n = 7$) and the proportion of patients needing rescue analgesia from 100 to 65%; $p < 0.005$ ($n = 1$), and propranolol decreased the need for rescue analgesics by 72%; $p < 0.001$ ($n = 1$). The time to the first rescue analgesics was longer ($p < 0.05$) and pain ratings were lower ($p < 0.05$) in patients with beta-adrenergic antagonists. However, in two opioid-controlled studies, one in knee arthroscopy and another in tubal ligation patients, the proportion of patients needing rescue analgesia was two-times higher in esmolol-treated patients: 52-57 vs. 23-34%, $p < 0.05$. Adverse effects were rarely reported, and as reported were mostly cardiovascular alterations. In conclusion, intra-operative beta-adrenergic antagonists' administration may decrease postoperative pain and analgesic consumption when given as an adjuvant to general anesthesia.

KEYWORDS: Adrenergic beta-antagonists; Analgesia; Analgesics; Esmolol; Operative; Pain; Propranolol; Surgical procedures

Практическое применение

Для профилактики ответа на интубацию

Rev Bras Anestesiol. 2014 Nov-Dec;64(6):425-32. doi: 10.1016/j.bjan.2013.09.008. Epub 2014 Aug 29.

[The effect of different doses of esmolol on hemodynamic, bispectral index and movement response during orotracheal intubation: prospective, randomized, double-blind study].

[Article in Portuguese]

Cakırgöz MY[1], Taşdöğen A[2], Olguner C[2], Korkmaz H[2], Oğün E[2], Küçükebe B[2], Duran E[2].

⊕ **Author information**

Abstract

OBJECTIVE: A prospective, randomized and double-blind study was planned to identify the optimum dose of esmolol infusion to suppress the increase in bispectral index values and the movement and hemodynamic responses to tracheal intubation.

MATERIALS AND METHODS: 120 patients were randomly allocated to one of three groups in a double-blind fashion. 2.5mgkg(-1) propofol was administered for anesthesia induction. After loss of consciousness, and before administration of 0.6mgkg(-1) rocuronium, a tourniquet was applied to one arm and inflated to 50mmHg greater than systolic pressure. The patients were divided into 3 groups; 1mgkg(-1)h(-1) esmolol was given as the loading dose and in Group Es50 50μgkg(-1)min(-1), in Group Es150 150μgkg(-1)min(-1), and in Group Es250 250μgkg(-1)min(-1) esmolol infusion was started. Five minutes after the esmolol has been begun, the trachea was intubated; gross movement within the first minute after orotracheal intubation was recorded.

RESULTS: Incidence of movement response and the ΔBIS max values were comparable in Group Es250 and Group Es150, but these values were significantly higher in Group Es50 than in the other two groups. In all three groups in the 1st minute after tracheal intubation heart rate and mean arterial pressure were significantly higher compared to values from before intubation ($p<0.05$). In the study period there was no significant difference between the groups in terms of heart rate and mean arterial pressure.

CONCLUSION: In clinical practise we believe that after 1mgkg(-1) loading dose, 150μgkg(-1)min(-1) iv esmolol dose is sufficient to suppress responses to tracheal intubation without increasing side effects.

KEYWORDS: Bispectral index; Depth of anesthesia; Esmolol; Intubation; Intubação; Profundidade da anestesia; Propofol; Índice bispectral

Практическое применение

Для кардиопротекции

Paediatr Anaesth. 2013 Mar;23(3):217-21. doi: 10.1111/pan.12117.

Protective effect of esmolol on myocardial ischemic injury during open heart surgery in children.

Gui P[1], Wu Q, Wu J, Yao S.

⊕ Author information

Abstract

OBJECTIVES: To investigate the efficacy of esmolol in protecting the myocardium from ischemia during pediatric cardiac surgery.

BACKGROUND: Esmolol, an ultra-short acting beta 1-adrenoceptor blocker, reduces myocardial injury in adult cardiac operations. However, this technique is rarely used in pediatric cardiac surgery.

METHODS: Thirty children with ventricular septal defect were randomly allocated to the esmolol group and the control group. Patients received intravenous esmolol (0.05 mg·kg(-1) ·min(-1) after tracheal intubation, 0.3 mg·kg(-1) ·min(-1) during cardiopulmonary bypass (CPB) and 0.03-0.05 mg·kg(-1) ·min(-1) until the end of surgery) or placebo, respectively.

RESULTS: Plasma levels of creatine kinase-MB, cardiac troponin I in the esmolol group 2 min after completion of CPB, at the end of surgery, 4 h after surgery, and the first postoperative day were significantly lower than those in the control group. Values of heart rate 10 min after induction, 2 min before institution of CPB, 2 min after completion of CPB, and at the end of surgery were significantly lower in the esmolol group; however, mean arterial pressure, CPB time, cross-clamp time, and the rate of heart spontaneous rebeating were not statistically different between two groups. Cumulative postoperative dosage of dopamine in the esmolol group (100.1 ± 53.1 mg) was significantly less than that in the control group (171.4 ± 92.1 mg).

CONCLUSIONS: Esmolol can protect the myocardium from ischemic injury during CPB in children and significantly reduce the use of inotropic drug.

Практическое применение

Для кардиопротекции

J Cardiothorac Vasc Anesth. 2009 Oct;23(5):625-32. doi: 10.1053/j.jvca.2009.01.003. Epub 2009 Mar 18.

Esmolol reduces perioperative ischemia in cardiac surgery: a meta-analysis of randomized controlled studies.

Zangrillo A[1], Turi S, Crescenzi G, Oriani A, Distaso F, Monaco F, Bignami E, Landoni G.

⊕ **Author information**

Abstract

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 outcomes. 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.

Заключение

Таким образом, Эсмолол при грамотном применении позволяет лечить и профилактировать грозные нарушения параметров гемодинамики за счет прецизионного контроля за ЧСС.

Препарат из разряда Must Have в отделениях анестезиологии-реанимации.

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