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补充左卡尼汀可预防主动脉瓣手术术后心房颤动

L-Carnitine supplementation for the prevention of postoperative atrial fibrillation in aortic valve surgery

医学及信息部　　信息事务组

2021-05-27

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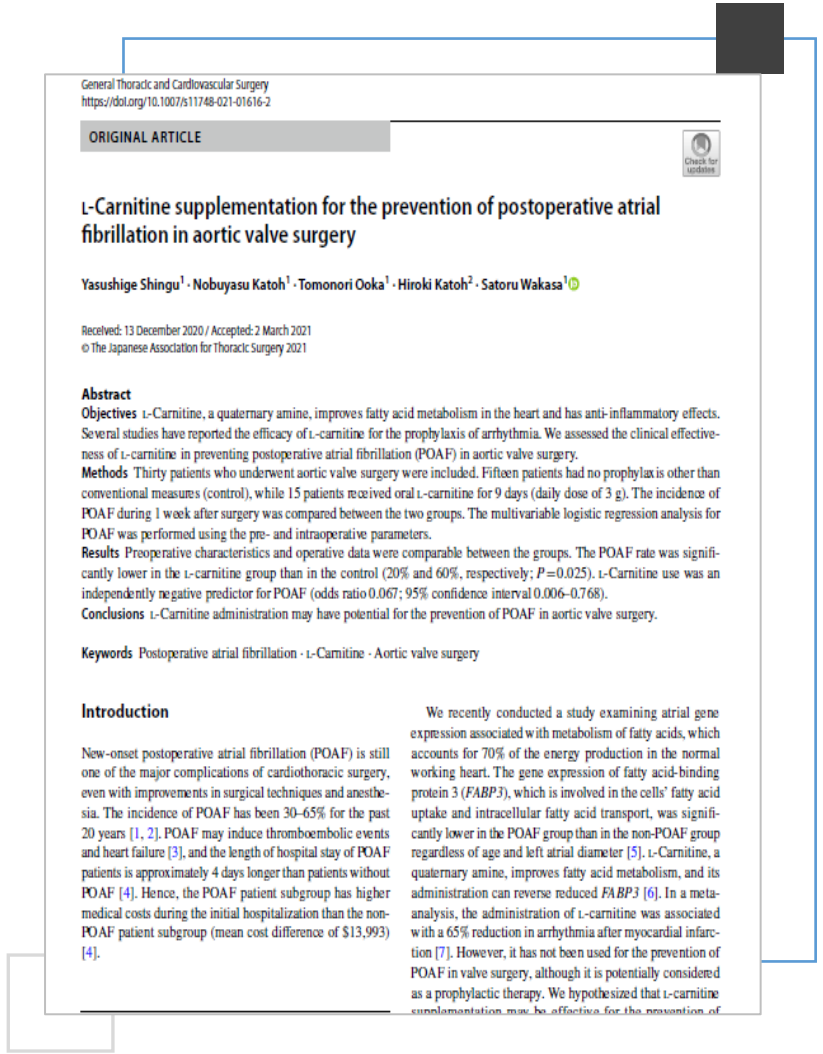

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ORIGINAL ARTICLE

L-Carnitine supplementation for the prevention of postoperative atrial fibrillation in aortic valve surgery

Yasushige Shingu[1] · Nobuyasu Katoh[1] · Tomonori Ooka[1] · Hiroki Katoh[2] · Satoru Wakasa[1]

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Abstract

Objectives L-Carnitine, a quaternary amine, improves fatty acid metabolism in the heart and has anti-inflammatory effects. Several studies have reported the efficacy of L-carnitine for the prophylaxis of arrhythmia. We assessed the clinical effectiveness of L-carnitine in preventing postoperative atrial fibrillation (POAF) in aortic valve surgery.

Methods Thirty patients who underwent aortic valve surgery were included. Fifteen patients had no prophylaxis other than conventional measures (control), while 15 patients received oral L-carnitine for 9 days (daily dose of 3 g). The incidence of POAF during 1 week after surgery was compared between the two groups. The multivariable logistic regression analysis for POAF was performed using the pre- and intraoperative parameters.

Results Preoperative characteristics and operative data were comparable between the groups. The POAF rate was significantly lower in the L-carnitine group than in the control (20% and 60%, respectively; $P = 0.025$). L-Carnitine use was an independently negative predictor for POAF (odds ratio 0.067; 95% confidence interval 0.006–0.768).

Conclusions L-Carnitine administration may have potential for the prevention of POAF in aortic valve surgery.

Keywords Postoperative atrial fibrillation · L-Carnitine · Aortic valve surgery

Introduction

New-onset postoperative atrial fibrillation (POAF) is still one of the major complications of cardiothoracic surgery, even with improvements in surgical techniques and anesthesia. The incidence of POAF has been 30–65% for the past 20 years [1, 2]. POAF may induce thromboembolic events and heart failure [3], and the length of hospital stay of POAF patients is approximately 4 days longer than patients without POAF [4]. Hence, the POAF patient subgroup has higher medical costs during the initial hospitalization than the non-POAF patient subgroup (mean cost difference of $13,993) [4].

We recently conducted a study examining atrial gene expression associated with metabolism of fatty acids, which accounts for 70% of the energy production in the normal working heart. The gene expression of fatty acid-binding protein 3 (*FABP3*), which is involved in the cells' fatty acid uptake and intracellular fatty acid transport, was significantly lower in the POAF group than in the non-POAF group regardless of age and left atrial diameter [5]. L-Carnitine, a quaternary amine, improves fatty acid metabolism, and its administration can reverse reduced *FABP3* [6]. In a meta-analysis, the administration of L-carnitine was associated with a 65% reduction in arrhythmia after myocardial infarction [7]. However, it has not been used for the prevention of POAF in valve surgery, although it is potentially considered as a prophylactic therapy. We hypothesized that L-carnitine supplementation may be effective for the prevention of

补充左卡尼汀可预防主动脉瓣手术术后心房颤动

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内容提要

目的

- ✓ 本研究的目的是评价左卡尼汀预防主动脉瓣术后心房颤动(POAF)的临床疗效;

方法

- ✓ 共30例接受主动脉瓣手术的患者，分为2组，对照组（15例患者除常规治疗外无其他预防措施）和左卡尼汀组（15例患者口服左卡尼汀9天，每日3 g）；

评估指标

- ✓ 比较两组术后1周主动脉瓣术后心房颤动（POAF）发生率;

结果

- ✓ 左卡尼汀组POAF发生率显著低于对照组(分别为20%和60%; P=0.025);
- ✓ 补充左卡尼汀是POAF的独立预测因子(优势比0.067; 95%置信区间 0.006-0.768)

结论

- ✓ 左卡尼汀可预防主动脉瓣术后心房颤动（POAF）的发生

02

文献重点内容

- 术后新发房颤(POAF)是心胸外科的主要并发症之一
- 左卡尼汀与心脏脂肪酸代谢的关系
- 补充左卡尼汀可预防主动脉瓣术后心房颤动的发生

01

术后新发房颤(POAF)是心胸外科的主要并发症之一

- POAF的发病率为30-65%
- POAF可引起血栓栓塞事件和心衰
- POAF患者医疗费用更高

02

左卡尼汀与心脏脂肪酸代谢的关系

- 脂肪酸占正常工作心脏能量生产的70%
- 脂肪酸结合蛋白3 (FABP3)基因表达在POAF组显著低于非POAF组
- 补充左卡尼汀可以逆转逆转FABP3的减少，改善心脏脂肪酸代谢

03

左卡尼汀可预防主动脉瓣术后心房颤动（POAF）的发生

- 补充左卡尼汀可以降低心肌梗死后心律失常的发生率
- 补充左卡尼汀可显著降低POAF发生率

术后新发房颤(POAF)是心胸外科的主要并发症之一

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- **术后新发房颤(POAF)仍然是心胸外科手术的主要并发症之一**，即使手术技术和麻醉有所改进；

- 在过去的20年中，POAF的发病率为**30-65%**[1,2]；

- POAF可引起血栓栓塞事件和心衰[3]；

- POAF患者住院时间约比无POAF患者长4天。因此，POAF患者在首次住院期间的医疗费用高于非POAF患者[4]

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补充左卡尼汀可以逆转FABP3的减少，改善心脏脂肪酸代谢

1. 脂肪酸代谢相关的心房基因的表达，脂肪酸占正常工作心脏能量生产的70%；
2. 无论年龄和左房内径如何，参与细胞脂肪酸摄取和细胞内脂肪酸转运的脂肪酸结合蛋白3 (FABP3)基因表达在POAF组显著低于非POAF组[5]；
3. 左卡尼汀是一种季胺，可以改善脂肪酸代谢，补充左卡尼汀可以逆转FABP3的减少[6]；

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01

术后新发房颤(POAF)是心胸外科的主要并发症之一

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补充左卡尼汀可显著降低心肌梗死后心律失常的发生率

a） 在一项荟萃分析中，给予左卡尼汀可以使心肌梗死后心律失常的发生率降低65%[7]；

b） 然而，虽然左卡尼汀可能被认为是一种预防性治疗，但在瓣膜手术中尚未用于预防POAF；

c） 我们推测，在心脏瓣膜手术中补充左卡尼汀可能对预防POAF有效，所以本研究旨在比较左卡尼汀介入组和我们的历史对照组POAF的发生率。

7. DiNicolantonio JJ, et al. Lavie CJ, Fares H, Menezes AR, O’ Keefe JH. l-Carnitine in the secondary prevention of cardiovascular disease: systematic review and meta-analysis. Mayo Clin Proc. 2013;88:544–51.

补充左卡尼汀显著降低主动脉瓣术后心房颤动的发生率

- 左卡尼汀组患者POAF发生率显著低于对照组(分别为20%和60%; P= 0.025);
- 左卡尼汀组术后最大CRP水平低于对照组（分别为6.8±2.3和8.5±2.3; P=0.055)

表3. 对照组和左卡尼汀组术后数据

Variables	Control ($n=15$)	L-Carnitine ($n=15$)	P values
POAF (n)	9	3	0.025
Maximum CRP (mg/dl)	8.5±2.3	6.8±2.3	0.055
Maximum CK-MB (IU/l)	42±14	45±20	0.68
Maximum creatinine (mg/dl)	0.93±0.36	1.03±0.35	0.44
Hospital stay (d)	15 (13–43)	16 (12–21)	0.51
Electrocardiogram before discharge			
Heart rate (bpm)	88±13	87±17	0.89
PQ interval (ms)	168±22	159±35	0.42
QRS duration (ms)	113±22	107±20	0.56
Complete atrioventricular block (n)	1	0	1.00
Left bundle branch block (n)	1	0	1.00
Right bundle branch block (n)	2	2	1.00

年龄和左卡尼汀的补充是POAF的独立预测因素

- 对术前和术中参数进行的POAF多因素分析中，年龄和左卡尼汀的使用是POAF的独立预测因素（P<0.05）

表4. POAF发生率的多因素分析

Variables	Odds ratio	95% CI	*P* values
Age	1.140	1.011–1.285	0.032
Carnitine supplementation	0.067	0.006–0.768	0.049
Aortic cross clamp time	0.967	0.930–1.005	0.085

03 小结

小结

- ✓ 左卡尼汀组POAF发生率显著低于对照组;
- ✓ 左卡尼汀可预防主动脉瓣手术术后POAF的发生;
- ✓ 左卡尼汀的使用是POAF的独立预测因素。

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