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SCIENTIFIC ARTICLE

The effect of two different glycemic management protocols on postoperative cognitive dysfunction in coronary artery bypass surgery

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KEYWORDS
Glucose control;
Cognitive dysfunction;
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Abstract
Introduction: Postoperative cognitive dysfunction (POCD) is an adverse outcome of surgery that is more common after open heart procedures. The aim of this study is to investigate the role of tightly controlled blood glucose levels during coronary artery surgery on early and late cognitive decline.
Methods: 40 patients older than 50 years undergoing elective coronary surgery were randomized into two groups. In the ''Tight Control'' group (GI), the glycaemia was maintained between 80 and 120 mg dL^{-1} while in the ''Liberal'' group (GII), it ranged between 80–180 mg dL^{-1}. A neuropsychological test battery was performed three times: baseline before surgery and follow-up first and 12th weeks, postoperatively. POCD was defined as a drop of 1 standard deviation from baseline on two or more tests.
Results: At the postoperative first week, neurocognitive tests showed that 10 patients in the GI and 11 patients in GII had POCD. The incidence of early POCD was similar between groups. However the late assessment revealed that cognitive dysfunction persisted in 5 patients in the GII whereas none was rated as cognitively impaired in GI ($p = 0.047$).
Conclusion: We suggest that tight perioperative glycemic control in coronary surgery may play a role in preventing persistent cognitive impairment.

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PALAVRAS-CHAVE
Controle glicêmico;
Disfunção cognitiva;
Cirurgia de revascularização do miocárdio

Efeito de dois protocolos de controle glicêmico diferentes sobre a disfunção cognitiva após cirurgia de revascularização do miocárdio

Resumo
Introdução: A disfunção cognitiva pós-operatória (DCPO) é um resultado adverso de cirurgia que é mais comum após cirurgias de coração aberto. O objetivo deste estudo foi investigar o papel dos níveis de glicose no sangue rigorosamente controlados durante a cirurgia coronariana no declínio cognitivo precoce e tardio.
Métodos: Quarenta pacientes com idades acima de 50 anos e submetidos à cirurgia coronariana eletiva foram randomizados em dois grupos. No grupo ''controle rigoroso'' (GI), a glicemia foi mantida entre 80-120 mg.dL^{-1}; enquanto no grupo ''liberal'' (GII), variou entre 80-180 mg.dL^{-1}. A bateria de testes neuropsicológicos foi realizada três vezes: fase basal, antes da cirurgia e na primeira e décima segunda semana de acompanhamento no pós-operatório. DCPO foi definida como uma queda de um no desvio padrão da fase basal em dois ou mais testes.
Resultados: Na primeira semana de pós-operatório, os testes neurocognitivos mostraram que 10 pacientes no GI e 11 pacientes no GII apresentaram DCPO. A incidência de DCPO precoce foi semelhante entre os grupos. No entanto, a avaliação tardia revelou que a disfunção cognitiva persistiu em cinco pacientes no GII, enquanto nenhum paciente foi classificado como cognitivamente prejudicado no GI ($p = 0{,}047$).
Conclusão: Sugerimos que o controle glicêmico rigoroso no perioperatório de cirurgia coronariana pode desempenhar um papel na prevenção da deterioração cognitiva persistente.

Introduction

Postoperative cognitive dysfunction (POCD) is an intellectual decline related to surgery. Older patients undergoing major surgery are at increased risk of POCD that covers a broad clinical spectrum ranging from mild concentration difficulties to serious behavioral problems that can be easily confounded with delirium.[1,2] The problem can be transient but also persist for a longer period. In the early phase, POCD causes prolonged hospitalization and can disrupt quality of life by complicating the rehabilitation period. POCD also affects the mortality rate in the long term.[3,4] Finally, although the mechanisms are not clear, POCD is a debatable risk factor for delayed and chronic changes associated to dementia and Alzheimer's disease.[5]

Cognitive decline after cardiac surgery is more frequent compared to non-cardiac major surgery. The incidence rate varies between 25% and 80% according to various studies.[6,7] Recent advances in the perioperative management including surgical techniques, anesthetic choice, and perfusion strategies have decreased the incidence rate of major complications. However, the frequency of cognitive decline after open heart surgery has not improved. The etiology of POCD related to cardiac surgery is multifactorial, and various preoperative and intraoperative factors are associated with the disorder. Cerebral hypoperfusion due to microembolization or systemic hypotension, serious inflammatory response to extracorporeal circulation and to surgical stimuli, temperature perturbations, and metabolic instability are the most common etiologic factors.[8,9]

Hyperglycemia induced by open heart procedures causes a series of adverse events, including serious arrhythmias, low output state, and infections, and results in a prolonged stay in the intensive care unit with delay in hospital discharge.[10,11] The hyperglycemic state triggered by cardiac surgery may also be harmful to the hypoperfused brain and worsen the neurologic status analogous to that stroke patients.[12] Cognitive deterioration in cardiac surgery can be associated and/or aggravated by this ''diabetic state'' of those patients and be restrained to some extent by controlling glucose levels during the operative period.

The aim of the present study is to investigate the role of tightly controlled blood glucose levels during coronary artery surgery in order to prevent early and late postoperative cognitive dysfunction.

Methods

The study was designed and conducted as a prospective, double-blind, randomized clinical trial. The physician performing the neuropsychological tests and the patients were blinded to the perioperative glycemic management.

Patients older than 50 years with preserved left ventricular systolic function undergoing coronary artery bypass (CABG) surgery who had at least primary school education, were included in the study after institutional ethical committee approval (1571/1405-09) and written informed consent from each patient were obtained. The exclusion criteria was determined as; drug and alcohol addiction, major psychiatric and central nervous system diseases, major antidepressive treatment, American Society of Anesthesiologists (ASA) status higher than III, preoperative infection, serious organ failure, and combined or urgent operations.

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