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SCIENTIFIC ARTICLE

Effects of cerebral oxygen changes during coronary bypass surgery on postoperative cognitive dysfunction in elderly patients: a pilot study☆

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KEYWORDS
Postoperative cognitive dysfunction;
Cerebral oximetry;
Cardiac surgery;
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Abstract
Background and objectives: Postoperative cognitive dysfunction is common after cardiac surgery. Adequate cerebral perfusion is essential and near infrared spectroscopy (NIRS) can measure cerebral oxygenation. Aim of this study is to compare incidence of early and late postoperative cognitive dysfunction in elderly patients treated with conventional or near infrared spectroscopy monitoring.
Methods: Patients undergoing coronary surgery above 60 years, were included and randomized to 2 groups; control and NIRS groups. Peroperative management was NIRS guided in GN; and with conventional approach in control group. Test battery was performed before surgery, at first week and 3rd month postoperatively. The battery comprised clock drawing, memory, word list generation, digit spam and visuospatial skills subtests. Postoperative cognitive dysfunction was defined as drop of 1 SD (standard deviation) from baseline on two or more tests. Mann-Whitney *U* test was used for comparison of quantitative measurements; Chi-square exact test to compare quantitative data.
Results: Twenty-one patients in control group and 19 in NIRS group completed study. Demographic and operative data were similar. At first week postoperative cognitive dysfunction were present in 9 (45%) and 7 (41%) of patients in control group and NIRS group respectively. At third month 10 patients (50%) were assessed as postoperative cognitive dysfunction; incidence was 4 (24%) in NIRS group (p:0.055). Early and late postoperative cognitive dysfunction group had significantly longer ICU stay (1.74 + 0.56 vs. 2.94 + 0.95; $p < 0.001$; 1.91 + 0.7 vs. 2.79 + 1.05; $p < 0.01$) and longer hospital stay (9.19 + 2.8 vs. 11.88 + 1.7; $p < 0.01$; 9.48 + 2.6 vs. 11.36 + 2.4; $p < 0.05$).

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Conclusion: In this pilot study conventional monitoring and near infrared spectroscopy resulted in similar rates of early postoperative cognitive dysfunction. Late cognitive dysfunction tended to ameliorate with near infrared spectroscopy. Early and late cognitive declines were associated with prolonged ICU and hospital stays.

PALAVRAS-CHAVE
Disfunção cognitiva no pós-operatório;
Oximetria cerebral;
Cirurgia cardíaca;
Paciente idoso

Efeitos das alterações no oxigênio cerebral durante cirurgia de revascularização do miocárdio sobre a disfunção cognitiva no pós-operatório em pacientes idosos: estudo piloto

Resumo
Justificativa e objetivos: A disfunção cognitiva no pós-operatório é comum após cirurgia cardíaca. A perfusão cerebral adequada é essencial, e a espectroscopia no infravermelho próximo (NIRS) pode medir a oxigenação cerebral. O objetivo deste estudo foi comparar a incidência de disfunção cognitiva no pós-operatório, precoce e tardio, em pacientes idosos tratados com monitorização convencional ou espectroscopia no infravermelho próximo.
Métodos: Os pacientes submetidos à cirurgia coronariana, acima de 60 anos de idade, foram incluídos e randomicamente alocados em dois grupos: Grupo controle e Grupo NIRS. O manejo dos pacientes no período peroperatório foi realizado com NIRS no grupo NH e com abordagem convencional no grupo controle. A bateria de testes foi feita antes da cirurgia, na primeira semana e no terceiro mês de pós-operatório. A bateria incluiu o desenho do relógio, a memória, a geração de uma lista de palavras, a sequência de dígitos e subtestes que exigem habilidades visuoespaciais. Disfunção cognitiva no pós-operatório foi definida como queda de um DP (desvio-padrão) da fase basal em dois ou mais testes. O teste *U* de Mann Whitney foi usado para comparação de medidas quantitativa e o teste exato do qui-quadrado para comparar dados quantitativos.
Resultados: Vinte e um pacientes do grupo controle e 19 do grupo NIRS concluíram o estudo. Os dados demográficos e operacionais foram semelhantes. Na primeira semana, nove pacientes (45%) do GC e sete pacientes (41%) do grupo NIRS apresentaram disfunção cognitiva no pós-operatório. No terceiro mês, 10 pacientes (50%) foram avaliados como disfunção cognitiva no pós-operatório; a incidência foi de quatro (24%) no grupo NIRS (p: 0,055). O grupo que apresentou disfunção cognitiva no pós-operatório precoce e tardio teve uma permanência significativamente maior na UTI (1,74 + 0,56 *vs.* 2,94 + 0,95; $p < 0,001$; 1,91 + 0,7 *vs.* 2,79 + 1,05; $p < 0,01$) e permanência hospitalar mais longa (9,19 + 2,8 *vs.* 11,88 + 1,7; $p < 0,01$; 9,48 + 2,6 *vs.* 11,36 + 2,4; $p < 0,05$).
Conclusão: Neste estudo piloto, a monitorização convencional e espectroscopia no infravermelho próximo resultaram em taxas semelhantes de disfunção cognitiva no pós-operatório precoce. A disfunção cognitiva tardia tende a melhorar com espectroscopia no infravermelho próximo. Os declínios cognitivos precoces e tardios foram associados a internações prolongadas tanto em UTI quanto hospitalares.

Introduction

Postoperative cognitive dysfunction (POCD) is a well-known phenomenon defined as decline in multiple intellectual domains such as language comprehension, memory, mathematical function or vigilance. Diagnosis is based on neuropsychometric tests. Incidence appears in a wide range from 30% to 80% in early postoperative period.[1–4] Recognized risk factors related to patients are advanced age, preoperative cognitive impairment or previous stroke, lower educational level, alcohol abuse, genetic predisposition (with some alleles) and severe atherosclerosis.[5,6] Older people suffer frequently from cardiovascular diseases, diabetes or organ dysfunctions, and are more disposed to complications. Then again older brain is more susceptible as size, distribution and type of neurotransmitters, metabolic function, and capacity for plasticity are all impaired. It is associated with impaired regulatory mechanisms and also, reduced ability to cope with operative stresses. Persistent cognitive decline is associated with loss of independence,

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