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SCIENTIFIC ARTICLE

Postoperative surveillance in neurosurgical patients – usefulness of neurological assessment scores and bispectral index

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Postoperative care;
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Abstract

Background and objectives: We examined the additive effect of the Ramsay scale, Canadian Neurological Scale (CNS), Nursing Delirium Screening Scale (Nu-DESC), and Bispectral Index (BIS) to see if, along with the assessment of pupils and Glasgow Coma Scale (GCS), it improved early detection of postoperative neurological complications.

Methods: We designed a prospective observational study of two elective neurosurgery groups of patients: craniotomies (CG) and non-craniotomies (NCG). We analyze the concordance and the odds ratio (OR) of altered neurological scales and BIS in the Post-Anesthesia Care Unit (PACU) for postoperative neurological complications. We compared the isolated assessment of pupils and GCS (pupils-GCS) with all the neurologic assessment scales and BIS (scales-BIS).

Results: In the CG ($n=70$), 16 patients (22.9%) had neurological complications in PACU. The scales-BIS registered more alterations than the pupils-GCS (31.4% vs. 20%; $p<0.001$), were more sensitive (94% vs. 50%) and allowed a more precise estimate for neurological complications in PACU ($p=0.002$; OR=7.15, 95% CI=2.1–24.7 vs. $p=0.002$; OR=9.5, 95% CI=2.3–39.4). In the NCG ($n=46$), there were no neurological complications in PACU. The scales-BIS showed alterations in 18 cases (39.1%) versus 1 (2.2%) with the pupils-GCS ($p<0.001$). Altered CNS on PACU admission increased the risk of neurological complications in the ward ($p=0.048$; OR=7.28, 95% CI=1.021–52.006).

Conclusions: Applied together, the assessment of pupils, GCS, Ramsay scale, CNS, Nu-DESC and BIS improved early detection of postoperative neurological complications in PACU after elective craniotomies.

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PALAVRAS-CHAVE

Monitor BIS;
Craniotomia eletiva;
Exame neurológico;
Procedimentos
neurocirúrgicos;
Cuidados no
pós-operatório;
Complicações no
pós-operatório

Monitoramento de pacientes neurocirúrgicos no pós-operatório – utilidade dos escores de avaliação neurológica e do índice bispectral

Resumo

Justificativa e objetivos: Avaliamos o efeito aditivo da escala de Ramsay, Escala Neurológica Canadense (CNS), Escala da Enfermagem de Triagem de Delírio (Nu-DESC) e Índice Bispectral (BIS) para ver se, juntamente com a avaliação das pupilas e da Escala de Coma de Glasgow (GCS), melhorava a detecção precoce de complicações neurológicas no pós-operatório.

Métodos: Projetamos um estudo observacional, prospectivo, de dois grupos de pacientes submetidos à neurocirurgia eletiva: craniotomia (Grupo C) e não-craniotomia (Grupo NC). Analisamos a concordância e a razão de chance (OR) de alterações nas escalas neurológicas e no BIS na sala de recuperação pós-anestesia (SRPA) para complicações neurológicas no pós-operatório. Comparamos a avaliação isolada das pupilas e da GCS (pupilas-GCS) com todas as escalas de avaliação neurológica e o BIS (escalas-BIS).

Resultados: No Grupo C (n=70), 16 pacientes (22,9%) apresentaram complicações neurológicas na SRPA. As escalas-BIS registraram mais alterações que as pupilas-GCS (31,4% vs. 20%; $p < 0,001$), foram mais sensíveis (94% vs. 50%) e permitiram uma estimativa mais precisa das complicações neurológicas na SRPA ($p = 0,002$; OR = 7,15, IC 95% = 2,1–24,7 vs. $p = 0,002$; OR = 9,5, IC 95% = 2,3–39,4). No grupo NC (n=46), não houve complicações neurológicas na SRPA. As escalas-BIS mostraram alterações em 18 casos (39,1%) versus um caso (2,2%) com as pupilas-GCS ($p < 0,001$). Alteração na CNS na admissão à SRPA aumentou o risco de complicações neurológicas na enfermagem ($p = 0,048$; OR = 7,28, IC 95% = 1,021–52,006).

Conclusões: Aplicados em conjunto, a avaliação das pupilas, GCS, escala de Ramsay, CNS, Nu-DESC e BIS melhoraram a detecção precoce de complicações neurológicas no pós-operatório na SRPA após craniotomias eletivas.

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Introduction

Neurosurgical patients have a high risk of neurological complications in the immediate postoperative period increasing both morbidity and mortality¹ and requiring specialized postoperative care. The Neurological Intensive Care Evaluation score is a simple assessment developed and validated specifically to assess the postoperative neurologic status of postoperative cardiac patients.^{2,3} It is not a complete neurologic assessment evaluation, and would not be enough for patients who have undergone brain surgery. To the best of our knowledge there is not such a neurological score validated for the postoperative neurosurgical population in the Post Anesthesia Care Unit (PACU). In our institution, we typically use the assessment of the pupillary size and reactivity and Glasgow Coma Scale (GCS)⁴ evaluating the mobility of all four limbs.

There are several validated clinical neurological assessment scales, as the National Institute of Health Stroke Scale,⁵ the Mini-Mental State Examination,⁶ and the Diagnostic and Statistical Manual of Mental Disorders.⁷ A major drawback of these assessment scales is that they are long and complex, and therefore not easily applicable for the immediate postoperative period.⁸ Other neurologic assessment scales, such as the Ramsay scale,⁹ the Canadian Neurological Scale (CNS)¹⁰ and the Nursing Delirium Screening Scale (Nu-DESC)¹¹ (Appendix A) are better suited to the assessment of extubated postoperative neurosurgical patients in the PACU. The main limitations of periodic

evaluations with clinical scales include: inter-observer subjectivity and high inter-observer variability,¹¹ discontinuous records, observer difficulty in differentiating among levels of deep sedation¹² and the overworked nursing care resulting from their systematic application.

The bispectral index (BIS) (BISTM brain function monitoring system, Covidien, Boulder, USA) is an index derived from the analysis of electroencephalography scaled to correlate with the depth of hypnosis. Today it has become standard monitoring during general anesthesia. BIS has also proven useful in predicting states of excessive sedation.¹³ While some studies show a poor correlation between BIS and the clinical sedation scales,^{12,14–16} other studies show that BIS correlates with clinical scales if BIS recordings associated with elevated electromyography (EMG) are excluded.^{14,17}

Because BIS records and displays continuously, it has the potential advantage of acting as an early warning signal of any of the neurological complications that are associated with a decreased level of consciousness. On the other hand, the clinical neurologic assessment scales are also useful to detect neurological alterations not associated with decreases in level of consciousness (motor or speech impairment, for instance). To date, we have not found any published studies that have compared BIS with other neurological assessment scales in postoperative neurosurgical patients.

In our hospital, the PACU is the main unit for the postoperative care of patients after elective craniotomies. The Surgical Intensive Care Unit (SICU) is reserved for more

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