

COMMENTARY

To wake-up, or not to wake-up: that is the Hamletic neurocritical care question!

Lara Prisco¹ and Giuseppe Citerio^{*2}

See related research by Helbok *et al.*, <http://ccforum.com/content/16/6/R226>

Abstract

The need for a reliable neurological evaluation in severely brain-injured patients conflicts with sedation, which is routinely administered. Helbok and colleagues prospectively evaluated in a small cohort of 20 sedated severely brain-injured patients the effects of a wake-up test on intracranial pressure (ICP), brain tissue oxygen tension and brain metabolism. The test has been considered potentially risky on 34% of the study days. When the test is performed, ICP and cerebral perfusion pressure increase, usually slightly, except in a subgroup of patients with lower cerebral compliance where marked ICP and cerebral perfusion pressure changes were recorded. In this cohort, the information gained with the wake-up test has been negligible. Given the current little knowledge about the benefits of interruption of continuous sedation in brain-injured patients, it is extremely important to adopt multiple monitoring modalities in neurocritical care in order to escape wake-up tests in those patients who will potentially be harmed by this procedure. Once the clinical condition will improve, sedation needs to be tapered and suspended as soon as possible.

Introduction

Neurological assessment remains a valuable tool for monitoring severely brain-injured patients and the need for a reliable evaluation conflicts with sedation, routinely administered to severely brain-injured patients. Most available sedative agents, reducing the cerebral metabolic rate and cerebral blood flow, reduce intracranial pressure (ICP) compared with no sedation.

Precise assessment and clinical modification tracking are essential for planning neuroimaging and surgical or medical interventions. For the clinical assessment of neurocritical patients, interruption of continuous sedation (IS) is therefore necessary. This interruption is usually short term, aimed to evaluate the patients and plan further management strategies, including the definitive sedation interruption once the clinical picture and ICP are no longer a concern and IS does not provoke patients' distress and metabolic imbalance. Close patient observation during IS is therefore strongly suggested.

The definitive interruption is possible once the clinical and cerebral state of the patient does not justify any sedation, whereas the brief interruption allows a neurological reassessment. The strategy of frequent sedative interruptions as well as the use of sedation algorithms allows a downward titration of sedative infusion rates over time, streamlining administration of these drugs and minimizing the tendency for accumulation. Unfortunately, even if almost all of the severely brain-injured patients receive sedative agents, IS in the clinical setting has received little attention.

In this issue of *Critical Care*, Helbok and colleagues prospectively evaluated in a small cohort of 20 sedated severely brain-injured patients the effects of a wake-up test on ICP, brain tissue oxygen tension and brain metabolism [1]. The study population was composed of severe brain-injured patients with multiple modality monitoring.

Some lessons could be learned from this study. First, not all patients can be safely woken up! IS has been considered potentially risky on 34% of the study days due to pre-existing hemodynamic instability and critical ICP. The benefit of having clinical evolution clues in the more severe subset is overwhelmed by the possible negative effect on ICP and, consequently, on cerebral blood flow. In this setting, multimodality monitoring and neuroimaging remain the clinicians' guide and we have to postpone clinical evaluations that could cause secondary insults. If IS could not be performed, the assessment of brainstem responses during sedation is feasible and loss of selected responses is predictive of mortality and severe disorder of consciousness [2].

*Correspondence: g.citerio@hsgerardo.org

²NeuroIntensive Care Unit, Department of Anaesthesia and Critical Care, Ospedale San Gerardo, Monza, Via Pergolesi 33, Monza 20900, Italy

Full list of author information is available at the end of the article

Second, ICP and cerebral perfusion pressure increase, usually slightly and tolerably, during IS when compared with baseline levels recorded during sedation. In the majority of patients, these changes are mild, transient and acceptable and do not preclude repeating IS in the neurointensive care setting. Nevertheless, IS is a stressful condition [3].

Third, the price paid in some patients is too high and unacceptable. In a subgroup of patients with lower cerebral compliance, IS induced marked ICP and cerebral perfusion pressure changes that could potentially negatively impact on the injured brain. Those patients should be excluded from repeated IS to assess the neurological status, and information should instead be gathered from other multimodality monitoring methods in combination with neuroimaging. Of all IS events performed, the trial had to be stopped frequently (that is, in one-third) due to ICP surge, agitation or systemic desaturation. In the aborted IS trials, a decrease in brain tissue oxygen tension and a tendency to brain metabolic distress were observed. A better risk stratification [4] needs to be defined accordingly.

Fourth, in severe cases, the information gained with multimodality monitoring is minimal. One of the major strengths of daily awakening trials is the additional information gained from a reliable clinical assessment in those patients who tolerate IS. Unfortunately this was not the case: evidence for a new focal neurologic deficit was found in only one (2%) patient with known cerebral vasospasm who developed motor weakness of the lower limb.

Conclusion

Given the current little knowledge about the benefits of IS in brain-injured patients, it is extremely important to adopt multiple monitoring modalities in neurocritical care in order to escape IS in those patients who will potentially be harmed by this procedure. Once the clinical condition will improve, sedation needs to be tapered and suspended as soon as possible.

Studying the phenomena of severely brain-injured patients is similar to a nightly sail on an uncharted sea.

We can find some important landmarks with the neurological examination in less severe patients. But when the night is without stars (that is, the neurological evaluation with IS cannot be safely performed) we need to rely on multimodality neuromonitoring. This monitoring needs to be in place and interpreted, helping us to find the correct way to treat the patient, taking decisions – including the one of performing IS when the patient is improving – and, finally, stopping sedation.

Abbreviations

ICP, intracranial pressure; IS, interruption of continuous sedation.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

LP and GC participated equally in writing this commentary.

Author details

¹Cardiothoracic Intensive Care Unit, St. George's Healthcare NHS Trust, St. George's Hospital, London, Blackshaw Road, London SW17 0QT, UK.

²NeuroIntensive Care Unit, Department of Anaesthesia and Critical Care, Ospedale San Gerardo, Monza, Via Pergolesi 33, Monza 20900, Italy.

Published: 28 December 2012

References

1. Helbok R, Kurtz P, Schmidt MJ, Stuart MR, Fernandez L, Connolly SE, Lee K, Schmutzhard E, Mayer SA, Claassen J, Badjatia N: **Effects of the neurological wake-up test on clinical examination, intracranial pressure, brain metabolism and brain tissue oxygenation in severely brain-injured patients.** *Crit Care* 2012, **16**:R226.
2. Sharshar T, Porcher R, Siami S, Rohaut B, Bailly-Salin J, Hopkinson NS, Clair B, Guidoux C, Iacobone E, Sonneviller R, Polito A, Aboab J, Gaudry S, Morla O, Amouyal G, Azuar J, Allary J, Vieillard-Baron A, Wolff M, Cariou A, Annane D; Paris-Ouest Study Group on Neurological Effect of Sedation (POSGNES): **Brainstem responses can predict death and delirium in sedated patients in intensive care unit.** *Crit Care Med* 2011, **39**:1960-1967.
3. Skoglund K, Enblad P, Hillered L, Marklund N: **The neurological wake-up test increases stress hormone levels in patients with severe traumatic brain injury.** *Crit Care Med* 2012, **40**:216-222.
4. Stover JF: **Arousal from sedation in wake-up tests requires careful risk stratification.** *Crit Care Med* 2012, **40**:338-340.

doi:10.1186/cc11891

Cite this article as: Prisco L, Citerio G: To wake-up, or not to wake-up: that is the Hamletic neurocritical care question! *Critical Care* 2012, **16**:190.