

The Role of Changes in Neurophysiologic Monitoring as a Predictor of Neurologic Deficit or Procedural Complication During the Endovascular Treatment of Cerebral Aneurysms

Jeffrey Balzer PhD; William J. Ares MD; Amy He; Nathan Winek; Ramesh Grandhi MD; Brian T. Jankowitz MD; Tudor Jovin MD; Michael B. Horowitz MD; Miguel Habeych; Donald Crammond; Parthasarathy D. Thirumala MD
University of Pittsburgh Medical Center



Introduction

Endovascular management of cerebral aneurysms carries with it inherent risks of procedure related ischemia and hemorrhage. Few studies have examined the use and efficacy of neurophysiologic monitoring in predicting neurologic deficits or procedural complications. This study represents the largest published patient series investigating the use and value of neurophysiologic monitoring as an adjunct to endovascular cerebral aneurysm treatment.

Methods

Patients presenting between October 2000 and July 2010 (n=2016) who underwent endovascular treatment of cerebral aneurysms with neurophysiologic monitoring were included in this study.

Neurophysiologic monitoring included somatosensory evoked potentials (SSEP), electroencephalography (EEG), and brainstem auditory evoked potentials (BAEP).

Changes in SSEPs were characterized as significant change in responses (SCR), transient loss of responses (TLR) and complete loss of responses (CLR).

Neurologic changes were defined as transient or permanent deficits not present prior to the procedure or rapid progression to death following a procedural complication. Procedural complications were defined as procedural rupture, embolic phenomenon, catheter related vasospasm and arterial dissection.

Results

Neurologic changes were observed in 64 patients and procedural complications observed in 38 patients. Changes in neurophysiologic monitoring were observed in 123 patients. The sensitivity and specificity of changes in neurophysiologic monitoring were 0.62 and 0.93 respectively. The positive and negative predictive values of neurophysiologic changes were 0.41 and 0.97 respectively.

When compared to the population with no changes in responses, odds ratios for neurologic changes or procedural complications were as follows: SCR 16.2 (95% CI 8.9-29.1), TLR 55.1 (95% CI 18.3-164.8) and CLR 146.8 (29.8-721.7).

Neurophysiologic Change	Odds Ratio
Significant Change (SCR)	16.2 (95% CI 8.9-29.1)
Total Loss (TLR)	55.1 (95% CI 18.3-164.8)
Complete Loss (CLR)	146.8 (29.8-721.7)

Conclusions

Neurophysiologic monitoring can be a powerful adjunct to the endovascular treatment of cerebral aneurysms. Proper characterization of the witnessed changes can increase the predictive value of a positive test result and potentially aid in the recognition of reversible neurologic deficits.

Learning Objectives

By the conclusion of this session participants should be able to describe the utility of differential changes in neurophysiologic monitoring and its relation to post procedural neurologic deficits and procedural complications in the endovascular management of cerebral aneurysms.

References

1) van Rooij, W.J., et al. Procedural Complications of Coiling of Ruptured Intracranial Aneurysms: Incidence and Risk Factors in a Consecutive Series of 681 Patients. American Journal of Neuroradiology. August 2006.

Demographics (n=2116)	
Male (%)	25
Age (years)	56
Unruptured (%)	54.5
Circulation Location	
Anterior (%)	75.8
Posterior (%)	22.9
Both (%)	1.2
Stent/Balloon Use (%)	21.5