

Your TCAR TAVR patients face stroke. SSEPs could make the difference.

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Somatosensory-evoked potentials (SSEPs) might provide an early alert for cerebral hypoperfusion during transcatheter aortic valve replacement (TCAR TAVR). Such early detection could allow for swift intervention, potentially mitigating the persistent risk of stroke. This approach offers a new avenue for protecting brain health during these high-stakes procedures.

KEY TAKEAWAYS

- ° lightbulb
- ° The Pivot: SSEP monitoring offers a potential real-time assessment of cerebral perfusion during TCAR TAVR, potentially allowing for immediate intervention to prevent ischemic injury.
- ° The Data: In a case report, SSEP amplitude decreased significantly during balloon inflation, prompting adjustments that likely averted a stroke.
- ° The Action: Consider incorporating SSEP monitoring into your TCAR TAVR protocol, ensuring that the anesthesiology and neurology teams are integrated into pre-operative planning and intraoperative monitoring.

Minimizing stroke risk remains paramount in transcatheter aortic valve replacement (TCAR TAVR). Despite advances in embolic protection devices and procedural techniques, the threat of neurological complications persists. Real-time identification of cerebral hypoperfusion is crucial. It allows for immediate corrective action before irreversible damage occurs. Can SSEPs provide a practical and actionable solution?

Transcatheter aortic valve replacement (TCAR TAVR) offers an alternative access route for patients deemed high-risk for traditional transfemoral TAVR. It avoids sternotomy. But the carotid artery manipulation inherent in TCAR introduces a unique set of cerebrovascular risks. Brain perfusion is critical during these procedures. Ischemic stroke, even transient, can lead to significant morbidity and mortality. Effective intraoperative surveillance is therefore essential. Current guidelines offer limited guidance on routine intraoperative neurophysiological monitoring for TAVR. The 2021 ACC/AHA/SCAI Guideline for the Management of Patients With Valvular Heart Disease mentions the importance of neurological assessment but does not specifically recommend SSEP monitoring. That's because robust data supporting its routine use in this context remains scarce. The European Society of Cardiology (ESC) guidelines are similarly silent on the issue. Any adoption of SSEP monitoring must therefore be viewed as adjunctive, not standard of care, until more definitive evidence emerges.

One patient undergoing TCAR TAVR received SSEP monitoring. During balloon inflation, a significant decrease in SSEP amplitude occurred, signaling compromised cerebral perfusion. Immediate surgical adjustments followed. The team

adjusted the balloon position and flow parameters, restoring SSEP amplitude. Post-procedure neurological examination revealed no deficits. This suggested SSEP monitoring played a crucial role in preventing a stroke. Still, this is a single case. It does not establish causality but points toward a potential benefit warranting further investigation.

In this specific case, SSEPs were recorded from the somatosensory cortex following stimulation of the median nerve. This technique assesses the integrity of the somatosensory pathways, which are highly sensitive to cerebral ischemia. A disruption to these pathways signals reduced blood flow. The observed SSEP changes, specifically a reduction in amplitude, indicate a disruption in the electrical activity of the cortical neurons. Prompt recognition of this change allowed for immediate surgical adjustments. That's because SSEPs show potential as an early warning system for cerebral hypoperfusion during critical phases of the TCAR TAVR procedure.

The single-case nature is the obvious caveat. These findings cannot extrapolate to a broader population. Still, SSEPs are susceptible to confounding factors, including anesthesia depth, body temperature, and pre-existing neurological conditions. The sensitivity and specificity of SSEPs for detecting clinically significant cerebral hypoperfusion during TCAR TAVR remain undefined. A decrease in SSEP amplitude could trigger unnecessary interventions, leading to increased procedural time and potential complications. Before widespread adoption, prospective studies with clearly defined endpoints and rigorous statistical analysis are needed to determine the true clinical utility of SSEP monitoring in this setting.

Interpreting SSEP changes demands specialized expertise. False positives can occur from technical issues or non-ischemic physiological fluctuations, potentially leading to unwarranted procedural interruptions. But false negatives are also a concern. Significant ischemia can occur without a detectable SSEP change, particularly in cases of focal ischemia that may not affect the somatosensory pathways being monitored. The optimal SSEP monitoring protocol, including the number of channels, stimulation sites, and alarm criteria, requires standardization for this specific procedural context.

Integrating SSEP monitoring into a TCAR TAVR program requires practical considerations. Ensure the anesthesiology team is experienced in SSEP monitoring and interpretation. A baseline SSEP must be established after induction and before any aortic valve manipulation.

Clear communication protocols between surgical, anesthesiology, and neurology teams are essential for rapid response to SSEP amplitude changes. The cost of SSEP monitoring must also factor into the overall cost of the TCAR TAVR procedure, covering equipment, neurologist's time, and resources for managing potential complications. A formal protocol, including decision trees based on SSEP changes, is essential to guide intraoperative management.

But does the potential benefit truly outweigh these operational complexities and costs for widespread adoption? That is the question future trials must answer.

CLINICAL IMPLICATIONS

The potential for real-time stroke prevention during TCAR TAVR procedures is a striking clinical consequence. Somatosensory-evoked potentials (SSEPs) could offer immediate feedback on cerebral perfusion, allowing swift intervention. The case report offers a compelling glimpse into this possibility, suggesting devastating neurological complications might be averted.

Still, widespread adoption is premature. The lack of robust data and specific guideline recommendations

means SSEPs remain an adjunctive tool, not a standard. Clinicians must weigh the potential benefits against practical challenges, including the need for specialized expertise and the risk of false positives or negatives. Future research must focus on large-scale prospective trials. These trials need to establish the true sensitivity, specificity, and clinical utility of SSEPs in this high-risk population. Standardization of monitoring protocols and alarm criteria is also essential. Only then can SSEPs confidently integrate into routine practice, truly enhancing patient safety and improving long-term outcomes.

For a foundational understanding of the cardiac and vascular implications in such complex interventional cases, readers may consult the Oxford Handbook of Cardiology.

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