Evaluating the Use of Visual Evoked Potential Monitoring During Spine Surgery to Predict Postoperative Visual Change

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Introduction

•Perioperative vision loss is a potentially devastating complication in spine surgery.
•Ophthalmic complications have been reported to occur in 0.13-1% of spine surgeries, but this number is increasing with advances in spinal instrumentation and rise in annual spinal operations.[1,2,3]

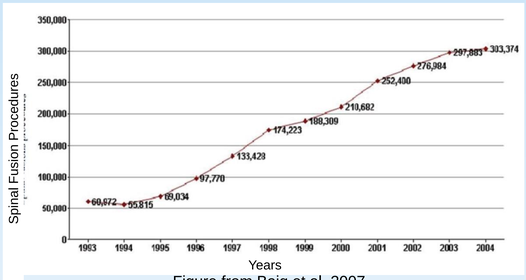
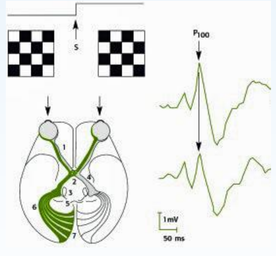


Figure from Baig et al, 2007

•No standard of care exists to directly monitor ophthalmic changes during surgery.[4]
•Visual Evoked Potential (VEP) is a clinical neurological tool that measures electrical signals in the occipital cortex in response to a light stimulus.[5]
•VEP has been effective during neurosurgeries to monitor patients to preserve vision, which gives the team a potential opportunity to limit the significance of this complication.[6,8]
•We hypothesize that there will be an increase in VEP events in prone patients and thus a higher likelihood of postoperative visual impairment as measured by visual acuity change.

VEP Use Intraoperatively
Figure from Luo et al, 2015



Visual Evoked Potential
Figure from Dr. Richard Vogel

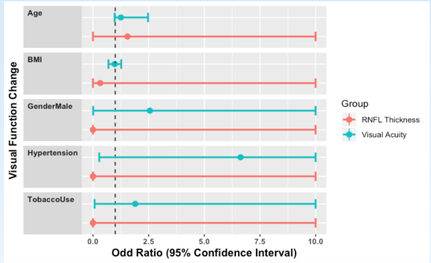
Methods

Purpose: To determine whether VEP events during surgery can predict changes in postoperative visual function.
Study Design: Prospective Cohort Study
Population: 150 patients, 18 & older, indicated for open cervical, thoracic, & lumbar surgeries. Grouped position during operation - Prone vs. Supine.
Process:
1. Prior to surgery, patients will undergo visual acuity, visual field, & optic coherence topography testing.
2. During surgery, VEPs will be monitored. Any events will be noted & triaged.
3. After surgery, patients will repeat visual tests.

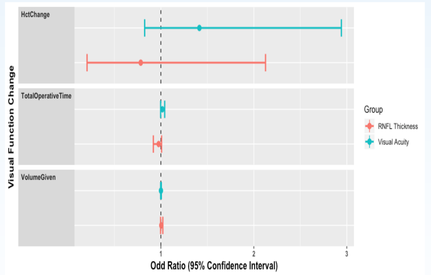
Analysis: Logistic regression to evaluate relationship between VEP & visual differences pre- & postoperatively & evaluate effects of risk factors.

Demographic and Clinical Characteristics of Patients who have Completed Study (N=11)

	Supine (N=9) (mean ± standard deviation)	*Prone (N=2) (mean ± standard deviation)*	*P-value*
Race			0.057
Caucasian	9	1	
Other	0	1	
Age	53.7 (±5.6)	57 (±12)	0.88
Gender			0.25
Male	3	2	
Female	6	0	
BMI	30.3 (±6.4)	37.5 (±9.1)	0.35
Diabetes	1	0	0.57
Hypertension	3	1	0.91
Hypotension	0	0	0
History of Anemia	1	0	0.4
History of Tobacco Use	6	0	0.07



Effects of clinical factors against visual function change



Effects of intraoperative factors against visual function change

Results

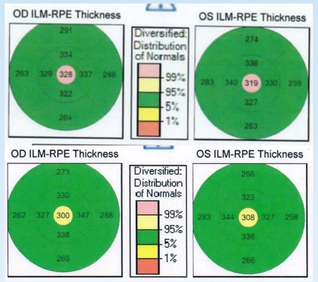
•To date, no patients have had VEP events intraoperatively.
•One patient who was in the prone group had worsening vision postoperatively and a slight decrease in the retinal nerve fiber layer length postoperatively which is correlated with postoperative vision changes.
•None of clinical (age, gender, past medical history) or intraoperative factors (hematocrit change, total operative time, volume resuscitation) were significant against RNFL thickness or visual acuity change.

Discussion

•No VEP events have been detected intraoperatively, however 1 patient had a visual function change.
•This prone patient had the longest procedure time, however had no medical history that would increase risk.
•It is possible VEP is unable to capture these events in the setting of spine surgery.

Visual Function Testing for Patient with Vision Change

	Preoperative	*Postoperative*
Visual Acuity L	20/20	20/25
Visual Acuity R	20/20	20/25
RNFL Thickness L	89	87
RNFL Thickness R	90	89



Retinal layer thickness preoperatively and postoperatively

Conclusion

•Injury to the visual pathway is often unnoticed until after the operation, where little can be done to reverse the injury.
•These results could suggest that VEP monitoring may not be an effective tool to monitor patients during spine surgery and anesthesiologists must focus on decreasing intraoperative risk factors to reduce the injury on the visual pathway and limit the complication of perioperative vision loss.

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