Post Operative Vision Loss (POVL):
Current Findings and Clinical Implications
The Implementation and Evaluation of an Intraoperative Guideline to Prevent POVL

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ABSTRACT

Problem: Post operative vision loss (POVL) is a rare but devastating complication that can occur in patients undergoing surgery in the prone position. The primary cause of this complication is unknown; however, a culmination of risk factors has been associated with its occurrence.

PICO: This paper presents an intervention in the form of an intraoperative guideline designed to increase awareness of the intraoperative risk factors related to POVL. Research was specifically directed towards obtaining information about the risk factors in patients undergoing spine surgery in the prone position.

Methodology: A literature review was performed to obtain information regarding the pathophysiology behind POVL as well as risk factors associated with the complication. Anesthesia providers were then surveyed to assess for the need of an intraoperative guideline for use as a reference during prone cases. The guideline was developed using information from the literature review and the survey results.

Findings: A synthesis of the literature revealed that there is an increased risk of POVL when there is a presence of both preoperative and intraoperative risk factors. A medical history of diabetes, smoking and vascular disease can all contribute to the development of POVL. Intraoperative risk factors include but are not limited to pressure on the orbit, anemia, length of surgery, patient position and amount of volume infused.

Proposed solution: The intraoperative guideline was used as a teaching tool and a reference to aid anesthesia providers in identifying the preoperative and intraoperative risks associated with POVL.
Conclusion: Results obtained from a trial period of implementation for the intraoperative guideline provided support for its continued use and suggestions for further research.
PART ONE

Introduction

There are numerous risks for intraoperative complications when a patient undergoes a surgical procedure. Some complications that occur intraoperatively, but are not discovered until the patient awakens postoperatively, can be catastrophic. An example of such a complication is the occurrence of post operative vision loss (POVL). This term refers to the partial or complete loss of vision upon postoperative assessment. Retrospective case studies have shown the rare occurrence of POVL to be most prominent in surgical cases involving the heart (0.113%) or the spine (0.028% - 0.2%), with the latter becoming increasingly more prevalent; however, the etiology of the complication is poorly understood.\textsuperscript{1,2,3} Possible causes of POVL identified from cohort studies include increased pressure on the globe leading to Central Retinal Artery Occlusion (CRAO), or decreased blood flow and oxygen delivery to the optic nerve, leading to Ischemic Optic Neuropathy (ION).\textsuperscript{1} In both cases, the blood flow to the optic nerve is compromised, causing ischemia and subsequent vision loss. This loss of vision can be temporary in some cases, but often the results are permanent and, therefore, severely debilitating to the patient.

Overview

The following project presents a review of the literature regarding POVL and a translation of the evidence into practice suggestions. This included an emerging intervention in the form of a survey of anesthesia providers and an intraoperative guide that can be implemented in order to assure the adequate steps are being taken in to prevent this complication.
A database search of the literature was conducted beginning September 2009 and continued through February 2011. The databases searched included MEDLINE, Academic Search Complete, and Google Scholar using the key terms and phrases; postoperative vision loss, vision, ischemic optic neuropathy, prone position, perfusion, intraocular pressure and spinal surgery. Non-English language articles were excluded. The majority of the evidence retrieved included case studies, retrospective cohort studies and other literature reviews from dates ranging from 1995-2009. A practice advisory published in 2006 by the American Society of Anesthesiologists was also consulted.\(^4\) The rarity of the complication and the inability to perform randomized controlled trials involving vision loss hinders the ability to provide high quality evidence with regards to POVL. The evidence that was obtained does provide some insight to the causes and recommendations for the prevention of POVL.

(Insert Table 1, Appendix A)
PART TWO

Literature

Background

The rare occurrence of POVL with a prevalence of 0.1% of cardiopulmonary bypass cases and 0.02% - 0.2% of spine surgery cases may appear inconsequential; however, when considering the debility of the complication, concentration on prevention becomes much more important. Surgeries on the spine requiring prone positioning are usually elective; thus, the majority of patients presenting for this type of surgery range in age from 18 to 85\(^5\) often having no or only few comorbidities.\(^6\) Considering this demographic, vision loss as a complication of non-ocular surgery is extremely detrimental. Due to the increasing number of spine surgeries being performed at facilities nationwide\(^5\), anesthesia providers must be aware of the risk factors for POVL and the recommended practices for prevention and treatment.

(Insert Figure 1, Appendix A)

Review of Literature

Central Retinal Artery Occlusion

Central Retinal Artery Occlusion (CRAO) is the second most prevalent cause of POVL following spinal surgeries performed with the patient in the prone position. CRAO presents with a pale retina with a cherry red spot at the macula and a reduced pupillary light reflex. It is manifested by thrombosis, direct pressure to the exterior of the eye, or increased intraocular pressure (IOP).\(^3,7\) The latter two are evident in some prone spinal surgical patients. In previous years authors have attributed ill fitting headrests used in prone spinal surgery cases as a cause of
POVL through CRAO by causing direct pressure on the globe; however, more recent studies have identified cases where external compression was not a factor.\textsuperscript{8} As of 2006, of the 93 cases of POVL associated with spine surgery reported by the ASA POVL registry, 10 were attributed to CRAO with the remaining 83 due to ischemic optic neuropathy.\textsuperscript{7} These findings lead to the assumption that POVL is more frequently related to ischemia than pressure on the eye exteriorly. Ischemia can result from CRAO if the IOP exceeds systemic blood pressure, resulting in a decrease in the blood flow through the retinal artery; however the ischemia present in ION is more often the cause of POVL.

**Ischemic Optic Neuropathy**

Ischemic Optic Neuropathy (ION) has been identified as the most common cause of POVL cases, with a reported incidence ranging from 0.01\% – 1\%, depending on the type of surgery.\textsuperscript{7} A retrospective study over a 12 year period involving the Mayo Clinic surgical population showed prevalence as low as 0.0008\%; however, this did not include cardiac cases.\textsuperscript{10} Ischemic Optic Neuropathy is reported in 0.113\% of cardiac cases involving cardiopulmonary bypass and in 0.028\% – 0.2\% of spinal surgery cases.\textsuperscript{2,3} Ischemic Optic Neuropathy is characterized by decreased blood flow and perfusion pressure to the optic nerve. The perfusion pressure of the eye is defined as the difference between the systemic mean arterial pressure (MAP) and the intraocular pressure (IOP). Thus, in conditions of increased IOP or decreased MAP, or a combination of both, there is resultant decrease in the perfusion pressure of the eye, possibly resulting in ischemia.\textsuperscript{11,12} ION can be subdivided into two categories based on the affected region of the optic nerve and the blood flow corresponding with that region.
**Anterior Ischemic Optic Neuropathy (AION).** AION is characterized by an ischemic lesion on the anterior portion of the optic nerve. This region of the optic nerve is supplied by the short posterior ciliary arteries in the choriocapillaris. Varying degrees of ischemia in this region can cause varying degrees of vision loss, ranging from that which is initially reversible, associated with moderate ischemia, to irreversible damage, associated with severe ischemia.\(^1\) AION is subdivided into two categories including arteritic AION and nonarteritic AION. The latter is the most common and often associated with POVL after cardiac surgery. Kalyani et al reported in their retrospective case control study that seven of the eight POVL cases following cardiac surgery involved the anterior portion of the optic nerve.\(^2\) The cause is associated with decreased oxygen availability in the blood supply to the optic disk. This can be a result of decreased perfusion pressure, increased vascular resistance, or decreased oxygen carrying capacity. Patients with a medical history of diseases involved with such circumstances such as smoking, peripheral vascular disease, diabetes, cardiovascular disease or atherosclerosis are at increased risk for developing AION postoperatively.\(^1\) In addition, an increase in blood viscosity may also play a role in the risk for developing AION in patients with sickle cell disease and polycythemia as well as patients undergoing CABG with induced hypothermia, in turn increasing blood viscosity and decreasing blood flow to the optic nerve.\(^2,13\) Diagnosis of AION results from a fundoscopic exam showing swelling of the optic disk. If irreversible damage to the optic nerve has occurred, over time, pallor will be noted.\(^14\)

**Posterior Ischemic Optic Neuropathy (PION).** PION is the most common reported cause of vision loss in spinal surgery cases\(^3,\) and is often, but not always associated with hemorrhage, anemia, and hypotension. The posterior optic nerve is nourished only by the centripetal pial vessels arising from the internal carotid\(^1\); thus, the posterior portion of the optic
nerve may be more susceptible to damage in the above conditions due to the smaller amount of blood supply in comparison to the anterior portion of the nerve. The centripetal pial vessels are small, compressible arterial end vessels that are specifically susceptible to increased venous pressure due to positioning, edema, or overhydration. Diagnosis of PION is difficult due to the lack of evidence of edema around the optic disk on the fundoscopic exam. Like AION findings, over time, pallor will be noted on the optic disk with irreversible damage. It is possible that these diagnoses of PION may actually be a combination of both AION and PION in which the AION is delayed.

(Insert Figure 2, Appendix A)

**Synthesis of the Literature**

In cases of POVL where ION is the indicative diagnosis, increased intraocular pressure (IOP) has been suspected as one of the culprits contributing to ION, specifically those cases reported following spinal surgery. The etiology of the increased IOP is due to the patient sustaining the prone and possibly prone trendelenburg position throughout the duration of the surgery. Walick et al. measured the IOPs of awake subjects without history of glaucoma, eye trauma or eye surgery. The researchers found significant differences between the measurements of IOP while sitting (19.3 ± 2.9 mmHg) and lying prone (25.6 ± 4.4 mmHg) and between sitting and lying prone trendelenburg (31.1 ± 2.8 mmHg) and the IOP increased in both groups with increased time (0 to 60 min). A similar study by Ozcan et al. measured IOP in relationship to body position as well as the type of operating table used (Jackson table or an OR table with a Wilson frame and a horseshoe headrest). Ozcan et al. found similar results to Walick et al. in their study with significant differences related to body position and inclination, but found no
significant difference in the type of surgical set up used. The mean IOP in the sitting position was 15.0 mmHg and 16.8 mmHg in the supine position. IOPs in the prone horizontal position and the prone trendelenburg position were 46% and 56% higher, respectively.\textsuperscript{9} Mean arterial pressure was also measured in the latter study in relation to the OR set up. However, no clinically significant findings resulted.\textsuperscript{9} Due to these findings, it is recommended that if possible, the prone trendelenburg position be avoided. According to the surgery being performed, a knee elbow position is favorable due to the smaller changes in IOP, as found by Tiefenthaler et al. in a study of anesthetized patients undergoing lumbar disk surgery in this position.\textsuperscript{15} This position involves the patient in a kneeling position with their head turned to the side, resting on a cushion. This study found no change in the IOP from an awake sitting position to an anesthetized knee-elbow position. In addition, results showed an unexpected decrease in the IOP of the dependent eye (17.0 mmHg sitting, 8.1 mmHg knee-elbow; both eyes had similar IOPs initially).\textsuperscript{15} There are multiple relevant findings of these studies involving changes in IOP. First, the increase in IOP when a patient is turned prone may explain the higher incidence of POVL in spine surgery as opposed to other non-ocular and non-cardiac surgeries. However, a drawback is that the subjects in the first two studies mentioned were not anesthetized.\textsuperscript{8,13} General anesthesia has been found to cause a decrease in IOP after induction, as well as during intentional hypotension, often the case in spinal procedures.\textsuperscript{15,16} Further studies involving anesthetized prone subjects have been attempted; however, were terminated prior to completion.\textsuperscript{17} In the latter study,\textsuperscript{15} the knee elbow position produces less pressure to the chest and abdomen, thus decreasing CVP, which can be increased in the prone position due to abdominal and thoracic pressure. Such a decrease in CVP could explain the lack of change in IOP when turning the patient prone to kneeling, as opposed to turning them prone.\textsuperscript{15}
Other intraoperative factors associated with POVL include, but are not limited to, anemia, hypotension (induced or due to hemorrhage), duration of surgery and over hydration. Chang et al reviewed 14,102 spine surgeries over 20 years at Johns Hopkins Hospital finding 4 cases of POVL with a diagnosis of PION. Three of the four cases involved the prone position and the remaining case involved a lateral decubitus position. All cases included a decrease in the hematocrit by 18% - 48%, estimated blood loss ranging from 1050 mL – 8000 mL, large amounts of fluid transfusion ranging from 4224 mL – 24,500 mL, and a duration of surgery ranging 235 min – 630 min. A period of hypotension (MAP 43-68) in comparison to baseline was reported in three of the four cases; however, data regarding blood pressure was not available for the fourth case. It can be assumed that this patient experienced hypotension due to the data for estimated blood loss (7000 mL) and amount of fluid input (24,500 mL). A similar retrospective cohort study was performed on a larger scale using the National Inpatient Sample (NIS) database. Of the 4,728,815 patients undergoing spinal procedures between 1993 and 2002, 4134 (0.087%) experienced vision impairment, with an additional 271 patients diagnosed specifically with ION and 47 patients diagnosed with CRAO. The total incidence of vision loss among this population was 0.094%. This study surprisingly found age <18 to be a risk factor for POVL; however, this statistic is related to non-ION related vision loss, an aspect of POVL that has had little attention in past studies. Most recently Shen et al. reports the majority of pediatric cases are due to cortical blindness, often caused by stroke or embolus. More attention needs to be paid to the pediatric population and POVL due to these findings. Chirag et al. reported similar results to Chang et al. in respect to intraoperative risk factors associated with ION. The study reported odds ratios for anemia, blood transfusion and hypotension of 6.3, 5.5, and 20.8 respectively, and the percent of patients reporting ION postoperatively with these
complications were respectively 0.028%, 0.027% and 0.111%, making these characteristics most associated to ION compared to others reported. Results of these two large retrospective studies implicate the common intraoperative risk factors of anemia, hypotension and blood loss as a contributory aspect in the development of POVL. Although there are also cases in which these instances are not apparent, minimizing these intraoperative risks should be the goal of the anesthesia provider. 18,19,20,21

**Summary**

A synthesis of the literature regarding POVL revealed data for the etiology, risk factors, and recommendations for the prevention of POVL. A retrospective review of cases identified numerous risk factors and co-morbidities related to POVL. Patients with a medical history including atherosclerosis, diabetes, hypertension, smoking and obesity are at an increased risk for the complication. In addition, intraoperative risk factors include situations that increase the intraocular pressure (such as the prone trendelenberg position) or decrease the flow of oxygen to the optic nerve. Surgeries in the prone position lasting longer than 6 hours, anemia (resulting from blood loss or other preexisting disease processes), and hypotension have all been identified as intraoperative risks. Overhydration with crystalloids has also recently been implicated in contributing to orbital edema and increased intraocular pressure. The literature synthesis provided data for the development of an intraoperative guideline to help prevent the risk factors for POVL. This guideline was used as an intervention aimed at reducing the risk for POVL among patients undergoing spine surgery.
PART THREE

Intervention

Annually, a group of nineteen nurse anesthetists and thirteen anesthesiologists provide anesthesia for an average of 2,500 spine surgeries in the prone position at Hillcrest Medical Center (HMC) in Tulsa, Oklahoma. The POVL intraoperative guideline was designed to be used as a teaching tool and as a guide for intraoperative care to reinforce the knowledge of the anesthesia department about the risk factors, both preoperative and intraoperative, associated with POVL.

Development of the guideline

The chief CRNA at Hillcrest Medical Center (Tulsa, OK) was consulted to ensure proper procedure in surveying the anesthesia providers about POVL. Support from this individual aided in achieving participation from the anesthesia providers. The anesthesia providers were surveyed regarding the need for an intraoperative guideline to prevent risk factors associated with POVL as well as to gain information about current policies regarding POVL. Information from this survey was coupled with the evidence from the literature synthesis and the protocol was developed.5

(Insert Survey, Appendix A)

Major points of the protocol included: identifying risk factors in the patient’s medical history, ensuring appropriate informed consent, proper positioning of the orbit, close monitoring of the length of the procedure, choice of replacement fluids and identifying a critical low hematocrit value at which the risk for POVL increases. A presentation was developed using POVL
background information plus evidence supporting the need for a protocol. Data supporting the major points of the protocol was included. In addition, the presentation included a brief review of the literature including the prevalence of POVL as a complication of prone spine surgeries. The presentation addressed the intraoperative risks associated with the complication and it was displayed in a poster format that easily conveyed the importance of the prevention of POVL.

Anesthetists assigned to spine cases in the prone position were asked to use the guideline as a reference in these cases for a period of two weeks. In addition, they were asked to evaluate the benefits of the guideline. An attached follow up questionnaire was distributed to the providers asking for feedback as to whether the guideline was helpful in decision making. This feedback was used to make needed changes and improvements.

Model for development

The intraoperative guideline was developed using the Iowa Model of evidence-based practice to promote quality care. The model begins with a problem and knowledge focused triggers which stem from the results of previous changes in practice, new research or literature, or an identified clinical problem. POVL was defined as the clinical problem in question based on findings from the literature associating POVL with prone spine surgery cases. The Iowa model continues with an assessment regarding whether the topic in question is a priority for the organization. The survey given to the anesthesia providers followed this part of the model. The questions included addressed the need for an intraoperative guideline to be used during cases in the prone position. Following the next step of the Iowa model, feedback from the survey provided information that was used, in correlation with the literature, to develop an
intraoperative guideline for POVL prevention. The intraoperative guideline was then implemented while continuing to follow the framework of the Iowa model.

(Insert Intraoperative guideline, Appendix A)
PART FOUR

Implementation and Results

Guiding Framework

The Iowa Model

The framework selected for implementing this intervention was the Iowa model of evidence-based practice to promote quality care. This model was chosen due to its provisions for feedback loops and for the encouragement of using other types of research in addition to randomized controlled trials. The latter is important to the topic of POVL due to the rarity of the complication and the inability to perform randomized controlled trials involving vision loss; therefore, a majority of the evidence for POVL comes from retrospective cohort studies and case reports. Figure 3 depicts the Iowa model, showing how it provides a systematic framework that simplifies implementing evidence-based knowledge into practice. The framework was easily applied to the process of developing and implementing the intraoperative guideline for POVL prevention.

(Insert Figure 3, Appendix A)

The first few steps in the Iowa model were addressed in the previous section describing the methods of development for the POVL intraoperative guideline. The implementation process continued to follow the model when the guideline was implemented for a trial or pilot period. Anesthesia providers were asked to address the guideline during their prone cases and provide feedback regarding whether or not they found the guideline useful. Feedback from the providers was compiled as data that either supports or does not support implementing the guideline into
daily practice. The data was evaluated and following the Iowa model, a decision was made regarding whether the guideline was appropriate for implementation. The evaluation of this data and the implications for practice are addressed in part five of this paper.

Results

Results were compiled in two stages. First, data from the anesthesia provider survey was assessed in order to develop an appropriate guideline that would be useful during prone spine cases. In general, the anesthesia providers were receptive to addressing the issue of POVL. They were willing to participate in the surveys and provided useful feedback regarding the intraoperative guideline. Of the thirty-two anesthesia providers (19 nurse anesthetists and 13 anesthesiologists), twenty-one responded to the survey administered. Accounting for three nurse anesthetists and three anesthesiologists that were on vacation during the time the survey was administered, roughly 80% of the anesthesia providers provided information from the initial survey regarding the need for an intraoperative guideline. Questions were presented in a likert scale format. Data from the survey is presented in table 2 of the appendix. There was one “no response” answer to the question asking if an intraoperative guide would be useful at HMC, and two responses in between agree and disagree for the statement: *POVL is an anesthesia related complication*. On the survey, providers were also questioned about their years of experience in anesthesia as well as if they had actually encountered a case of POVL. Time of experience ranged from six months to forty years. Of twenty-one surveys returned, three different providers had witnessed a case of POVL each with eighteen, twenty, and forty years of experience respectively.
The second stage of data collection involved the feedback received from anesthesia providers after they were asked to address the protocol during their cases. The number of responses for this feedback was considerably lower than the survey responses due to the low number of prone spine surgeries taking place at the time of the data collection. Feedback was received from four anesthesia providers after they addressed the guideline during prone spine cases. On a scale of one to five, one representing very useful/informative and five representing not useful at all, three of the four providers gave the guideline a rating of one and one provider gave the guideline a rating of four. Given more time and a larger amount of prone cases, it would be helpful to distribute the guideline to a larger number of anesthesia providers.
PART FIVE

Evaluation

Following a trial period for the intervention, the next step of the Iowa model involved evaluating the process and outcomes from the trial and modifying the guideline based on the evaluation. 24,23

Evaluation of the process involved addressing the results of the initial surveys distributed to the anesthesia providers. There was a large amount of input by the anesthesia providers as evidenced by the 81% response rate from the surveys. The participation of the providers was a major strength of the developmental process of the intervention. The survey responses were combined and organized in a table format presenting the number of responses per likert scale number for each question. Answers to the survey questions gave information that supported the need for the intraoperative guideline. In addition, some providers supplied other suggestions and comments of support. Nearly 91% (19 out of 21) of the providers replied with agree or strongly agree to the statement: An intraoperative guideline to help prevent the risk factors associated with POVL would be helpful at this facility. The response to this statement alone supplied enough data to support going forward with developing the intraoperative guideline for POVL prevention.

(Insert Table 2, Appendix A)

The expected outcome for the implementation of the intraoperative guideline for POVL prevention was positive feedback from the anesthesia providers regarding the usefulness of the guideline. The outcome was evaluated by using the data collected from the follow up question attached to the guideline. The question asked the provider to rate the guideline’s usefulness on a
scale of one to five, 1- very useful/informative and 5- not useful at all. Although there were only four sources of feedback due to the low volume of prone spine cases during the data collection period, 75% of the responses regarded the guideline as 1-very useful/informative. One provider suggested posting the guideline in the operating suites where most prone spine surgeries were assigned or sending the guideline by e-mail to all anesthesia providers. Thus, the majority of the data collected was positive and supported the implementation of the intraoperative guideline.

Following the Iowa model for Evidence-Based practice, an intraoperative guideline was implemented in order to help prevent the intraoperative risk factors associated with POVL. Based on the evaluation of the process for the guideline development and the evaluation of the outcomes achieved, the implementation of the intervention was successful. The support of the anesthesia providers and their response to the initial survey was pivotal in providing the groundwork for developing the intervention. The data obtained from the surveys, combined with the information that emerged from the literature review, supplied the basis for an intraoperative guideline that was simple yet informative.

Implications

Lessons Learned

The methods used for the development and implementation of an intraoperative guideline for POVL prevention at HMC were extremely successful. The success is partly due to the simplicity of the Iowa model for evidence-based practice. The model provides for feedback loops when a problem arises and directs the researcher toward actions that can overcome the problem. For example, although there was not a significant amount of strong evidence (RCTs,
controlled trials) supporting a specific cause of POVL, the model directed toward using other forms of evidence such as case reports and cohort studies to support the intervention.

**Future Directions**

Although POVL is a rare complication, the results are extremely devastating. Therefore, the implementation of this intervention has implications for further development and future research that can help decrease the prevalence of POVL. The intervention presented in this paper focused on preventing the intraoperative risk factors associated with POVL in hopes of preventing the occurrence of the complication. The continuation of the use of the intraoperative guideline at HMC and implementation of a similar guideline at other facilities will aid in expanding the awareness of POVL as a complication of spine surgery in the prone position. Gaining the support of the anesthesia providers was the most important aspect of being successful in implementing this intervention. In addition, a longer trial period with more cases would be beneficial, supplying more data to support the effectiveness of the guideline. Such data would provide a strong background for the implementer or translator wanting to present the guideline to other anesthesia providers at other facilities.

**Recommendations for Future Studies**

The use of the intraoperative guideline implemented at HMC will potentially lead to a decrease in the intraoperative risk factors associated with POVL and ultimately a decrease in its prevalence. On a larger scale, the intervention could include a cohort study involving several facilities over an extended period of time. Conducting such a study would provide evidence that either supported or refuted the effectiveness of the guideline in ultimately decreasing the overall prevalence of POVL. Although a culmination of risk factors associated with POVL has been
presented, the primary cause of the complication is still unknown. Future studies involving the effects of the risk factors on the perfusion to the optic nerve may supply more data pointing to which factor, or combination of factors, requires the most attention.
References


### APPENDIX A

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<tr>
<th>Author</th>
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<th>Level of Evidence</th>
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<td>Wallick, K., MD et al.</td>
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Table 1. Levels of evidence. II – Evidence obtained from at least one well-designed RCT, III – Evidence obtained from well-designed controlled trials without randomization, IV – Evidence from well-designed case-controlled and cohort studies, V – Evidence from systematic reviews of descriptive and qualitative studies, VI – Evidence from the opinion of authorities and/or reports of expert committees.
Figure 1. Spinal fusions performed yearly as categorized by age group. Data retrieved from The Agency for Healthcare and Research Quality.

Figure 2. Diagram of optic nerve with corresponding blood supply and marked areas of ischemia.
Figure 3. The Iowa model of evidence-based practice to promote quality care."
Anesthesia provider Survey – Participation in this survey implies consent to use the information provided by the survey, names of participants will not be identifiable.

I have ________ years of experience as an anesthesia provider.

I have seen a case of post operative vision loss related to non-ocular surgery in my career as an anesthesia provider – (circle one) yes no

Please respond to each statement by circling one answer

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<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>POVL is an anesthesia related complication</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>POVL is caused solely by compression of the orbit</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>POVL unrelated to ocular surgery occurs only with surgeries in the prone position</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Comments:

Thank you for your participation! 😊
Intraoperative guideline for cases in the prone position

Preoperative risk factors for POVL
*Factors associated with decreased perfusion pressure, increased vascular resistance, decreased oxygen carrying capacity*

- Smoking
- Peripheral Vascular Disease
- Diabetes
- Cardiovascular disease
- Atherosclerosis
- Sickle Cell Disease
- Polycythemia
- Glaucoma
- Anemia

Intraoperative risk factors for POVL

- Hemorrhage/Anemia - blood loss > 1000 ml
- Large amounts of crystalloids infused > 4000 ml
- Hypotension - MAP < 65
- Surgery length > 240 minutes

Guidelines for POVL Prevention

- Minimize increases in intraocular pressure – ensure eyes are free from pressure
- Maintain MAP > 65
- Limit crystalloids, consider colloids early if there is significant blood loss
- Minimize blood loss by avoiding hypertension
- Take extra caution with cases longer than 240 minutes

Please rate this guideline (1 = very useful/informative, 5 = not useful at all)

1  2  3  4  5

Thank you for your participation!!! 😊 Participation implies consent to use information provided.
<table>
<thead>
<tr>
<th>Statement</th>
<th># of responses per likert scale number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post operative vision loss (POVL is a potential complication of prone position spine surgery at this facility)</td>
<td>1 1 8 11</td>
</tr>
<tr>
<td>I have a strong understanding of the preoperative risk factors associated with POVL</td>
<td>0 1 10 10</td>
</tr>
<tr>
<td>I have a strong understanding of the intraoperative risk factors associated with POVL</td>
<td>0 11 10</td>
</tr>
<tr>
<td>An intraoperative guideline to help prevent the risk factors associated with POVL would be helpful at this facility</td>
<td>0 1 13 6 1</td>
</tr>
<tr>
<td>The risk for POVL should be included when the patient is consented for surgery</td>
<td>0 1 11 9</td>
</tr>
<tr>
<td>Informing the patient about the risk for POVL is the responsibility of the anesthesia provider</td>
<td>0 7 8 6</td>
</tr>
<tr>
<td>Informing the patient about the risk for POVL is the responsibility of the surgeon</td>
<td>4 8 8 1</td>
</tr>
<tr>
<td>POVL is an anesthesia related complication</td>
<td>1 9 6 3 2 (between disagree and agree)</td>
</tr>
<tr>
<td>POVL is caused solely by compression of the orbit</td>
<td>11 10</td>
</tr>
<tr>
<td>POVL unrelated to ocular surgery occurs only with surgeries in the prone position</td>
<td>6 14 1</td>
</tr>
</tbody>
</table>

Table 2. Results from anesthesia provider surveys. Number of responses per likert scale number.
Ms. Heather Jones

Dear Ms. Jones:

RE: Post operative vision loss (POVL), Current findings and clinical implications

The proposed study has been reviewed by the TCU Nursing Institutional Review Board (IRB) and was determined to meet the criteria for an expedited review. The proposed study is a survey with education to determine the best practice for preventing POVL.

The study is approved for one year from the above date. Another review by the TCU Nursing IRB is required if your study changes in any way and the TCU Nursing IRB must be notified immediately with regard to any adverse events.

If you have any question please do not hesitate in contacting the TCU Nursing IRB.

Sincerely,

Terri S. Jones, CRNA, DNP

TCU Nursing IRB- Chair