

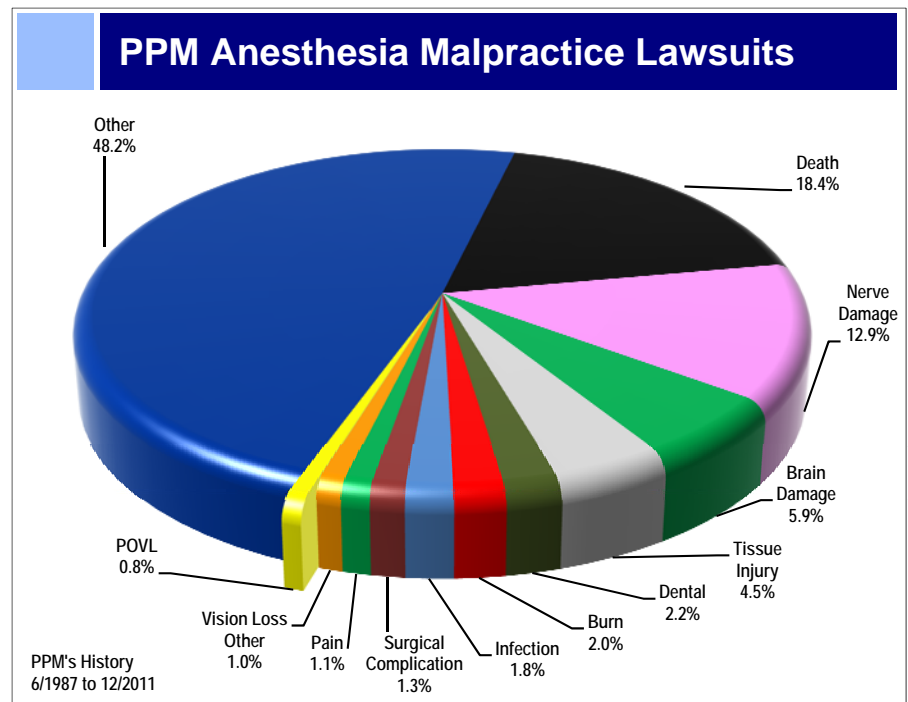
APSF Workshop Provides POVL Update and Recommendations

Preferred Physicians Medical (PPM), based on its involvement in numerous anesthesia risk management initiatives, was invited to participate in a September 12, 2012 multidisciplinary conference organized by the Anesthesia Patient Safety Foundation (APSF) to address postoperative vision loss (POVL).

Steve Sanford, PPM’s President and COO, shared medical liability data with conference attendees and noted that while POVL remains a rare complication, it is highly devastating injury that typically results in litigation. Mr. Sanford suggested that lessons derived from malpractice litigation provide a useful perspective for understanding the scope of the problem and addressing specific concerns presented in POVL procedures. Mr. Sanford cautioned that because litigation tends to focus on extreme outcomes, those most likely to produce compensable harm, litigation generally understates the frequency of injury and overstates the severity. Non-catastrophic outcomes, both temporary impairments and those not resulting in significant monetary losses, are typically underrepresented in malpractice data.

According to Mr. Sanford, PPM’s database from June of 1987 to December 2012 includes 38 events reporting POVL. These adverse outcomes resulted in 26 claim and/or litigation files occurring from 1995 through 2012. Indemnity losses (including both jury verdicts and settlements) for these 26 claims totaled \$6,869,433, with additional defense costs of \$2,801,422. These losses include only those amounts paid by PPM on behalf of its insured anesthesia providers and/or anesthesia practice. The losses exclude payments which may have been paid by the facility, surgeon or other health care providers. According to Mr. Sanford, the majority of POVL cases in PPM’s database involve lengthy spine surgeries; although other surgical procedures including cardiac procedures and gastric bypass cases are also represented in PPM’s data. With respect to frequency of litigation, Mr. Sanford indicated POVL represents only 1 percent of PPM’s anesthesia litigation.

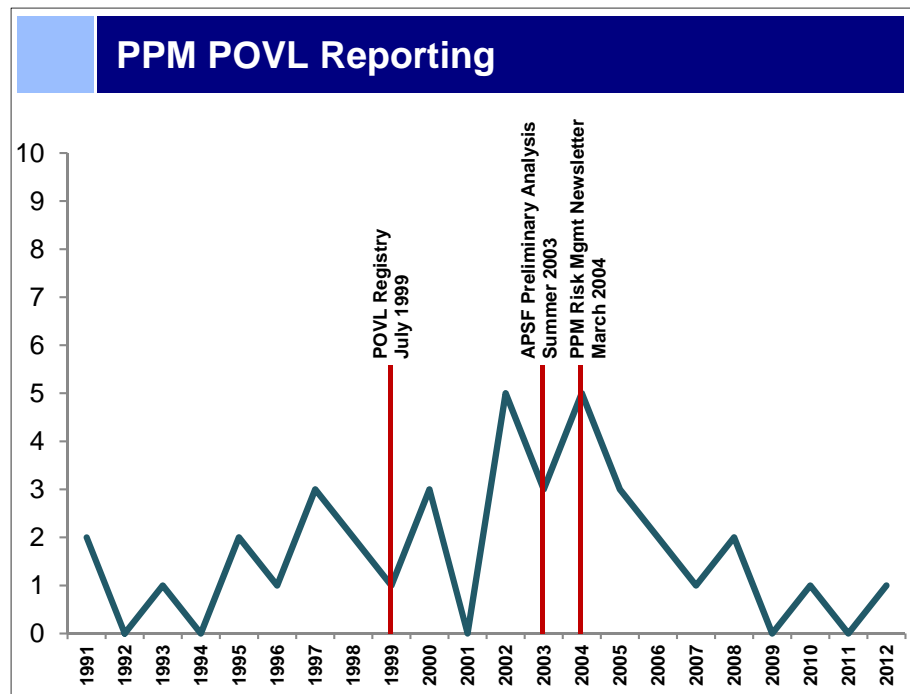
In reviewing the body of litigation reported to PPM, Mr. Sanford indicated a significant area of expert criticism focused on the absence of informed consent regarding the risk of POVL. In PPM’s experience, spine surgeons routinely omitted POVL from the surgical consent. In a number of cases, PPM insured anesthesiologists reported surgeons actively discouraged anesthesiologists from discussing the risk of POVL, especially on the day of surgery. Mr. Sanford noted that in the event of an adverse outcome, surgeons also frequently suggested to the patient that POVL is an anesthesia complication, not a surgical issue. Additional criticisms typically included in POVL litigation frequently focused on the role of hypotension, including the use of deliberate or controlled hypotension. Experts testifying in POVL cases cite both a failure to accurately assess the patient’s baseline blood pressure and the failure to maintain pressures near that baseline. Additionally, most POVL cases also include a wide range of criticisms regarding the specifics of fluid management.



Mr. Sanford noted that despite the absence of evidence-based studies upon which to base recommendations, substantial progress in addressing POVL has been accomplished following the creation of the POVL Registry by the American Society of Anesthesiologists (ASA) in July 1999 and the APSF's Preliminary Analysis published in 2003. Relying primarily on those preliminary recommendations,

PPM successfully brought this issue to its policyholders' attention and through its risk management efforts encouraged anesthesiologists to consider adjustments in their anesthesia care. PPM's early risk management advice encouraged more proactive treatment of preoperative anemia, consideration of blood replacement rather than relying primarily on crystalloid and a more patient specific plan for managing blood pressure and avoiding a "cookie cutter" approach. Other risk management recommendations included discussing the length of the procedure with the surgeon with consideration given to staging more complex procedures and avoiding the use of deliberate or controlled hypotension.

According to Mr. Sanford, following these collective efforts, PPM noted a reduction in the number of reported adverse outcomes following the publication of these early recommendations and suggested that meaningful patient safety advances resulted from the attention focused on this issue by ASA and APSF.



PPM Cases Illustrate Likely Criticisms in the Event of POVL

Examining past litigation provides useful insights into common factors in POVL cases as well as likely expert criticism that anesthesiologist can expect to face in the event of future litigation.

Case #1

- A 64 year-old female patient presented for spinal surgery due to an unstable lumbar spine. The patient was obese, borderline diabetic and had undergone a 3 hour back surgery six months earlier. The current procedure was scheduled for 8 hours, but lasted 11 hours. During the procedure, the patient lost 3,000 cc's of blood, which was addressed with crystalloid. There were no signs of hypotension recorded during the procedure. The patient's head was positioned in a prone-view that allowed the patient's eyes to be monitored throughout the procedure for signs of pressure. No signs of pressure were noted. Three PPM insured anesthesiologists along with a certified registered nurse anesthetist (CRNA) provided the anesthesia care. Post-operatively, the patient reported bilateral blindness. An ophthalmology consult suggested the patient suffered an ischemic optic neuropathy and recommended steroids to treat the patient. Unfortunately, the patient's vision did not improve following treatment.

The patient sued three PPM insured anesthesiologists and a CRNA involved in her care. Plaintiff's anesthesiology expert, Dr. Kenneth Rothfield of Leonardtown, Maryland, testified the defendant anesthesiologists and CRNA were at fault for the patient's loss of vision. According to Dr. Rothfield the patient was at high risk for POVL given her pre-existing medical conditions, the length of surgery at over 11 hours with the patient in a prone position. The expert opined this was a "black and white" case of negligence because the anesthesiologist starting the case had failed to develop a proper anesthesia plan prior to the commencement of surgery. According to this expert, the patient's pre-existing hypertension, treated with medication, suggested that the anesthesiologists needed to establish a reliable baseline blood pressure for managing the case. According to the plaintiff's expert, reliance on a single BP reading of 140/70 was not acceptable. According to Dr. Rothfield, the patient's blood pressure was maintained far too low for far too long with inadequate fluid replacement based on the patient's size and weight.

Although the expert conceded the patient's blindness may have resulted from a multi-factorial situation, including the patient's diabetes, weight and hypertension, in his opinion the period of severe hypotension during the procedure was the ultimate cause of the injury. The plaintiff's expert described the anesthetic as a case of accidental hypotension versus deliberate hypotension.

With respect to informed consent, Dr. Rothfield indicated that at the time of this procedure it was not a deviation from the standard of care for the anesthesiologist to omit informing the patient about the risk of blindness. However, he believed it would be better practice today for an anesthesiologist to disclose this risk. Furthermore, Dr. Rothfield testified, in his opinion, it was not the orthopedic surgeon's responsibility to discuss the risk of blindness. He conceded POVL is a rare and unusual complication that involves multiple factors involving a loss of the perfusion to the optic nerve.

Anesthesiology experts retained for the defense were supportive of the anesthetic management for the 11 hour surgery. Defense experts testified all of the anesthesia providers met the standard of care both as it related to the maintenance of the patient's blood pressure and the administration of fluids. The defense expert also testified that it was the surgeon's responsibility to discuss the risk of blindness with the patient during the surgical informed consent process.

Based on the deposition testimony, defense counsel estimated a potential jury verdict range of \$1.5 million to \$3 million. The plaintiff was employed at the time of this incident and surveillance confirmed she is totally blind. Based on this assessment and with the consent of the PPM insured anesthesiologists and the CRNA, the case settled for \$1,300,000.

Case #2

- A 49 year-old male presented for anterior cervical fusion with general anesthesia. The patient had been involved in a MVA several months prior to this surgery, and decided to undergo anterior cervical fusion to relieve neurological problems he was experiencing.

The patient's blood pressure was 124/83 at the start of the case. The surgery proceeded largely as expected, except the patient's systolic blood pressure (BP) dropped into the 80s and 90s for approximately one hour. The PPM insured anesthesiologist, believing the patient was otherwise healthy, determined the BP was within the safe range and made a clinical decision to wait to see if the BP rose by itself. After approximately an hour, the patient's systolic pressure did, in fact, return to the 90s and above. The surgery was completed without complication and the patient did well in recovery.

The following morning, the patient complained of bilateral double-vision. The double-vision complaints were followed later in the chart by complaints of vertigo. The patient continued to experience vertical and torsional diplopia.

The patient initially sued the PPM insured anesthesiologist, her anesthesia practice group and the hospital. The plaintiff alleged he suffered an ischemic event caused by the prolonged period of hypotension that was not timely and properly treated by the PPM insured anesthesiologist. The plaintiff alleged further that the hospital did not have the appropriate surgical equipment, which allegedly contributed to his surgical hypotension. The plaintiff alleged his vision loss rendered him disabled from performing work in his profession as an osteopathic internal medicine physician.

Plaintiffs' anesthesiology expert, Elizabeth Frost, MD of New York, testified the PPM insured anesthesiologist failed to appropriately monitor the patient's BP, allowed the patient to become hypotensive for more than one hour during surgery, failed to appropriately treat the patient's hypotension and unnecessarily exposed the patient to risks associated with surgical hypotension without justification.

Regarding hemodynamic stability, Dr. Frost was confronted during her deposition with her own prior testimony in another lawsuit. In the current case, Dr. Frost testified that there were general protocols or guidelines for determining an appropriate level of hypotension as a 20% to 25% reduction from normal mean arterial pressure (MAP). In a previous case, Dr. Frost had testified a 40% reduction from normal MAP was acceptable. Despite her earlier testimony, Dr. Frost opined it was a deviation from the standard of care for the PPM insured anesthesiologist to allow the patient's systolic blood pressures to fall below 100 mm Hg without taking corrective action. Dr. Frost was again challenged with previous testimony suggesting that blood pressure of 70/40 was acceptable in a patient with preoperative BP of 120/80.

Defense anesthesiology experts were supportive of the range of mean arterial blood pressures that never fell below 57 to 58 MAP. The defense anesthesiology expert testified the patient injury likely resulted from a right brain stem infarct, most likely due to surgical manipulation. The defense experts testified the embolic event that caused the patient's vision loss and vertigo was not caused by hypotension. Following the defense experts' depositions, plaintiff sued the neurosurgeon and his practice group. The co-defendant neurosurgeon rejected the defense experts' opinions that the patient suffered an embolic event and his defense counsel assured PPM that the co-defendant neurosurgeon would instead criticize the anesthesia care in the event the case proceeded to trial.

Plaintiff's economic expert's report provided an estimate of the plaintiff's economic loss in the amount of \$640,020 in past economic loss and future economic loss of \$4,985,035 for total economic losses in the amount of \$5,631,055. Defense counsel estimated the PPM insured anesthesiologist's chances of prevailing at trial at 50%. Despite successfully challenging the plaintiff's anesthesia expert and providing an alternative theory of causation, PPM settled this case for \$1,700,000 with the consent of its insureds. The hospital also settled prior to trial for a confidential amount. At the time of settlement, plaintiff continued his case against the co-defendant neurosurgeon and his practice group. ❖

APSF POVL Conference Highlights

By Steve Sanford, JD

Fifteen presenters - representing patients, anesthesia providers, surgeons, researchers and experts in post operative vision loss - provided conference attendees with a broad range of perspectives.

Anthony Lehner, MD, an anesthesiologist, provided a compelling patient perspective detailing his own vision loss following a three-level lumbar fusion in September 2006.

David Corda, MD addressed the vital importance of informed consent in POVL given the devastating nature of blindness. According to Dr. Corda, "variability in physicians' understanding of POVL, shared responsibility by surgeons and anesthesiologists and lack of institutional guidelines has contributed to inconsistent disclosure of the risk of POVL." Dr. Corda reported on a study by the Mayo Clinic that "determined that at least 80% of neurosurgical patients undergoing prone spinal surgery with instrumentation prefer full disclosure of the risk of POVL, by the surgeon, during a face-to-face discussion before the day of scheduled surgery." The impact of Dr. Corda's presentation is reflected in the emphasis placed on the importance of informed consent in the workshop's consensus conclusions, as reported by the APSF.

Lorri A. Lee, MD provided an overview of data collected in the ASA's POVL Registry. According to Dr. Lee, ischemic optic neuropathy (ION) was the most common cause of POVL in the spine surgery cases. Relying on peri-operative data captured in the POVL Registry, six risk factors were significantly and independently associated with ION after prone spinal fusion surgery:

- 1) Male sex
- 2) Obesity
- 3) Duration of anesthesia (as surrogate for surgical time)
- 4) Estimated blood loss
- 5) Use of Wilson spine frame
- 6) Lower percent colloid in the non-blood fluid administration

Dr. Lee concluded that given the lack of an effective treatment for ION and because vision rarely recovers fully, preventative strategies are essential.

Nancy Newman, MD, a neuro-ophthalmologist, provided attendees with a comprehensive and impressive overview of the various physiological mechanisms that may explain POVL. According to Dr. Newman, the "proposed mechanisms all relate to decreased oxygen availability to portions of the optic nerves."

Michael Olympio, MD, an anesthesiologist, and Ronney Abaza, MD, a urological surgeon, discussed the potential for an increased number of POVL cases arising from robotic pelvic surgery. While reported cases of POVL following robotic pelvic surgery remain rare when compared to the increasing number of robotic procedures, both presenters suggested the need to identify risk factors and strategies to minimize evolving POVL risk. ❖

Introduction to POVL by an Anesthesiologist Who Experienced It

By Anthony D. Lehner, MD (anesthesiologist and patient — reprinted with permission)

I was a practicing anesthesiologist in Dallas at the time of my 5th back operation, a redo three-level lumbar fusion in September 2006, which resulted in incomplete posterior ischemic optic neuropathy (PION). The anesthesiologist for my surgery was my partner of many years. I remember her asking me several days preoperatively if I had thought about the “blindness issue” and what would I do if that occurred? In fact, I had actually lectured on the subject and said, “I doubted that would happen, but it was a risk I would have to take.” Like many back surgery patients, I was in a lot of pain with neurologic deficit and few options.

My operation took 7 hours (a lot less than some) and while I was described as awake in recovery, I do not remember that. Surgery finished at 7 pm and it was 11pm when I left PACU. My first awareness was 6:30 am the next morning. When you wake up from these prolonged prone procedures everything is swollen. My tongue had swollen to completely fill my mouth except for a small opening where the endotracheal tube had been. My eyes were quite swollen and it was a long time before I could open them. It was noon before I was awake enough to realize the visual field defect in my right eye was not due to Lacrilube® ointment. My visual field defect involved the upper 70% of the right eye only. It was like a purple veil with flashing yellow, green and red squares, exactly like what you see when your digital TV loses its signal. By the following morning the defect appeared the same but involved only the top 50% of the visual field in the right eye. When you looked at something for a while, it seemed like fibers were recruited and the defect would move up to involve only about 30% of the upper visual field. Whereas the day before I couldn't see through the purple veil, now I could see objects behind it fairly distinctly – kind of like a transparent layer.

I considered my situation for awhile and remembered the one ophthalmology lecture we received in medical school. Thirty minutes of anatomy and some disease stuff followed by “You don't need to know this - call us.” But in that lecture, I recalled the word scotoma (Greek for darkness) and that if that part of the visual field was just flat grey it meant dead cells, if it flashed (or scintillated) these were live cells that were not happy. So I had scintillating scotomata.

I was also aware that you needed an early fundoscopic exam to differentiate anterior from posterior ischemic optic neuropathy. There was a phone by the bed, so I decided to call the orthopedic nurse practitioner, who I knew well, and tell her I needed an ophthalmology exam ASAP. Although I got through, I am not sure how she ever understood me with my swollen tongue. An ophthalmologist did arrive late that same afternoon and declared slit-lamp exam normal. Subsequently, I was referred to a neuro-ophthalmologist who followed me for more than a year with monthly visual fields that changed little. Scintillating decreased over the next twelve days and was replaced by a 70% grey area superior-lateral visual field right eye only. Over the past six years this has decreased to 55% - slight improvement visual field. The slit-lamp exam remained normal until the 20th day postoperatively when inferomedial paleness of both optic nerves was noted, much more pronounced on the right.

When the orthopedic spine surgeon came by the day after I telephoned his nurse, his comment was “sounds like an anesthesia problem.” In response, I sent reams of literature to his office. He finally acknowledged he had seen one case of blindness during his fellowship but thought it was a “fluke.”

I fully intended to go back to anesthesiology following my surgery, but must admit I was a bit anxious. In the past I saw maybe one or two difficult intubations a year. But by that time, the increasing number of obese patients had made it into 1-2 per week and what happens if your vision doesn't let you see your one chance to place the tube? It wasn't right to be primarily responsible for intubating patients when you had a visual field defect. I had planned to practice anesthesiology forever. But having made this observation, I retired the next day and moved on to other areas of medicine.

Looking back, perhaps it was time for a change. Maybe things happen for a reason. I found challenging new work. The back operation worked out very well and I have less back pain than anyone I know. So while I lost a career to PION, I did make the right decision about having the operation. I have a lot to be thankful for – I'm not blind and statistics at the time said that 68% of the folks who had this happen ended up blind. Would I feel the same way about the decision to have the operation if I was blind? I don't know. Clearly I am the outlier in terms of informed consent. Going into this, I knew far more about the risks than any patient probably has before or since. But had I known nothing about visual risk, I think there would have been a lot of anger and difficulty adapting to what followed. ❖

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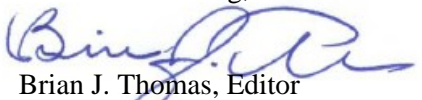
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Thanks for reading,


Brian J. Thomas, Editor

Note: The purpose of this newsletter is to provide information to policyholders and defense counsel regarding professional liability issues. Risk management analysis is offered for general guidance and is not intended to establish a standard of care or to provide legal advice.

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APSF-Sponsored Conference on Perioperative Visual Loss Develops Consensus Conclusions

by Lorri A. Lee, MD, and Robert K. Stoelting, MD
(reprinted with APSF permission)

On September 12, 2012, the APSF sponsored a multidisciplinary conference, *Perioperative Visual Loss: Who is at risk, What should we tell patients preoperatively, and How should we manage their intraoperative care?*

The goals of this Perioperative Visual Loss (POVL) conference were to

- Assure that current management reflects evolving information and understanding of “best practices” for patients at risk for POVL.
- Create a “participant-developed, moderator-led statement of safety recommendations (“best practices”) for managing patients considered at risk for POVL.

The 87 attendees included

- Anesthesia professionals (n-74) (anesthesiologists, CRNAs, AAs)
- Other physicians (n-4) (orthopedic surgeon, neurosurgeon, neuro-ophthalmologist, robotic surgeon)
- Non-physicians (n-8) (2 risk managers, an anesthesia researcher, professional liability insurer, practice administrator, pharmacist, Veterans Administration Hospitals and APSF staff)
- Industry (n-1).

The anesthesia professionals included 13 attendees who had participated in the *Postoperative Visual Loss Study Group* (*Anesthesiology* 2012;116:15-24). Several of the other attendees participated in or represented organizations that supported the most recent American Society of Anesthesiologists *Practice Advisory for Perioperative Visual Loss Associated with Spine Surgery* (*Anesthesiology* 2012;116:274-285).

The POVL conference included podium presentations, panel discussions, small group breakout sessions, and completion near the end of the conference (following all podium presentations and panel discussions) of a questionnaire/survey (<http://www.apsf.org/announcements.php?id=12>).

For the initial organizational purposes of the conference, POVL was assumed to be due to ischemic optic neuropathy (ION) or central retinal artery occlusion (CRAO). High-risk patients for ION were defined as those undergoing spine procedures while positioned prone and who had prolonged procedures (exceeding an average of 6.5 hours) and experienced substantial blood loss (an average of 44.7% of the estimated blood volume), or both (*Anesthesiology* 2012;116:274-282). A similar definition with regard to operative duration was arbitrarily applied by the APSF to head-down (degree of head-down not definable) robotic/laparoscopic surgeries.

An overwhelming theme of the conference presentations, panel discussions, and small group breakout sessions as well as the questionnaire/survey was the importance of including the risk of POVL caused by ION in the informed consent process. For patients considered to be at risk of POVL caused by ION, anesthesia professionals and surgeons should include discussion of the remote risk of visual impairment, ranging from partial vision loss to complete blindness in both eyes, during the informed consent process. POVL from CRAO caused by external globe compression was felt by the attendees to be largely preventable with the use of appropriate positioning aids and monitoring of the external globes (eye checks) during the intraoperative period. Discussion of the rare adverse event of CRAO during the informed consent process should be left to the discretion of the anesthesia professional and surgeon.

It was further recognized that the informed consent process should include a discussion of

- The current state of understanding as to risk factors for POVL due to ION.
- The interventions that may reduce the risk of POVL due to ION.

Indeed, the value of the informed consent process to the patient is dependent on those responsible for the perioperative care to be cognizant of evolving information and strategies designed to reduce the risk of POVL caused by ION.

It was recognized that POVL is a rare event that, based on its incidence (less than 0.2% of spine surgeries), might not be considered for inclusion in an informed consent by anesthesia professionals and surgeons. However, the rare occurrence of POVL caused by ION is negated by the “**extreme value that patients place on vision**”) as demonstrated by patients’ willingness (>80% surveyed) to accept risks of stroke or death to save some vestige of vision (*Ophthalmology* 1996;103:691-696). When patients who had undergone prior spine surgery were asked if they would want to be consented for the risk of POVL with prone spine surgery, more than 80% reported that they would prefer full disclosure of the risk of POVL by the surgeon in a face-to-face discussion prior to the day of surgery (*Mayo Clinic Proc* 2011;86:865-868).

A total of 67 questionnaire/surveys out of a possible 74 were returned by attendees at the conference who designated their affiliation as “anesthesia professionals” (<http://www.apsf.org/announcements.php?id=12>). Their responses to the survey questions are discussed below. The questionnaire/surveys available from the other professional affiliations were considered too few (n-12) to analyze but were recognized to be supportive of the consensus of the anesthesia professionals with respect to the need for inclusion of the risk of POVL during the informed consent process.

Of anesthesia professionals, 23.9% (16 of 27) had cared for one or more patients who had experienced ION, whereas another 46.8% (30 of 67) were aware of this complication occurring in their hospital/practice group. CRAO was infrequent with 95.5% (64 of 67) of the anesthesia professionals indicating they had not cared for a patient who experienced blindness due to this mechanism, and only 22.3% (15 of 67) were aware of this

complication occurring in their hospital/practice group. **Thus, for the purposes of this report, POVL will be considered to be due to ION in the subsequent sections.**

The vast majority of anesthesia professionals, (86.6%) responding to the questionnaire felt that “most surgeons do not recognize the risk of ION in the susceptible patient population, whereas 52.2% felt the same was true for anesthesia professionals. Of respondents, 85.9% felt that “risk factors for ION” could be modified or eliminated by both the anesthesia professional and surgeon.

When asked if “ION should be discussed during the informed consent process” the majority of participants believed it should be included in the “informed consent form,” either as a single document for surgeons and anesthesia professionals or as a separate consent form from each specialty. The information to be included in the informed consent process can be inferred from responses to specific questions and was supported by the podium presentations, panel discussions, and small group breakout sessions. For example 60 of 67 anesthesia professionals (89.6%) agreed that the “best option available for patients and those responsible for their care is to create and adopt universal best practices management guidelines and recommendations (based on current knowledge and understanding) at their institution and to apply it to the intraoperative management of all patients considered to be at risk for ION.”

Of anesthesia professionals, 85.1% agreed that best practices management guidelines to decrease the risk of ION should be based on steps to decrease the likelihood of venous congestion and edema formation in the periorbital area/head. There was agreement among 63 of 67 anesthesia professionals that male gender, obesity, decreased percent colloid administration of nonblood replacement, and use of the Wilson frame should be added to the risk factors for developing ION following spine surgery. A need to balance colloid and crystalloid administration was supported by 58 of 67 attendees (86.6%). Most anesthesia professionals (97%) agreed that “during spine surgery, the patient’s head should be positioned level with or higher than the heart” in patients considered to be at risk for ION.

Although controlled hypotension has not been identified as an independent risk factor for ION, 57 of 67 anesthesia professionals (85.1%) agreed that “controlled hypotension should not be used routinely in patients considered to be at risk for ION.”

There was agreement among 55 of 67 anesthesia professionals (82.1%) that “consideration should be given to the use of staged spine procedures” when the duration of spine surgery is anticipated to be prolonged (preoperatively) or becomes prolonged (intraoperatively).

The need to periodically monitor hemoglobin or hematocrit to detect anemia in patients considered to be at risk for ION was supported by 60 of 67 anesthesia professionals (92.3%), while 86.6% agreed that a specific “transfusion threshold that would reduce the risk of ION related to anemia was not known.” Further, 89.6% of the anesthesia professionals agreed there is no proven treatment for ION when it manifests postoperatively.

In conclusion, the consensus of the attendees at the APSF-sponsored POVL conference may be summarized as follows:

- During the informed consent process, anesthesia professionals and surgeons should include discussion of the remote risk of visual impairment ranging from partial vision loss to complete blindness in both eyes for patients considered to be at risk for POVL from ION.
- If the risk of POVL from ION is not part of a combined anesthetic and surgical informed consent process, or part of a separate surgical informed consent process, it should be part of the anesthetic informed consent process.
- The informed consent process may include a discussion of risk factors (prolonged spine surgery in the prone position or prolonged robotic surgery in the head down position, increased blood loss, male gender, obesity, use of Wilson surgical frame) and the current understanding of interventions that may reduce the likelihood of POVL caused by ION (minimize duration of surgery, consider staged spine procedures, keep head at or above the level of the heart, minimize use of surgical frames that place the head lower than the heart, include colloid in nonblood replacement). Discussion may include the concept that this complication is difficult to study because of its low incidence. Preventive measures are based on our best educated guess from what we know of the risk factors but have not been tested.
- Use of controlled hypotension in patients at risk for POVL caused by ION, although not documented to be an independent risk factor, is not recommended on a routine basis.
- POVL from CRAO caused by globe compression should be preventable with the use of appropriate positioning aids and monitoring of the external globes (eye checks) during the intraoperative period.

Supporting Literature

1. Practice advisory for perioperative visual loss associated with spine surgery: An updated report by the American Society of Anesthesiologists Task Force on Perioperative Visual Loss. *Anesthesiology* 2012;116:274-285.
2. Risk factors associated with ischemic optic neuropathy and spinal fusion surgery. The Postoperative Visual Loss Study Group. *Anesthesiology* 2012;116:15-24.
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4. Corda DM, Dexter F, Pasternak JJ et al. Patients’ perspective on full disclosure and informed consent regarding postoperative visual loss associated with spinal surgery in the prone position. *Mayo Clinic Proc* 2011;86:865-868.

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