ANESTHESIA & the LAW
A Risk Management Newsletter
APRIL 2012
ISSUE 33

No Day at the Beach: Catastrophic Injuries in Head-Up Position Surgeries

While the controversy and debate continues in the anesthesiology community regarding the hemodynamic management of patients in the beach chair or head-up position[1], Preferred Physicians Medical (PPM) continues to receive reports of these rare[2], catastrophic injuries from their policyholders. Some challenges PPM and its policyholders face in defending these devastating cases include no current consensus about the causes, risk factors or effective preventive strategies to avoid these injuries. Further, there is no scientific, evidence-based standard of care for determining and monitoring the minimum mean arterial pressure (MAP) in order to avoid cerebral hypoperfusion and ischemic injury. Notwithstanding these facts, plaintiff attorneys have little difficulty identifying anesthesiologists who will testify against their peers there is a standard of care that was violated.

The following case summaries highlight the devastating injuries that can occur during surgery in the beach chair position and some of plaintiff's anesthesiology expert opinions PPM policyholders have faced in litigation:

- 61 year-old female fell and fractured her left humerus. There was no reported loss of consciousness or central nervous system changes at the time of the fall. She was evaluated at the hospital where she had a syncopal episode (that was not reported to the PPM insured anesthesiologist prior to surgery) and referred for an open reduction internal fixation (ORIF) of her left shoulder. The patient had no significant medical history, except remote history of smoking. Laboratory findings included normal labs and chest x-ray. Hematocrit was 35. Past medical records revealed an average systolic blood pressure of 120, and an average mean blood pressure of 88. The patient had no history of transient ischemic attack (TIA) or stroke. The patient was assigned an ASA classification of II based on her history of smoking.

  The patient entered the operating room (OR) at 0727. Monitors included small adult blood pressure cuff on the upper arm, EKG, pulse oximeter, end tidal CO2, temperature, nerve stimulator, and inspired O2. At 0732 the patient received Midazolam 2 mg. At 0735 anesthesia was induced with Propofol. The patient was administered Rocuronium and intubated without difficulty. Anesthesia was maintained with Desflurane 6%, oxygen, Rocuronium, Fentanyl 50 mcg x 5 (250 mcg total), and Dilaudid 0.4 mg x5 (2 mg total). At 0747 the patient was placed in a beach chair position, as required by the surgeon and with the assistance of the OR staff. The upper body was inclined to approximately 55 degrees relative to the base of the table. The table was placed in a slight Trendelenburg position to maintain the patient's hips in place (making the upper body about 45 degrees with respect to the floor). A Philadelphia collar was used to stabilize the patient's head in a neutral position.

  Surgery began at approximately 0800 and ended at 1000. The surgery and anesthetic proceeded normally with no indication of any complications. The patient was returned to the supine position at approximately 1005. Total fluid during the surgery was 1500 ml, total urine output was 500 ml, and blood loss was estimated at 100 ml. All values for oxygen saturation and end tidal CO2 were normal for the entire case. During the case, the patient's vital signs were stable. Neuromuscular blockade was reversed in the OR.

[1] The Summer 2007 issue of the *APSF Newsletter* featured an article authored by David J. Cullen, MD and Robert R. Kirby, MD in which they provided a formula for correcting hydrostatic blood pressure gradients from the site of measurements to the site of the vulnerable brain tissues. That article sparked a series of letters to the *APSF Newsletter*, either supporting or challenging the need for the blood pressure corrections. The complex physiology involved in that debate is beyond the scope of PPM's Risk Management Newsletter, *Anesthesia & the Law*. For a more detailed discussion of this debate, please see the References at the end of this article.

[2] PPM has defended three lawsuits, including the two cases highlighted in this newsletter, and is currently defending six other lawsuits involving injuries sustained during surgeries in the beach chair position.

During surgery, 73% of recorded systolic pressures were 110 or higher, and 27% of blood pressure readings were between 100-109. The lowest recorded systolic blood pressure was 100. There were no observed or clinical signs of hypoxia or anoxia during the surgical procedure. The calculated mean blood pressures during surgery, using recorded values, were distributed as follows: 3% were 100 or greater, 93% were between70-89, and 3% were between 60-69. The lowest calculated mean blood pressure from the recorded values was 66. The average systolic blood pressure during the surgery was 114 mmHg, and the average mean pressure was 78 mmHg. The patient's mean arterial pressure (MAP) never approached the generally accepted level of 50 mmHg (in 2007) at which time cerebral autoregulation might be affected. The anesthesia record indicated the patient was not hypotensive at any time during the surgery, nor was the patient hypoxic as evidenced by SaO2.

The patient was taken to the recovery room around 1030. She was extubated and was breathing on her own, but was slow to wake up. The PPM insured anesthesiologist left to do another case. He again checked on the patient at 1230. At that time the patient was still not awake, but would open her eyes when vigorously stimulated. The PPM insured anesthesiologist ordered reversal of medications, a blood gas and neurology consult. He then left to do a third case. When he returned at 1430 the patient was still not awake. He ordered a MRI and CT scan, which both were reported as normal. The blood gas was normal. The patient's care was turned over to the hospitalist and neurologist. Carotid ultrasound studies taken post-operatively showed evidence of abnormal flow or velocity. Another MRI showed changes similar to a stroke. The patient was transferred to another hospital where she passed away. An autopsy listed cause of death as anoxic brain injury.

The patient's husband and four adult children sued the PPM insured anesthesiologist and his personal professional corporation. Plaintiffs alleged the PPM insured anesthesiologist failed to adequately monitor and control blood pressure and blood perfusion to the patient's brain during the surgery resulting in hypoxic ischemic brain injury and death.

Plaintiff's anesthesiology expert, Ronald Wender, MD from Los Angeles, California, testified in his deposition that the patient's blood pressure was allowed to reach a dangerous low point leading to a lowered mean arterial pressure (MAP) and resulting in inadequate cerebral perfusion pressure (CPP). He testified further the consequence of the inadequate CPP was inadequate blood flow throughout the brain leading to deprivation of oxygen resulting in irreversible brain damage.

As part of his opinions, Dr. Wender made certain assumptions. Initially he assumed the patient's baseline blood pressure was the value the PPM insured anesthesiologist obtained as part of his pre-operative assessment. The reading was 149/88, which corresponded to a MAP of 108. In using this blood pressure reading as the patient's baseline he claimed to have never heard of the term "white coat hypertension" (a phenomenon in which patients exhibit elevated blood pressure in a clinical setting but not in other settings. It is believed this is due to the anxiety some people experience during a clinic visit).

Apparently, plaintiffs' counsel never provided Dr. Wender with any of the patient's pre-injury blood pressure readings that were in the 110s-120s systolic and 70s-80s diastolic. When questioned about the various MAP values during the first hour of surgery, he testified that the "old school" thinking that MAP values ranging between 50-150 thought to be in the normal range are no longer applicable. Instead, he testified he teaches his residents to never approach MAPs in the 50 range and that ideally, the range should be 70-80. Defense counsel pointed out to him the MAP values during the first hour of the surgery never dropped below 70 and were as high as 80. Dr. Wender indicated that the MAP values had to be corrected to calculate an estimated CPP. When he performed his series of corrections, he employed calculations different than the PPM insured anesthesiologist outlined in his deposition. According to Dr. Wender's calculations, the patient's resulting CPP's ranged from 43 to 60 during the first hour of surgery. He opined that these CPP's were inadequate to allow enough oxygen to flow to the patient's brain.

The defense anesthesiology expert was questioned extensively by plaintiff's counsel during his deposition on issues related to MAP and correction factors related to the beach chair position. In conjunction with this line of questioning, plaintiff's counsel presented the defense anesthesiology expert with various articles, which pointed out that the older standards for MAP were no longer applicable. While the defense

expert acknowledged that literature of this type was available, he maintained there is no recognized standard for what would have constituted the minimal MAP in 2007. In applying this opinion to this case, the defense expert testified the patient's anesthesia record was so benign that he would not have expected anything but a routine outcome. His testimony was that the PPM insured anesthesiologist met the standard of care for 2007 in all regards.

In further support of his opinion, the defense expert pointed out the fact that nationally recognized institutions, such as the Hospital for Special Surgery in New York, established their MAP levels consistent with those the patient had in this case. In fact, he indicated this institution continues to rely on MAP levels, like the patient's, as being acceptable in 2011.

Plaintiffs' counsel was able to establish through the defense expert that there are at least 6 or 7 reported cases of the type similar to the patient's situation. The defense expert explained that even 6 or 7 complications of this type, given the hundreds of thousands of shoulder surgeries performed in the beach chair position, is an incredibly small number. The defense expert added there is no science-based evidence that adequately explains why only a handful of patients like this patient experience a devastating complication and the overwhelming number of patients do not. The defense expert indicated in retrospect this patient may have come into surgery with an unknown and increased sensitivity for cerebral hypoperfusion due to the carotid stenosis that was found post-operatively. Upon further questioning by plaintiffs' counsel, the defense expert had to concede the beach chair position likely played a role in the patient's neurological insult.

During discovery, plaintiffs produced an economic expert who estimated economic damages in the range of $300,000 to $400,000. The economic damages coupled with anticipated jury sympathy for the surviving family resulted in an evaluation from defense counsel that the overall exposure at trial could exceed $1,000,000.

Based on defense counsel's evaluation, the PPM insured anesthesiologist consented to settlement. The parties participated in mediation and the case was settled on behalf of the PPM insured anesthesiologist and his personal professional corporation for a confidential amount within the $1 million policy limits.

- 56 year-old female patient presented for left total shoulder arthroplasty. The patient's medical history was significant for mastectomy, ulcerative colitis, pouch procedure and other GI procedures. Normally the blood pressure cuff and IV would have been placed on the patient's right arm; however, due to her previous mastectomy, the arm could not be used because her lymph nodes had been removed. Instead, the right calf and foot were used for the blood pressure cuff and IV, respectively.

  The PPM insured anesthesiologist and PPM insured certified registered nurse anesthetist (CRNA) administered general anesthesia with interscalene block. The PPM insured anesthesiologist induced general anesthesia with the CRNA present, who then handled the procedure with breaks covered by the PPM insured anesthesiologist.

  There were no apparent anesthetic problems and the patient's oxygen saturations and end tidal carbon dioxide (ETCO2) were within acceptable levels throughout the procedure. There was no intra-operative hypoxemia or hypotension noted in the anesthetic record. As the blood pressure cuff was placed on the patient's calf, the PPM insureds kept the blood pressure a little higher and maintained a mean arterial pressure (MAP) in the 70-80 range with systolic in the 100 to 120 range.

  Post-operatively, the patient had a brief period (approximately 3 minutes) of hypotension. The MAP was around 50 but the PPM insured was able to palpate a carotid pulse so he was not too concerned. He administered neosynephrine and continued her on a infusion for approximately 20 minutes. The patient's blood pressure responded appropriately and the drip was discontinued.

  However, following the procedure the patient did not awaken and her pupils were fixed and dilated. EEG showed no brain activity. All other scans showed diffuse bilateral brain ischemia. The patient was placed on a ventilator but after neurology consults confirmed brain death, the family decided to discontinue physiologic support.

An autopsy revealed the patient's vertebral arteries on the left side were congenitally deformed and occluded. On the right side, there was a dissection, which the PPM insured anesthesiologist could not explain (but did not believe it was caused by placing the patient in the beach chair position since there was no untoward movement of her head and neck and the intubation was without difficulty).

The patient's husband sued the PPM insured anesthesiologist, CRNA and their anesthesia group practice.

Plaintiff's anesthesiology expert, David J. Cullen, MD from Massachusetts, signed a sworn affidavit testifying the PPM insured CRNA deviated from the accepted and prevailing standard of care in his treatment of the patient in that: 1) the patient was allowed to be intentionally placed in a hypotensive state while elective shoulder replacement surgery was performed in a sitting or upright position ; 2) the CRNA failed to manage the patient during the surgery to ensure she received adequate cerebral perfusion; 3) the CRNA failed to utilize an arterial line properly calibrated to measure cerebral perfusion; 4) the CRNA failed to ensure the blood pressure cuff placed on the right calf was properly correlated to her arm; and 5) the CRNA failed to take into account the pressure differentials that existed between the patient's calf and cranium.

Plaintiff further alleged the PPM insured anesthesiologist failed to properly supervise the CRNA during the surgery to ensure the patient received adequate cerebral perfusion, which caused her brain death and subsequent demise.

The defense anesthesiology expert executed a sworn affidavit testifying the PPM insured anesthesiologist and CRNA employed anesthesia techniques within the accepted standard of care and did not place the patient in a hypotensive state. He testified further the choice of positioning and monitoring during anesthesia was entirely appropriate given the circumstances of the procedure and health history. The defense expert also refuted the plaintiff's expert's criticism for not using an arterial line as it was his opinion that was not required by the standard of care.

During his deposition, the PPM insured anesthesiologist denied placing the patient in a hypotensive state. He testified the surgeon likes the blood pressure to be lowered during certain portions of the anesthetic so the pressure may be decreased to within cerebral autoregulation ranges, but by no means is there deliberate hypotensive technique utilized (in which systolic pressures in the 80's or MAPs in the 50's are maintained throughout the anesthetic). The PPM insured anesthesiologist testified further he had provided anesthesia for approximately 2,000 surgeries where the patient was placed in the beach chair position.

During his deposition, the PPM insured CRNA testified he and the anesthesiologist discussed the patient's case and how they planned to take care of her during the surgery. He testified they discussed that with the blood pressure cuff on the leg, the readings would be higher and, in his recollection, it was in the 10 mmHg range. According to the CRNA, the anesthesia plan was to maintain a mean arterial pressure of no lower than 60. He testified he believed all of the readings were well above that range, although they did not record the MAP. He testified the case went without incident until the end when he was trying to get the patient to breathe spontaneously. When he was unable to do so, he called the PPM insured anesthesiologist. They compared the blood pressure monitor record and confirmed they matched the patient's chart entries. They then un-taped the patient's eyes and found them to be fixed and dilated. The CRNA testified the blood pressure readings were never printed out apparently due to some confusion as to who was responsible for printing them.

Defense counsel's evaluation of potential damages included: $250,000 to $400,000 in economic damages; $250,000 to $500,000 in non-economic damages; and $500,000 to $900,000 total damages.

With the consent to settle from all of the PPM insureds, PPM engaged in settlement negotiations and reached a confidential settlement for less than defense counsel's lowest damage range.

References:

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Expert Witness Testimony Peer Review Programs

In 2003, the ASA implemented the ASA Administrative Procedures and Guidelines for Expert Witness Qualifications and Testimony. Several state societies have implemented similar peer review programs. The purpose of these programs is to monitor expert testimony that is inconsistent with medical literature and mainstream opinion regarding the standard of care. These programs may impose sanctions on the organization's members if it is determined the expert testimony offered in litigation is not supported by medical literature or generally accepted in that medical specialty.

In Texas, for example, a plaintiff's anesthesiology expert withdrew from a PPM case after being sanctioned by the Texas Society of Anesthesiologists for testimony that was determined to be "misleading, biased, and [that did] not reflect generally accepted standards of care in the practice of anesthesiology."

PPM routinely instructs defense counsel to ask plaintiff's anesthesiology experts during their depositions if they are aware of the ASA Guidelines for Expert Witness Qualifications and Testimony. In several cases, plaintiff's anesthesiology experts changed their testimony and in a few cases withdrew completely when reminded of the ASA guidelines on expert testimony. PPM will continue to monitor plaintiff's expert testimony and assist PPM policyholders by providing deposition and trial testimony to submit to the ASA Administrative Council with any complaint alleging a violation of the ASA guidelines on expert testimony.

Most Prolific Plaintiff's Experts[3]

Name	PPM cases (last 5 years)	Total PPM cases	Total Expert Research On-Demand cases
Brian McAlary, MD	8	38	445
Ronald Wender, MD	5	29	159
Alexander Weingarten, MD	4	12	169
Kenneth Rothfield, MD	4	11	72
Martin Dauber, MD	4	5	60
James Pepple, MD	3	22	58
Ronald Burt, MD	3	12	134
Edward Ochroch, MD	3	4	10
Miles Dinner, MD	3	3	26
Don Mills, MD	2	7	51

[3] These figures compiled by PPM reflect the number of cases defended by PPM and recorded in our electronic database initiated in 1999. Total Expert Research On-Demand cases reflect the number of medical malpractice cases (plaintiff and defendant) in which the expert has testified as compiled by Expert Research On-Demand, a national clearinghouse for expert witness testimony. ❖

Risk Management Tips to Prevent Ischemic Injury in Beach Chair Position

As previously noted, there currently is no scientific, evidence-based standard of care for determining and monitoring the minimum mean arterial pressure (MAP) in order to avoid cerebral hypoperfusion and ischemic injury. However, from Preferred Physicians Medical's (PPM) perspective as a professional liability insurance company exclusively defending anesthesiologists and their anesthesia practices, PPM concurs with the ASPF's recommendations to err on the side of caution and offers the following risk management tips:

- Help educate surgeons about the potential risks associated with the use of deliberate hypotension in the beach chair position
- Increase focus on informed consent and note surgical positioning is a shared responsibility with surgeon
- Document when surgeon requires or insists on beach chair position
- Titrate anesthetics to avoid excessive depth of anesthesia
- Minimize sudden changes in position
- Use vasopressors to maintain blood pressure
- Focus on blood pressure at the level of the most vulnerable tissue (i.e. the brain)
- Correct for the difference in height between the site of blood pressure measurement and the brain (1 cm height = 0.77 mmHg or 1 mmHg = 1.25 cm height)
- Maintain blood pressure as close to baseline as possible
- Use lower limit of 70 mmHg rather than conventional limit of 50 mmHg (the most recent chapter in *Miller's Anesthesia* has been modified to reflect this change in interpretation of studies)
- Consider performing regional blocks post-operatively

PREFERRED PHYSICIANS MEDICAL RISK RETENTION GROUP, INC.
9000 West 67th Street
Shawnee Mission, KS 66202-3656

T 913.262.2585 • 800.562.5589
F 913.262.3633

NEWSLETTER EDITOR
Brian J. Thomas, JD
Senior Claims Attorney
Director of Risk Management

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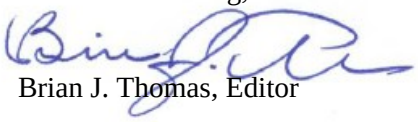
APRIL 2012
ISSUE 33

In This Issue

We highlight the catastrophic global ischemic brain damage that can occur during surgery in the beach chair or head-up position and offer some risk management tips to prevent these devastating injuries. We also examine the challenges of defending PPM insureds who are involved in these difficult cases, including the plaintiff experts who offer questionable testimony against their peers.

We also remind PPM policyholders that the American Society of Anesthesiologists (ASA) and several state societies have implemented procedures to peer review expert witness testimony. Sanctions may be levied against anesthesiologists whose expert testimony is found to fall outside the generally accepted practice standards and/or is inconsistent with relevant medical literature. Finally, we list the current most prolific plaintiff's experts in cases defended by PPM.

Thanks for reading,



Brian J. Thomas, Editor