

# Patient Safety Tip of the Week

January 2, 2018

## Preventing Perioperative Nerve Injuries

We just recently did a column on perioperative nerve injuries (see our November 7, 2017 Patient Safety Tip of the Week “[Perioperative Neuropathies](#)”). But since that column two informative papers on the topic have been published.

The American Society of Anesthesiologists just published its “Practice Advisory for the Prevention of Perioperative Peripheral Neuropathies 2018: An Updated Report by the American Society of Anesthesiologists Task Force on Prevention of Perioperative Peripheral Neuropathies.” ([ASA 2018](#)). This is an update to the 2011 Advisory we have discussed before. The Advisory reviews the literature on perioperative nerve injuries and grades the evidence, solicits opinions from consultants with expertise on the topic, and also provides results of surveys of anesthesiologists. Key elements from the update are listed below.

The preoperative history and physical should focus on **risk factors** for nerve damage including: body habitus, preexisting neurologic symptoms, diabetes mellitus, peripheral vascular disease, alcohol dependency, arthritis, and sex (e.g., male sex and its association with ulnar neuropathy). It should also ascertain whether patients can comfortably tolerate the anticipated operative position. (Note that in our previous columns we have also noted that patients with recent weight loss and those with hypertrophic neuropathies, whether congenital or acquired, are at particular risk for compressive neuropathies.)

It then focuses on **limb positioning** issues, first describing vulnerable positions identified from the literature and then making recommendations for positioning to avoid injury to various peripheral nerves. The Advisory has recommendations on positioning to reduce the likelihood of injuries to specific nerves (we refer you to the actual document for details):

- Positioning Strategies to Reduce Perioperative Brachial Plexus Neuropathy
- Positioning Strategies to Reduce Perioperative Ulnar Neuropathy
- Positioning Strategies to Reduce Perioperative Radial Neuropathy
- Positioning Strategies to Reduce Perioperative Median Neuropathy
- Positioning Strategies to Reduce Perioperative Sciatic Neuropathy
- Positioning Strategies to Reduce Perioperative Femoral Neuropathy
- Positioning Strategies to Reduce Perioperative Peroneal Neuropathy

The Advisory does recommend that **periodic perioperative assessments** may be performed to ensure maintenance of the desired position.

It makes recommendations about the use of **protective padding**:

- Padded armboards may be used to decrease the risk of upper extremity neuropathy.
- Chest rolls in the laterally positioned patient may be used to decrease the risk of upper extremity neuropathy.
- Padding at the elbow may be used to decrease the risk of upper extremity neuropathy.
- Specific padding to prevent pressure of a hard surface against the peroneal nerve at the fibular head may be used to decrease the risk of peroneal neuropathy.
- Avoid the inappropriate use of padding (e.g., padding too tight) to decrease the risk of perioperative neuropathy.

And recommendations about other equipment:

- When possible, avoid the improper use of automated blood pressure cuffs on the arm (i.e., placed below the antecubital fossa) to reduce the risk of upper extremity neuropathy.
- When possible, avoid the use of shoulder braces in a steep head-down position to decrease the risk of perioperative neuropathies.

And a recommendation we wholeheartedly endorse: **examine the patient after the procedure!** We love telling the story about a time when neurology and neurosurgery residents performed their own angiograms. One neurosurgeon had a much higher complication rate than others, which was surprising since he was one of the best neurosurgeons. Finally, it was recognized why his complication rates were higher than those of his peers: he examined the patients after the procedure! (something his peers were remiss of).

The Advisory also has a section on documentation of perioperative positioning actions.

The second paper was on the “Prevention and Recognition of Ulnar Nerve and Brachial Plexus Injuries” ([Duffy & Tubog 2017](#)). It is a well-illustrated article that does an excellent job focusing on the anatomy, physiology, and mechanisms of injury (such as stretch, compression, or ischemia). Though it is written from the perspective of perianesthesia nurses, it stresses that prevention of nerve injuries is the job of all members of the surgical team. It notes that preoperative nurses’ knowledge of risks factors and use of preoperative assessment tools is critical to detecting high-risk patients. The surgeon’s role determines the length of surgical time, type of surgical procedures, and position of the patient. The circulating registered nurse and the anesthesia provider can collaborate in the use of positioning devices, protective pads, and positioning strategies, while frequently monitoring patient’s hemodynamic status during surgery. And the postanesthesia care unit nurses must have knowledge on early identification of signs of nerve injury. This paper is an excellent complement to the updated ASA Advisory.

We'd like to add two things from our November 7, 2017 Patient Safety Tip of the Week "[Perioperative Neuropathies](#)"). One is periodic "calling out" the time duration of the procedure. While we know of no evidence-based recommendations regarding specific timeframes, it would make sense in some long cases to briefly reposition patients to relieve pressure on vulnerable parts. Second would be to consider use of electrophysiological tools, such as intraoperative monitoring of **somatosensory evoked potentials (SSEP's)** as used by Kamel and colleagues ([Kamel 2006](#), [Kamel 2016](#)), in patients deemed to be at high risk for nerve injury. If SSEP's were being monitored, you would briefly reposition the patient when the amplitude of the SSEP changed. The ASA Advisory unfortunately did not include reference to either Kamel study. The latter Kamel study ([Kamel 2016](#)) also noted that at least for one type of surgery and positioning (i.e. spine surgery with the patient in the "superman" or "prone surrender" position) changes in intraoperative MAP (mean arterial pressure) were independent predictors associated with upper extremity position-related neurapraxia. Specifically, they found that intraoperative MAP <55 mm Hg for a total duration of  $\geq 5$  minutes was an independent risk factor associated with a greater incidence of upper extremity position-related neurapraxia compared with a duration of <5 minutes with MAP <55 mm Hg. Compared with patients in their control group, patients in the case group had significantly longer duration of surgery. The mean onset time of position-related neurapraxia from the beginning of surgery was 283 minutes (range, 79–700 minutes). Those findings are also in keeping with the argument by Duffy and Tubog that impaired capillary perfusion to nerves is the ultimate mechanism of injury whether the other mechanisms are compression or stretch.

We agree with Duffy and Tubog that everyone on the surgical team has an important role in preventing perioperative nerve injuries. Having a good understanding of the risk factors, vulnerable anatomical positions, preventive measures, and monitoring is critical to minimize the risk of such injuries. We hope all involved in surgery will read the two new papers and heed the recommendations therein and also consider the use of electrophysiologic monitoring at least in patients deemed to be at high risk for perioperative nerve injury. The latter, of course, needs further refinement in studies that might clarify issues such as in which patients and for which procedures would SSEP monitoring prove to be cost-effective.

#### **Some of our prior columns on perioperative nerve injuries:**

- September 29, 2009 "[Perioperative Peripheral Nerve Injuries](#)"
- May 2011 "[ASA Updates Advisory for Prevention of Perioperative Peripheral Neuropathies](#)"
- December 30, 2014 "[Data Accumulates on Impact of Long Surgical Duration](#)"
- November 7, 2017 "[Perioperative Neuropathies](#)"

#### **References:**

ASA (American Society of Anesthesiologists). Committee on Standards and Practice Parameters, Jeffrey L. Apfelbaum, M.D. Practice Advisory for the Prevention of Perioperative Peripheral Neuropathies 2018: An Updated Report by the American Society of Anesthesiologists Task Force on Prevention of Perioperative Peripheral Neuropathies. *Anesthesiology* 2018; 128(1): 11-26

<http://anesthesiology.pubs.asahq.org/article.aspx?articleid=2662986>

Duffy BJ, Tubog TD. The Prevention and Recognition of Ulnar Nerve and Brachial Plexus Injuries. *Journal of PeriAnesthesia Nursing* 2017; 32(6): 636-649

Published online: April 14, 2017

[http://www.jopan.org/article/S1089-9472\(16\)30258-1/fulltext](http://www.jopan.org/article/S1089-9472(16)30258-1/fulltext)

Kamel I, Zhao H, Koch SA et al. The Use of Somatosensory Evoked Potentials to Determine the Relationship Between Intraoperative Arterial Blood Pressure and Intraoperative Upper Extremity Position–Related Neurapraxia in the Prone Surrender Position During Spine Surgery: A Retrospective Analysis. *Anesthesia & Analgesia* 2016; 122(5): 1423-1433

[http://journals.lww.com/anesthesia-analgesia/Fulltext/2016/05000/The\\_Use\\_of\\_Somatosensory\\_Evoked\\_Potentials\\_to.29.aspx](http://journals.lww.com/anesthesia-analgesia/Fulltext/2016/05000/The_Use_of_Somatosensory_Evoked_Potentials_to.29.aspx)

Kamel IR, Drum ET, Koch SA, Whitten JA et al. The Use of Somatosensory Evoked Potentials to Determine the Relationship Between Patient Positioning and Impending Upper Extremity Nerve Injury During Spine Surgery: A Retrospective Analysis. *Anesthesia & Analgesia* 2006; 102(5): 1538-1542

[http://journals.lww.com/anesthesia-analgesia/Fulltext/2006/05000/The\\_Use\\_of\\_Somatosensory\\_Evoked\\_Potentials\\_to.40.aspx](http://journals.lww.com/anesthesia-analgesia/Fulltext/2006/05000/The_Use_of_Somatosensory_Evoked_Potentials_to.40.aspx)



The  
Truax  
Group  
Healthcare Consulting  
[www.patientsafetysolutions.com](http://www.patientsafetysolutions.com)

<http://www.patientsafetysolutions.com/>

[Home](#)

[Tip of the Week Archive](#)

[What's New in the Patient Safety World Archive](#)