Patient Safety Tip of the Week

November 7, 2017 Perioperative Neuropathies

A recent article in Anesthesiology News reminds us about the risk of nerve injuries during surgical procedures but also reminds us that not all perioperative neuropathies are related to patient positioning (Hardman 2017).

Hardman presents 3 cases of perioperative nerve injuries (PNI's) but makes a good argument that patient positioning during surgery was not likely the cause in each of the 3 cases. In one patient, bilateral ulnar neuropathies were as likely to have occurred during a SICU or hospital ward stay. In a second case, the patient may have simply had progression of an underlying diabetic peripheral neuropathy. And the third case may have represented an inflammatory brachial plexopathy that happened to occur in the postoperative period.

Hardman does discuss the epidemiology of and risk factors for PNI's. He cites studies showing estimates of PNI's range from 0.037% to 0.5% of surgeries. PNI's are more common in men but other risk factors include extremes of BMI and duration of hospitalization greater than 14 days. Kamal et al. (Kamel 2016) note that in addition to those risk factors, chronic hypertension, diabetes mellitus, tobacco use, neurosurgical procedures, orthopedic procedures, and prone position have all been associated with perioperative peripheral nerve injury.

In our September 29, 2009 Patient Safety Tip of the Week "Perioperative Peripheral Nerve Injuries" we discussed perioperative neuropathies related to pressure, stretch, and other mechanisms. We do know that the existence of some underlying polyneuropathies may render nerves more vulnerable to the effects of pressure or other trauma. It's well known that entrapment neuropathies are more common in patients with underlying polyneuropathies. So a history of known polyneuropathy, such as a diabetic polyneuropathy, should clearly be considered as a risk factor for perioperative nerve injury. Patients with hypertrophic neuropathies, whether hereditary or acquired, are especially susceptible to the effects of compression.

Weight loss is another predisposing factor to some compressive neuropathies. Peroneal nerve injuries are particularly likely to occur in individuals who have lost the typical subcutaneous fat pad that protects the nerve near the head of the fibula. So it might be expected that cancer patients might be particularly susceptible because of weight loss and the frequent occurrence of polyneuropathy (either as a remote effect of cancer or a result of chemotherapy).

One of the potentially modifiable risk factors for perioperative nerve injuries that we have stressed is the duration of surgery. That is one of the reasons we recommend periodic "calling out" of the case duration time (see our columns on surgical case duration listed below). That way the surgical team can consider whether repositioning the patient is indicated (of course, there are other things to consider as the case duration becomes longer, such as the need for re-dosing prophylactic antibiotics or initiation of DVT prophylaxis). Hardman, in his current article, does appropriately point out that the literature is insufficient to evaluate the efficacy of periodic assessment of patient positioning. Nevertheless, such periodic evaluation is a common sense strategy. The 2011 ASA Practice Advisory for the Prevention of Perioperative Peripheral Neuropathies states "The literature is insufficient to evaluate the efficacy of periodic assessment of patient position during a procedure in reducing the risk of upper extremity peripheral neuropathies" but goes on to say that 92% of the consultants and 97% of the ASA members agree that upper extremity position should be periodically assessed during procedures.

Strikingly, even the data from the medicolegal databases lacks information about total duration of anesthesia, duration a patient was in a certain position, etc. You don't have to be a neurologist to know that positional changes may affect nerve function. All of you have experienced your arm or leg "falling asleep" when it is in a certain position too long. What do you do in response? You change position and maybe shake the limb around a little bit and the sensation returns in a few seconds. You can often then return it to the original position. It is amazing that the literature on perioperative nerve injuries does not even comment on the issue of periodic or intermittent repositioning of limbs.

There have been at least a few attempts at better understanding the relationship between positional changes and nerve damage. Kamel et al (Kamel 2006) retrospectively looked at patient undergoing spinal surgery who had intraoperative monitoring of somatosensory evoked potentials (SSEP's). The amplitudes of SSEP's are affected by multiple factors, such as mean arterial blood pressure, depth of anesthesia, manipulation of the spine, etc. but they may also be sensitive to ischemia, compression, stretching or other dysfunction of peripheral nerves or plexuses. In their study, they found that about 6% of changes in upper extremity SSEP's during spine surgery responded to changes in position of the affected upper extremity. They were thus able to determine which body positions were more likely to be associated with such changes during spine surgery. The study did not include assessment of individual nerve function so information cannot be generalized to make recommendations for protection of specific peripheral nerves. But such methodology is promising and needs to be studied prospectively in a variety of surgical settings. Since patients under anesthesia cannot sense symptoms related to peripheral nerve dysfunction, SSEP's do have promise at uncovering reversible changes during a variety of surgical procedures, not just spinal surgery.

Kamal and colleagues (Kamel 2016) also reported on intraoperative monitoring of SSEP's during spine surgeries performed on adult patients in the prone surrender ("superman") position. They identified that changes in intraoperative MAP (mean arterial pressure) were independent predictors associated with upper extremity position–related

neurapraxia (the term we use to denote a temporary and reversible failure of conduction in the peripheral nerve) in the prone surrender position under general anesthesia. Specifically, the found that intraoperative MAP <55 mm Hg for a total duration of ≥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).

Ideally, using techniques such as those used by Kamal et al to monitor somatosensory evoked potentials of multiple nerves during surgery could identify cases where stretching or compression of nerves is occurring and lead to at least temporary repositioning of the patient to minimize the risk of a PNI. However, it certainly would not be practical to do such monitoring on all surgical patients. However, using such techniques on a series of patients might well lead to recommendations about how frequently or at what intervals we might at least temporarily reposition patients.

We still wish we had some firmer recommendations for you in this significant patient safety issue. However, all we can say at this time is that you should attempt to identify patients at highest risk, try to minimize the total duration of anesthesia or the duration they are in certain positions, and use the ASA recommendations for position, padding, equipment, etc. A lot more needs to be done before we have any definitive recommendations.

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"

Our prior columns focusing on surgical case duration:

- March 10, 2009 "Prolonged Surgical Duration and Time Awareness"
- January 2010 "Operative Duration and Infection"
- July 21, 2012 "Surgical Case Duration and Miscommunications"
- August 26, 2014 "Surgeons' Perception of Intraoperative Time"
- December 30, 2014 "Data Accumulates on Impact of Long Surgical Duration"
- November 24, 2015 "Door Opening and Foot Traffic in the OR"
- July 26, 2016 "Confirmed: Keep Your OR Doors Closed"

References:

Hardman D. Intraoperative Positioning-Related Nerve Injury, or a Case of Mistaken Identity?: 3 Selected Cases. Anesthesiology News 2017; October 13, 2017 http://www.anesthesiologynews.com/Review-Articles/Article/10-17/Intraoperative-Positioning-Related-Nerve-Injury-or-a-Case-of-Mistaken-Identity-3-Selected-Cases/44809/ses=ogst?enl=true

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

The American Society of Anesthesiologists Task Force on Prevention of Perioperative Peripheral Neuropathies. Practice Advisory for the Prevention of Perioperative Peripheral Neuropathies: An Updated Report by the American Society of Anesthesiologists Task Force on Prevention of Perioperative Peripheral Neuropathies. Anesthesiology 2011; 114(4): 741-754 http://anesthesiology.pubs.asahq.org/article.aspx?articleid=1930729

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

Healthcare Consulting
www.patientsafetysolutions.com

http://www.patientsafetysolutions.com/

Home

Tip of the Week Archive

What's New in the Patient Safety World Archive