



Learning From Others:

Anesthesia
Quality Institute
ANESTHESIA INCIDENT
REPORTING SYSTEM (AIRS)

A Case Report From the Anesthesia Incident Reporting System

Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will abstract a case and provide a detailed discussion based on a submission to the national Anesthesia Incident Reporting System. Feedback regarding this item can be sent by email to r.dutton@asahq.org. Report incidents to www.aqiairs.org.

Case 2013-12: The Weight of the World on Your Shoulders

A 37-year-old, 150 kg, ASA Physical Status 3 woman underwent a robot-assisted laparoscopic vaginal hysterectomy (RAVH) under general anesthesia in steep Trendelenberg position. A customized positioning device that fit over the shoulders was used to secure the patient to the bed. The anesthetic lasted for six hours and the procedure itself took more than 4.5 hours. The patient was awakened and extubated uneventfully. Postoperatively, dark-colored urine was noted in the PACU. Laboratory assay revealed serum creatinine of 1.5 mg/dl and creatine phosphokinase of 1,500 IU/liter. Rhabdomyolysis was diagnosed and the patient treated with increased intravenous hydration, sodium bicarbonate and diuretics. Laboratory values returned to normal over 24 hours postoperatively and the patient experienced no long-term sequelae.

Discussion

This case raises a number of concerns. First is the trend toward robotic-assistance for a growing number of abdominal, thoracic and even head and neck surgeries. Robotic assistance offers the surgeon increased precision in tissue dissection, the ability to work more effectively around corners compared to laparoscopy and the potential for reduced injury to adjoining structures, at the expense of problematic positioning, increased surgical time and higher cost. In prostate surgery, the most established model, use of a robotic technique – compared to a non-robotic laparoscopic approach – has been associated with reduced risk for positive tumor margins¹ and a lower occurrence of urinary incontinence and impotence,² although these findings are still controversial. The major confounder of these studies is the surgeon's experience with the robot. The website of the biggest vendor of robotic surgery systems has a feature titled "find a Davinci surgeon," and under "important information about this locator," they do not explain how and why certain physicians made their list (www.davincisurgery.com). For at least some specialties, these physicians underwent training provided

by the company (by their own admission only technical training related to the device) and did 100 procedures. A review suggests that more than 500 cases are required to achieve similar rates of cancer non-recurrence to an open surgical approach in the case of prostatectomy.¹ Another observational review, looking specifically at the occurrence of leg muscle compartment syndrome, found that surgical experience less than 20 cases and "console time" of greater than four hours were positive risk factors, as was patient obesity.³

Hysterectomy has been performed or assisted by laparoscopy for more than two decades, but the introduction of robotic assistance is a more recent innovation. Use of robotic assistance is increasing rapidly,⁴ but there are fewer outcome data available in the literature for hysterectomy than for prostatectomy. Furthermore, radical prostatectomy has only one indication, whereas hysterectomy has multiple, so endpoint definition is hard to compare. One report suggests that the addition of robotic assistance can shorten operative times and reduce surgical blood loss compared to the conventional laparoscopic approach,⁵ but at least one prospective, randomized trial found exactly the opposite.⁶ The most definitive publication to date, a review of more than 260,000 hysterectomies in the National Inpatient Sample, did not find a difference in intraoperative blood loss, hospital length of stay or the relative risk of complications.⁷ This study did note an increase in cost of more than \$2,000 for RAVH versus laparoscopic hysterectomy and documented a marked increase in the utilization of either technique (versus traditional open surgery) over the past five years.

There are few reports in the literature of compartment syndrome, positioning injuries or rhabdomyolysis associated with RAVH. One paper in the French literature described all three events, leading to a residual neurologic injury, occurring in the bilateral forearms of an obese woman who underwent a 12-hour procedure for extensive endometriosis.⁸ A retrospective observational study of complications associated with RAVH found a risk for any adverse event of 11.9 percent, with no differences seen based on the patient's weight.⁹ The lack of impact of body-

mass index on the rate of complications was confirmed in another study from a different group,¹⁰ although it may be that the technique is too novel and complications overall too rare for a statistically significant association to emerge. Obesity is a known risk factor for positioning injuries in general and for prostate surgery in steep Trendelenberg position as well.¹¹

The AIRS case report did not include information about what body compartment was affected or whether any other evidence of compartment syndrome was present. Anesthetic experience with surgery in steep Trendelenberg position has suggested risk to the legs (from obstructed blood flow and possible direct pressure from stirrups), the gluteal muscles (from prolonged compression) and the arms (from obstructed blood flow and direct compression). Misapplication of shoulder straps or holders can create traction on the brachial plexus in this position if the patient's body slides down the bed. Injury is likely the result of multiple factors, including comorbid conditions, the degree of vascular compromise, the blood pressure during the case, the hemoglobin concentration, the use of vasopressors, and – most importantly – the duration of the ischemic insult. These risk factors are similar to those seen for postoperative visual loss, which is another very rare complication that has been reported in patients maintained for long periods in the head-down position.¹²

Recommendations

Positioning injuries are uncommon in most surgical case types because preventive strategies are developed as clusters of events emerge. New surgical techniques can present new risks, especially during the institutional learning curve when cases and anesthetics are likely to last longer. In the case presented, there were multiple risk factors present, beginning with the need for steep Trendelenberg position. This approach will improve vision and reduce blood loss in the surgical field and thus expedite the procedure, but this benefit must be weighed against the risk of complications such as the one presented here. Mitigation strategies might have included reducing the degree of tilt, periodically coming out of Trendelenberg position, maintaining a higher mean blood pressure, using alternative positioning devices and shifting the patient's body during the case. However, each of these would presumably have some negative effect on the overall speed and efficiency of the surgery. Vigilance to the potential for injury with RAHV should enable early rescue strategies and reduce the risk of permanent harm, as illustrated by this case. Another consideration would be avoiding patients at higher risk until advancing experience with the surgical procedure reduces the anticipated case time, but there are no evidence-based guidelines available to tell us which patients are too heavy and which procedures are too long. The idea of risk associated with the learning curve for new surgical procedures is an ethically challenging area that is not as clear as it might

seem: if new procedures are never introduced into clinical practice, then everyone loses out on advances such as cardiac bypass, laparoscopy and organ transplantation. Introduction of new techniques into practice is an area of risk that should be discussed between surgeons and anesthesiologists – especially when there is concern that the patient might be at increased risk – and specifically included as part of the informed consent process.

References:

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