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Perioperative visual loss

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Perioperative visual loss is an infrequent, devastating complication associated with spine surgery, most commonly from ischemic optic neuropathy. Current research and expert opinion indicate that it is associated with procedures that create elevated venous pressure in the head for prolonged periods of time. The largest case–control study on ischemic optic neuropathy associated with spine surgery found six independent and significant risk factors including male sex, obesity, Wilson frame use, longer operative times, greater blood loss, and a lower colloid to crystalloid ratio in the non-blood fluid administration. The American Society of Anesthesiologists developed a practice advisory for the prevention of this complication. In this setting, it is advisable to avoid significant physiologic and hemodynamic perturbations as much as possible, given the uncertainty of the pathophysiology. Because prevention of this complication cannot be guaranteed, consent for perioperative visual loss should be strongly considered in patients at high risk for this complication.

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Perioperative visual loss

Perioperative visual loss (POVL) is an uncommon but devastating complication related to spinal surgery. As most patients undergoing spinal surgery are already debilitated by their spinal disease, adding visual impairment can greatly decrease their productivity and quality of life. The reported incidence of POVL after spine surgery ranges from 0.03% to 0.2% [1–3]. Numerous factors have been proposed that contribute to the development of POVL including anemia, emboli, hypotension, globe compression, prone positioning, volume and/or type of fluid administered, and preexisting diseases.

Background

In the late 1940s and early 1950s, the first case reports and case series involving POVL started appearing in the literature and were related to central retinal artery occlusion (CRAO) [4–6]. These case reports described patients with postoperative unilateral loss of vision which the authors attributed to direct pressure on the eye, hypotension, or a combination of the two. These reports were followed, in 1954, by a case series of eight patients over a 12-year period with unilateral postoperative blindness. All eight patients had neurosurgical procedures which involved a suboccipital or posterior cervical approach in the sitting or prone position using the horseshoe headrest [7]. The authors concluded that these cases were caused by direct pressure on the eye from the headrest which resulted in retinal ischemia. They were able to replicate these findings in monkeys in which they applied pressure to the globe, lowered the blood pressure, and decreased the circulating blood volume under general anesthesia. After these findings, one of the authors of the study changed the configuration of the horseshoe headrest at their institution that was routinely used such that there was more space for the face to rest and less chance of pressure on the eye. With this change to the headrest, the authors reported that in the 2 years following there were no ocular complications [7].

Over the next several decades, CRAO from pressure on the globe decreased as anesthesiologists became very diligent about checking the eyes during prone cases, mask anesthesia was phased out in favor of endotracheal intubation, and surgeons gradually shifted away from using the horseshoe headrest to the Mayfield holder with pins for posterior cervical and suboccipital procedures. Although CRAO still occurs occasionally with prone procedures, most cases of POVL in the past two decades have been associated with ischemic optic neuropathy (ION).

In the mid-to-late 1990s, increasing reports and publications regarding POVL associated with spine surgery started surfacing with two separate groups publishing on this topic in June of 1997 [3,8]. The coincident publication of these two articles in the same month and year is indicative of the fact that the incidence of POVL had suddenly increased. These new reports were in the setting of a change in spine surgical practice with increased use of complex instrumented fusion for the same diseases, particularly in middle-aged to elderly adults [9–11]. The drive for this change was undoubtedly related to an aging population with a demand for a more active lifestyle and advances in other perioperative care areas, such as anesthesia and intensive care, that made these major operations safer in this population. This change in practice resulted in more cases with longer operative times and higher blood loss in the prone position. Stevens and colleagues retrospectively reviewed 3450 spinal operations and identified an incidence of POVL of 0.2% with at least four out of these seven cases being diagnosed with ION and the other three cases with central retinal vein occlusion, air embolism, and an occipital infarction [3]. These procedures were associated with major spinal fusions, prolonged operative times, large blood loss and fluid resuscitation, and variable degrees of hypotension. The other study published in the same journal in the same month in 1997 was the first case–control study on POVL associated with spine surgery. This case–control study from multiple institutions and case reports revealed that different types of POVL occurred in these 37 patients including ION (59%), CRAO (24%), and cortical ischemia (8%) and were also associated with prolonged operative times in the prone position, large estimated blood loss (EBL) with large fluid resuscitation, and variable degrees of hypotension [8]. The only statistically significant differences between the affected patients and control patients were the operative duration and the EBL. Neither the lowest systolic blood pressure nor the lowest hematocrit differed between the cases and control groups.