



## **VISION LOSS AFTER PRONE SPINAL SURGERY IN A 38-YEAR-OLD WOMAN: IMPLICATIONS FOR PERIOPERATIVE NURSING PRACTICE**

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### **Abstract**

*Prone positioning in spine surgery improves surgical exposure but is associated with significant ocular, neurologic, and pressure-related risks. Central retinal artery occlusion (CRAO) is a rare yet devastating complication linked to compromised ocular perfusion during prone procedures. Prolonged prone positioning also increases the risk of perioperative pressure injuries due to sustained external pressure and immobility. Perioperative nurses play a crucial role in risk identification, safe positioning, pressure injury prevention, and early recognition of adverse events to minimize irreversible complications. This case report describes a 38-year-old woman who underwent cervical spine surgery in the prone position and developed sudden painless unilateral vision loss accompanied by incomplete cranial nerve palsies postoperatively. Perioperative nursing interventions focused on comprehensive risk stratification, safe prone positioning with appropriate padding and eye protection, prevention of pressure-related tissue injury, close hemodynamic monitoring, and targeted postoperative visual and skin integrity assessments. Despite prompt multidisciplinary management, visual recovery remained limited. This case highlights the importance of evidence-based perioperative nursing practices in reducing prone position-related ocular and pressure injuries, supports the implementation of standardized positioning and pressure injury prevention protocols, and underscores the need for continuous vigilance in perioperative clinical practice.*

**Keywords:** Perioperative Nursing; Prone Position; Cervical Spine Surgery; Postoperative Visual Loss; Pressure Injury Prevention

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## INTRODUCTION

Prone positioning is a standard practice in cervical spine surgery due to its facilitation of surgical exposure; however, it alters hemodynamics and increases venous pressure, which may reduce ocular perfusion and contribute to postoperative visual complications, including central retinal artery occlusion (CRAO) and ischemic optic neuropathy (ION). Evidence from a comprehensive review of perioperative visual loss indicates that prone positioning and related intraoperative factors (e.g., hypotension, prolonged surgery time, and improper head positioning) are associated with rare but severe visual outcomes in spinal surgery patients (Epstein, 2016). Although postoperative visual loss (POVL) is uncommon, literature reports variable incidence and severe outcomes, highlighting the importance of preventive healthcare measures and preoperative risk stratification (Sperber et al., 2024). Headrest misalignment, prolonged surgical duration, systemic hypotension, and external orbital pressure are among the documented risk factors for POVL following prone surgery (Epstein, 2016).

In addition to visual and neurologic risks, prolonged prone positioning also increases the risk of pressure related skin and soft tissue injuries particularly over facial, bony prominences and dependent areas which may further complicate recovery and patient comfort. Perioperative pressure injuries are a well-recognized concern in surgical settings, where prolonged immobility and procedural characteristics (e.g., duration of surgery, unrelieved pressure) are key risk factors warranting early risk assessment and preventive interventions (Betts, Scott, & Makic, 2022). Structured risk assessment and preventive strategies such as perioperative pressure injury stratification tools (e.g., Munro Scale, ELPO, Scott Triggers) are therefore integral to comprehensive nursing care for patients undergoing prone procedures [4].

Perioperative nursing care therefore plays a pivotal role in risk assessment, positioning safety, pressure injury prevention, and early detection of warning signs to mitigate these risks. This case report aims to illustrate perioperative nursing strategies in risk assessment, complication prevention, and early recognition of vision and position related adverse events in patients undergoing prone position cervical spine surgery.

## METHODS

This case report used a descriptive approach to illustrate perioperative nursing roles and interventions in a patient who developed postoperative complications related to prone positioning. The subject was a 38-year-old woman who underwent cervical spine surgery in the prone position at a tertiary referral hospital. Data were

collected retrospectively through a review of medical records, perioperative nursing documentation, clinical examination findings, and relevant diagnostic reports. Data collection encompassed the preoperative, intraoperative, and postoperative phases, with particular emphasis on risk assessment, preventive positioning strategies, early detection of visual and pressure-related complications, and evaluation of nursing outcomes. Patient confidentiality was strictly maintained, and this case report was prepared in accordance with ethical principles of health care practice, with consent obtained for the use of clinical data for scientific publication.

## CASE PRESENTATION

A 38-year-old woman presented with a one-year history of chronic neck pain radiating to both arms, unresponsive to conservative treatment. She had no history of hypertension, diabetes, or prior visual disturbances. On initial perioperative nursing assessment in the preoperative holding area, her vital signs were blood pressure 149/87 mmHg, heart rate 98 beats/minute, respiratory rate 20 breaths/minute, temperature 36.5°C, and oxygen saturation 97% on room air. Baseline visual acuity and neurological findings were within normal limits. The patient was scheduled for unilateral biportal endoscopic posterior cervical foraminotomy at the C5–C6 level under general anesthesia. At 09:05, she was positioned in the prone position using standard supports and padding, and the surgical team completed the time-out procedure. The surgery proceeded without intraoperative complications and was completed at 11:05, after which the patient was transferred to the recovery room. At 12:00, approximately one hour after surgery, the patient reported a sudden painless loss of vision in her left eye upon awakening from anesthesia, accompanied by a left sided headache. Motor and sensory functions of the upper and lower extremities remained intact. An ophthalmologic evaluation, performed several hours postoperatively, revealed that the left eye had light perception only with poor projection to the superior visual field. A positive relative afferent pupillary defect was present. Fundoscopic examination demonstrated a characteristic cherry red spot, consistent with central retinal artery occlusion (CRAO).

Extraocular movement testing revealed significant restrictions: elevation (-1), depression (-3), adduction (-2), and abduction (-3) in the left eye, indicating involvement of cranial nerve III and VI. In contrast, the right eye demonstrated normal visual acuity (1.0 on Rosenbaum chart) and full extraocular movements. Intraocular pressure measured by iCare was 17 mmHg in the right eye and 14 mmHg in the left eye. Brain and orbit MRI with contrast was obtained later that evening and revealed multiple punctate white matter lesions in

the bilateral centrum semiovale and frontal lobes, suggestive of microvascular ischemic changes without hemorrhage, mass effect, or space-occupying lesions.

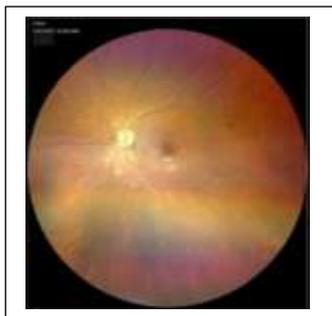


Figure 1. Fundoscopic image of the left eye demonstrating papillary atrophy and retinal changes consistent with central retinal artery occlusion (CRAO) after prone cervical spine surgery.

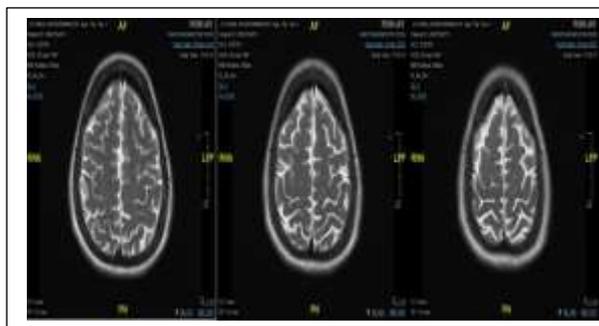


Figure 2. Magnetic resonance imaging (MRI) of the head and orbits with contrast showing multiple punctate white matter lesions in the bilateral centrum semiovale and frontal subcortical regions, without evidence of hemorrhage or space-occupying lesions.

A clinical timeline was documented. At 19:24, the patient was assessed in the emergency department approximately 7 hours postoperatively; intravenous methylprednisolone 500 mg was administered as a bolus, followed by three subsequent 500 mg infusions, and ocular massage was performed. Later, at 20:20, formal ophthalmologic documentation and assessments were completed, corresponding to ~8 hours postoperatively. By 21:00, the patient was evaluated in the inpatient unit, and consultations with neurology and stroke specialists were arranged (~8.5 hours postoperatively). Adjunctive therapy included intravenous ketorolac, omeprazole, and ceftriaxone as part of supportive care. Despite early recognition and multidisciplinary intervention, visual recovery remained limited on subsequent follow-up examinations.

## DISCUSSION

### Pathophysiology and Risk Considerations

Prone positioning is widely used in spinal surgery to improve surgical access; however, this position alters physiologic parameters such as intraocular pressure (IOP), which steadily

increases throughout the duration of prone positioning and can decrease ocular perfusion pressure, thereby predisposing pressure-sensitive tissues such as the retina to ischemic injury (Van, 2020). In addition to hemodynamic and ocular monitoring, perioperative nurses should also prioritize the prevention of pressure injuries associated with prolonged prone positioning. Pressure injuries in prone patients can occur due to sustained pressure on facial, ocular, and bony prominences, contributing to discomfort and potential secondary injury. Evidence from surgical settings highlights that pressure injuries are a significant perioperative concern, where positioning, surgical duration, and patient factors (e.g., limited mobility and edema) influence risk and should be identified early to guide prevention (Karadede, Tođluk Yiđitođlu, Őeremet, & Őzyilmaz Dařtan, 2025).

Pressure injury prevention remains a critical component of perioperative nursing care, particularly in patients undergoing prolonged procedures in the prone position. Evidence from studies published in *Jurnal Ners* highlights that nurses' knowledge and preventive practices play a central role in reducing the risk of pressure-related skin and soft tissue injuries (Seman, Kuta, & Mamat, 2025). These findings reinforce the importance of structured risk assessment and proactive nursing interventions in minimizing pressure-related complications during perioperative care.

Postoperative visual loss (POVL) is a rare but severe complication following prone spine surgery, with published rates in the literature ranging from approximately 0.013% to 1% of cases. POVL has multiple etiologies, including ischemic optic neuropathy (ION), central retinal artery occlusion (CRAO), and other vascular or compressive mechanisms, as described in meta-analyses and systematic reviews on prone-related ocular risk (Van, 2020). While much attention in this case has focused on ocular perfusion and neurologic complications, the risk of pressure injuries in patients positioned prone warrants equal consideration. Literature supports the use of risk assessment tools, such as the Munro Pressure Injury Risk Assessment Scale, to guide preventive actions that can minimize pressure-induced skin and soft tissue injuries during prolonged surgical procedures. The Munro Scale provides a phased perioperative-specific assessment incorporating factors such as mobility, nutritional status, body mass index, anesthesia type, surgical position, and hypotensive events to stratify risk before, during, and after surgery (Sousa & Acunã, 2022).

Central retinal artery occlusion in the perioperative period is often linked to compromised ocular perfusion pressure due to increased IOP and reduced venous outflow associated with prone positioning, and has been

reported in the literature as a consequence of external pressure from headrests or head support misplacement, as described in perioperative risk analyses (Dhoon, Debra E, Evan, & Vakharia, 2024). Reports of CRAO accompanied by ophthalmoplegia following prone spine surgery are rare but documented in recent case series and clinical reports. A recent case of CRAO after spinal surgery in the prone position highlighted orbital compression as a likely factor causing ischemic injury (Rathod, Pandit, & Patil, 2025). Additionally, ophthalmoplegia associated with CRAO has been described in clinical case reports involving cervical spine surgery, demonstrating that ischemic insult may extend to involve extraocular muscles and cranial nerves following prolonged prone positioning.

By proactively identifying patients at higher risk and implementing early preventive measures including specialized padding, support surface selection, and intraoperative pressure point assessment perioperative nursing practice contributes substantially to overall surgical safety. Studies comparing pressure injury risk tools have demonstrated the value of surgery specific scales (including the Munro Scale) over more general measures by capturing intraoperative and dynamic risk factors relevant to perioperative care (Chen, Wang, Qian, & Wu, 2023). Comparative analyses have shown that prone positioning is associated with significant reductions in ocular perfusion pressure when contrasted with supine alignment, and that greater declines in perfusion pressure correlate with increased frequency of early postoperative visual disturbances, highlighting the importance of maintaining perfusion as a protective strategy [9].

The Munro Pressure Injury Risk Assessment Scale is a validated tool used in perioperative settings to identify patients at high risk for pressure injuries. It consists of three stages (preoperative, intraoperative, and postoperative) covering intrinsic and procedure-specific risk factors to guide targeted preventive strategies. Implementation of this comprehensive assessment enables nurses to tailor interventions such as padding, frequent pressure point checking, and adjustment of positioning supports throughout the surgical procedure (Munro & Jiang, 2024). From a nursing perspective, understanding these pathophysiological changes underscores the importance of comprehensive perioperative assessment and the implementation of positioning protocols aimed at minimizing external pressure on the eyes and preserving ocular perfusion. Preoperative risk stratification, careful head and neck positioning with adequate padding, frequent checks of positioning during prolonged surgeries, and maintenance of hemodynamic stability are essential interventions to reduce the likelihood of ischemic and pressure-related complications.

Integrating risk assessment tools such as the Munro Scale into preoperative evaluation enhances the ability to detect patients at high risk for tissue breakdown and align interventions accordingly, thus reducing the incidence of pressure-related complications in patients undergoing prone spine surgery. Early recognition of visual disturbances through vigilant postoperative nursing assessments including visual acuity checks, pupil reactivity, and extraocular movement evaluations facilitates timely referral for specialist evaluation and intervention, even though definitive recovery in CRAO remains limited.

### **Perioperative Nursing Management and Prevention**

Standardized perioperative nursing care, including structured nursing diagnoses, interventions, and outcome documentation, plays an important role in improving patient safety during surgical procedures. Findings published in *Jurnal Ners* emphasize that the implementation of perioperative care instruments supports consistent and evidence-based nursing practice in operating room settings and strengthens the quality of perioperative nursing management (Widodo, Nursalam, & Wahyuni, 2020). By integrating standardized assessment tools and documentation frameworks, perioperative nurses are better equipped to identify risks early and implement targeted preventive strategies.

#### **1. Nursing Diagnosis**

Based on comprehensive perioperative assessment and postoperative clinical findings, the following nursing diagnoses were identified:

- a. Risk for ineffective tissue perfusion (ocular) related to prone positioning and altered ocular perfusion pressure during spine surgery.
- b. Risk for pressure injury related to prolonged prone positioning, sustained external pressure on facial and orbital areas, and immobility under general anesthesia.
- c. Anxiety related to sudden postoperative vision loss and uncertainty regarding prognosis and recovery.

#### **2. Nursing Intervention.**

##### **a. Risk Assessment**

Perioperative nurses should conduct comprehensive preoperative evaluations to identify patients at heightened risk for prone related complications including pressure injury because prone positioning and prolonged immobility increase sustained pressure on vulnerable tissues such as facial and orbital areas. Evidence suggests that pressure injury risk assessment should begin in the preoperative phase, incorporating both patient-specific factors (e.g., nutritional status, impaired mobility, edema) and

procedure-related factors (e.g., anticipated surgical duration, body position, interface pressure), with structured tools such as the Munro Pressure Injury Risk Assessment Scale aiding nurses in systematically identifying high-risk individuals and tailoring preventive interventions accordingly (AORN, 2024b; Betts et al., 2022; Sousa & Acunã, 2022).

In addition to this procedural risk screening, baseline visual assessment is an essential component of the perioperative evaluation when visual complications are a concern. This includes documenting visual acuity, pupillary light reflexes, extraocular movements, and intraocular pressure prior to surgery to establish the patient's normal ocular status and facilitate early detection of postoperative changes. Comprehensive preoperative visual assessment ensures that any postoperative visual deficit (such as central retinal artery occlusion) can be accurately identified as a new event rather than a preexisting condition. Establishing these baselines supports nurses in planning targeted measures, such as optimizing support surfaces, positioning strategies, and intraoperative checks, with the goal of reducing the likelihood of skin and soft tissue damage as well as ocular complications in patients undergoing prone spine procedures [13,14].

b. Positioning Safety and Eye Protection

Correct patient positioning is a critical component of perioperative care and plays a significant role in preventing external pressure injuries and maintaining adequate tissue perfusion during surgery. In the prone position, improper alignment of the head, neck, and soft tissues can exert direct or indirect pressure on delicate structures such as the eyes, facial tissues, and bony prominences, leading to ischemia, nerve injury, pressure ulcers, or ocular complications, including corneal abrasion or optic nerve ischemia (Dhoon et al., 2024). To mitigate these risks, perioperative nurses must ensure neutral alignment of the head and neck, use appropriately specialized headrests and padding to protect the eyes and surrounding soft tissues, and frequently recheck head support and padding placement during prolonged procedures. These practices are consistent with perioperative safety guidelines that emphasize collaborative team efforts to provide optimal surgical exposure while minimizing pressure-related injury and

circulatory compromise, particularly in areas vulnerable to sustained pressure under anesthesia when patients cannot respond to discomfort themselves [15].

c. Hemodynamic Monitoring

Maintaining stable systemic and ocular perfusion is essential during surgery, as perturbations in hemodynamic status can compromise tissue oxygen delivery and increase the risk of perioperative complications. Intraoperative hemodynamic monitoring including continuous assessment of blood pressure, heart rate, and oxygenation is a core component of perioperative care that enables early detection of deviations that may predispose patients to ischemia and organ dysfunction (Betts et al., 2022; Kouz, Thiele, Michard, & Saugel, 2024). Evidence indicates that fluctuations in hemodynamic variables, particularly hypotension and wide blood pressure variability, are associated with poorer surgical outcomes and that careful monitoring facilitates targeted interventions such as fluid management and vasoactive support to maintain perfusion pressure (Kouz et al., 2024). Perioperative nurses must therefore collaborate closely with anesthesia providers to avoid prolonged periods of hypotension, support adequate intravascular volume, and ensure continuous physiologic monitoring throughout the operative period. By maintaining stable tissue, organ, and ocular perfusion, these practices help reduce the likelihood of ischemic injury to vulnerable structures during prone surgery, where both positional factors and anesthetic effects may further disrupt cardiovascular stability and perfusion.

d. Education and Early Detection

Education and early recognition of symptoms are critical components of perioperative nursing care for patients undergoing prone procedures, as prone positioning carries risk of ocular, neurologic, and pressure-related soft tissue injuries (Morata, Vollman, Rechter, & Cox, 2023). Preoperative education should therefore include information about rare visual and neurologic complications as well as the potential for pressure injuries due to sustained pressure over bony prominences and soft tissues, and patients should be advised on the importance of reporting new symptoms promptly (Ali, Ahsan, Liaqat, & Din, 2024; Morata et al., 2023). Focused postoperative assessments should not only

include visual acuity checks, pupillary light reflex, and extraocular movement evaluations, but also careful inspection of pressure areas (e.g., forehead, chin, chest) for early signs of pressure injury. Patient-reported symptoms such as visual field changes, eye pain, localized skin discomfort, or persistent redness at pressure sites should be documented and escalated for appropriate specialist evaluation, as early detection enables timely intervention and may reduce the severity of complications.

e. Protocol Implementation

The use of structured, evidence-based protocols and checklists is widely recognized as a key strategy to enhance patient safety in perioperative care, particularly in complex surgical procedures such as those requiring prone positioning. Standardized perioperative nursing checklists including documented verification of risk stratification, pressure point assessments, positioning confirmation, eye protection, and head alignment help ensure that critical safety steps are consistently performed, reducing the likelihood of omissions that can lead to adverse events. The World Health Organization's Surgical Safety Checklist (SSC), for example, has been shown to improve teamwork, communication, and adherence to safety practices across the entire surgical pathway, resulting in reduced surgical complications and improved patient outcomes when implemented effectively (Barimani, Ahangar, Nandra, & Porter, 2020; WHO, 2026).

Similarly, evidence from perioperative nursing guideline bodies such as the Association of periOperative Registered Nurses (AORN) supports the use of standardized checklists during critical processes like the surgical time-out to improve communication among team members and minimize potential errors (AORN, 2024a). These comprehensive checklists reinforce safety practices by prompting multidisciplinary review of essential components including patient identity, planned procedures, and protective measures before, during, and after surgery, thereby fostering a consistent culture of safety and helping to prevent complications associated with general anesthesia and prone positioning.

### Evaluation

Evaluation of nursing outcomes in this case centered on the early detection, documentation,

and management of postoperative vision loss and the prevention of pressure-related injuries associated with prone positioning. From a nursing perspective, outcome evaluation emphasized the effectiveness of perioperative assessments and interventions in identifying adverse events and mitigating secondary harm, as recommended in perioperative safety and positioning guidelines (Barimani et al., 2020; WHO, 2026).

Postoperatively, focused nursing assessments were conducted to evaluate visual outcomes, including changes in visual acuity, pupillary light reflexes, and extraocular movements, in accordance with evidence-based recommendations for early recognition of postoperative visual loss (Epstein, 2016; Sperber et al., 2024). The sudden onset of painless unilateral vision loss was promptly recognized and documented by nursing staff, facilitating early ophthalmologic and neurologic consultation. Although visual recovery remained limited despite timely multidisciplinary intervention, early nursing recognition supported rapid diagnostic evaluation and appropriate escalation of care, which is consistent with published reports emphasizing the importance of early detection in cases of CRAO and prone-related visual complications (Epstein, 2016; Rathod et al., 2025; Van, 2020).

In parallel, nursing evaluation addressed outcomes related to pressure injury prevention. Postoperative inspection of pressure-prone areas—particularly the facial, orbital, and dependent surfaces—was performed to assess the effectiveness of intraoperative positioning and padding strategies. The absence or presence of pressure-related skin changes and patient-reported discomfort were used as outcome indicators to evaluate the adequacy of pressure redistribution measures, as supported by perioperative pressure injury prevention literature and nursing risk assessment frameworks (Betts et al., 2022; Chen et al., 2023; Karadede et al., 2025; Sousa & Acunã, 2022).

Additionally, the occurrence of neurologic complaints, including cranial nerve involvement associated with ophthalmoplegia, was reviewed as part of the nursing outcome evaluation to refine perioperative risk stratification and preventive strategies (Dhoon et al., 2024; Rathod et al., 2025). Consistent with findings from systematic reviews and meta-analyses, this case reinforces that patient positioning is closely associated with harmful perioperative events—including postoperative visual loss and pressure-related injuries—and highlights the critical role of ongoing nursing evaluation, documentation, and quality improvement to minimize positioning-related risks in prone spine surgery (Barimani et al., 2020; Cai, Huang, & He, 2023; Van, 2020).

### CONCLUSION

This case underscores the essential role of perioperative nurses in preventing and detecting position-related complications associated with prone positioning in spine surgery, including ocular complications such as central retinal artery occlusion (CRAO) and pressure-related skin and soft tissue injuries. The findings reinforce that comprehensive perioperative nursing care encompassing structured risk assessment, meticulous patient positioning, vigilant hemodynamic, neurologic, and skin integrity monitoring, as well as patient education, forms the foundation of evidence-based practice aimed at minimizing the risk of irreversible visual loss and perioperative pressure injuries.

To optimize patient outcomes, the integration of standardized positioning and pressure injury prevention checklists into routine perioperative practice is strongly recommended. The use of evidence-based checklists supports consistent verification of head and eye protection, appropriate padding of pressure-prone areas, and regular reassessment of patient positioning throughout the surgical procedure, thereby reducing the likelihood of both ocular ischemic events and pressure-related tissue damage (WHO, 2026). In parallel, prioritizing simulation-based education and structured training for perioperative teams enhances competence in safe prone positioning, early identification of excessive pressure, and adherence to preventive protocols, particularly during prolonged or complex spine surgeries (Cai et al., 2023).

Effective interdisciplinary communication among surgical, anesthesia, ophthalmology, and nursing teams is also critical to ensuring early recognition and timely management of visual disturbances, neurologic deficits, and pressure-related complications. Prompt escalation of abnormal findings such as changes in visual function, cranial nerve involvement, or early signs of pressure injury facilitates rapid multidisciplinary evaluation and intervention, which may limit the severity of injury and improve overall patient outcomes. Establishing clear communication pathways and shared accountability across disciplines fosters a culture of perioperative safety and coordinated care.

Future research should focus on validating perioperative risk stratification tools that simultaneously address ocular perfusion compromise and pressure injury risk in patients undergoing prone positioning. Additionally, the development of continuous intraoperative perfusion and pressure-monitoring technologies may further enhance early detection of tissue compromise, support real-time nursing interventions, and strengthen preventive strategies to improve patient safety in prone spine surgery.

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