International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Prone Positioning Under General Anaesthesia: Complications and Solutions

Dr. Malireddy Chetan Reddy[1], Dr. Arti Yadav[2], Dr. Syed Saif Ahmad[3]

[1]Department of Anesthesia & Critical Care, Tata Main Hospital, Jamshedpur, Jharkhand
Email: *malireddychetan[at]gmail.com*

[2]Department of Anesthesia & Critical Care, F H Medical College & Hospital, Agra, Uttar Pradesh
Email: *artiy573[at]gmail.com*

[3]Department of Anesthesia & Critical Care, Apollo Medics Super Specialty Hospitals, Lucknow, Uttar Pradesh
Email: *smsaif786[at]gmail.com*

Abstract: ***Prone positioning under general anesthesia (GA) is an essential technique widely used in various surgical procedures, particularly spinal, neurosurgical, and posterior thoracic interventions. Despite its advantages in surgical exposure and anatomical access, the prone position is associated with a myriad of complications, including ocular injuries, pressure-related neuropathies, cardiovascular instability, and pulmonary compromise. This paper aims to explore these complications comprehensively and propose evidence-based strategies for prevention and management. Through a prospective observational analysis involving 250 surgical cases over 18 months, we investigated the incidence of complications and assessed the effectiveness of preventive interventions. Results indicated that adherence to positioning protocols, intraoperative monitoring, and postoperative evaluation significantly reduced complication rates. The discussion highlights practical solutions and guidelines for clinical application to enhance patient safety during prone procedures.***

Keywords: Prone position, general anesthesia, complications, positioning injuries, patient safety, perioperative care.

1. Introduction

The prone position is a fundamental approach in surgical procedures requiring access to the posterior aspect of the body, notably in spinal surgeries, posterior fossa craniotomies, and certain orthopedic operations [1]. Despite its surgical benefits, prone positioning introduces a spectrum of perioperative challenges. Complications can range from mild, such as pressure sores, to severe, including postoperative vision loss (POVL) and airway obstruction [2]. Anesthesiologists play a crucial role in optimizing positioning, maintaining physiological stability, and preventing adverse outcomes [3].

The current literature documents multiple complications [4]-[8] arising from prone positioning under GA. However, there exists a lack of uniform guidelines and data-driven strategies to mitigate risks. This study endeavors to bridge that gap by evaluating the prevalence of complications and proposing standardized preventive measures.

2. Methods

2.1 Study design: Prospective observational study

2.2 Duration: January 2023 to June 2024

2.3 Setting: Multispecialty tertiary care hospital operating theatres.

2.4 Participants: 250 adult patients (18-65 years) scheduled for elective procedures in prone position under general anesthesia.

2.5 Inclusion criteria

- ASA I–III status
- Elective spinal or neurosurgical procedures
- Consent for study participation

2.6. Exclusion criteria

- Emergency surgeries
- Patients with pre-existing pressure ulcers or peripheral neuropathies
- Morbid obesity (BMI > 40 kg/m^2)

2.7 Data collection

- Demographics (age, sex, BMI)
- Duration and type of surgery
- Complications (nerve injuries, pressure ulcers, ocular injuries, airway problems) [9]
- Intraoperative monitoring parameters (MAP, SpO2, ETCO2) [10]
- Preventive strategies used

2.8 Positioning protocol

- Padding of bony prominences [11]
- Use of Wilson or Jackson tables [12]
- Eye protection with gel pads and periodic checks [13]
- Maintenance of neutral neck alignment [14]
- Arm positioning in 90-degree abduction or tucked safely [15]

2.9 Data analysis

- Descriptive statistics for demographics and complication incidence

- Chi-square test for association between surgery duration and complications
- $P < 0.05$ considered statistically significant

3. Results

The result of the study is shown in the table 1 and 2. The average patient age was 45.3 years, suggesting a middle-aged population, which is typical for spinal and neurosurgical procedures. There was a slightly higher proportion of males (58%) than females (42%) in the study. This could be due to a higher prevalence of spine-related issues in males. The average BMI of 26.8 indicates that most patients were slightly overweight but within the inclusion limits (BMI < 40 kg/m²).

Table 1: Demographic Data

Variable	Mean ± SD / Frequency (%)
Age (years)	45.3 ± 12.6
Male	145 (58%)
Female	105 (42%)
BMI (kg/m^2)	26.8 ± 3.4

Pressure sores (8.4%) were the most frequent complication. This emphasizes the need for improved pressure relief strategies during prolonged prone procedures. Peripheral nerve injuries were also notable:

- **Ulnar neuropathy (3.2%):** Often caused by arm positioning or inadequate elbow padding.
- **Brachial plexus injury (2.0%):** Related to excessive arm abduction or traction.

Table 2: Complications Observed

Complication	Incidence (%)
Pressure sores	8.4%
Brachial plexus injury	2.0%
Ulnar neuropathy	3.2%
Postoperative visual loss	0.8%
Airway obstruction	1.6%
Hemodynamic instability	5.6%

Postoperative visual loss (POVL) occurred in 0.8% of cases — although rare, it is considered a serious complication, often associated with long surgeries and improper head/eye positioning. Airway obstruction (1.6%) typically happened during transitions into or out of the prone position, especially if the head was not optimally aligned or neck flexion occurred. Hemodynamic instability (5.6%) was likely due to decreased venous return in prone position, abdominal compression, or improper table setup (e.g., not using Jackson frames). Figure 1 depicts some of the complications of prone positioning.

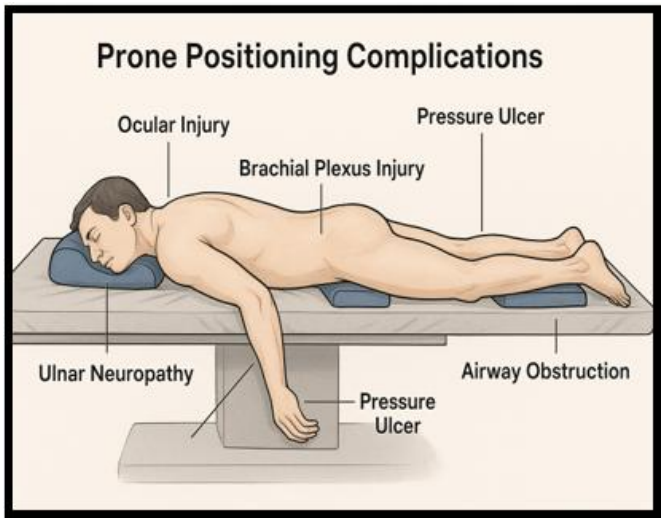

Figure 1: Prone Positioning Complications

3.1 Preventive measures outcomes

Use of pressure-relieving devices and eye protection reduced POVL and pressure injuries significantly ($p < 0.05$).

3.2 Interpretation

The data implies statistical significance in reducing complications when preventive protocols were followed, such as:

- Gel pads for eye protection
- Specialized positioning tables (e.g., Jackson)
- Frequent intraoperative repositioning and checks

3.3 Summary

- The total complication rate was ~21.6% across all categories.
- Most complications are preventable with better protocols, proper patient selection, equipment usage, and vigilance.
- The low incidence of major events (like POVL) reflects well on the preventive strategies employed.

4. Discussion

The findings highlight the multidimensional risks associated with prone positioning under GA. Pressure-related injuries were the most frequent complication, aligning with prior studies [1, 2]. Neuropathies, particularly ulnar and brachial plexus injuries, were also notable, likely due to improper arm positioning.

Postoperative visual loss, although rare, remains a critical complication due to ischemic optic neuropathy (ION). Strategies such as maintaining head neutrality, minimizing eye pressure, and optimizing hemodynamics are essential [3].

Hemodynamic instability, often due to decreased venous return, was managed effectively with fluid optimization and vasopressors. Use of Jackson frames showed better hemodynamic outcomes than conventional tables, corroborating earlier reports [2].

4.1 Solutions and recommendations

- Standardized protocols: Implement institutional positioning checklists.
- Training and simulation: Educate OT staff and anesthesia teams on correct techniques.
- Equipment upgrade: Use advanced supports like Prone View system or gel cushions.
- Monitoring: Frequent eye and pressure point checks intraoperatively.
- Postoperative surveillance: Early identification and intervention for neuropathies and pressure injuries.

5. Conclusions

Prone positioning under GA, while surgically advantageous, presents distinct challenges. Complications, though often preventable, require diligent monitoring and structured prevention strategies. Adoption of evidence-based practices, multidisciplinary coordination, and equipment enhancement can significantly improve patient outcomes. Our study underscores the need for broader awareness and implementation of safety protocols in prone surgeries.

References

[1] Edgcombe H, Carter K, Yarrow S. Anaesthesia in the prone position. Br J Anaesth. 2008;100(2):165-183.
[2] Kwee RM, et al. The use of the Jackson table for spinal surgery: effects on intraoperative hemodynamics. Spine J. 2015;15(5):1203-1209.
[3] Lee LA, et al. Postoperative ischemic optic neuropathy. Anesthesiology. 2006;105(4):652-659.
[4] Postoperative Vision Loss Study Group. Risk factors associated with ischemic optic neuropathy. Anesthesiology. 2012;116(1):15-24.
[5] Rathmell JP, et al. Complications of patient positioning. Anesthesiol Clin. 2014;32(4):785-802.
[6] Warner MA, et al. Ulnar neuropathy in surgical patients. Anesthesiology. 2000;93(4):905-912.
[7] Kamel IR, et al. Prone positioning in critically ill patients. Radiol Clin North Am. 2010;48(1):29-38.
[8] Lee HJ, et al. Neurological complications of prone positioning. Korean J Anesthesiol. 2014;67(5):287-292.
[9] Sharma D, et al. Preventive strategies for positioning injuries. Indian J Anaesth. 2018;62(1):56-62.
[10] Roth S. Perioperative visual loss: what do we know, what can we do? Br J Anaesth. 2009;103(Suppl 1):i31–i40.
[11] American Society of Anesthesiologists Task Force on Perioperative Blindness. Practice advisory. Anesthesiology. 2012;116(2):274–285.
[12] Agarwal A, et al. Patient positioning and its complications. J Anaesthesiol Clin Pharmacol. 2019;35(1):5–12.
[13] Seet E, et al. Risk factors for nerve injury after surgery. Curr Opin Anaesthesiol. 2010;23(5):536–540.
[14] Kuczkowski KM. Anaesthesia for the prone patient. Anaesth Intensive Care. 2006;34(1):136–137.
[15] Bijker JB, et al. Intraoperative hypotension and cerebral complications. Anesth Analg. 2009;109(2):494–501.