

CASE REPORT

Unilateral Acute Angle-Closure Glaucoma After Lumbar Spine Surgery

A Case Report and Systematic Review of the Literature

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Study Design. A case report and literature review is presented of a patient that developed acute angle-closure glaucoma (AACG) after undergoing spine surgery in the prone position.

Objectives. To report a case of AACG after undergoing spine surgery in the prone position and describe potential causes and implications for future care.

Summary of Background Data. Visual loss is a devastating complication after spine surgery and is most often due to ischemic optic neuropathy. Although far less common, three cases of AACG have previously been reported, all of which were bilateral. Mydriatic agents and prone positioning were hypothesized as precipitating factors as both are known to increase intraocular pressure. In contrast to other visual loss diseases after spine surgery, AACG is amenable to treatment if recognized and treated early; however, its diagnosis is often complicated by patients presenting days after surgery. We report the case of a 65-year-old male who underwent multilevel revision spine surgery in the prone position and developed unilateral AACG after discharge on postoperative day 5.

Methods. The case report is described. A literature review was performed using PubMed and keywords. The resulting articles were evaluated and references checked for additional cases.

Results. The case herein resulted in no vision loss after the AACG was treated with laser iridotomy. The patient had a history of ocular issues in the affected side, highlighting the potential role anatomy plays in the development of AACG following spine surgery. Three reports of AACG were found after the literature review was performed.

Conclusion. Although it is not practical to screen all patients through ophthalmologic referral, there may be a role for targeted preoperative screening of patients with risk factors for AACG.

Key words: acute angle-closure glaucoma, glaucoma, lumbar spine surgery, postoperative vision changes, prone position, revision spine surgery.

Level of Evidence: 5

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Visual loss is a devastating complication after spine surgery.^{1–4} Causes include ischemic optic neuropathy and central retinal artery thrombosis. Risk factors include operating time greater than 8 hours, Wilson Frame use, and significant blood loss.⁵ In contrast to the aforementioned diseases, acute angle-closure glaucoma (AACG) has been less frequently reported, and patients present days after surgery. We present a case of unilateral AACG after spine surgery.

CASE REPORT

A 65-year-old male who previously underwent laminectomy with L4-L5 posterolateral fusion presented with progressive L5 radicular symptoms that had failed conservative management. Imaging demonstrated right L5-S1 foraminal stenosis and L1-L2 central stenosis. His medical history included well-controlled hyperlipidemia, benign prostatic hypertrophy, and asthma. His ophthalmologic history included macular pucker and cataract of the left eye.

The patient underwent revision surgery, which included L5-S1 interbody fusion and L4-S1 instrumentation, in the prone position using a ProneView face holder (Mizuho OSI, Union City, CA) on an open table frame with individual positioning pads (Mizuho OSI, Union City, CA). During surgery, he spent 4.5 hours prone and estimated blood loss was 150 mL. He received 1000 µg phenylephrine, 50 mg ephedrine, 2 mg neostigmine, and 1 mg glycopyrrolate. There were no intraoperative complications and the patient remained hemodynamically stable.

Postoperatively, the patient was on a standard dose of hydromorphone patient-controlled analgesia. On postoperative day 1, he was transitioned to oxycodone. On postoperative day 2, he developed left eye blurry vision,

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soreness, and tearing. Ophthalmology was consulted and a small corneal abrasion was noted. Intraocular pressures (IOP) were 25 and 15 mm Hg in the left and right eyes, respectively. Erythromycin ointment was prescribed. On postoperative day 3, he was discharged with stable eye symptoms. On postoperative day 5, he presented to the ophthalmology clinic with worsened left eye pain and IOP of 45 mm Hg. This was medically treated to 20 mm Hg; however, the pain returned that evening and laser peripheral iridotomy was performed. The patient had no further eye symptoms.

Literature Review

To identify previously reported cases of AACG after spine surgery, PubMed was searched using the keywords, "Spine," and, "Glaucoma," which yielded 30 results. References from these articles were reviewed but yielded no additional results. Three of these were cases of closed-angle glaucoma following spine surgery. These cases are summarized with the current case (Table 1).

DISCUSSION

Prone positioning and mydriatic agents have been shown to increase IOP and both were commonly used to identify patients susceptible to AACG prior to tonometric testing.^{9,10} This study illustrates a case of unilateral AACG related to prone positioning, ephedrine administration, and pre-existing risk factors.

In a normal eye, aqueous humor is produced in the ciliary body, and flows from the posterior to anterior chamber through the pupil. The trabecular meshwork is located at the angle of the anterior chamber and acts as the filter through which aqueous humor is drained. The balance between fluid production and drainage determines IOP. In AACG,

pupillary block results in the iris obstructing the trabecular meshwork, impeding aqueous humor drainage and increasing IOP. AACG requires the coexistence of both a pupillary block and an anatomically predisposed eye.⁷

Risk factors for increased IOP include Asian ethnicity,¹¹ female gender, shallow anterior chamber, hypermetropia, increased lens thickness, small corneal diameter, and increased age.^{12,13} Our patient had a shallow anterior chamber and hypermetropia that, in addition to a long period of prone positioning and administration of a mydriatic drug, might have shifted the lens forward, resulting in increased IOP.

There are key differences between previous studies and the current case. Singer and Salim⁶ reported a patient who had bilateral symptoms and was reintubated prior to ophthalmologic evaluation. Similar to the present case, Gayat *et al*⁷ reported a patient who received high doses of ephedrine, the mydriatic effect of which can last up to 6 hours. Jaroudi *et al*⁸ reported a patient with plateau iris-like AACG, which is one mechanism for developing angle closure in which the ciliary body is large and anteriorly positioned.

An important distinguishing aspect of the current study is the unilateral nature, suggesting that predisposing anatomic risk factors play a critical role. Prior to spine surgeries in the prone position, it is advisable to assess for the presence of AACG risk factors. Although it is not practical to screen all patients through ophthalmologic referral, there may be a role for routine questions regarding ophthalmologic history to screen for risk factors. Furthermore, preoperative laser iridotomy or postoperative topical pilocarpine may benefit these patients. AACG is amenable to treatment but can result in permanent vision loss if not recognized and treated in a timely manner.¹⁴

TABLE 1. Summary of Previously Reported Cases and Present Case of Closed-Angle Glaucoma After Spine Surgery

Author (s), Year Reported	Patient Age, Sex	Visual History	Position (Duration)	Spinal Level, Procedure	Onset	Ocular Symptoms (Laterality)	Systemic Symptoms	Intraocular Pressure
Singer and Salim, ⁶ (2010)	68-year-old, female	Not reported	Prone (5 hrs)	Lumbar, fusion	POD2	Pain (L)	Nausea, vomiting	70 mm Hg-L 45 mm Hg-R
Gayat <i>et al</i> , ⁷ (2011)	72-year-old, female	Hyperopia	Prone (1.5 hrs)	Cervical, not reported	POD2	Pain and vision changes (B)	Nausea	36 mm Hg-L 26 mm Hg-R
Jaroudi <i>et al</i> , ⁸ (2013)	59-year-old, male	Hyperopia	Prone (5.5 hrs)	Cervical, laminectomy	POD1	Vision changes (B)	Nausea, headache	65 mm Hg-L 65 mm Hg-R
Present Case	65-year-old, male	Hyperopia, Macular puckering (L), cataract (L)	Prone (4.5 hrs)	Lumbar, fusion and laminectomy	POD5	Pain and vision changes (L)	None	45 mm Hg-L 15 mm Hg-R

B, bilateral; L, left; POD, postoperative day; R, right.

➤ Key Points

- Visual changes after spine surgery are among the most feared and devastating complications after spine surgery.
- This case report depicts revision lumbar spine surgery complicated by unilateral acute angle-closure glaucoma precipitated by prone-positioning, mydriatic drug administration (ephedrine and glycopyrrolate), and an otherwise normal postoperative course.
- An important distinguishing aspect of the current study is the unilateral nature of the complication, suggesting that predisposing anatomic risk factors likely play a critical role in developing acute angle-closure glaucoma.
- There may be a role for targeted screening in the clinical setting preoperatively.

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