

Case Report

Hyperbaric oxygenation therapy treatment option in perioperative visual loss in spine surgery

Catarina Aleixo^{1,2}, Ricardo Santos Pereira^{1,2}, Filipe Lima Santos^{1,2}, Henrique Sousa^{1,2}, José Carlos Soares¹, João Pedro Maia Gonçalves¹

¹Porto Spine Unit – Hospital da Luz Arrábida, Vila Nova de Gaia, Portugal

²Department of Orthopedics, Centro Hospitalar Vila Nova de Gaia/Espinho, Vila Nova de Gaia, Portugal

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*Correspondence:

Dr. Catarina Aleixo,

E-mail: catarinabpaleixo@gmail.com

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ABSTRACT

Perioperative vision loss (POVL) is a catastrophic complication of spine surgery and several risk factors are identified. As spine fusion surgery is rising in number, POVL incidence is increasing. Preventive strategies can decrease the risk of this complication. Prognosis depends on the level of occlusion and how quickly oxygen supply can be restored to retina. We present a 65-year-old female patient with multiple cardiovascular risk factors that who underwent lumbar fusion. Upon waking up from anesthesia, the patient reported total loss of vision in her left eye. An occlusion of the central retinal artery due to a probable embolic cause was diagnosed and the patient promptly started treatment with anti-aggregation therapy and hyperbaric oxygen therapy (HBOT) with good results. The combination of HBOT with anti-aggregation therapy may have had a synergistic effect contributing to the good outcome presented in this case and may be a good option for the treatment of this patients.

Keywords: Perioperative vision loss, Hyperbaric oxygen therapy, Spine surgery, Central retinal artery occlusion

INTRODUCTION

Perioperative vision loss (POVL) associated with routine surgical procedures is a rare but catastrophic event.¹ There is significant variation in the reported incidence of POVL ranging from 0.056 to 1.3% for all surgeries and up to 0.2% for spine surgery.^{2,3}

Furthermore, in association with the rising number of spinal fusion surgeries, strong evidence indicates an increasing incidence of POVL.^{3,4}

The etiology of POVL is not yet entirely understood.⁵ Several preoperative and intraoperative risk factors have been identified, including hypertension, diabetes, vascular diseases, intraoperative hypotension, overhydration, and surgical positioning and possible causes include ischemic optic neuropathy (ION), central retinal artery occlusion

(CRAO), cortical blindness (CB), and corneal abrasion (CA).^{1,4-7}

While few treatment options exist, patient management varies depending on the type of POVL identified.⁵

The retina is very sensitive to ischemia, and that's the reason why the prognosis of CRAO is poor. Hyperbaric oxygen therapy (HBOT) can give the adequate partial pressure of oxygen in order to keep the retina viable until circulation is restored.⁸ Prognosis depends on the level of occlusion and how quickly oxygen supply can be restored to retina.⁹

CASE REPORT

We describe the case of a 65-year-old female patient with multiple cardiovascular risk factors (hypertension,

dyslipidemia, obesity) and psoriatic arthritis treated with low-dose adalimumab and corticosteroids. She had complaints of low back pain and neurogenic claudication resistant to conservative treatment. Complementary diagnostic tests revealed an L4-L5 spondylolisthesis with a L3-L5 lumbar spinal stenosis (Figure 1). The patient was proposed surgical treatment – L3-L5 instrumentation, decompression and posterolateral fusion (Figure 2). The entire preoperative study was carried out, with the patient's preoperative hemoglobin being 14.1 g/dL.

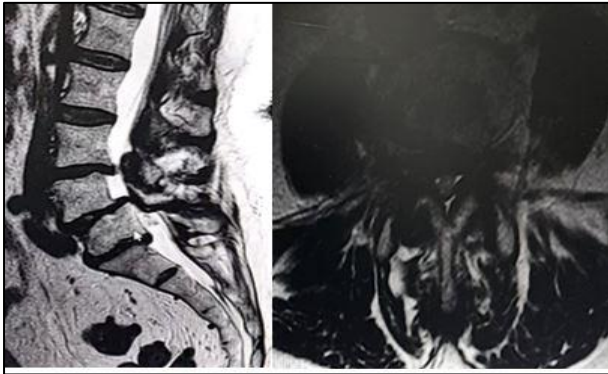


Figure 1: Pre-operative MRI- L3-L5 lumbar spinal stenosis.

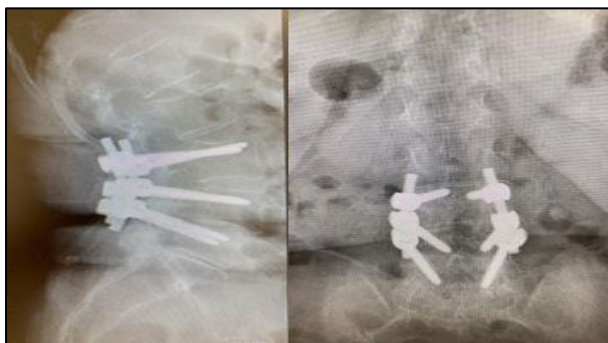


Figure 2: Post-operative X-ray.

The surgery was performed with the patient in prone position, with the face supported by a protective device (Proneview®). During surgery, she remained hemodynamically stable, with low blood loss, and there were no intraoperative complications. Total surgical time was 140 minutes.

Upon waking up from anesthesia, the patient reported total loss of vision in her left eye. She was observed immediately by an ophthalmologist who diagnosed an occlusion of the central retinal artery due to a probable embolic cause. Cardiac, carotid and vertebral vessel Doppler ultrasound evaluation did not identify any predisposing lesions. Head computed tomography scan did not show any brain injury.

The patient started anti-aggregation therapy and performed 4 sessions of hyperbaric oxygen therapy - immediately

after the surgery and then once a day for 3 days. There was a noticeable improvement in visual acuity immediately after the initial sessions with posterior stabilization of the improvement, which prompted us to stop hyperbaric treatment. At the time of hospital discharge, 5 days after the surgery, she had a permeable central retinal artery, with pulsatility, but still with marked macular edema. Visual recovery was slow and gradual. At one year postoperatively, the patient had completely recovered vision acuity comparable to the contralateral eye and the preoperative period.

DISCUSSION

POVL is a rare but devastating complication following spine surgery.

Central retinal artery occlusion (CRAO) accounts for a small percentage of POVL cases, but is the second most common cause associated with spinal surgery, accounting for 11% of all cases, following ION with 89% of cases.^{3,4,10}

CRAO was also largely attributed to poor prone positioning (direct eye compression and/or rotation of the neck with jugular/carotid compromise) and embolic events.¹¹

The prognosis is poor mainly because the retina is very sensitive to ischemia being the tissue of the human body with the highest oxygen consumption.⁸ Ischemia time is the critical prognosis factor and the damage is only considered reversible if treated within the first 6 hours of onset so emergent ophthalmological consultation with funduscopic examination and central nervous system imaging are mandatory to identify the actual cause of POVL.^{3,6}

Conventional CRAO treatments are focused in moving the embolus downstream by lowering intraocular pressure and producing vasodilatation. These treatments include ocular massage, anterior chamber paracentesis, intraocular pressure-lowering medications, vasodilators, oral diuretics and thrombolytic agents but even when started immediately and in combination, they are currently not very effective.^{3,5-7}

HBOT is a recently described treatment modality with encouraging results in case reports and small case series.¹² HBOT delivers 100% oxygen by a pressure greater than 1 atmosphere (atm), increasing plasma oxygen transportation and diffusion in order to keep the retina viable until circulation is restored via natural recanalization, which usually occurs within 72 hours.¹²

The Undersea and Hyperbaric Medical Society has recommended that patients presenting for treatment within 24 hours after symptom onset should be considered for HBOT.¹³

The combination of HBOT with anti-aggregation therapy may have had a synergistic effect contributing to the good outcome presented in this case.

CONCLUSION

Although rare, POVL is a devastating complication of spine surgery. Preventive strategies such as optimization of pre-operative hemoglobin levels, maintenance of a stable intra-operative hemodynamic status and use of devices that avoid excessive ocular pressure can decrease the risk of this complication. A multidisciplinary approach to the evaluation and follow-up of these patients is essential to improve long-term results. Hyperbaric treatment may be a valid option but further studies are necessary.

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REFERENCES

1. Alwon K, Hewer I. Perioperative Vision Loss: Considerations and Management. *AANA J*. 2016;84(5):363-70.
2. Kitaba A, Martin DP, Gopalakrishnan S, Tobias JD. Perioperative visual loss after nonocular surgery. *J Anesth*. 2013;27(6):919-26.
3. Mendel E, Stoicea N, Rao R. Revisiting Postoperative Vision Loss following Non-Ocular Surgery: A Short Review of Etiology and Legal Considerations. *Front Surg*. 2017;4:34.
4. Baig MN, Lubow M, Immesoete P, Bergese SD, Hamdy EA, Mendel E. Vision loss after spine surgery: review of the literature and recommendations. *Neurosurg Focus*. 2007;23(5):E15.
5. Li A, Swinney C, Veeravagu A, Bhatti I, Ratliff J. Postoperative Visual Loss Following Lumbar Spine Surgery: A Review of Risk Factors by Diagnosis. *World Neurosurg*. 2015;84(6):2010-021.
6. Nickels TJ, Manlapaz MR, Farag E. Perioperative visual loss after spine surgery. *World J Orthop*. 2014;5(2):100-06.
7. De la Garza-Ramos R, Samdani AF, Sponseller PD. Visual loss after corrective surgery for pediatric scoliosis: incidence and risk factors from a nationwide database. *Spine J*. 2016;16(4):516-22.
8. Kim SH, Cha YS, Lee Y, Kim H, Yoon IN. Successful treatment of central retinal artery occlusion using hyperbaric oxygen therapy. *Clin Exp Emerg Med*. 2018;5(4):278-81.
9. Hayreh SS, Zimmerman MB. Central retinal artery occlusion: visual outcome. *Am J Ophthalmol*. 2005;140(3):376-91.
10. Lee LA, Roth S, Posner KL. The American Society of Anesthesiologists Postoperative Visual Loss Registry: analysis of 93 spine surgery cases with postoperative visual loss. *Anesthesiology*. 2006;105(4):652-868.
11. Epstein NE. How to avoid perioperative visual loss following prone spinal surgery. *Surg Neurol Int*. 2016;7(Suppl 13):S328-30.
12. Chandra KN, Kundan M. Perda visual no pós-operatório de laminectomia cervical em pronação [Post operative visual loss after cervical laminectomy in prone position]. *Rev Bras Anesthesiol*. 2017;67(4):435-38.
13. Murphy-Lavoie H, Butler F, Hagan C. Arterial inefficiencies: central renal artery occlusion. In: Lindell KW, editor. *Hyperbaric oxygen therapy indication*. 13th ed. Durham, NC: Best Publishing Company; 2014: 11-24.

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