

Case report

Bilateral Vision Loss in a Patient Following Cardiac Surgery

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Cardiac surgery describes any surgical procedure involving the heart or the blood vessels carrying blood to and from it. It is usually a safe surgery regarding the visual system; however, in rare cases, due to certain complications, a devastating consequence occurs, leading to total blindness in patients. In this regard, a central vision loss in a 62-year-old patient following cardiovascular surgery is reported.

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Introduction

Central vision loss, specifically affecting the macula (the central part of the retina responsible for sharp, detailed vision), can occur in rare cases following cardiac surgery. However, it is a significant concern due to its potential impact on the quality of life for those affected. The condition is known as central retinal artery occlusion (CRAO) or ischemic optic neuropathy ¹.

The exact mechanisms behind vision loss after cardiac surgery are not fully understood, and further investigation is required to determine the underlying causes. However, several potential factors have been suggested:

1. Embolic events: During cardiac surgery, tiny particles or emboli can be dislodged from the heart or blood vessels and travel to the eye's retinal artery, blocking blood flow to the macula. These emboli can be composed of fat, air bubbles, or other debris ².
2. Hypotension: Cardiac surgery often involves fluctuations in blood pressure, including periods of low blood pressure (hypotension). Insufficient blood supply to the retina during hypotensive episodes can lead to ischemic damage, resulting in vision loss ³.
3. Microvascular dysfunction: Surgery and extracorporeal circulation (use of a heart-lung machine) can cause temporary dysfunction of the microvasculature supplying the macula. This can impair blood flow to the retina, leading to ischemic damage ⁴.
4. Atherosclerosis: Patients who undergo cardiac surgery often have underlying cardiovascular risk factors, including atherosclerosis (plaque buildup in the arteries). Atherosclerotic plaques can contribute to embolic events or compromise blood flow to the retina, resulting in vision loss ⁵.
5. Individual susceptibility: Some individuals

may have preexisting conditions or factors that make them more susceptible to vision loss during surgery. These factors could include certain anatomical variations, clotting disorders, or underlying eye conditions ⁶.

A 62-year-old patient with central vision loss was referred to Basir clinic for recording visual evoked potential (VEP). VEP is an efficient technique for several physiological and pathological changes in the visual system. Shushtarian S M et al. (1999) worked on VEP measurement in female subjects during a monthly physiological period. Their results indicated the prolongation of P100 of VEP due to hormonal changes during this period ⁷.

Sarzaeim F et al. (2022) worked on the effect of antiepileptics. They observed a delay in VEP, P100 peak compared to the normal population. This effect shows that drugs may induce disturbances in the visual pathway, which VEP can diagnose ⁸.

Visual evoked potential can be used in patients with cortical blindness. In this regard, a case was reported with total blindness following an anaphylactic shock after treatment with co-amoxiclav. The blindness was cortical, and the VEP was altered, indicating its usefulness in such conditions ⁹.

There are quite enough references in this regard ¹⁰⁻²⁴. Considering the above literature survey, a case is reported regarding a 62-year-old patient with central vision loss following cardiac surgery.

Case report

A 62-year-old male with central vision loss following a cardiac operation was tested for VEP examination. The VEP pattern was flat, and no VEP, P100 peak could be distinguished. The patient's medical history showed a recent heart surgery. The surgery was successful and he had normal vision after the operation.

However, during his second day in the ICU (heart), he started complaining about having visual problems and finally losing sight altogether. The record showed that he was a healthy man without any specific pathological changes in his laboratory records. The underlying cause for this episode was a central retinal artery occlusion.

Discussion

A 62-year-old healthy man was admitted to a heart clinic for cardiac surgery. The operation was successful, but unfortunately, he had central vision loss during his stay in the ICU (heart). Overall, visual problems during surgeries are rare but not impossible.

Shushtarian S M et al. 2020 reported a distance blurry vision following rhinoplasty in a 25-year-old female patient. Her medical history was normal, including her MRI, VEP, and ophthalmoscopy. However, the reason for her visual problem remained unclear and required future examination ²⁵.

Such complications may occur in the case of cardiac surgery too.

Young Duck shin et al. (2010) reported a pediatric patient who had undergone cardiopulmonary bypass (CPB) surgery and experienced four weeks of cortical blindness before it healed naturally. The patient was a 21-month-old male. Two days after the surgery, his eye could not focus. His visual loss probably occurred due to convulsion and cortical damage. After 28 days of operation, the patient's eye refocused, and he could recognize the objects in front of his eyes, and on day 31, his sight had returned to normal ²⁶. Young Meng Hsein et al. (2016) reported two cases of visual problems following heart surgery. The first case was a 74-year-old

man with pre-existing diabetes mellitus and hypertension. He was electively admitted for percutaneous coronary intervention (PCI) to treat his coronary artery disease (CAD). A few hours after the procedure, the patient complained of sudden blurring of vision in his right eye. He was found to have an occlusion in a retinal artery branch. The second case was a 49-year-old male presenting with ST-segment elevation myocardial infarction (STEMI) and had emergency PCI performed two hours upon admission. He noticed his right eye's vision was worsening immediately after the procedure. He was diagnosed with central retinal artery occlusion ²⁷. More cases have been reported in this regard ^{22, 23}.

Extracorporeal circulation refers to the use of a heart-lung machine during cardiac surgery to temporarily bypass the patient's heart and lungs, allowing the surgeon to operate on a still heart. The heart-lung machine takes over the functions of the heart and lungs, oxygenating the blood and circulating it throughout the body. During cardiac surgery, there is a risk of various complications, including vision impairment. Vision impairment can occur as a result of several factors, such as emboli (small particles or clots) that can block blood vessels supplying the eyes, decreased blood flow to the optic nerve, or systemic inflammatory response during extracorporeal circulation ¹

Conclusion

Visual disturbances are a possible complication of heart surgery. Patients, especially the high-risk ones, need to be informed accordingly. The exact mechanisms behind vision loss after cardiac surgery are not fully understood, and further investigation is required to determine the underlying causes. However, several potential factors have been suggested.

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References

1. Nenekidis I, Pournaras CJ, Tsironi E, Tsilimingas N. Vision impairment during cardiac surgery and extracorporeal circulation: current understanding and the need for further investigation. *Acta ophthalmologica*. 2012;90(3):e168-e72.
2. Patel N, Banahan C, Janus J, Horsfield MA, Cox A, Marshall D, et al. Neurological impact of emboli during adult cardiac surgery. *Journal of the neurological sciences*. 2020;416:117006. Epub 2020/07/06. doi: 10.1016/j.jns.2020.117006. PubMed PMID: 32623144; PubMed Central PMCID: PMC7718579.
3. Raphael J, Moss HE, Roth S. Perioperative visual loss in cardiac surgery. *Journal of cardiothoracic and vascular anesthesia*. 2019;33(5):1420-9.
4. Rubin DS, Matsumoto MM, Moss HE, Joslin CE, Tung A, Roth S. Ischemic optic neuropathy in cardiac surgery: incidence and risk factors in the United States from the National Inpatient Sample 1998 to 2013. *Anesthesiology*. 2017;126(5):810-21.
5. Roth S. Perioperative visual loss: what do we know, what can we do? *British journal of anaesthesia*. 2009;103(suppl_1):i31-i40.
6. Grogan K, Stearns J, Hogue CW. Brain protection in cardiac surgery. *Anesthesiology clinics*. 2008;26(3):521-38.
7. Shushtarian S, Yahyavi S. Study of visual evoked potentials during normal monthly cycle in normal female subjects. *Biomedical sciences instrumentation*. 1999;35:165-7.
8. Sarzaeim F, Abdolalizadeh S, Shushtarian SMM, Shojaei A. Visual Evoked Potential Findings in Patients using Anti-Seizure Medicine. *Journal of Ophthalmology and Research*. 2022;5(3):123-6.
9. Shushtarian SMM, Dastjerdi MV. Total Blindness Following Anaphylactic Shock due to Co-Amoxiclav Treatment. *Journal of Ophthalmic and Optometric Sciences*. 2020;4(4).
10. Shushtarian S, Kalantari AS, Tajik F, Adhami-Moghadam F. Effect of occupational vibration on visual pathway measured by visual evoked potentials. *Journal of Ophthalmic and Optometric Sciences*. 2017;1(5):7-11.
11. Keramti S, Ojani F, Shushtarian SMM, Shojaei A, Mohammad-Rabei H. Early Diagnosis of Pathological Changes in Visual System of Prolactinoma Patients Using Visual Evoked Potential. *Journal of Ophthalmology and Research*. 2021;4(3):289-93.
12. Ojani F, Shushtarian SMM, Shojaei A, Naghib J. Visual Evoked Potential Findings of Bardet-Biedl Syndrome. *Journal of Ophthalmology and Research*. 2021;4(3):254-7.
13. Sarzaeim F, Hashemzahi M, Shushtarian SMM, Shojaei A, Naghib J. Flash Visual Evoked Potential as a Suitable Technique to Evaluate the Extent of Injury to Visual Pathway Following Head Trauma. *Journal of Ophthalmology and Research*. 2022;5(1):0-.
14. Sarzaeim F, Hashemzahi M, Shushtarian SMM, Shojaei A. Visual Evoked Potential Findings in Road Drilling Machine laborers. *Journal of Ophthalmology and Research*. 2022;5(1):43-7.
15. Allahdady F, Amiri MA, Shushtarian SMM, Tabatabaee SM, Sahraei F, Shojaei A, et al. Comparison of visual evoked potential and electro-oculogram tests in early detection of hydroxychloroquine retinal toxicity. *Journal of Ophthalmic and Optometric Sciences*. 2016;1(1):19-26.

16. Naser M, Shushtarian SMM, Shojaei A, Adlami-Moghadam F. Visual Disturbance in a Patient with Amiodarone Treatment Following Refractive Surgery. *Journal of Ophthalmic and Optometric Sciences*. 2017;1(3):39-42.
17. Shushtarian SMM, Shojaei A, Adhami-Moghadam F. Visual Evoked Potentials Changes among Patients with Chronic Mustard Gas Exposure. *Journal of Ophthalmic and Optometric Sciences*. 2018;2(2018):6-9.
18. Shushtarian SMM, Adhami-Moghadam F, Naser M, Shojaei A. Severe Headache Initiated by Flash Stimulation during Visual Evoked Potential Recording in a Patient with Monocular Optic Neuritis and History of Migraine Headache. *Journal of Ophthalmic and Optometric Sciences Volume*. 2017;1(4).
19. Hajibeygi R, Shushtarian SMM, Abolghasemi S. Visual Evoked Potential Findings of Sjogren's Syndrome. *Journal of Ophthalmic and Optometric Sciences*. 2020;4(1):13-7.
20. Shushtarian SMM. Suitable Stimulation Technique to Record Visual Evoked Potential in Migraine Patients. *Journal of Ophthalmic and Optometric Sciences Volume*. 2020;4(2).
21. Shushtarian SMM, Tajik F, Abdolhoseinpour H. Measurement of Visual Evoked Potentials in Patients with Spastic Cerebral Palsy. *J Ophthalmic Optom Sci*. 2018;2:10-3.
22. Shushtarian SMM, Naghib SJ, Adhami-Moghadam F, Shojaei A. Diplopia and Blurry Vision Following Refractive Eye Surgery: a Comorbidity Case Report. *Journal of Ophthalmic and Optometric Sciences Volume*. 2020;4(1).
23. Shushtarian SMM, Naghitehrani KH, Aflaki F. Diplopia and Flashes of Light Sensation in a Patient with Fragrance Allergy. *Journal of Ophthalmic and Optometric Sciences Volume*. 2020;4(3).
24. Fatemian N, Adhami-Moghadam F, Shushtarian SMM. Study of Visual Evoked Potentials in Patients Suffering from Exotropia. *Journal of Ophthalmic and Optometric Sciences*. 2021;5(2).
25. Shushtarian SMM, Mazar RP. Far Distance Blurry Vision Following Rhinoplasty. *Journal of Ophthalmic and Optometric Sciences*. 2021;5(1):71-4.
26. Shin YD, Lim SW, Bae JH, Lee DH, Baek DH, Hong JS. Transient cortical blindness after heart surgery in a child patient-A case report. *Korean Journal of Anesthesiology*. 2010;59(1):61-4.
27. Hsien YM, Mustapha M, Hamzah JC, Maskon O, Ken CC, Hamdi CHH. Why can't I see after my heart is fixed: a case series of ocular complications after cardiac intervention. *BMC ophthalmology*. 2016;16:1-5.

Footnotes and Financial Disclosures

Conflict of interest:

The authors have no conflict of interest with the subject matter of the present manuscript.