

Challenges of Cerebral Hyperperfusion Syndrome: A Clinical Case Report

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Background

Cerebral Hyperperfusion syndrome (CHS) is a clinical syndrome of hypertension, headache, neurological deficits, with or without seizures, following a revascularization procedure. It is characterized by an excessive and sudden increase in cerebral blood flow, occurring in less than 5% of cases¹. Theories of the underlying mechanism involve impaired cerebrovascular autoregulation, free radical damage, and baroreceptor reflex damage, possible from the procedure itself¹. Common presentations include severe ipsilateral headache to the side of the lesion with typical onset within 12 hours to 6 days, but can occur up to one month after. Investigations include imaging with CT or MRI, or transcranial color duplex to measure velocity in the middle cerebral artery as a correlate of cerebral blood flow³. The hallmark of management is blood pressure regulation to less than 140/90, in order to prevent and limit neurological complications.

Case Presentation

We present a 71M with PMH HTN, HLD, DM2, OSA, Tobacco use 60 pack years in remission, who was initially admitted with severe Carotid Artery Stenosis. He underwent R Carotid Artery endarterectomy and subsequent R neck hematoma evacuation on the same day, and was discharged on POD#3. At home, he developed a severe right sided headache with severely elevated home blood pressure and presented to the nearest emergency room as advised. On examination, he had right neck swelling with left tracheal deviation. Neurological exam was unremarkable with no focal deficits. CT angiogram revealed a new 5 x 6cm R neck hematoma and patient underwent emergent surgical evacuation. Scheduled beta blockers were initiated post-operatively; however, patient had resulting symptomatic and extremely fluctuant blood pressures with subsequent negative CT imaging. Shared decision making with the patient, neurology and neurosurgery resulted in the cessation of the beta blockers with only as needed IV medication blood control with wider blood pressure parameters than typical. Patient remained in hospital for monitoring until consistent normalization of blood pressure was observed. He was safely discharged without medications and without further complications.

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Images



Figure 1: Axial view - CT Neck Soft Tissue without contrast showing R sided neck hematoma



Figure 2: Coronal view - CT Neck Soft Tissue without contrast showing R Sided neck hematoma

Discussion

This case emphasizes the multifaceted complexity of CHS, emphasizing the need for heightened clinical awareness, patient education and individualized management approaches. Risk factors for CHS, including prolonged duration of severe carotid artery stenosis, hypertension, and older age, are common amongst most patients who undergo carotid artery endarterectomy or stenting¹. Notably, CHS can develop up to one month post-procedure¹, highlighting the importance of educating patients about diligent home blood pressure monitoring and recognizing red flag symptoms and signs.

In this case, the administration of beta-blockers, a common therapeutic approach², led to further complications, necessitating discontinuation and broadening of the blood pressure parameters. Collaborative decision-making involving multiple medical specialties played a pivotal role in guiding therapeutic interventions and decisions.

Conclusion

CHS is an unusual but serious complication of revascularization procedures, managed primarily with beta blockers for blood pressure control. As shown by our case, management may need to be tailored to the patient. Continued research into CHS mechanisms and optimal management strategies is ongoing. Nevertheless, communication, ease of access to care, and prompt coordination of management are equally crucial in enhancing patient outcomes.

References

1. Lin YH, Liu HM. Update on cerebral hyperperfusion syndrome. *Journal of NeuroInterventional Surgery*. 2020;12(8):788-793. doi:<https://doi.org/10.1136/neurintsurg-2019-015621>
2. Farooq MU, Goshgarian C, Min J, Gorelick PB. Pathophysiology and management of reperfusion injury and hyperperfusion syndrome after carotid endarterectomy and carotid artery stenting. *Experimental & Translational Stroke Medicine*. 2016;8(1). doi:<https://doi.org/10.1186/s13231-016-0021>
3. Huibers AE, Westerink J, de Vries EE, et al. Editor's Choice – Cerebral Hyperperfusion Syndrome After Carotid Artery Stenting: A Systematic Review and Meta-analysis. *European Journal of Vascular and Endovascular Surgery*. 2018;56(3):322-333. doi:<https://doi.org/10.1016/j.ejvs.2018.05.012>