

Favorable neurological outcome after suboccipital decompressive craniectomy for space-occupying cerebellar infarction despite severe neurological deterioration: a case report and literature review

Luiz Guilherme Machado

luizgmachado87@gmail.com

Hospital São Lucas, Campo Largo, Paraná, Brazil. <https://orcid.org/0009-0008-1413-8971>

Guilherme Moretto

Hospital São Lucas, Campo Largo, Paraná, Brazil. <https://orcid.org/0009-0007-1913-8180>

Tiago Rosa

Hospital São Lucas, Campo Largo, Paraná, Brazil. <https://orcid.org/0000-0001-5875-9181>

Leonardo Carmo Kawakame da Silva

Hospital São Lucas, Campo Largo, Paraná, Brazil. <https://orcid.org/0000-0003-3355-9807>

John Addison

Hospital São Lucas, Campo Largo, Paraná, Brazil. <https://orcid.org/0009-0008-4298-4091>

Case Report

Keywords: Cerebellar infarction, Posterior fossa stroke, Suboccipital decompressive craniectomy, Obstructive hydrocephalus, Case report

Posted Date: October 7th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11279847/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: The authors declare no competing interests.

Abstract

Background

Space-occupying cerebellar infarction is a potentially fatal neurological condition because progressive edema within the restricted posterior fossa may cause fourth ventricular obstruction, acute hydrocephalus, brainstem compression, and herniation. Suboccipital decompressive craniectomy is recommended when neurological deterioration or radiological evidence of mass effect develops. However, the potential benefit of surgery after severe deterioration remains an important clinical consideration.

Case presentation:

A 49-year-old woman with systemic arterial hypertension and obesity developed an acute reduction in consciousness and progressive neurological deterioration approximately 48 hours before admission to a specialized center. She required orotracheal intubation for airway protection, and her Glasgow Coma Scale score was below 9. Cranial computed tomography demonstrated an extensive left cerebellar infarction with marked edema, compression of the fourth ventricle, obstructive hydrocephalus, and brainstem compression. She underwent urgent suboccipital decompressive craniectomy combined with external ventricular drainage. Neurological improvement was observed during the early postoperative period. On the second postoperative day, her Glasgow Coma Scale score increased to 13, spontaneous movement of all four limbs was present, and she was successfully extubated. The external ventricular drain was removed on the sixth postoperative day. She was discharged with a Glasgow Coma Scale score of 15 and no focal neurological deficits.

Conclusions

Suboccipital decompressive craniectomy may provide substantial neurological benefit in selected patients with space-occupying cerebellar infarction, even after severe impairment of consciousness, provided that irreversible brainstem injury has not occurred. Surgical decisions should integrate the neurological examination, radiological evidence of posterior fossa mass effect and hydrocephalus, clinical progression, and the presumed viability of the brainstem rather than relying exclusively on the time elapsed since symptom onset.

1. BACKGROUND

Posterior circulation ischemic stroke accounts for approximately 15% to 20% of all ischemic strokes and is associated with substantial mortality and neurological disability [1, 2]. Cerebellar infarction represents approximately 1% to 4% of all strokes but carries a disproportionate risk of clinical deterioration when extensive edema develops [3]. Because of the limited anatomical space within the posterior fossa,

progressive cerebellar swelling may rapidly lead to fourth ventricular obstruction, obstructive hydrocephalus, brainstem compression, and potentially fatal herniation [4].

Mortality remains high in patients with space-occupying cerebellar infarction who develop neurological deterioration, whereas surgical decompression may improve survival and functional outcomes in appropriately selected patients [5, 6]. Initial treatment includes intensive neurological monitoring, cardiorespiratory support, blood pressure management, osmotherapy when indicated, and serial neuroimaging [7]. Nevertheless, a clinically important subset of patients may experience worsening consciousness or develop clinical and radiological signs of brainstem compression, requiring urgent neurosurgical evaluation [8].

Cerebrospinal fluid diversion and suboccipital decompressive craniectomy, frequently combined with dural expansion, are recognized therapeutic options in patients with obstructive hydrocephalus, progressive ventricular enlargement, or brainstem compression [9, 10]. Observational studies and previous evidence syntheses support suboccipital decompression as a potentially life-saving intervention in patients with malignant cerebellar edema [10–14].

However, the optimal criteria for patient selection and the timing of surgery remain uncertain. Imaging-based parameters, including infarct volume and the ratio between the infarcted tissue and the total posterior fossa volume, have been proposed as predictors of neurological deterioration and potential surgical benefit [15, 16]. Although some studies suggest that larger infarct volumes are associated with unfavorable clinical progression, no universally accepted volumetric threshold or definitive time window for decompression has been established [17, 18].

Current evidence supports suboccipital decompressive craniectomy as the principal surgical treatment for space-occupying cerebellar infarction associated with neurological deterioration, hydrocephalus, or brainstem compression [19–22]. In specialized centers, favorable survival and functional outcomes have been reported after surgical decompression, including among patients presenting with severe neurological impairment [23, 24]. Neuroimaging is also central to identifying posterior fossa mass effect, fourth ventricular obstruction, hydrocephalus, and brainstem compression and to supporting prognostic assessment and surgical decision-making [25]. This report describes a patient with an extensive cerebellar infarction, obstructive hydrocephalus, and marked impairment of consciousness who achieved a favorable early neurological outcome after urgent suboccipital decompressive craniectomy and external ventricular drainage.

2. CASE PRESENTATION

A 49-year-old woman with a medical history of systemic arterial hypertension treated with losartan and obesity developed an acute reduction in consciousness. She was initially evaluated at a local hospital, where she experienced progressive neurological deterioration over approximately 48 hours and required orotracheal intubation for airway protection. She was transferred by air to a specialized center, where her Glasgow Coma Scale (GCS) score was below 9.

Cranial computed tomography demonstrated an extensive left cerebellar infarction with marked edema, posterior fossa mass effect, compression of the fourth ventricle, obstructive hydrocephalus, and associated brainstem compression (Fig. 1).

(A) Axial image showing an extensive left cerebellar infarction with edema and posterior fossa mass effect. (B) Sagittal image demonstrating posterior fossa mass effect and brainstem compression.

She underwent urgent suboccipital decompressive craniectomy combined with external ventricular drainage (EVD). The procedure was completed without intraoperative complications.

On the first postoperative day, she remained hemodynamically stable under mechanical ventilation. The EVD was patent, and the surgical wound was clean and dry. On the second postoperative day, progressive neurological improvement was observed, with a GCS score of 13 and spontaneous movement of all four limbs. She was successfully extubated without complications. Follow-up computed tomography demonstrated adequate posterior fossa decompression and effective ventricular drainage.

On the third postoperative day, her GCS score increased to 14. The EVD had drained a total of 350 mL of blood-tinged cerebrospinal fluid. The drain was removed on the sixth postoperative day without complications. She was subsequently discharged with a GCS score of 15 and no focal neurological deficits. At discharge, she was prescribed an antiplatelet agent, a statin, and antihypertensive therapy, with outpatient follow-up scheduled for 30 days.

3. DISCUSSION

To contextualize the present case, a focused literature search was conducted in PubMed, Embase, Scopus, Cochrane Library, SciELO, and LILACS, prioritizing studies published between January 2020 and July 2026 and supplemented by landmark earlier publications. The search combined terms related to posterior fossa stroke, cerebellar infarction, suboccipital decompressive craniectomy, surgical timing, mortality, complications, and functional outcomes. The findings were narratively synthesized to discuss patient selection, timing of intervention, prognostic imaging features, and postoperative outcomes.

Space-occupying cerebellar infarction is a neurological emergency that may rapidly progress to obstructive hydrocephalus, brainstem compression, herniation, and death. Contemporary studies support suboccipital decompressive craniectomy as an effective treatment for patients with extensive cerebellar infarction and progressive neurological deterioration [26–28]. Observational cohorts and comparative studies have reported favorable survival and functional outcomes in appropriately selected patients undergoing surgical decompression [29–31].

The timing of surgical intervention remains an important determinant of outcome. Declining consciousness, obstructive hydrocephalus, brainstem compression, and progressive posterior fossa mass effect are commonly used as clinical and radiological triggers for urgent surgical consideration [32, 33]. Outcomes appear to be influenced by the preoperative neurological condition, patient age,

associated brainstem injury, and the stage of clinical deterioration at which surgery is performed [34–36]. Nevertheless, the available evidence does not establish a rigid time threshold beyond which surgery becomes futile. Clinical progression, neurological examination, radiological findings, and evidence of brainstem viability should therefore be considered together when determining whether decompression remains appropriate.

Radiological characteristics—including infarct extent, posterior fossa mass effect, fourth ventricular compression, hydrocephalus, and brainstem distortion—are central to prognostic assessment and surgical decision-making [37–39]. Although greater lesion extent and progressive mass effect are associated with an increased risk of clinical deterioration, no single imaging threshold should replace the neurological assessment.

Suboccipital decompressive craniectomy is an invasive procedure and may be associated with complications such as cerebrospinal fluid leakage, surgical-site infection, postoperative hydrocephalus, and the need for reoperation. However, recent surgical series have reported generally acceptable complication rates when the procedure is performed in specialized centers with appropriate neurocritical care support [40, 41]. The potential procedural risks must be weighed against the high likelihood of severe disability or death associated with untreated posterior fossa mass effect.

The present case is clinically relevant because the patient underwent decompressive craniectomy after approximately 48 hours of neurological deterioration and with a GCS score below 9. Despite the severity of her condition, including obstructive hydrocephalus and brainstem compression, she showed rapid postoperative improvement and was discharged with a GCS score of 15 and no focal neurological deficits. This outcome is consistent with recent evidence suggesting that impaired consciousness and surgical timing within the first 72 hours should be interpreted alongside infarct volume, neurological progression, and radiological findings rather than used as isolated contraindications to surgical treatment [42].

Surgical decision-making in space-occupying cerebellar infarction should therefore be individualized and based on the integration of clinical severity, neurological progression, neuroimaging findings, hydrocephalus, brainstem compression, comorbidities, and the time elapsed since symptom onset. The present case also emphasizes the importance of rapid transfer to a specialized center and coordinated management involving neurology, neurosurgery, anesthesiology, and intensive care.

As a single case report, this study cannot establish the effectiveness of delayed decompression or define optimal criteria for patient selection. In addition, the favorable outcome described at hospital discharge does not replace standardized long-term functional assessment. Nevertheless, the case provides clinically relevant evidence that meaningful neurological recovery may remain possible after severe deterioration when urgent decompression is performed in a carefully selected patient.

4. CONCLUSIONS

Suboccipital decompressive craniectomy remains a key surgical treatment for space-occupying cerebellar infarction associated with neurological deterioration, obstructive hydrocephalus, and brainstem compression.

The present case demonstrates that substantial neurological recovery may still occur despite severe impairment of consciousness and delayed referral, provided that irreversible brainstem injury has not developed. Surgical decision-making should therefore be individualized and based on the integration of clinical progression, neurological examination, neuroimaging findings, hydrocephalus, brainstem compression, and time since symptom onset.

Early recognition of malignant cerebellar edema, rapid transfer to a specialized center, and coordinated management among neurology, neurosurgery, anesthesiology, and intensive care teams are essential to optimize outcomes.

Abbreviations

EVD

External ventricular drainage

GCS

Glasgow Coma Scale

Declarations

Ethics approval and consent to participate

Not applicable. This manuscript reports a single case arising from routine clinical care and does not involve a prospective research protocol or experimental intervention.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and the accompanying images.

Availability of data and materials

All data supporting the findings of this case report are included within the article. Additional de-identified clinical information may be made available by the corresponding author upon reasonable request, subject to patient confidentiality.

Competing interests

The authors declare that they have no competing interests.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors' contributions

Author contribution details are provided in the separate title page to preserve double-anonymous peer review.

Acknowledgements

Not applicable.

Use of generative artificial intelligence

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) for English-language editing and manuscript organization. No artificial intelligence tool was used to generate clinical data. The authors reviewed and verified the entire content and take full responsibility for the final manuscript.

References

1. Markus HS, Michel P. Treatment of posterior circulation stroke: acute management and secondary prevention. *Int J Stroke*. 2022;17(7):723–732. doi:10.1177/17474930221107500.
2. Nouh A, Remke J, Ruland S. Ischemic posterior circulation stroke: a review of anatomy, clinical presentations, diagnosis, and current management. *Front Neurol*. 2014;5:30. doi:10.3389/fneur.2014.00030.
3. Lucia K, Reitz S, Hattingen E, Steinmetz H, Seifert V, Czabanka M. Predictors of clinical outcomes in space-occupying cerebellar infarction undergoing suboccipital decompressive craniectomy. *Front Neurol*. 2023;14:1165258. doi:10.3389/fneur.2023.1165258.
4. Neugebauer H, Witsch J, Zweckberger K, Jüttler E. Space-occupying cerebellar infarction: complications, treatment, and outcome. *Neurosurg Focus*. 2013;34(5):E8. doi:10.3171/2013.2.FOCUS12363.
5. Lim NA, Lin HY, Tan CH, Ho AFW, Yeo TT, Nga VDW, et al. Functional and mortality outcomes with medical and surgical therapy in malignant posterior circulation infarcts: a systematic review. *J Clin Med*. 2023;12(9):3185. doi:10.3390/jcm12093185.
6. Won SY, Hernández-Durán S, Behmanesh B, Bernstock JD, Czabanka M, Dinc N, et al. Functional outcomes in conservatively vs surgically treated cerebellar infarcts. *JAMA Neurol*. 2024;81(4):384–393. doi:10.1001/jamaneurol.2023.5773.
7. Wijdicks EFM, Sheth KN, Carter BS, Greer DM, Kasner SE, Kimberly WT, et al. Recommendations for the management of cerebral and cerebellar infarction with swelling: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2014;45(4):1222–1238. doi:10.1161/01.STR.0000441965.15164.d6.

8. Wang Y, Binkley MM, Qiao M, Pardon A, Keyrouz S, Dhar R, et al. Rate of infarct-edema growth on CT predicts need for surgical intervention and clinical outcome in patients with cerebellar infarction. *Neurocrit Care*. 2022;36(3):1011–1021. doi:10.1007/s12028-021-01414-x.
9. van der Worp HB, Hofmeijer J, Jüttler E, Lal A, Michel P, Santalucia P, et al. European Stroke Organisation (ESO) guidelines on the management of space-occupying brain infarction. *Eur Stroke J*. 2021;6(2):XC–CX. doi:10.1177/23969873211014112.
10. Ayling OGS, Alotaibi NM, Wang JZ, Fatehi M, Ibrahim GM, Benavente O, et al. Suboccipital decompressive craniectomy for cerebellar infarction: a systematic review and meta-analysis. *World Neurosurg*. 2018;110:450–459.e5. doi:10.1016/j.wneu.2017.10.144.
11. Lindeskog D, Lilja-Cyron A, Kelsen J, Juhler M. Long-term functional outcome after decompressive suboccipital craniectomy for space-occupying cerebellar infarction. *Clin Neurol Neurosurg*. 2019;176:47–52. doi:10.1016/j.clineuro.2018.11.023.
12. Jüttler E, Schweickert S, Ringleb PA, Huttner HB, Köhrmann M, Aschoff A. Long-term outcome after surgical treatment for space-occupying cerebellar infarction: experience in 56 patients. *Stroke*. 2009;40(9):3060–3066. doi:10.1161/STROKEAHA.109.550913.
13. Baki E, Baumgart L, Kehl V, Hess F, Wolff AW, Wagner A, et al. Functional outcomes after decompressive surgery in patients with malignant space-occupying cerebellar infarction. *Neurol Int*. 2024;16(6):1239–1246. doi:10.3390/neurolint16060094.
14. Kim MJ, Park SK, Song J, Oh SY, Lim YC, Sim SY, et al. Preventive suboccipital decompressive craniectomy for cerebellar infarction: a retrospective-matched case-control study. *Stroke*. 2016;47(10):2565–2573. doi:10.1161/STROKEAHA.116.014078.
15. Kapapa T, Pala A, Alber B, Mauer UM, Harth A, Neugebauer H, et al. Volumetry as a criterion for suboccipital craniectomy after cerebellar infarction. *J Clin Med*. 2024;13(19):5689. doi:10.3390/jcm13195689.
16. Goulin Lippi Fernandes E, Ridwan S, Greeve I, Schäbitz WR, Grote A, Simon M. Clinical and computerized volumetric analysis of posterior fossa decompression for space-occupying cerebellar infarction. *Front Neurol*. 2022;13:840212. doi:10.3389/fneur.2022.840212.
17. Tchopov Z, Hiller M, Zhuo J, Betz J, Gullapalli R, Sheth KN. Prediction of poor outcome in cerebellar infarction by diffusion MRI. *Neurocrit Care*. 2013;19(3):276–282. doi:10.1007/s12028-013-9886-2.
18. Hernandez-Duran S, Walter J, Behmanesh B, Bernstock JD, Czabanka M, Dinc N, et al. Surgical infarct volume reduction and functional outcomes in patients with ischemic cerebellar stroke: results from a multicentric retrospective study. *J Neurosurg*. 2024;141(6):1681–1686. doi:10.3171/2024.3.JNS232883.
19. Suyama Y, Wakabayashi S, Aihara H, Ebiko Y, Kajikawa H, Nakahara I. Evaluation of clinical significance of decompressive suboccipital craniectomy on the prognosis of cerebellar infarction. *Fujita Med J*. 2019;5(1):21–24. doi:10.20407/fmj.2018-010.
20. Mattar MA, Maher H, Zakaria WK. The impact of emergent suboccipital craniectomy upon outcome and prognosis of massive cerebellar infarction: a single institutional study. *Interdiscip Neurosurg*.

- 2021;25:101223. doi:10.1016/j.inat.2021.101223.
21. Pfefferkorn T, Eppinger U, Linn J, Birnbaum T, Herzog J, Straube A, et al. Long-term outcome after suboccipital decompressive craniectomy for malignant cerebellar infarction. *Stroke*. 2009;40(9):3045–3050. doi:10.1161/STROKEAHA.109.550871.
 22. Jauss M, Krieger D, Hornig C, Schramm J, Busse O. Surgical and medical management of patients with massive cerebellar infarctions: results of the German-Austrian Cerebellar Infarction Study. *J Neurol*. 1999;246(4):257–264. doi:10.1007/s004150050344.
 23. Hornig CR, Rust DS, Busse O, Jauss M, Laun A. Space-occupying cerebellar infarction: clinical course and prognosis. *Stroke*. 1994;25(2):372–374. doi:10.1161/01.STR.25.2.372.
 24. Chen HJ, Lee TC, Wei CP. Treatment of cerebellar infarction by decompressive suboccipital craniectomy. *Stroke*. 1992;23(7):957–961. doi:10.1161/01.STR.23.7.957.
 25. Koh MG, Phan TG, Atkinson JLD, Wijdicks EFM. Neuroimaging in deteriorating patients with cerebellar infarcts and mass effect. *Stroke*. 2000;31(9):2062–2067. doi:10.1161/01.STR.31.9.2062.
 26. Raco A, Caroli E, Isidori A, Salvati M. Management of acute cerebellar infarction: one institution's experience. *Neurosurgery*. 2003;53(5):1061–1065; discussion 1065–1066. doi:10.1227/01.NEU.0000088766.34559.3E.
 27. Tartara F, Bongetta D, Colombo EV, Bortolotti C, Cenzato M, Giombelli E, et al. Strokectomy and extensive cerebrospinal fluid drainage for the treatment of space-occupying cerebellar ischemic stroke. *World Neurosurg*. 2018;115:e80–e84. doi:10.1016/j.wneu.2018.03.178.
 28. Hernández-Durán S, Wolfert C, Rohde V, Mielke D. Cerebellar necrosectomy instead of suboccipital decompression: a suitable alternative for patients with space-occupying cerebellar infarction. *World Neurosurg*. 2020;144:e723–e733. doi:10.1016/j.wneu.2020.09.067.
 29. Taylor DR, Basma J, Jones GM, Lillard J, Wallace D, Ajmera S, et al. Predicting surgical intervention in cerebellar stroke: a quantitative retrospective analysis. *World Neurosurg*. 2020;142:e160–e172. doi:10.1016/j.wneu.2020.06.156.
 30. Winslow N, Olson E, Martin R, Ivankovic S, Garst J, Maldonado A. Posterior fossa ischemic infarction: single-center retrospective review of non-surgical and surgical cases. *Neurosurg Rev*. 2023;46:35. doi:10.1007/s10143-022-01939-5.
 31. Tsitsopoulos PP, Tobieson L, Enblad P, Marklund N. Clinical outcome following surgical treatment for bilateral cerebellar infarction. *Acta Neurol Scand*. 2011;123(5):345–351. doi:10.1111/j.1600-0404.2010.01404.x.
 32. Tsitsopoulos PP, Tobieson L, Enblad P, Marklund N. Surgical treatment of patients with unilateral cerebellar infarcts: clinical outcome and prognostic factors. *Acta Neurochir (Wien)*. 2011;153(10):2075–2083. doi:10.1007/s00701-011-1120-4.
 33. Mohsenipour I, Gabl M, Schutzhard E, Twerdy K. Suboccipital decompressive surgery in cerebellar infarction. *Zentralbl Neurochir*. 1999;60(2):68–73.
 34. Kudo H, Kawaguchi T, Minami H, Kuwamura K, Miyata M, Kohmura E. Controversy of surgical treatment for severe cerebellar infarction. *J Stroke Cerebrovasc Dis*. 2007;16(6):259–262.

- doi:10.1016/j.jstrokecerebrovasdis.2007.09.001.
35. Puffer RC, Graffeo C, Rabinstein A, Van Gompel JJ. Mortality rates after emergent posterior fossa decompression for ischemic or hemorrhagic stroke in older patients. *World Neurosurg*. 2016;92:166–170. doi:10.1016/j.wneu.2016.05.003.
 36. Dashyan VG, Khodykin EA, Nikitin AS, Godkov IM, Khovrin DV, Sosnovsky EA, et al. Malignant cerebellar infarction: clinical course and surgical treatment. *Zh Nevrol Psikhiatr Im S S Korsakova*. 2019;119(8 Suppl 2):75–83. doi:10.17116/jnevro201911908275.
 37. Macdonell RA, Kalnins RM, Donnan GA. Cerebellar infarction: natural history, prognosis, and pathology. *Stroke*. 1987;18(5):849–855. doi:10.1161/01.STR.18.5.849.
 38. Kase CS, Norrving B, Levine SR, Babikian VL, Chodosh EH, Wolf PA, et al. Cerebellar infarction: clinical and anatomic observations in 66 cases. *Stroke*. 1993;24(1):76–83. doi:10.1161/01.STR.24.1.76.
 39. Tohgi H, Takahashi S, Chiba K, Hirata Y. Cerebellar infarction: clinical and neuroimaging analysis in 293 patients. The Tohoku Cerebellar Infarction Study Group. *Stroke*. 1993;24(11):1697–1701. doi:10.1161/01.STR.24.11.1697.
 40. Vychopen M, Hadjiathanasiou A, Brandecker S, Borger V, Schuss P, Vatter H, et al. Rapid closure technique in suboccipital decompression. *Eur J Trauma Emerg Surg*. 2022;48(3):2407–2412. doi:10.1007/s00068-021-01779-w.
 41. Hernandez-Duran S, Walter J, Behmanesh B, Bernstock JD, Czabanka M, Dinc N, et al. Necrosectomy versus stand-alone suboccipital decompressive craniectomy for the management of space-occupying cerebellar infarctions—a retrospective multicenter study. *Neurosurgery*. 2024;94(3):559–566. doi:10.1227/neu.0000000000002707.
 42. Mendieta-Barrera CD, Dhondt P, Punukollu A, Garcia-Torrico F, Ochoa-Hernández DL, da Silva Sanglard R, et al. Comparison of neurosurgical and medical management options of space-occupying cerebellar infarction. *Acta Neurochir (Wien)*. 2026;168:60. doi:10.1007/s00701-026-06809-3.

Figures

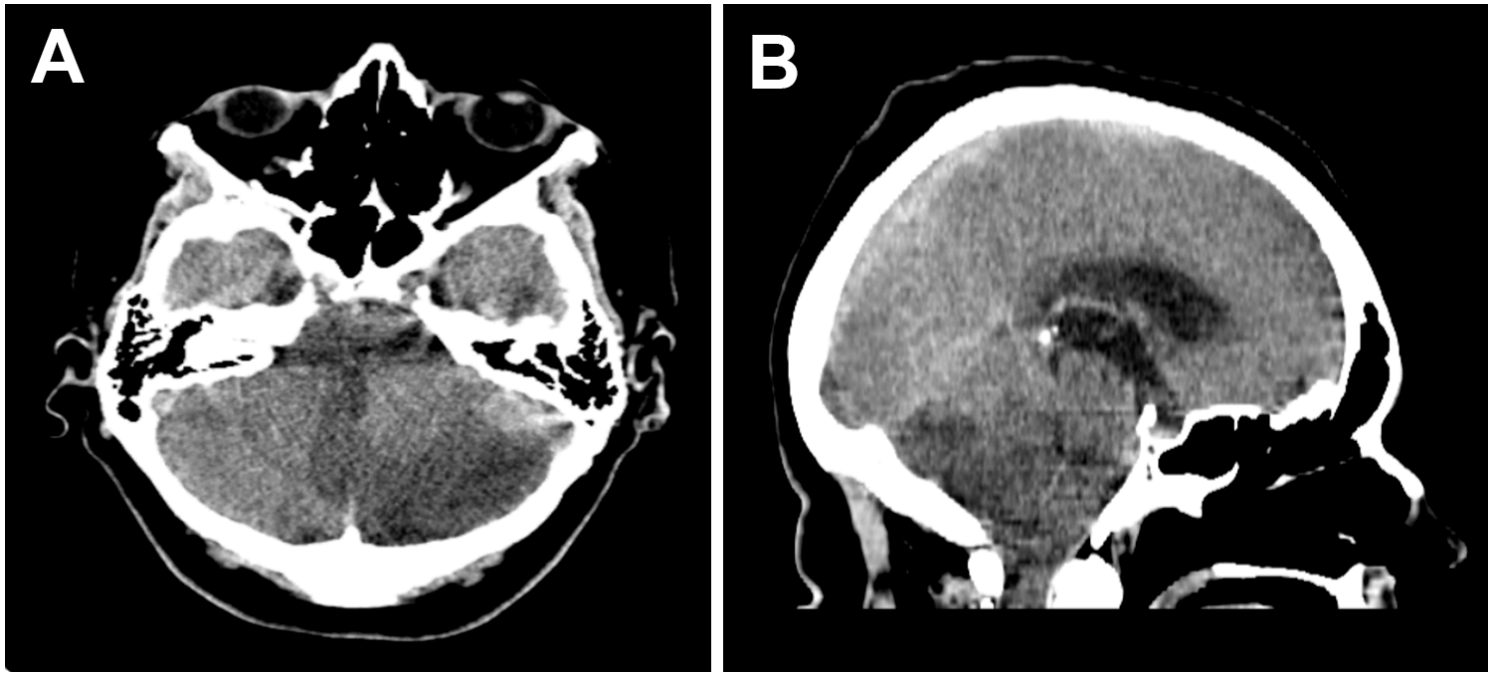


Figure 1

Admission cranial computed tomography.

(A) Axial image showing an extensive left cerebellar infarction with edema and posterior fossa mass effect. (B) Sagittal image demonstrating posterior fossa mass effect and brainstem compression.