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Asymptomatic Acute Intraventricular Hemorrhage Discovered Before Caudal Epidural Injection in A Patient with in Moyamoya Disease: A Case Report

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Abstract **Case Report**

Background: Moyamoya disease (MMD) carries substantial hemorrhagic risk in adults, with intraventricular hemorrhage (IVH) occurring frequently. Intracranial complications after neuraxial procedures have been reported, but distinguishing procedure-related events from spontaneous progression of underlying cerebrovascular disease remains challenging, particularly when acute hemorrhagic changes are obscured by chronic baseline pathology and delayed radiological reporting complicates clinical decision-making. ***Case:*** A 67-year-old woman with MMD under regular neurosurgical follow-up underwent routine brain computed tomography (CT) angiography on June 23, 2025, which demonstrated acute IVH and subarachnoid hemorrhage while she remained completely asymptomatic. Formal radiological interpretation was delayed, and a scheduled caudal epidural injection for chronic low back pain was performed approximately 17 hours later on June 24. Following the procedure, the patient developed headache and dizziness and presented to the emergency department. Serial CT imaging on post-procedure days 1, 2, and 7 demonstrated no interval progression of hemorrhage compared with pre-procedural imaging, providing objective evidence that the bleeding predated rather than resulted from the intervention. ***Conclusions:*** This case demonstrates that acute intracranial hemorrhage in MMD may remain clinically silent for 24 hours or longer, and delayed symptom onset after neuraxial procedures does not establish procedural causation when pre-procedural imaging documents the hemorrhage and serial imaging demonstrate stability. The critical lesson is the importance of timely formal radiological interpretation and systematic verification of imaging results before elective procedures in high-risk cerebrovascular patients. Multidisciplinary communication protocols and pre-procedural imaging checklists represent practical strategies to prevent similar scenarios.

Keywords: Moyamoya disease; Intraventricular hemorrhage; Caudal epidural injection; Neuraxial anesthesia.

INTRODUCTION

Moyamoya disease (MMD) is characterized by progressive stenosis of the terminal internal carotid arteries with fragile collateral networks and, in adults, carries a substantial risk of hemorrhagic events including intraventricular hemorrhage (IVH), which often involves periventricular territories supplied by dilated choroidal arteries. Adults with hemorrhagic MMD face elevated risk of recurrent bleeding, and most post-hemorrhage ischemic events (88.9%) occur within one month, requiring vigilant surveillance hemodynamic management [1,2].

Intracranial complications after neuraxial procedures–ranging from dural puncture-related subdural hematoma to subarachnoid and intraventricular hemorrhage after epidural injection–have been reported, implicating transient craniospinal pressure shifts, cerebrospinal fluid (CSF) loss, vascular shear, or inadvertent vascular injury in susceptible patients [3-6].

Caudal epidural interventions are widely used for low back pain (LBP) with generally low rates of major complications, yet rare serious events have been documented, warranting heightened vigilance in populations with cerebrovascular vulnerability [7]. In patients with MMD and chronic baseline pathology,

acute hemorrhagic changes–even when clinically silent–may be obscured by pre-existing findings, and delayed availability of formal radiological reports can complicate real-time procedural decision-making and post-procedural symptom attribution.

We report a case in which routine neurosurgical follow-up computed tomography angiography (CTA) obtained the day before a scheduled caudal epidural injection demonstrated acute IVH and subarachnoid hemorrhage (SAH) in an asymptomatic patient with MMD, but formal radiological interpretation was not available until after the procedure was completed. Following the procedure, the patient developed headache and dizziness; however, serial computed tomography (CT) imaging on post-procedure days 1, 2, and 7 demonstrated no interval progression of hemorrhage, indicating that the bleeding predated rather than resulted from the intervention. This case illustrates the diagnostic and decision-making challenges posed by acute-on-chronic intracranial pathology in high-risk cerebrovascular patients and emphasizes the critical importance of timely imaging verification before elective neuraxial procedures. It also highlights the difficulty of distinguishing delayed clinical manifestation of pre-existing hemorrhage from procedure-related complications.

CASE REPORT

A 67-year-old woman with MMD diagnosed in 2020 had a complex medical history including prior cerebral infarction, prior intracranial hemorrhage (both in 2020), diabetes mellitus since 2005, and chronic left-sided weakness. She was under regular neurosurgical follow-up and was also being managed in a pain clinic for spinal stenosis–related chronic LBP. As part of her routine neurosurgical surveillance, brain CTA was performed on June 23, 2025, approximately 16:00; at that time, the patient was asymptomatic with no headache, dizziness, or new neurologic complaints. The CTA images demonstrated encephalomalacia in the right frontal lobe consistent with prior infarction, acute IVH in the right lateral ventricle, mid-sulcal SAH in the right hemisphere, and diffuse luminal narrowing of the right internal carotid artery with steno-occlusion of the right distal carotid artery and M1 segment associated with collateral vessels in the right supratentorium consistent with MMD. However, formal radiological interpretation of this study was not available at the time of the subsequent intervention.

On June 24, 2025, at 09:00–approximately 17 hours after the CTA imaging and while the patient remained clinically asymptomatic–a fluoroscopy-guided caudal epidural injection was performed for pain control in the pain clinic. Local infiltration was performed with 1% lidocaine, and the epidural injectate consisted of 0.1% ropivacaine 6 mL without epinephrine. There was no blood or CSF aspiration during the procedure, and no technical difficulties were encountered. Periprocedural vital signs remained stable, and the patient was monitored in the recovery area without immediate complications. Most recent laboratory tests obtained on April 17, 2025, had shown a platelet count of 171,000/μL, prothrombin time 11.5 seconds, activated partial thromboplastin time 27.2 seconds, and international normalized ratio 1.02, all within normal limits. The patient was not taking antiplatelet agents, anticoagulants, or nonsteroidal anti-inflammatory drugs; her home medications included levetiracetam for seizure prophylaxis, dantrolene sodium hydrate for spasticity, choline alfoscerate, and limaprost alfadex.

After the procedure, the patient reported a headache rated numeric rating scale (NRS) 3 that improved with bed rest, and she was discharged home. At approximately 17:00 on the same day, approximately eight hours after the caudal injection, she developed recurrent dizziness and headache at home. She presented to the emergency department the following day at approximately 12:00 with a persistent headache rated NRS 4 and no new focal neurologic deficits or complaints. At this point, the delayed formal radiological report became available, confirming acute IVH and SAH on the pre-procedural CTA. Non-contrast brain CT performed in the emergency department on June 25 was compared with the June 23 CTA and showed no significant interval change in the extent or distribution of hemorrhage, indicating that the IVH and SAH had not progressed since before the caudal procedure. The patient was admitted under neurosurgical service for observation and management of the acute-on-chronic intracranial pathology.

Follow-up three-dimensional CT imaging obtained on June 26 and July 1 demonstrated no interval radiographic progression of the IVH or SAH compared with the pre-procedural CTA. The patient was managed conservatively in the intensive care unit with meticulous blood pressure control and symptomatic treatment of headache, consistent with recommended perioperative management principles for MMD patients. She was discharged after a 10-day hospitalization with improved symptoms and no new neurologic sequelae. Serial imaging stability over the seven-day post-procedural period, coupled with the presence of acute hemorrhage on pre-procedural imaging obtained while the patient was asymptomatic, indicated that the IVH and SAH predated rather than resulted from the caudal epidural intervention.

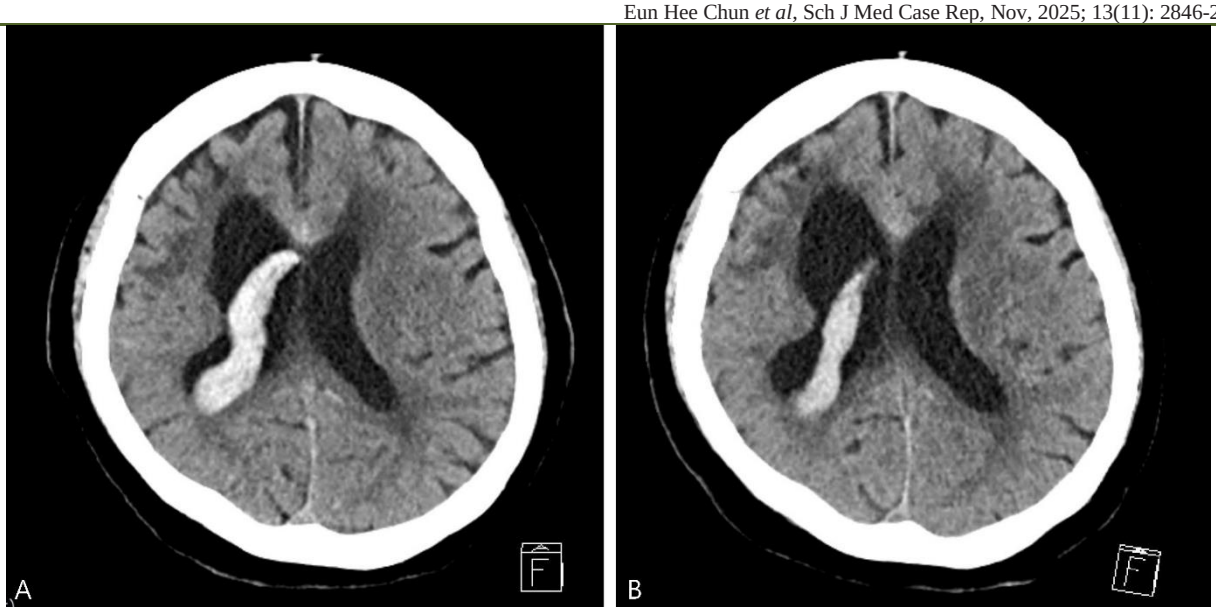

Figure 1. Serial brain CT images demonstrating stable intraventricular hemorrhage. (A) Pre-procedural CT (June 23, 2025) showing acute intraventricular hemorrhage in the right lateral ventricle in an asymptomatic patient. (B) Follow-up brain CT (June 25, approximately 20 hours post-procedure). CT, computed tomography

DISCUSSION

This case demonstrates acute intracranial hemorrhage discovered on pre-procedural imaging in an asymptomatic MMD patient, where delayed radiological reporting led to procedural completion before formal interpretation, followed by symptom development without radiographic progression. The temporal sequence and serial imaging stability provide compelling evidence that the hemorrhage preceded rather than resulted from the caudal epidural injection, while highlighting critical systems issues in high-risk patient management.

Adult MMD carries substantial hemorrhagic risk, with intraventricular hemorrhage occurring in up to 80% of hemorrhagic presentations, arising predominantly from fragile periventricular collaterals, particularly dilated anterior choroidal arteries [8,9]. Importantly, not all acute hemorrhages present with immediate symptoms; small-volume bleeding may remain clinically silent initially, with symptoms emerging hours to days later [10]. In this case, the patient underwent CTA at 16:00 on June 23 while completely asymptomatic, yet imaging revealed acute IVH and SAH. Symptom onset approximately 25 hours later (eight hours post-procedure) strongly suggests spontaneous hemorrhage with delayed clinical manifestation rather than procedure-induced bleeding.

Intracranial complications after neuraxial procedures have been documented, typically involving dural puncture with CSF loss, characteristic orthostatic headache, and subdural collections evolving over days [3-6]. However, caudal epidural injection carries minimal dural puncture risk, and in this case there was no CSF or blood aspiration, no technical difficulty, stable periprocedural vital signs, and mild non-orthostatic headache that improved before discharge. Most critically, serial CT imaging on June 25, 26, and July 1 demonstrated complete stability of hemorrhage extent compared with pre-procedural baseline, providing objective evidence that no bleeding or progression occurred after the caudal injection.

The crux of this case lies in delayed formal radiological interpretation. The CTA performed as routine surveillance on June 23 afternoon was followed by the scheduled caudal injection at 09:00 on June 24, but the formal report confirming acute IVH and SAH became available only on June 25. This reveals a systems-level vulnerability: even when appropriate pre-procedural imaging is obtained, delays in formal interpretation can result in interventions proceeding without full knowledge of acute pathological changes. In patients with chronic baseline abnormalities, distinguishing new acute findings from chronic pathology requires expert radiological review and is not reliably accomplished by non-radiologists.

From a clinical decision-making perspective, this case suggests that in patients under active neurosurgical surveillance with recent imaging, systematic verification—ensuring formal radiological reports are reviewed and acute findings communicated before elective interventions—constitutes prudent practice. Patient remaing asymptomatic for over 24 hours despite acute hemorrhage demonstrates that clinical assessment alone cannot exclude active intracranial pathology in high-risk populations. Several alternative explanations warrant consideration. First, the symptoms may represent purely coincidental timing of delayed manifestation of spontaneous hemorrhage. Second, procedure-related physiological perturbations may have lowered the threshold for symptom expression. Third,

initial mild procedural headache may have resolved independently while later symptoms reflected the natural history of underlying hemorrhage.

CONCLUSION

This report highlights that acute intracranial hemorrhage in MMD may remain clinically silent for 24 hours or longer, and that delayed symptom onset after an intervening procedure does not establish procedural causation when pre-procedural imaging documents the hemorrhage and serial post-procedural imaging demonstrates stability. The critical lesson is the importance of timely formal radiological interpretation and systematic verification of imaging results before elective neuraxial procedures in high-risk cerebrovascular patients. Multidisciplinary communication protocols, pre-procedural imaging checklists, and expedited radiological review for high-risk patients represent practical strategies to prevent similar scenarios. When post-procedural symptoms occur in patients with complex cerebrovascular disease, comparison with pre-procedural imaging is essential to distinguish delayed manifestation of pre-existing pathology from true procedure-related complications.

REFERENCES

1. Nah, H.-W., Kwon, S.U., Kang, D.-W., Ahn, J.-S., Kwun, B.-D., Kim, J.S. Moyamoya disease-related versus primary intracerebral hemorrhage: location and outcomes are different. *Stroke* **2012**, *43*, 1947-1950.
2. Cho, W.-S., Chung, Y.S., Kim, J.E., Jeon, J.P., Son, Y.J., Bang, J.S., Kang, H.-S., Sohn, C.-H., Oh, C.W. The natural clinical course of hemodynamically stable adult moyamoya disease. *Journal of Neurosurgery* **2015**, *122*, 82-89.
3. Mehta, N. Intracranial hemorrhage and pneumocephaly after cervical epidural injection. *Clinical Practice and Cases in Emergency Medicine* **2019**, *3*, 369.
4. Lim, G., Zorn, J.M., Dong, Y.J., DeRenzo, J.S., Waters, J.H. Subdural hematoma associated with labor epidural analgesia: a case series. *Regional Anesthesia & Pain Medicine* **2016**, *41*, 628-631.
5. Bos, E.M., van der Lee, K., Haumann, J., de Queleriij, M., Vandertop, W.P., Kalkman, C.J., Hollmann, M.W., Lirk, P. Intracranial hematoma and abscess after neuraxial analgesia and anesthesia: a review of the literature describing 297 cases. *Regional Anesthesia & Pain Medicine* **2021**, *46*, 337-343.
6. Issı, Z., Öztürk, V., İyilikçi, L., Erkin, Y. Spinal epidural and intracranial subdural haemorrhage that is a complication of spinal anaesthesia. *Turkish Journal of Anaesthesiology and Reanimation* **2018**, *46*, 319.
7. Epstein, N.E. The risks of epidural and transforaminal steroid injections in the spine: commentary and a comprehensive review of the literature. *Surgical neurology international* **2013**, *4*, S74.
8. Lv, X. Hemorrhagic factors of moyamoya disease. *AJNR: American Journal of Neuroradiology* **2019**, *40*, 1672.
9. Kim, J.S. Moyamoya disease: epidemiology, clinical features, and diagnosis. *Journal of stroke* **2016**, *18*, 2.
10. Liao, Y.-C., Hu, Y.-C., Chung, C.-P., Wang, Y.-F., Guo, Y.-C., Tsai, Y.-S., Lee, Y.-C. Intracerebral hemorrhage in cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy. *Stroke* **2021**.