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Case Report

Two Strikes In the Cath Lab: Lessons From Repeat Aneurysm Ruptures During Endovascular Treatment

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Introduction: Repeat aneurysmal rupture in the catheterization laboratory remains a critical concern, with periprocedural mortality rates reported as high as 63%. Such rebleeding requires rapid multidisciplinary decision-making, particularly in high-grade aneurysmal subarachnoid hemorrhage (aSAH) complicated by hydrocephalus. **Case:** A 56-year-old hypertensive man presented with sudden-onset headache followed by loss of consciousness (Hunt and Hess grade III). Computed tomography (CT) revealed subarachnoid and intraventricular hemorrhage, and CT angiography identified a left saccular posterior communicating artery aneurysm. During induction in the catheterization laboratory, he developed severe headache, seizures, hypertension, and pupil anisocoria, raising concern for impending cerebral herniation. Owing to a postictal comatose state, his clinical Hunt and Hess grade deteriorated to grade V. Emergent CT confirmed acute hydrocephalus and rebleeding. Endovascular coiling was deferred, and an external ventricular drain was placed, resulting in improved consciousness. Subsequent angiography demonstrated contrast extravasation from the aneurysm dome, confirming rebleeding. The aneurysm ruptured three times over two weeks, including twice during separate catheterization laboratory sessions. Definitive endovascular coiling ultimately achieved near-complete aneurysm packing. Neurological status improved to Hunt and Hess grade II, followed by ventriculoperitoneal shunt placement. At discharge, the modified Rankin Scale score improved from 4 to 3 without new focal neurological deficits. Three-month follow-up confirmed stable neurological recovery. **Conclusion:** This case highlights the challenges of repeat aSAH rupture in the catheterization laboratory, emphasizing hydrocephalus management and dynamic Hunt and Hess grading to guide aneurysm treatment timing. Urgent endovascular coiling may be warranted despite clinical instability, using individualized strategies to optimize neurological outcomes.

Keywords: Catheterization laboratory, Hunt and Hess grading, Hydrocephalus, Ruptured aneurysm

Highlights
- Repeat aneurysm rupture during endovascular therapy is rare but often fatal.
- This case highlights the need for careful hydrocephalus management and monitoring.
- Dynamic neurological assessment guides urgent aneurysm repair and improves outcomes.

Introduction

Rebleeding, defined as recurrent hemorrhage occurring after the initial aneurysmal rupture, is a serious complication that may arise in the angiography suite during diagnostic cerebral digital subatraction angiography (DSA), endovascular coiling, or the immediate periprocedural period. In this context,

rebleeding refers specifically to the timing of hemorrhage while the patient is in the catheterization laboratory, rather than its underlying cause. This event—consistently termed *intraprocedural aneurysmal rupture* when occurring during intervention, or early *postprocedural rebleeding* when occurring shortly thereafter—has a reported incidence of approximately 0.5–1% during DSA for ruptured aneurysms and 1–5% during or after coiling, with mortality and morbidity rates reported as high as 63%.[1]

Untreated aneurysms following rebleeding carry a 13–38% risk of subsequent rupture. Furthermore, rebleeding rates during diagnostic angiography have been reported at 2–3.3%, particularly in anterior circulation aneurysms. One series reported a 3.3% rebleeding rate among 144 patients, underscoring the importance of procedural preparedness in high-risk cases.[2,3] In a cohort of 1,896 patients with ruptured aneurysms treated between 2006 and 2013, 11 patients (0.58%) experienced rebleeding during DSA, all involving anterior circulation aneurysms (odds ratio 14.3). Outcomes were unfavorable in 55% of cases, including a mortality rate of 45%.[4]

The Hunt and Hess (HH) grading scale is a clinical tool used to assess neurological status in patients with aneurysmal subarachnoid hemorrhage (aSAH) at presentation. It aids in triage, prognostication, and risk stratification for rebleeding and other complications.[5,6] This report presents a representative case of rebleeding in the angiography suite during endovascular coiling, focusing on clinical presentation, procedural context, and timing of interventions. Rebleeding was identified based on clinical deterioration and confirmed with imaging.

Case

A 56-year-old man with a history of hypertension and heavy smoking was referred to a tertiary general hospital for neurointerventional management following aSAH. He presented with a sudden-onset headache followed by loss of consciousness, with a modified Rankin Scale (mRS) score of 4, reflecting moderately severe disability due to impaired consciousness at presentation. Neurological examination revealed isocoric pupils, no ptosis, and no prior ocular symptoms. and his condition was classified as HH grade III. Initial non-contrast head computed tomography (CT) demonstrated diffuse subarachnoid and intraventricular hemorrhage (modified Fisher scale grade 4), while CT angiography identified a left saccular posterior communicating artery (PcoA) aneurysm (Figure 1).

During inpatient care, hemodynamic stability was achieved through blood pressure control, maintenance of euvolemia, and prophylactic administration of nimodipine. On day 14 post-hemorrhage, endovascular coiling was planned. However, at the onset of anesthetic induction in the catheterization laboratory, he developed severe headache, seizures, hypertension, and pupil anisocoria. The anisocoria raised concern for ipsilateral oculomotor nerve compression.

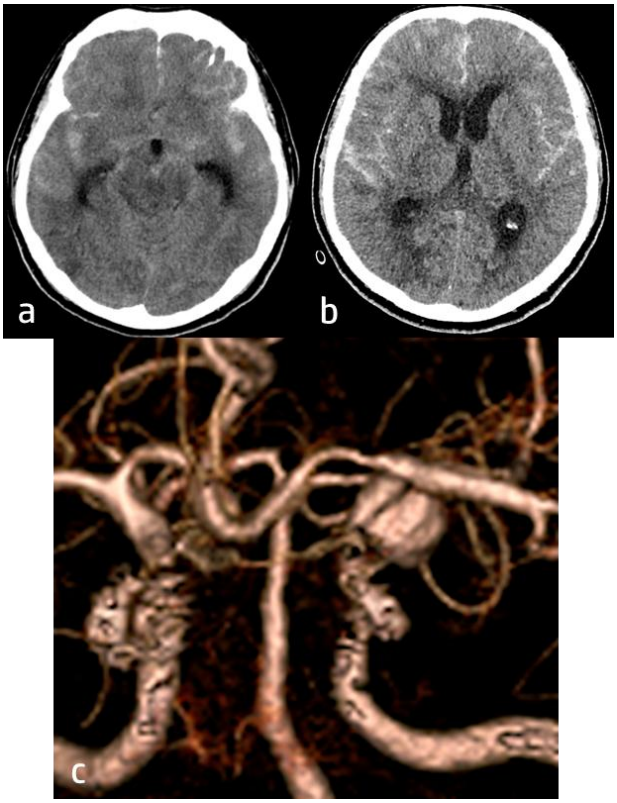

Figure 1. Initial head CT scan **(a, b)** demonstrated diffuse subarachnoid, and CT angiography **(c)** identified a left saccular PCoA aneurysm.

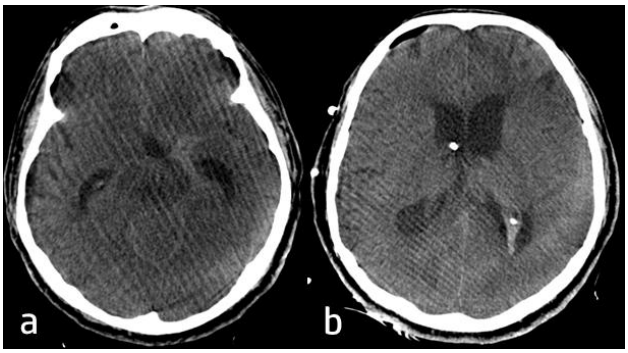

Figure 2. **(a)** Emergent CT confirmed acute non-communicating hydrocephalus and rebleeding; **(b)** an EVD was placed.

Clinically, the patient deteriorated to HH grade V due to a transcient postictal comatose state, which improved with supportive management. Emergent CT confirmed acute non-communicating hydrocephalus and rebleeding, compared with initial imaging (modified Fischer scale grade 4) (Figure 2). Endovascular coiling was deferred, and an external ventricular drain (EVD) was placed. Electroencephalography was not performed; however, anticonvulsant therapy was initiated for seizure control.

One day after EVD insertion, the drain was set at 15 cmH_2O, with approximately 10 cmH_2O undulation and cerebrospinal fluid (CSF) output of 100 mL over 24 hours. Clinically, the patient's level of consciousness improved to a Glasgow Coma Scale (GCS) score of 13-14 (World Federation of Neurosurgical Societies grade II) and HH grade III.

On day 16, corresponding to two days after EVD placement and one day after neurological improvement, endovascular coiling was performed in the catheteriation laboratory. During the procedure, cerebral DSA demonstrated contrast extravasation from the aneurysm dome (Figure 3), confirming rebleeding. Left internal carotid artery (ICA) anteroposterior and lateral projections revealed a ruptured saccular PCoA aneurysm with a neck size 3,31 mm, and a dome measuring 10,03 mm x 8,6 mm, projecting posteriorly and superiorly, with active contrast extravasation.

Prompt endovascular coiling was performed, achieving approximately 90% aneurysm packing with a modified Raymond-Roy Class I neck remnant (Figure 4), indicating near-complete occlusion with minimal neck filling. The procedure utilized a diagnostic catheter, guiding catheter, 45°-tip microcatheter, microguidewire, and five detachable coils. Post-procedurally, the patient's neurological status improved to HH grade II. The EVD was subsequently converted to a ventriculoperitoneal shunt. He was discharged on day 26 without new focal neurological deficits (mRS score of 3). Outpatient follow-up includes cognitive assessment and physical rehabilitation, with follow-up imaging planned at 3–6 months.

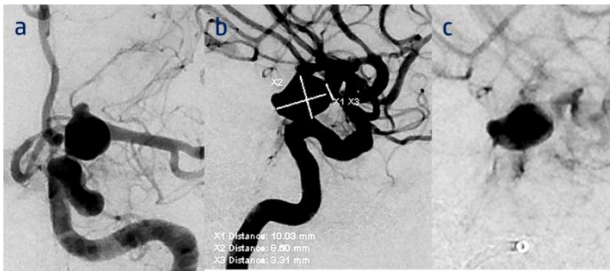

Figure 3. Cerebral DSA (2D angiogram). Left ICA anteroposterior and lateral injections **(a, b)** demonstrating a ruptured saccular PCoA aneurysm with contrast extravasation from the aneurysmal dome **(c)**.

Discussion

Hydrocephalus management

In neurointerventional practice, patients presenting with high-grade aSAH require emergent intervention and intensive neurocritical care. The 2023 American Heart Association/American Stroke Association (AHA/ASA) guidelines advocate for early aneurysm securing (within 24–72 hours) to mitigate the risk of rebleeding. However, in cases complicated by hydrocephalus and poor clinical grade, management must remain dynamic. Hydrocephalus exacerbates intracranial pressure and may mimic or worsen poor HH grades. Diagnosis is confirmed by CT evidence of ventricular dilation (Evans index >30%) and clinical signs such as decreased consciousness. Non-communicating hydrocephalus represents a critical emergency requiring rapid multidisciplinary intervention.[7]

The present case is notable for the rarity of three aneurysmal ruptures within two weeks, including two intraprocedural events in the catheterization laboratory. Recurrent ruptures of this frequency are exceptional. This case illustrates the dynamic interplay between hydrocephalus management, evolving HH grades, and timing of aneurysm repair, underscoring the importance of individualized strategies in clinically unstable patients.

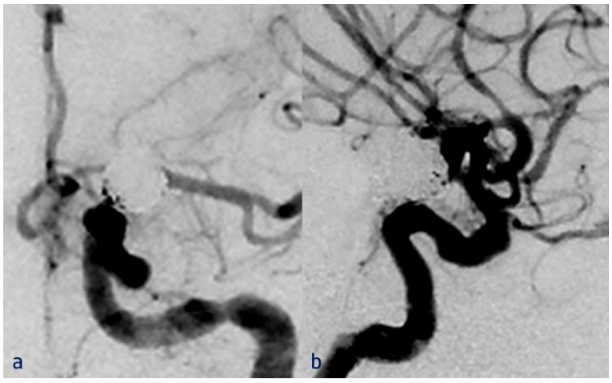

Figure 4. Post-coiling cerebral DSA (2D angiogram), left ICA anteroposterior **(a)** and lateral projections **(b)**, showing approximately 90% aneurysm packing with a modified Raymond-Roy Class I neck remnant.

In PCoA aneurysms, anisocoria is a key indicator of active compression, and warrants urgent assessment. In this case, anisocoria was absent at initial presentation but developed during the first rebleeding event. The underlying mechanism likely involved direct mechanical compression of the oculomotor nerve—particularly the parasympathetic pupillomotor fibers—by the aneurysm dome, especially in early rupture without significant hematoma. This compression results in ischemia of the nerve fibers and a fixed, dilated pupil on the affected side.[8,9] Immediate recognition of intraprocedural rupture was achieved by identifying contrast extravasation on DSA, prompting rapid hemodynamic stabilization during active bleeding. Anesthetic management was critical to maintaining airway and circulatory stability while balancing the decision to defer coiling during the first rupture versus preceding during the second rupture. This contrast highlights the need for individualized clinical judgment in unstable patients, in whom aborting or continuing intervention depends on neurological grade, hemodynamic status, and procedural risk.

Emergent head CT scan at the time of the first rebleeding demonstrated acute non-communicating hydrocephalus without evidence of herniation. Distinguishing between pure dome compression and combined compression-herniation can be challenging, as both mechanisms may coexist; however, direct dome compression is generally the predominant cause of

anisocoria in PCoA aneurysms.[10] In this case, placement of an EVD was pivotal, improving neurological status from HH grade V to grade III by relieving intracranial pressure. Timely EVD insertion immediately after CT confirmation allowed clinical stabilization prior to definitive aneurysm repair. Continuous monitoring of CSF drainage parameters facilitated controlled ventricular decompression and guided safe transition to ventriculoperitoneal shunt.

Dynamic Hunt and Hess grading to guide timing of aneurysm repair

Poor-grade subarachnoid hemorrhage (HH ≥3) is associated with increased risks of rebleeding, delayed cerebral ischemia, seizures, hydrocephalus requiring CSF diversion, and unfavorable outcomes. Meta-analyses confirm its independent association with higher mortality and poorer functional recovery. In this case, delay in intervention until day 14 reflected the poor clinical grade at presentation and the need for clinical stabilization before intervention. Dynamic HH grading played a critical role in decision making, as neurological deterioration to grade V necessitated deferral of intervention, whereas subsequent improvement following EVD placement enabled safe progression to endovascular coiling. Management required careful balancing of rebleeding risk against procedural risk, highlighting that urgent repair may be feasible, even in grade V patients once stabilization is achieved. Such cases require intensive neurocritical care, including meticulous blood pressure control, with individualized strategies guided by evolving HH grade. [11,12]

The HH scale (grades I–V) is inherently dynamic, and reassessment after stabilization—particularly after CSF diversion—is essential, especially in the presence of ventricular compression. Timing of aneurysm repair must balance the risks of rebleeding against procedural safety. Current guidelines support ultra-early (<24 hours) repair for good grade aSAH, while dynamic HH informs timing in poor grade patients with hydrocephalus. Early aneurysm securing (≤24 hours) reduces rebleeding rates (<5%) and improves outcomes, particularly following effective hydrocephalus management. Moreover, ultra-early intervention in poor-grade subarachnoid hemorrhage has been associated with improved outcomes compared with delayed treatment (odds ratio for poor outcome 0.62 for early vs. intermediate).[13]

For symptomatic hydrocephalus, the 2023 AHA/ASA guidelines recommend CSF diversion, favoring EVD over lumbar drainage due to a lower infection risk. Gradual CSF drainage (5–10 mL/hour) is advised to prevent abrupt pressure shifts. If chronic hydrocephalus persists after aneurysm repair, ventriculoperitoneal shunt placement is indicated, with reported shunt dependency rates of approximately 20–35%. CSF diversion has been shown to reduce mortality and improve outcomes in SAH-associated hydrocephalus. High Fisher grade and poor initial HH grade are recognized risk factors for shunt dependency, supporting proactive management. Effective hydrocephalus treatment may improve apparent HH grade, thereby enabling earlier aneurysm repair.[14]

This report is limited by its single-case design and focus on a specific aneurysm type, which limits generalizability. Earlier intervention might have prevented the second and third ruptures, although poor initial clinical grade necessitated delayed repair. Surgical clipping could be considered in unstable patients; however, endovascular coiling was selected for its minimally invasive nature. Balloon-assisted coiling has been proposed as a strategy to reduce rupture risk, although it was not utilized in this case. In retrospect, earlier aneurysm securing following stabilization with EVD may have altered the clinical course, underscoring the importance of individualized timing strategies in complex aSAH cases.[15]

Conclusion

Based on this case, repeat aneurysmal rupture during endovascular treatment presents critical challenges, particularly in the management of hydrocephalus and the dynamic assessment of neurological status to guide the timing of intervention. Urgent multidisciplinary action is essential; however, the therapeutic benefit of immediate coiling in the setting of impending cerebral herniation remains controversial.

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Conflict of interest
The two authors of this manuscript are members of the editorial team of the Journal of Neurointervention and Stroke. However, they were completely blinded to the peer-review process and had no role or influence in the submission, evaluation, or decision-making for this manuscript. This article was managed entirely by an independent editor and underwent the journal's standard double-blind peer-review process.

Patient consent for publication
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Author contribution
Vita Kusuma Rahmawati: Investigation, Writing–Original Draft, Writing–Review and Editing. **Achmad Firdaus Sani:** Conceptualization, Investigation, Writing–Review and Editing. **Dedy Kurniawan:** Conceptualization,

Investigation, Writing–Review and Editing. **Faishol Hamdani:** Investigation, Writing–Review and Editing. **Muh. Wildan Yahya:** Investigation, Writing–Review and Editing.

References

1. Aoki K, Murayama Y, Tanaka Y, Ishibashi T, Irie K, Fuga M, et al. Risk factors and management of intraprocedural rupture during coil embolization of unruptured intracranial aneurysms: Role of balloon guiding catheter. Front Neurol. 2024;15:1343137. DOI: 10.3389/fneur.2024.1343137
2. Baldvinsdóttir B, Klurfan P, Eneling J, Ronne-Engström E, Enblad P, Lindvall P, et al. Adverse events during endovascular treatment of ruptured aneurysms: A prospective nationwide study on subarachnoid hemorrhage in Sweden. Brain Spine. 2023;3:102708. DOI: 10.1016/j.bas.2023.102708
3. Klisch J, Weyerbrock A, Spetzger U, Schumacher M. Active bleeding from ruptured cerebral aneurysms during diagnostic angiography: Emergency treatment. Am J Neuroradiol. 2003;24(10):2062-5.
4. Lim YC, Kim CH, Kim YB, Joo JY, Shin YS, Chung J. Incidence and Risk Factors for Rebleeding during Cerebral Angiography for Ruptured Intracranial Aneurysms. Yonsei Med J. 2015;56(2):403-409. DOI: 10.3349/ymj.2015.56.2.403
5. Hoh BL, Ko NU, Amin-Hanjani S, Chou SH, Cruz-Flores S, Dangayach NS, et al. 2023 guideline for the management of patients with aneurysmal subarachnoid hemorrhage: A guideline from the American Heart Association/American Stroke Association. Stroke. 2023;54(7):e314-70. DOI: 10.1161/STR.0000000000000436
6. Al-Mufti F, Dicpinigaitis AJ, Bowers CA, Claassen J, Park S, Agarwal S, et al. Prognostication following aneurysmal subarachnoid hemorrhage: The modified hunt and hess grading scale. Stroke Vasc Interv Neurol. 2024;4(5):e001349. DOI: 10.1161/SVIN.124.001349
7. Wilson CD, Safavi-Abbasi S, Sun H, Kalani MY, Zhao YD, Levitt MR, et al. Meta-analysis and systematic review of risk factors for shunt dependency after aneurysmal subarachnoid hemorrhage. J Neurosurg. 2017;126(2):586-95. DOI: 10.3171/2015.11.JNS152094
8. Nikova AS, Sioutas GS, Sfyrlida K, Tripsianis G, Karanikas M, Birbilis T. Oculomotor nerve palsy due to posterior communicating artery aneurysm: clipping vs coiling. Neurochirurgie. 2022;68(1):86-93. DOI: 10.1016/j.neuchi.2021.03.012
9. Finger G, Martins OG, Nesi WM, Casarin MC, de Almeida LP, Schiavo FL, et al. Ruptured aneurysm in the posterior communicating segment of carotid artery presenting with contralateral oculomotor nerve palsy. Surg Neurol Int. 2019;10:177. DOI: 10.25259/SNI_203_2019
10. Güresir E, Schuss P, Setzer M, Platz J, Seifert V, Vatter H. Posterior communicating artery aneurysm–related oculomotor nerve palsy: Influence of surgical and endovascular treatment on recovery: Single-center series and systematic review. Neurosurg. 2011 Jun 1;68(6):1527-34. DOI: 10.1227/NEU.0b013e31820edd82
11. Rojas-Panta G, Reyes-Narro GF, Toro-Huamanchumo C, Choque-Velasquez J, Saal-Zapata G. Prognostic value of scales for aneurysmal subarachnoid hemorrhage: Report of a reference center in Peru. Neurocirugía (Engl Ed). 2024;35(1):1-5. DOI: 10.1016/j.neucie.2023.05.001
12. Couret D, Boussen S, Cardoso D, Alonzo A, Madec S, Reyre A, et al. Comparison of scales for the evaluation of aneurysmal subarachnoid haemorrhage: A retrospective cohort study. Eur Radiol. 2024;34(11):7526-36. DOI: 10.1007/s00330-024-10814-4
13. Munasinghe T, Huang H, Phan T, Lai L. Timing of aneurysm repair after subarachnoid haemorrhage: A systematic review and meta-analysis of ultra-early and early intervention. J Clin Neurosci. 2025;141:111623. DOI: 10.1016/j.jocn.2025.111623
14. Lylyk P, lylyk I, Bleise C, Scrivano E, Lylyk PN, Beneduce B, et al. Management of intractable hydrocephalus following aneurysmal subarachnoid hemorrhage with the eShunt® system endovascular CSF shunt (S16. 004). Neurol. 2024;102(7 Supplement 1):7184 DOI: 10.1212/WNL.0000000000208335
15. Loconi-Vallejos A, Jorge-Dejo C, Azurín-Peña M, Garcia-Solorzano FO. Timing of aneurysm treatment in subarachnoid hemorrhage and grade of functional capacity at discharge: A retrospective cohort study. Egypt J Neurol Psychiat Neurosurg. 2023;59(1):89. DOI: 10.1186/s41983-023-00692-w