Open Access Library Journal
2025, Volume 12, e13686
ISSN Online: 2333-9721
ISSN Print: 2333-9705

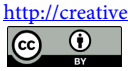
Third Cranial Nerve Palsy Complicating Peri Mesencephalic Non Aneurysmal Subarachnoid Hemorrhage: A Case Report

Zineb Bayoum[1], Mounia Rahmani[1], Meriem Fikri[2], Najoua Maarad[1], Wadie Bnouhanna[1], Maria Benabdeljlil[1], Saadia Aidi[1]

[1]Research Team in Neurology and Neurogenetics, Department of Neurology A and Neuropsychology, Faculty of Medicine and Pharmacy, Hôpital des Spécialités, Universiy Mohammed V, Rabat, Morocco
[2]Department of Neuroradiology, Faculty of Medicine and Pharmacy, Hôpital des Spécialités, University Mohammed V, Rabat, Morocco
Email: bayoum.zineb@gmail.com

How to cite this paper: Bayoum, Z., Rahmani, M., Fikri, M., Maarad, N., Bnouhanna, W., Benabdeljlil, M. and Aidi, S. (2025) Third Cranial Nerve Palsy Complicating Peri Mesencephalic Non Aneurysmal Subarachnoid Hemorrhage: A Case Report. *Open Access Library Journal*, **12**: e13686.
https://doi.org/10.4236/oalib.1113686

Received: May 28, 2025
Accepted: July 5, 2025
Published: July 8, 2025



Abstract

Background and Clinical Significance: Peri-mesencephalic hemorrhage is a rare and benign type of subarachnoid hemorrhage (SAH) defined by the presence of SAH in peri-pontic and peri-mesencephalic cisterns, with no aneurysm or other source of bleeding on angiography. Cranial nerve involvement is very rare and has been rarely reported in the previous studies. Peri mesencephalic subarachnoid hemorrhage (PMSAH) typically presents with benign clinical symptoms such as headache and neck pain and cranial nerve involvement is extremely uncommon, with only few cases documented in the literature. Understanding the pathophysiology and clinical spectrum of PMSAH is essential to avoid misdiagnosis and unnecessary interventions. **Case Presentation:** We report the case of a 51-year-old man with a non-controlled type 2 diabetes mellitus who presented with sudden onset thunderclap headache following sexual activity. One week later, he developed vertical binocular diplopia and partial right-sided ptosis. Neurological examination revealed a partial third cranial nerve palsy affecting all ocular movements except abduction, along with absent direct and consensual pupillary light reflexes on the right. Brain MRI showed a typical PMSAH and cerebral angiography performed 12 days after symptom onset ruled out aneurysm or vasospasm. Patient was managed conservatively with symptomatic treatment and diabetes optimization, resulting in complete resolution of cranial nerve palsy after three months. **Conclusion:** This case highlights an unusual presentation of PMSAH complicated by isolated third cranial nerve palsy in the context of poorly controlled diabetes and post-coital effort. Recognizing these rare manifestations can prevent unneces-

sary invasive procedures and guide appropriate management. Further studies are warranted to better understand the pathophysiology of cranial nerve involvement in PMSAH.

Subject Areas

Neurology, Neurosurgery

Keywords

Peri Mesencephalic Hemorrhage, Non-Aneurysmal Subarachnoid Hemorrhage, Third Cranial Nerve Palsy

1. Introduction

Peri mesencephalic subarachnoid hemorrhage (PMSAH) was first described by Van Gijn in 1985 as a rare and distinct subtype of subarachnoid hemorrhage (SAH). It is characterized by the presence of localized bleeding confined to the peri mesencephalic and prepontine cisterns, in the absence of aneurysmal rupture or any other identifiable source of bleeding on cerebral angiography [1]. Patients usually present with a relatively benign clinical course with symptoms often limited to acute or subacute headache, neck pain, and occasionally transient neurological deficit. Cranial nerve involvement is rare and has only been reported in the literature in very few cases. This case highlights an unusual presentation of PMSAH, manifesting as third cranial nerve palsy, and discusses its clinical implications and underlying pathophysiological mechanisms.

2. Case Presentation

We report the case of a 51-year-old man with poorly controlled type 2 diabetes mellitus treated with oral antidiabetic agents. Few hours after sexual intercourse, he developed a sudden onset of thunderclap headache associated with vomiting. One week later, patient noticed upon awakening a vertical binocular diplopia and a partial right-sided ptosis. The patient did not seek medical care until day 8 after symptom onset.

Upon admission to the emergency department, neurological examination revealed a conscious, alert and oriented patient, impaired eye movements except abduction with no direct and indirect light reflexes indicating a complete third cranial nerve palsy. No other neurological deficits were observed neither neck stiffness. General physical examination was normal.

A non-contrast brain CT with angiography (CTA) was performed immediately at admission and showed perimesencephalic subarachnoid hemorrhage, with no evidence of aneurysm or vascular malformation. This initial imaging enabled the exclusion of aneurysmal SAH at presentation. Brain MRI demonstrated hyperintense signals on FLAIR, diffusion, and T2-weighted images (**Figures 1-4**), con-

sistent with subarachnoid blood in the prepontine and peri mesencephalic cisterns, suggestive of a PMSAH. Cerebral digital subtraction angiography was scheduled on day 12 post symptom onset as a confirmatory, rather than diagnostic, step. The DSA remained negative for aneurysm or vasospasm (Figure 5).

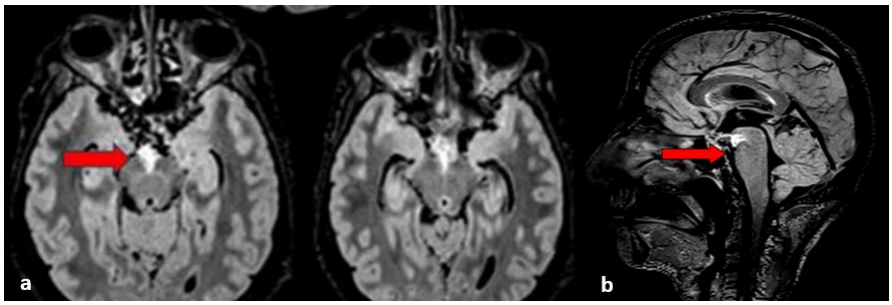


Figure 1. Brain MRI, FLAIR sequence. (a) Axial view and (b) sagittal view showing hyperintensity in the perimesencephalic region, consistent with PAMSH (red arrow).

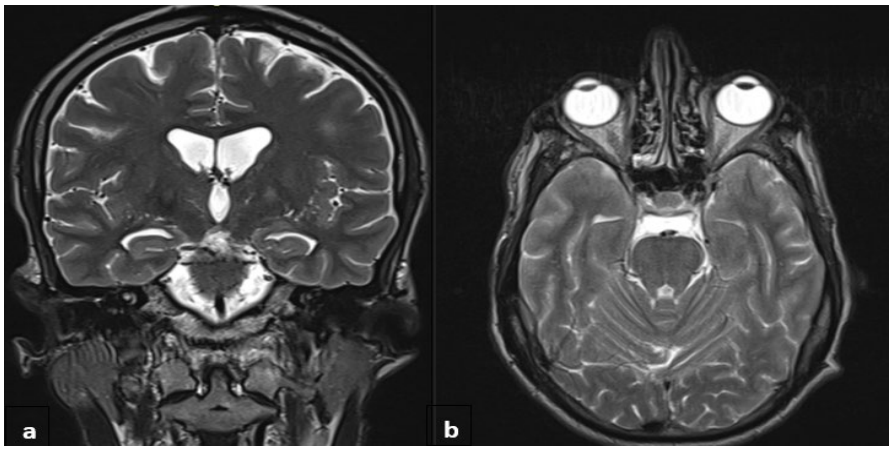


Figure 2. Brain MRI, T2-weighted sequence. (a) Coronal view (2.3 mm thickness) showing subtle hyperintensity in the midline perimesencephalic region. (b) Axial view (4 mm thickness) where no evidence of perimesencephalic hemorrhage is visible.

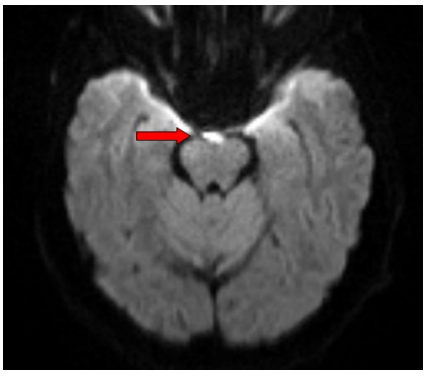


Figure 3. Brain MRI, diffusion-weighted sequence (slice thickness: 5 mm): hyperintense signal in the midline perimesencephalic region consistent with a perimesencephalic subarachnoid hemorrhage (red arrow).

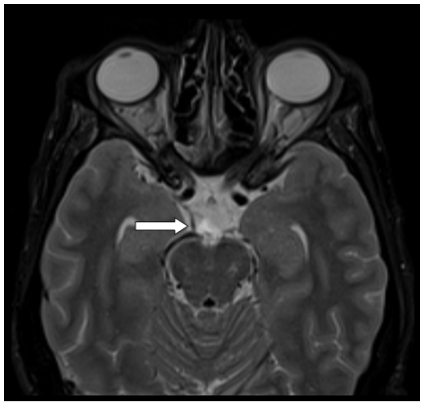


Figure 4. Brain MRI, orbital T2-weighted fat-suppressed sequence (slice thickness: 2.2 mm): hyperintense signal in the midline peri-mesencephalic region consistent with PMSH (white arrow).

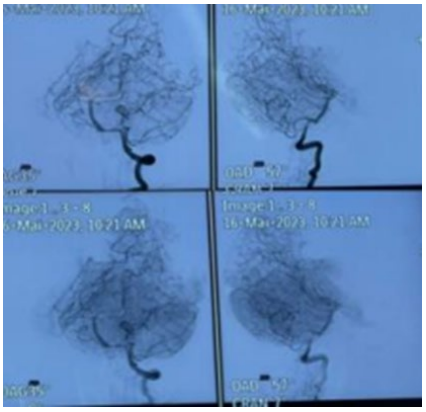


Figure 5. Cerebral angiography of the posterior circulation showing no abnormalities.

Lumbar puncture revealed xanthochromic cerebrospinal fluid containing 25 white blood cells, 6 red blood cells, a protein level of 0.42 g/l, and glucose level of 1.5 g/l. Blood tests including electrolyte panel, liver and renal function tests, complete blood count, C-reactive protein, thyroid function, hepatitis and HIV serologies were all within normal limits, except for hyperglycemia (3.13 g/L) and elevated HbA1c (9.5%) without ketosis. Notably, the patient exhibited no evidence of diabetic microvascular complications, such as retinopathy or neuropathy, upon ophthalmologic and neurological examination.

A final diagnosis of PMSAH was made, likely triggered by sexual activity in the context of poorly controlled diabetes. The third nerve palsy was considered a delayed complication. Patient was treated with analgesics only and optimization of glycemic control. A spontaneous and complete recovery of both the third cranial nerve palsy and headaches was observed three months later. Unfortunately, the patient was transferred to another city for follow-up care and was only contacted by phone to confirm the clinical resolution of symptoms. No imaging studies were performed to document the resolution of the hemorrhage.

3. Discussion

PMSAH is a rare condition with a low incidence estimated at 0.3 - 0.5 cases per 100,000 inhabitants. It accounts for only 5% to 10% of all SAH and less than 30% of non-aneurysmal SAH [2]. PMSAH differs from other types of SAH by an earlier age of onset, typically around 50 years [3], a lower prevalence of hypertension, and a strong association with physical efforts and the Valsalva maneuver. This last point is a notable feature of PMSAH. Indeed, our patient's headaches occurred following sexual activity. Similarly, in Foreman *et al.*'s series, 16 patients developed PMSAH after coitus or masturbation [4]. A hyperdynamic circulatory state during sexual activity may trigger SAH, possibly through transient hypertensive peaks.

The exact pathophysiological mechanism underlying PMSAH remains unclear. Given the normal angiographic findings, limited hemorrhage extension, and benign clinical signs, a venous origin has been suggested in several reports [5]-[7]. Investigations into venous drainage in PMSAH patients propose rupture of the basal vein of Rosenthal (BVR) or its tributaries, including the interpeduncular veins or posterior communicating veins, as possible causes [5]. The rupture of the BVR is the most common theory; a primitive anatomical variant (type C) can divert blood drainage away from the vein of Galen which makes the BVR more fragile and prone to rupture (**Figure 6**).

Clinically, PMSAH usually presents with acute-onset headaches evolving over a few hours. Focal neurological deficits, transient consciousness disturbances and seizures are rare, reflecting the generally benign course of this hemorrhage. According to Sahin *et al.* [8], only 7% of patients were classified as grade III or higher on the Hunt and Hess scale for SAH, while 93% were grade I or II. A Moroccan study including 24 patients with PMSAH between September 1999 and June 2009 reported that 80% were admitted with grade I, and only two patients had grade IV on the Hunt and Hess scale [9].

Our patient developed binocular diplopia due to third cranial nerve palsy complicating PMSAH in the context of physical effort (sexual activity) and poorly controlled diabetes. Diabetic microvascular third nerve palsy is well-known; diabetes likely acted as a cofactor along with the post-coital trigger in the development of the cranial nerve III palsy. This complication is exceptional in PMSAH and has rarely been reported. Roman *et al.* [2] described a series of seven patients, five of whom had diplopia or ocular motor palsy associated with headaches. Abbatemarco *et al.* [10] reported a 63-year-old woman presenting with severe headaches and total third nerve palsy related to non-aneurysmal PMSAH. Two other cases of painful third nerve involvement in PMSAH were described by Kamat *et al.* [11] and Sakashita *et al.* [5]. The exact pathophysiological mechanism remains uncertain but hypotheses include: direct nerve compression by hematoma mass effect, ischemic injury due to occult vasospasm undetectable by angiography, or a small mesencephalic ischemic stroke secondary to vasospasm [10] [11]. In our patient, the seven-day delay between headaches onset and cranial nerve palsy suggests a

mechanism involving vasospasm-induced ischemia of the nerve, possibly exacerbated by diabetes-related vulnerability.

Brain MRI combined with arterial angiography is the key diagnostic tool for PMSAH, enabling detection of subtle hemorrhages missed by CT and identification of aneurysms. Vessel wall MRI may also aid diagnosis by directly visualizing vessel wall changes [2]. However, cerebral angiography remains the gold standard for definitively excluding aneurysms. In our case, diagnosis was established by MRI and angiography ruling out aneurysmal cause.

Although PMSAH is generally benign, it is not without complications. Wolfert *et al.* [12] reported a series of 71 patients, of whom 35% developed complications including hydrocephalus, delayed arterial vasospasm, and cerebral ischemia, increasing mortality risk by 3%. Regarding prognosis, our patient achieved complete recovery within three months with a Rankin score of 1. This aligns with the Moroccan study showing favorable long-term outcomes after a mean follow-up of 38 months: 50% of subjects became completely asymptomatic, and 45% had only mild headaches with no seizures or rebleeding observed [8].

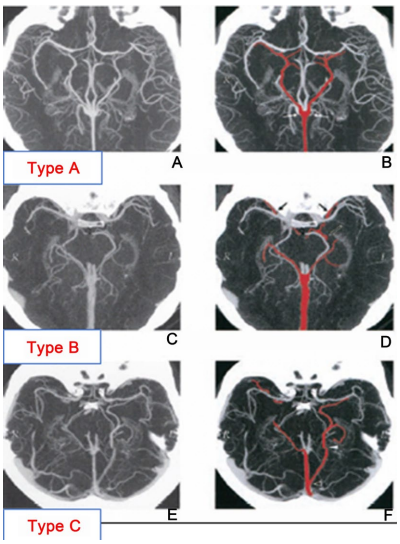


Figure 6. Venous angiography the different variants of the basal vein of Rosenthal according to Watanabe's classification: Type A: continuous normal vein; Type B: discontinuous normal vein; Type C: primitive variant.

4. Conclusions

This case highlights a rare and intriguing presentation of PMSAH initially manifesting as an isolated third cranial nerve palsy in the setting of post-coital exertion and poorly controlled diabetes mellitus. While PMSAH is generally considered a benign subtype of subarachnoid hemorrhage with a favorable prognosis, this case demonstrates the importance of recognizing that cranial nerve involvement particularly of the oculomotor nerve may occur even in the absence of an aneurysm or mass effect. The delayed onset of third nerve palsy, in this context, may point

toward transient ischemic mechanisms such as occult vasospasm, especially when compounded by vascular risk factors like diabetes. Clinicians should be aware of this rare but possible complication, as early recognition may facilitate more tailored investigations and appropriate follow-up. Further studies are warranted to elucidate the exact pathophysiological processes involved and to better define the prognostic implications of cranial nerve involvement in PMSAH.

Emergency physicians and neurologists should include perimesencephalic subarachnoid hemorrhage in the differential diagnosis of acute, isolated cranial nerve III palsy especially following a thunderclap headache and even when aneurysm is not immediately apparent. Early high-resolution CTA and/or MRI is recommended, and in individuals with vascular risk factors, a sustained level of vigilance is essential.

Authors' Contributions

Bayoum Zineb, Mounia Rahmani: writing the manuscript and collecting clinical data.
Meriem Fikri: Collecting the radiological data.
Najoua Maarad: Collecting clinical data.
Wadie Bnouhanna, Maria benabdejlil, Aidi Saadia: Reviewed the manuscript.

Funding

This research received no external funding.

Informed Consent Statement

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

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Hou, K. and Yu, J. (2022) Current Status of Perimesencephalic Non-Aneurysmal Subarachnoid Hemorrhage. *Frontiers in Neurology*, **13**, Article 960702. https://doi.org/10.3389/fneur.2022.960702

[2] Roman-Filip, I., Morosanu, V., Bajko, Z., Roman-Filip, C. and Balasa, R.I. (2023) Non-Aneurysmal Perimesencephalic Subarachnoid Hemorrhage: A Literature Review. *Diagnostics*, **13**, Article 1195. https://doi.org/10.3390/diagnostics13061195

[3] Mensing, L.A., Vergouwen, M.D.I., Laban, K.G., Ruigrok, Y.M., Velthuis, B.K., Algra, A., *et al.* (2018) Perimesencephalic Hemorrhage: A Review of Epidemiology, Risk Factors, Presumed Cause, Clinical Course, and Outcome. *Stroke*, **49**, 1363-1370. https://doi.org/10.1161/strokeaha.117.019843

[4] Foreman, P.M., Griessenauer, C.J., Selim, M.H., Searls, D.E.C., Safdar, A., Kasper, E.M., *et al.* (2015) Sexual Activity as a Trigger for Intracranial Hemorrhage. *Acta Neurochirurgica*, **158**, 189-195. https://doi.org/10.1007/s00701-015-2643-x

[5] Sakashita, K., Miyata, K., Saito, R., *et al.* (2022) A Case of Perimesencephalic Subarachnoid Hemorrhage with Cerebral Venous Sinus Thrombosis Due to Stenosis of the Junction of the Vein of Galen and Rectus Sinus. *Case Reports in Neurology*, **14**, 307-313.

[6] Shad, A., Rourke, T.J., Hamidian Jahromi, A., *et al.* (2008) Straight Sinus Stenosis as a Proposed Cause of Perimesencephalic Non-Aneurysmal Haemorrhage. *Journal of Clinical Neuroscience*, **15**, 839-841.

[7] Mathews, M.S., Brown, D. and Brant-Zawadzki, M. (2008) Perimesencephalic Non-aneurysmal Hemorrhage Associated with Vein of Galen Stenosis. *Neurology*, **70**, 2410-2411. https://doi.org/10.1212/01.wnl.0000314688.26295.03

[8] Sahin, S., Delen, E. and Korfali, E. (2016) Perimesencephalic Subarachnoid Hemorrhage: Etiologies, Risk Factors, and Necessity of the Second Angiogram. *Asian Journal of Neurosurgery*, **11**, 50-53. https://doi.org/10.4103/1793-5482.165793

[9] Cherif El Asri, A., Akhaddar, A., Naama, O., Belfquih, H., Boulhroud, O., Mandour, C., *et al.* (2013) Les hémorragies méningées péri-mésencéphaliques avec artériographie cérébrale normale; quelle conduite diagnostique? *Feuillets de Radiologie*, **53**, 143-147. https://doi.org/10.1016/j.frad.2013.04.002

[10] Abbatemarco, J.R. and Yacoub, H.A. (2016) Isolated Cranial Nerve-Iii Palsy Secondary to Perimesencephalic Subarachnoid Hemorrhage. *Case Reports in Neurological Medicine*, **2016**, Article ID: 6319548. https://doi.org/10.1155/2016/6319548

[11] Kamat, A.A., Tizzard, S. and Mathew, B. (2005) Painful Third Nerve Palsy in a Patient with Perimesencephalic Subarachnoid Haemorrhage. *British Journal of Neurosurgery*, **19**, 247-250. https://doi.org/10.1080/02688690500208403

[12] Wolfert, C., Maurer, C.J., Berlis, A., Schneider, H., Steininger, K., Motov, S., *et al.* (2022) Hydrocephalus, Cerebral Vasospasm, and Delayed Cerebral Ischemia Following Non-Aneurysmatic Spontaneous Subarachnoid Hemorrhages: An Underestimated Problem. *Neurosurgical Review*, **46**, Article No. 23. https://doi.org/10.1007/s10143-022-01919-9