



## Case Report

# Warfarin-induced isolated spontaneous subarachnoid hemorrhage: Rare case report



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## ABSTRACT

**Introduction and importance:** Subarachnoid hemorrhage (SAH) is mostly associated with head trauma. Non-traumatic subarachnoid hemorrhage is mostly due to vascular abnormalities: either hemorrhage from ruptured aneurysm or bleeding from arteriovenous malformation. Aneurysmal hemorrhage is the biggest cause in non-traumatic cases. Warfarin is associated with cerebral intraparenchymal hemorrhage, but it is rarely associated with SAH.

**Case presentation:** Here, we report the case of a 45-year-old male patient who was admitted to the neurology ward of our hospital due to acute ischemic stroke. The patient was treated with a vitamin K antagonist (warfarin). However, on the third day, his condition deteriorated (his GCS regressed from 11/15 to 5/15). His pupils were anisocoric. Brain CT showed extensive subarachnoid hemorrhage without intraparenchymal involvement. Cerebral magnetic resonance angiography ruled out aneurysmal rupture. The patient was intubated and transferred to the intensive care unit. Due to his poor condition, neurosurgical intervention could not be done. The patient was managed conservatively, but the patient passed away 4 days later in the intensive care unit.

**Clinical discussion:** Non-traumatic SAH is mostly caused by aneurysmal rupture. Warfarin increases the risk of intracranial hemorrhage and mostly causes intraparenchymal hemorrhage. Isolated warfarin-related SAH without parenchymal involvement is a rare event. Here we present a young male patient with an isolated warfarin-induced SAH.

**Conclusion:** Warfarin is rarely associated with isolated subarachnoid hemorrhage. This case highlights a young male patient with spontaneous SAH after warfarin therapy for acute ischemic stroke. Aneurysmal rupture and trauma should be excluded before a diagnosis of warfarin-induced SAH is made.

## 1. Introduction

Subarachnoid hemorrhage (SAH) represents 5% of all stroke forms and carries higher morbidity and mortality. The incidence of subarachnoid hemorrhage is 9.1 cases per 100,000 people per year. Despite advances in medical and surgical care, SAH continues to account for 27% of all stroke-related potential years of life lost before the age of 65, despite advances in medical and surgical care [1]. The majority of cases of non-traumatic SAH are due to vascular abnormalities such as ruptured aneurysms (85% of cases) or other vascular malformations [2,11]. Other associated etiologies of spontaneous SAH include dural fistula or dural sinus thrombosis, cocaine use, and coagulation disorders [6]. Endoscopic procedures have also been associated with the development of

subarachnoid hemorrhage [16,17]. Use of anticoagulation is associated with an increased risk of intracranial hemorrhage. However, in most cases, warfarin causes intraparenchymal hemorrhage rather than subarachnoid bleeding [3,4]. The occurrence of isolated subarachnoid hemorrhage without involvement of the cerebral parenchyma is a rare finding [5]. Here we present a case of isolated subarachnoid hemorrhage without parenchymal involvement after treatment with warfarin for acute ischemic stroke.

## 2. Case presentation

A 45-year old male patient was admitted to the neurology ward of our hospital with a decreased level of consciousness (GCS of 11/15) and

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left-sided weakness (power 1/5 on the MRC scale). His vital signs were normal except for elevated blood pressure (165/98 mmHg). Brain MRI with diffusion sequence showed multiple cerebral infarct (see Fig. 1). The patient was admitted to the neurology ward. He had no prior history of hypertension, diabetes mellitus, known cardiac disease, or coagulation disorder. He had no previous history of a stroke. He had no history of drug abuse. His baseline ECG and transthoracic echocardiography did not show any underlying cardiac pathology. MRI Cerebral angiography did not show underlying stenosis or aneurysm (see Fig. 3). The patient was admitted to the neurology ward. He was treated with a vitamin K antagonist (warfarin 5 mg) for secondary prevention with regular INR control. However, on the third day of treatment, his condition deteriorated (his GCS regressed from 11/15 to 5/15). Pupils were anisocoric. Brain CT showed extensive subarachnoid hemorrhage without intraparenchymal involvement (see Fig. 2). Laboratory investigation showed an INR of 2.5 (normal range: 1.1 or below) and an APTT of 52 (normal range: 21–35 seconds). The patient was intubated and transferred to the intensive care unit. Due to his poor condition, neurosurgical intervention could not be done. The patient was treated with fresh frozen plasma and vitamin K, but due to his poor condition, he did not survive. The patient passed away four days later in the intensive care unit.

Since there were no other associated risk factors for subarachnoid hemorrhage, warfarin administration was considered as the underlying cause of acute subarachnoid bleeding in this case. Mostly, warfarin is associated with intracranial hemorrhage other than SAH. What makes this case interesting is that the patient developed an isolated subarachnoid hemorrhage without cerebral parenchymal involvement. This case has been reported in line with the SCARE 2020 criteria [18].

### 3. Discussion

Subarachnoid hemorrhage (SAH) is mostly caused by trauma or aneurismal rupture in most cases. SAH is a serious neurologic emergency with an incidence of 6–7 cases per 100,000 per year. Acute SAH has 40% mortality among hospitalized patients. Nearly 85% of spontaneous SAH cases are due to rupture of an intracranial aneurism [3,7]. Epidemiological data on SAH risk factors are not well established. Associated risk factors are smoking, hypertension, and excessive alcohol intake [12]. About 15% of spontaneous SAH patients have no angiographic finding of demonstrable source of hemorrhage. Intracranial hemorrhage is one of the most serious complications of warfarin anticoagulation. Intracranial hemorrhage associated with warfarin can be categorized into intraparenchymal, subdural/epidural, and subarachnoid [9]. Intraparenchymal hemorrhage accounts for approximately 70% of anticoagulation-associated intracranial hemorrhages. The occurrence of isolated subarachnoid hemorrhage is rare. Up to now, very few cases have been reported in the literature [13].

Use of vitamin K antagonists is associated with an increased risk of hemorrhage. Warfarin increases the overall risk of intracranial hemorrhage and is responsible for higher mortality and disability among its

users [8]. According to Mattle et al., patients on vitamin K antagonist have a four-times higher incidence of extracranial/intracranial bleeding (subdural, epidural, and subarachnoid hemorrhage) than the general population (25 of the 155 studies investigated) [10].

Warfarin-related intraparenchymal hemorrhage is a common incidence in the literature. Nevertheless, isolated spontaneous subarachnoid hemorrhage in these patients is a rare occurrence. Patients on anticoagulation may develop SAH with minimal head trauma, therefore it should be excluded. For accurate diagnosis of warfarin-induced SAH, the presence of an intracranial aneurysm or other intracranial vascular abnormality should be excluded through cerebral angiography and magnetic resonance imaging [14]. Our case was in the hospital when he was anticoagulated for acute ischemic stroke. He did not suffer any head trauma. MR angiography excluded any intracranial aneurysm. Likewise, brain MRI did not show any vascular anomalies. Warfarin-associated SAH should be managed with correction of the INR to reduce the risk of expanding hemorrhage [15]. The present case was treated with fresh frozen plasma and vitamin K, but due to his poor condition, he did not survive. We lost the patient due to massive SAH.

### 4. Conclusion

Oral Anticoagulation is mostly associated with cerebral intraparenchymal hemorrhage. Warfarin related Isolated SAH is very rare event. Patients on warfarin should be monitored for the possibility of SAH. Here we reported an interesting and rare case of isolated warfarin induced SAH.

### Ethical approval

Ethical approval is not required in our institution. However, written informed consent was obtained from the patient for publication of this case report and the accompanying image.

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The authors declared that this study received no financial support.

### Author contribution

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

### Research registration number

N/A.

### Guarantor

Mohamed Sheikh Hassan, the corresponding author.

### Provenance and peer review

Not commissioned, externally peer-reviewed.

### Consent for publication

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

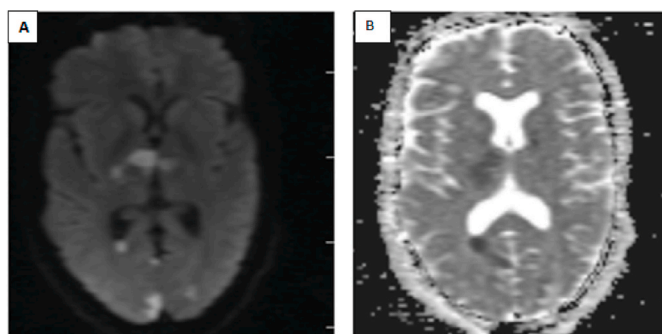


Fig. 1. A, B: MRI of Brain: Diffusion & ADC sequences showing multiple diffusion restrictions consistent with acute infarct.

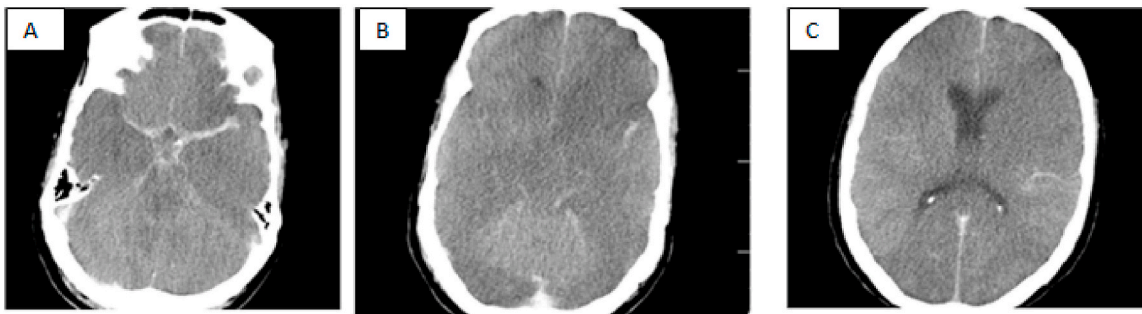


Fig. 2. Non-Contrast Brain CT; A, B & C showing subarachnoid hemorrhage in the basal cisterns and sylvian fissure without intraparenchymal bleeding.

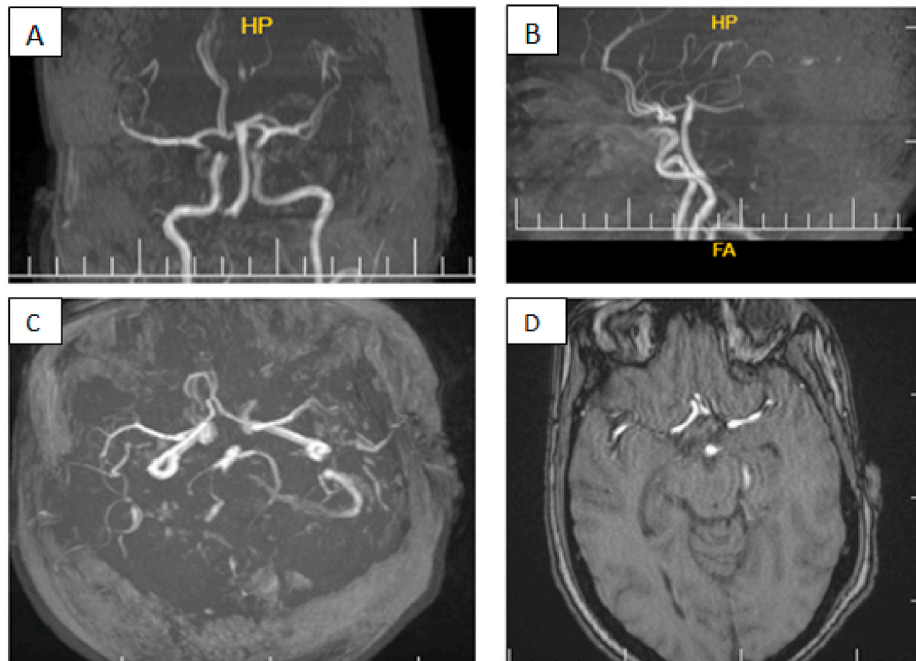


Fig. 3. A, B, C & D: Brain MRI Angiography, not showing any evidence of aneurysm rupture or other vascular malformation.

### Declaration of competing interest

The authors declare no conflict of interest.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.104946>.

### References

- [1] N. Etminan, H.S. Chang, K. Hackenberg, N.K. De Rooij, M.D. Vergouwen, G. J. Rinkel, A. Algra, Worldwide incidence of aneurysmal subarachnoid hemorrhage according to region, time period, blood pressure, and smoking prevalence in the population: a systematic review and meta-analysis, *JAMA Neurol.* 76 (5) (2019 May 1) 588–597.
- [2] R. Sarabia, A. Lagares, J.A. Fernández-Alén, F. Arikian, J. Vilalta, J. Ibáñez, A. Maíllo, A. Gabarros, J. Domínguez, A. Horcajadas, F. Ballenilla, Idiopathic subarachnoid hemorrhage: a multicentre series of 220 patients, *Neurocirugía* 21 (6) (2010 Jan 1) 441–451.
- [3] M. Olsen, M.B. Johansen, S. Christensen, H.T. Sørensen, Use of vitamin K antagonists and risk of subarachnoid haemorrhage: a population-based case-control study, *Eur. J. Intern. Med.* 21 (4) (2010 Aug 1) 297–300.
- [4] A.Y. Zubkov, J.N. Mandrekar, D.O. Claassen, E.M. Manno, E.F. Wijdicks, A. A. Rabinstein, Predictors of outcome in warfarin-related intracerebral hemorrhage, *Arch. Neurol.* 65 (10) (2008 Oct 13) 1320–1325.
- [5] R.R. Campos, A.M. Cunha, M.E. dos Santos, G.B. de Aguiar, Spontaneous subarachnoid hemorrhage induced by warfarin use: case report and literature review, *JBNC-J. Bras. Neurocirurgia* 22 (4) (2011) 190–193.
- [6] G.J. Rinkel, J. Van Gijn, E.F. Wijdicks, Subarachnoid hemorrhage without detectable aneurysm. A review of the causes, *Stroke* 24 (9) (1993 Sep) 1403–1409.
- [7] J. Van Gijn, R.S. Kerr, G.J. Rinkel, Subarachnoid haemorrhage, *Lancet* 369 (9558) (2007 Jan 27) 306–318.
- [8] D.N. Orken, G. Kenangil, E. Uysal, H. Forta, Cerebral microbleeds in ischemic stroke patients on warfarin treatment, *Stroke* 40 (11) (2009 Nov 1) 3638–3640.
- [9] I.A. Abdi, N.O. Sidow, M.S. Hassan, M.F. Mohamud, M. Karataş, Spontaneous bilateral subdural hematoma in a patient with a prosthetic valve and association with plasmodium vivax malaria: a rare case report, *Annals of Medicine and Surgery* 80 (2022 Aug 1), 104191.
- [10] A. Lagares, P.A. Gomez, R.D. Lobato, J.F. Alen, R. Alday, J. Campollo, Prognostic factors on hospital admission after spontaneous subarachnoid haemorrhage, *Acta Neurochir.* 143 (7) (2001 Jul) 665–672.
- [11] M.S. Hassan, A.M. Ali, M.F. Osman, A. Ahmed, Spontaneous bilateral basal Ganglia hemorrhage due to severe hypertension, *Vasc. Health Risk Manag.* 18 (2022) 473.
- [12] H. Mattle, S. Kohler, P. Huber, M. Rohner, K.F. Steinsiepe, Anticoagulation-related intracranial extracerebral haemorrhage, *J. Neurol. Neurosurg. Psychiatr.* 52 (7) (1989 Jul 1) 829–837.
- [13] V.L. Feigin, G.J. Rinkel, C.M. Lawes, A. Algra, D.A. Bennett, J. van Gijn, C. S. Anderson, Risk factors for subarachnoid hemorrhage: an updated systematic review of epidemiological studies, *Stroke* 36 (12) (2005 Dec 1) 2773–2780.
- [14] I.F. Ricarte, F.G. Calente, M.M. Alves, D.L. Gomes, R.A. Valiente, F.A. Carvalho, G. S. Silva, Cerebral vasospasm and delayed cerebral ischemia after warfarin-induced subarachnoid hemorrhage, *J. Stroke Cerebrovasc. Dis.* 24 (9) (2015 Sep 1) e275–e278.
- [15] S.B. Lee, E.M. Manno, K.F. Layton, E.F. Wijdicks, Progression of warfarin-associated intracerebral hemorrhage after INR normalization with FFP, *Neurology* 67 (7) (2006 Oct 10) 1272–1274.

- [16] J. Zhang, Y. Xue, J. Gao, Y. Li, K. Shi, W. Diao, J. Li, Subarachnoid hemorrhage after full endoscopic transforaminal lumbar interbody fusion: a case report, *Br. J. Neurosurg.* (2021 Mar 18) 1–6.
- [17] W.F. Ismaiel, M.H. Abdelazim, A. Younes, M.E. Alsobky, A. Hasan, A.M. Taha, Outcome of the endoscopic repair of frontal sinus cerebrospinal fluid leak, *Annals of Medicine and Surgery* 70 (2021 Oct 1), 102887.
- [18] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, A. Kerwan, A. Thoma, A.J. Beamish, A. Noureldin, A. Rao, B. Vasudevan, B. Challacombe, The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines, *Int. J. Surg.* 84 (2020 Dec 1) 226–230.