Case Report

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Cerebral Venous Aneurysm: Microsurgical Management of Two Cases and Literature Review

Others Section

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ABSTRACT

Cerebral venous aneurysms are rare vascular anomalies that may present incidentally or with neurological symptoms such as seizures or intracranial haemorrhage. Their diagnosis and management remain challenging due to the lack of standardised guidelines and limited clinical experience. Two rare and clinically significant cases are reported here. The first case involved a 70-year-old male presenting with focal seizures, who was found to have a large isolated cerebral venous aneurysm. The second case concerned a 27-year-old male who developed a frontal intracerebral haematoma associated with an abnormal venous channel. Both patients underwent successful microsurgical treatment with favourable outcomes. These cases underscore the importance of individualised diagnostic assessment and surgical planning when managing cerebral venous aneurysms, especially when they present with symptomatic mass effect or haemorrhage. A comprehensive literature review was conducted to compare conservative, surgical and endovascular management strategies, highlighting the absence of consensus guidelines and the need for case-by-case decision-making. The novelty of these cases lies in their rare presentations and the successful application of microsurgical techniques, which remain underreported in the literature. The authors experience contributes valuable insights into the clinical approach, surgical considerations and outcomes associated with cerebral venous aneurysms, advocating for heightened awareness and reporting to inform future management strategies.

Keywords: Arteriovenous malformation, Cerebral varix, Developmental venous anomalies, Microsurgery

CASE REPORT

Case 1

A 70-year-old male presented with recurrent focal seizures and facial deviation since past two months. Patient had a history of similar episodes two years back for which he was started on Antiepileptic Drugs (AED). Despite being on multiple AEDs, including levetiracetam and lacosamide, his seizures persisted. He underwent Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) imaging and was referred for further management.

Imaging findings on MR venogram [Table/Fig-1a] revealed a large venous channel with aneurysmal dilatation draining into superior sagittal sinus and a CT angiogram [Table/Fig-1b] confirmed a large isolated venous aneurysm in the same area. Magnetic resonance imaging with T2-weighted sequence revealed a large saccular-shaped flow void in the left basifrontal region, accompanied by a linear flow void [Table/Fig-1c]. After evaluating both conservative and surgical options, the decision was made to proceed with surgical excision. A right frontal craniotomy was performed as planned [Table/Fig-1d].

Intraoperative findings [Table/Fig-1e] findings showed a large, tortuous cortical vein. An aneurysm-like structure with feeding and draining vessels was observed. Temporary compression of the feeding vein for 10-15 minutes did not result in any signs of congestion. The aneurysm was subsequently excised after ligation of the feeding and draining veins [Table/Fig-1f,g]. Postoperatively, the patient experienced one episode of generalised tonic-clonic seizure in the immediate period; however, CT imaging [Table/Fig-1h] demonstrated no venous congestion or oedema. The patient was discharged on the sixth postoperative day with an intact neurological status. At the 2-year follow-up, the patient remained symptom-free and neurologically intact.

Case 2

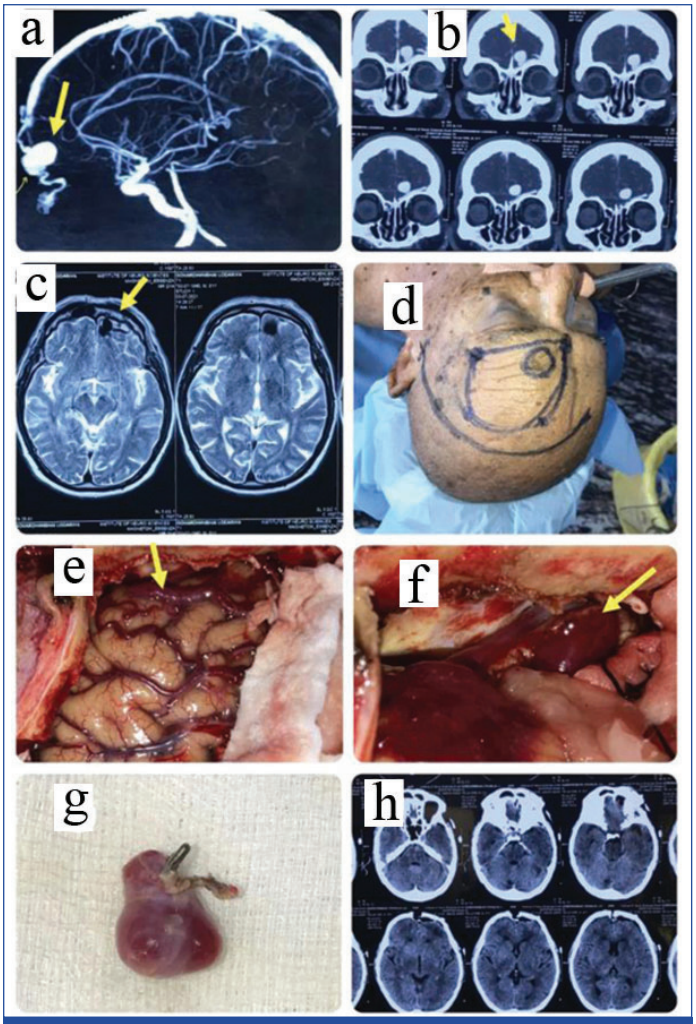
A 27-year-old male patient presented with an abrupt onset of severe headache for the past week, preceded by a three-month history of mild headaches occurring 3-4 times per week. Patient not have any known co-morbidity and was initially managed with medications. After one week, he was referred with the radiographic imaging (CT scan), which revealed a right basifrontal resolving haematoma [Table/Fig-2a] without subarachnoid haemorrhage. MRI images also showed subacute haematoma in right basifrontal region with associated oedema [Table/Fig-2b]. The CT angiogram [Table/Fig-2c] and 3D reconstruction [Table/Fig-2d] demonstrated an abnormal vascular channel with aneurysmal dilatation at the base of the haematoma, drained into the superior sagittal sinus.

The patient underwent a right frontal craniotomy for haematoma removal and excision of the dilated venous channel using an endoscope-assisted microsurgical approach. Intraoperative findings included the identification of a large venous channel with an associated aneurysm at the base of the haematoma cavity, with the venous channel draining into the superior sagittal sinus. Endoscopic view [Table/Fig-2e] showed zoomed-in view of the dilated tortuous vein.

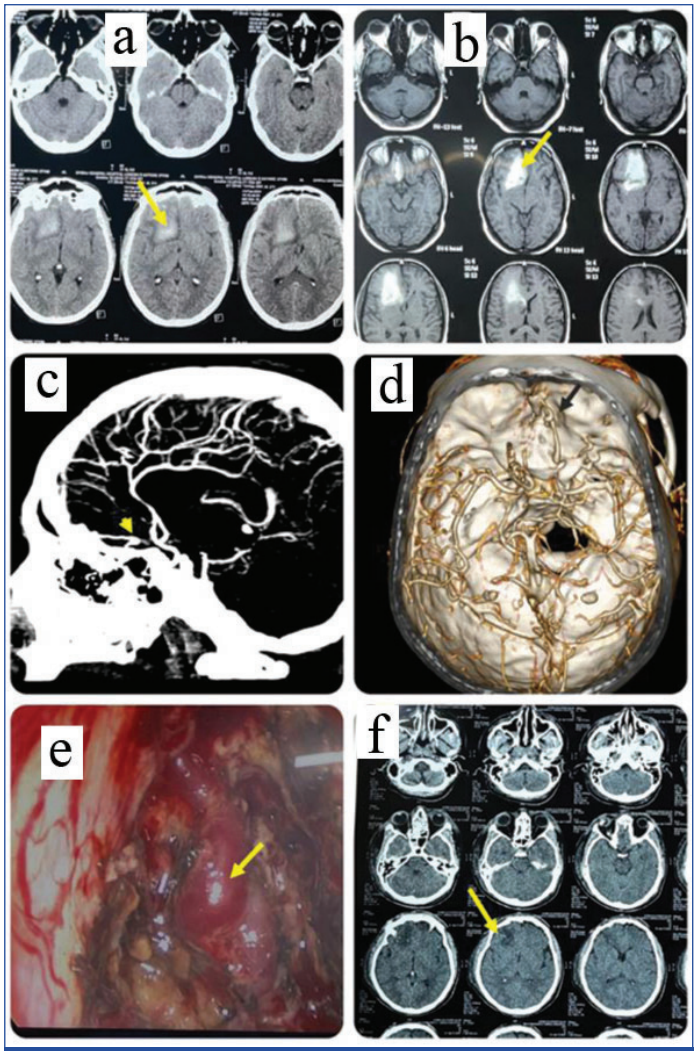
Postoperatively, the patient experienced no neurological deficits and follow-up CT scan [Table/Fig-2f] showed complete resolution of haematoma. On long-term follow-up patient remains symptom-free and neurologically intact.

DISCUSSION

Aneurysms are primarily arterial diseases; however, venous aneurysms, also known as isolated cerebral varices, can occur. These anomalies are often found in association with Arteriovenous Malformation (AVM) or Developmental Venous Anomalies (DVAs) due to increased arterial pressure on venous drainage [1,2]. Isolated cerebral varices are extremely rare and often incidental findings in imaging studies. They can present with symptoms such as seizures, intracranial haemorrhage, or neurological deficits when they rupture or exert mass effects on adjacent structures [3]. This article presents two cases of isolated cerebral venous aneurysms and reviews the current literature on their management.



[Table/Fig-1]: a) MR Venogram shows a large aneurysmal dilatation involving a vein draining into superior sagittal sinus; b) CT angiogram demonstrate a left basifrontal venous aneurysm; c) Magnetic resonance imaging with T2-weighted sequence revealed a large saccular-shaped flow void in the left basifrontal region, accompanied by a linear flow void; d) Preoperative planning included head positioning, incision planning and marking for craniotomy as depicted in figure; e,f) The intraoperative view showed a dilated, tortuous vein in the anterior frontal region which on tracing led to the aneurysm; g) The final view of the excised aneurysm; h) Postoperative CT scan.



[Table/Fig-2]: The radiographic imaging revealed right basifrontal parenchymal haematoma on plain CT scan and MRI; c) CT angiogram showed an abnormal dilated vessel with aneurysmal dilatation in basifrontal area; d) The 3D CT reconstruction further confirmed the presence of a venous aneurysm; e) The intraoperative endoscopic view is showing a dilated tortuous vein in the base of right frontal lobe; f) Postop CT scan shows complete evacuation of haematoma.

Cerebral venous aneurysms, also known as cerebral varices, are rare vascular anomalies characterised by the focal dilation of cerebral veins. Isolated cerebral varices were first described in 1987 and remain a rare finding [4]. Cerebral venous aneurysms are uncommon and can occur in isolation or in association with other vascular malformations, such as AVMs or DVAs [5]. The pathogenesis of these lesions is still debated, but they are believed to result from chronic venous hypertension caused by abnormal venous drainage [6].

These anomalies are often discovered incidentally during imaging studies but can occasionally present with clinical symptoms. Radiological diagnosis is essential for identifying these anomalies. Non contrast CT scans may show isodense lesions that can remodel adjacent bone. MRI provides detailed images of these lesions, showing intermediate signal intensity on T1-weighted images and high signal intensity on T2-weighted images. CT and MRI angiography help differentiate these anomalies from other vascular malformations and tumours [5,7].

The literature on cerebral venous aneurysms presents a spectrum of management strategies, with some authors advocating for conservative observation and other recommending surgical intervention, depending on the clinical context. [Table/Fig-3] represents data from the literature with an emphasis on management strategy [4,6-23]. Kim HS et al., emphasised the importance of conservative management for non-fistulous cerebral varices, noting that these lesions are often asymptomatic and can remain clinically silent for many years [6]. Their study of 39 cases found that most patients did not experience neurological events during follow-up and the authors suggested that regular imaging surveillance is sufficient for such cases, particularly when no symptoms are present.

Similarly, Sirin S et al., and Shibata Y et al., both reported cases of isolated cerebral varices where observation and follow-up were deemed appropriate [8,9]. They highlighted that in patients without symptoms or complications, the risks associated with surgical intervention may outweigh the potential benefits. For example, Shibata Y et al., described a case where an isolated deep Sylvian vein varix was managed conservatively with no adverse events during follow-up [9]. Ozturk M et al., advocated for observation in cases where the varices were discovered incidentally or during imaging for unrelated reasons [10]. The authors noted that spontaneous thrombosis of a giant cerebral varix in a paediatric patient resolved without the need for surgical intervention.

On the other hand, authors such as Tyson GW et al., and Roda JM et al., favoured surgical intervention in cases involving symptomatic lesions [11,12]. Tyson GW et al., described two cases of intracerebral haemorrhage resulting from ruptured venous aneurysms, both of which required surgical removal to prevent further complications [11]. Similarly, Roda JM et al., reported a case of intraventricular haemorrhage caused by a cerebral varix, where surgical excision of the lesion was performed to control the bleeding and reduce the risk of recurrence [12]. Kazumata K et al., and Kelly KJ et al., both highlighted the role of surgical resection in managing isolated cerebral varices presenting with neurological symptoms [13,14].

Author Name	Place and year of study	Localisation	Presentation	Management
Sirin S et al., [8]	Turkey, 2008	Left temporal	Absence seizures	Conservative management with follow-up
Tyson GW et al., [11]	UK, 1978	Right temporal lobe, left tempooroparietal region	Intracerebral haemorrhage	Surgical removal
Roda JM et al., [12]	Spain, 1988	Right lateral ventricle	Intraventricular haemorrhage	Surgical excision
Viñuela F et al., [15]	Canada, 1987	Left cerebellopontine angle, vein of galen, right occipital lobe, right temporal lobe, hypothalamic region, right parietal lobe, right cerebellopontine angle, right frontal lobe	Seizures, increased intracranial pressure, paresis	In six cases successful surgical and/or endovascular occlusion of the intracranial AV fistula was obtained and one case was treated conservatively.
Vattoth S et al., [16]	India, 2004	Right frontotemporal region	Generalised seizures	Conservative management
Shibata Y et al., [9]	Japan, 1991	Left deep sylvian vein	Incidental finding	No surgery, follow-up
Ozturk M et al., [10]	Turkey, 2017	Right parietal convexity	Spontaneous thrombosis	Observation
Numaguchi Y et al., [17]	Japan, 1986	Right parietal region	Decreased visual acuity, headaches	Conservative treatment
Kim HS et al., [6]	Korea, 2018	22 patients	Various	Conservative management, except with two presented with sinus pericranii
Chakraborty S et al., [18]	UK, 2010	Left temporal lobe	Haemorrhage	Endovascular occlusion
Nishioka T et al., [19]	Japan, 1990	Left insular	Seizures	Observation
Gomez DF et al., [20]	Colombia, 2016	Right temporal lobe	Headache	Observation
Kelly KJ et al., [14]	USA, 1995	Left temporal lobe	Dizzy spells, seizures	Surgical resection
Tan ZG et al., [21]	USA, 2016	Right frontal lobe	Headache, insomnia	Surgical removal
Kazumata K et al., [13]	Japan, 1999	Right cervical region	Palpable neck mass	Surgical resection
Hoell T et al., [4]	Germany, 2004	Right frontal lobe	Headache	Surgical excision
Inoue T et al., [22]	Japan, 2014	Right cerebellopontine angle	Trigeminal neuralgia	Microvascular decompression
Meyer FB et al., [23]	USA,1989	Right basal ganglia	Headache	Observation
Tanju S et al., [7]	Turkey, 2006	Left parietal	Headache	Surgical excision
Present case	India, 2024	Right frontal lobe	Seizures, Haematoma	Surgical excision

[Table/Fig-3]: Summary of reported cases of cerebral venous aneurysms and their management [4,6-23].

Kazumata K et al., reported a case of a palpable neck mass caused by varix in the internal jugular vein, which was successfully treated with surgical resection [13]. Kelly KJ et al., described a case of a patient with dizzy spells and seizures, where surgical intervention led to a favourable outcome [14].

Viñuela F et al., took a more endovascular approach, particularly in cases involving high-flow fistulas. They described the successful use of endovascular occlusion to manage giant intracranial varices associated with arteriovenous shunts, emphasising that this technique can be less invasive and more effective in reducing the risk of rupture [15].

In the first case, the patient presented with new-onset focal seizures that persisted despite antiepileptic therapy (levetiracetam and lacosamide). Given the aneurysm's location in a non eloquent brain area, surgical excision was deemed appropriate. Postoperative follow-up showed that the patient remained seizure-free for one year. In the second case, a young male presented with a ruptured cerebral varix causing a basifrontal haematoma. Surgical evacuation of the haematoma and excision of the venous aneurysm resulted in a complete resolution of symptoms. The patient remained symptom-free at the one-year follow-up. These cases highlight the importance of early surgical intervention in symptomatic cerebral venous aneurysms. Preoperative planning and intraoperative techniques must aim to preserve critical venous drainage pathways to minimise the risk of complications.

Given the diverse presentations and potential complications associated with isolated cerebral varices, there is a critical need for well-defined management guidelines. Distinct approaches should be established for extra-axial and intra-axial lesions, considering key factors such as symptomatic status, lesion size and anatomical location. The development of standardised protocols will assist clinicians in making informed decisions, carefully weighing the risks of conservative management against the potential benefits of surgical intervention. In the absence of comprehensive guidelines, published case reports serve as valuable references for surgeons seeking insights into optimal management strategies.

Although cerebral venous aneurysms are rare entities, endovascular treatment has emerged as a viable therapeutic option, however, typically not as a primary indication. Rather, such aneurysms are often treated in the context of underlying high-flow arteriovenous shunting, such as Pial Arteriovenous Fistulas (PAVFs), Dural Arteriovenous Fistulas (DAVFs), or complex DVAs with arteriovenous components. As documented in the literature, endovascular approaches including transarterial embolisation with Onyx, n-butyl-2-cyanoacrylate (NBCA) glue, or coils have been successfully employed for the management of venous pouches when they coexist with aggressive vascular lesions that pose a haemorrhagic risk [24-26].

For instance, Deniwar MA et al., demonstrated that large venous varices and aneurysms were not treated in isolation but addressed during transarterial embolisation of high-flow AVFs, often improving access and reducing haemodynamic stress on venous structures [24]. Similarly, Oh HJ et al., described the use of coil embolisation for a giant venous aneurysm associated with a single-channel pial AVF, focusing on fistula disconnection rather than direct aneurysm occlusion alone [25]. In a distinct case, Ducruet AF et al., reported successful endovascular treatment of a ruptured transitional aneurysm arising from a DVA with arteriovenous shunting, highlighting that embolisation was only indicated due to the dynamic, haemorrhagic nature of the lesion [26].

These cases collectively emphasise that cerebral venous aneurysms are rarely standalone indications for intervention. Instead, they are typically addressed as part of the broader management of underlying shunt pathologies, where controlling flow dynamics reduces aneurysmal stress and rupture risk.

CONCLUSION(S)

Cerebral venous aneurysms and isolated varices are rare but important vascular anomalies that should be considered in the

differential diagnosis of intracranial mass lesions. Timely diagnosis and appropriate management strategies can significantly impact patient outcomes. Further research and case reports are essential to better understand these rare lesions' natural history and optimal treatment approaches.

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