


Multiple Cerebral Dolichoectasia as a Potential Contributor to Intracranial and Intraventricular Hemorrhage During Hypertensive Crisis: A Case Report

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ABSTRACT

Introduction: Dolichoectasia (DE) represents an uncommon vascular anomaly of the brain, characterized by abnormal dilation and elongation of cerebral blood vessels. Its occurrence is relatively rare, with an estimated prevalence ranging from 0.05% to 0.06%. Although predominantly observed within the vertebrobasilar system, cases involving the anterior cerebral circulation have also been documented. Patients with DE are susceptible to intracranial and intraventricular hemorrhage. **Case**: A 54-year-old male with sudden extremity weakness, hypertensive crisis, and hyperlipidemia. CT imaging showed intracranial hemorrhage in the left thalamic and intraventricular hemorrhage in the posterior horn of the left ventricle with enlargement and tortuosity of the intracerebral artery and vertebrobasilar artery. These imaging findings led to a diagnosis of multiple cerebral dolichoectasia. The patient underwent conservative management with antihypertension and decompression therapy, leading to a gradual alleviation of symptoms. **Discussion:** Hypertension is considered the major risk factor for intracranial hemorrhage in this patient, while dolichoectasia may represent an associated vascular abnormality that potentially increases vessel wall vulnerability. Structural alterations in dolichoectatic vessels, including disruption of elastic fibers and remodeling of the tunica media, may contribute to reduced vascular integrity under severe hemodynamic stress. The coexistence of hypertensive crisis and multiple dolichoectasia may therefore increase susceptibility to hemorrhagic complications. **Conclusion:** CT imaging is essential for the diagnosis of dolichoectasia and the detection of associated complications, including intracranial and intraventricular hemorrhage. Early and accurate diagnosis may improve patient outcomes by enabling appropriate therapy.

Keywords: Dolichoectasia, case report, intracranial hemorrhage, intraventricular hemorrhage, vascular.

ABSTRAK

Pendahuluan: *Dolichoectasia* (DE) merupakan anomali vaskular otak yang jarang terjadi, ditandai dengan pelebaran dan pemanjangan pembuluh darah otak yang abnormal. Kejadiannya relatif jarang, dengan perkiraan prevalensi berkisar 0,05% hingga 0,06%. Meskipun sebagian besar diamati dalam sistem vertebrobasilar, kasus yang melibatkan sirkulasi serebral anterior juga telah didokumentasikan. Pasien dengan DE rentan terhadap perdarahan intrakranial dan intraventrikular. **Kasus:** Pria berusia 54 tahun dengan kelemahan ekstremitas mendadak, krisis hipertensi, dan hiperlipidemia. Pemeriksaan CT menunjukkan perdarahan intrakranial di talamus kiri dan perdarahan intraventrikular di *cornu* posterior ventrikel kiri dengan pelebaran arteri intraserebral dan arteri vertebrobasilar. Temuan pencitraan ini mengarah pada diagnosis dolichoectasia multipel serebral. Pasien menjalani penanganan konservatif dengan terapi antihipertensi dan dekompresi yang menghasilkan pengurangan gejala secara bertahap. **Pembahasan:** Hipertensi dianggap sebagai faktor risiko utama terjadinya perdarahan intrakranial pada pasien ini, sedangkan dolichoectasia dapat merupakan kelainan vaskular yang menyertai dan berpotensi meningkatkan kerentanan dinding pembuluh darah. Perubahan struktural pada pembuluh darah yang mengalami dolichoectasia, termasuk gangguan serabut elastis dan remodeling tunika media, dapat menyebabkan berkurangnya integritas vaskular pada kondisi stres hemodinamik berat. Oleh karena itu, koeksistensi antara krisis hipertensi dan dolichoectasia multipel dapat meningkatkan kerentanan terhadap komplikasi perdarahan. **Simpulan:** Pencitraan CT sangat penting untuk diagnosis *dolichoectasia* dan deteksi komplikasi terkait, termasuk perdarahan intrakranial dan intraventrikular. Diagnosis dini dan akurat dapat memastikan pengobatan yang efektif. **Agnes Triana Basja, Lathifatul Fikriyah. *Multiple Cerebral Dolichoectasia* sebagai Faktor Potensial Penyebab Perdarahan Intrakranial dan Intraventrikular Selama Krisis Hipertensi: Laporan Kasus.**

Kata Kunci: *Dolichoectasia*, laporan kasus, perdarahan intrakranial, perdarahan intraventrikular, vaskular.

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INTRODUCTION

Dolichoectasia (DE) is an uncommon vascular condition of the brain characterized by abnormal elongation, dilation, and tortuosity of blood vessels. It predominantly affects the vertebral and basilar arteries, but can also involve the intracranial arteries.[1,2] Vertebrobasilar dolichoectasia (VBD) refers to a condition marked by abnormal dilation, lengthening, and tortuosity of the vertebrobasilar arteries. Its prevalence has been reported to vary between 7.6% and 18.8% among individuals who have experienced a stroke and 1.3% to 4.4% in unselected populations.[3] Compared to the rare involvement of the anterior circulation, diffuse intracranial dolichoectasia, which affects both the anterior and posterior regions, is an exceedingly rare phenomenon. It is recognized as a separate vascular subtype, distinct from isolated vertebrobasilar dolichoectasia.[2] The exact etiology is unknown, but it appears to be associated with several other diseases, such as atherosclerosis, hypertension, collagen vascular disorders, polycystic kidney disease, and sickle cell anemia, which are conditions linked to this disease, with its prevalence rising alongside advancing age. Typically manifesting after the age of 40 and more frequently affecting males, the condition is further associated with conventional cardiovascular risk elements.[1,4] DE is predominantly identified by chance in clinical settings. Approximately 90% of cases remain asymptomatic. However, when manifestations do occur, they generally fall into three categories: ischemic events, hemorrhagic episodes, or symptoms resulting from mass effect.[1] In a previous study,[5] it was stated that patients with DE experienced intracranial hemorrhage with an unexpectedly high frequency.[4] Hemorrhagic extension into the ventricular system, observed in approximately 40% of cases, may occur at various stages, either during the initial or subsequent phases of the condition.[3] While conventional CT imaging remains the benchmark diagnostic tool, advanced modalities such as CT angiography and magnetic resonance angiography are increasingly relied upon for accurate assessment. Currently, there is no globally recognized or definitive therapeutic approach for managing DE. Medical management for ischemic symptoms includes antihypertension and decompression therapy.[4]

Although dolichoectasia is frequently identified incidentally and remains asymptomatic in most patients, its coexistence with severe hypertension may have important clinical implications. Structural abnormalities in dolichoectatic vessels, including elongation, dilation, fragmentation of elastic fibers, and remodeling of the tunica media, may reduce vascular wall integrity and alter hemodynamic stress distribution. In patients experiencing a hypertensive crisis, these vascular changes may increase susceptibility to vessel wall injury and hemorrhagic complications. The uniqueness of this case lies in the coexistence of multiple cerebral dolichoectasias and severe uncontrolled hypertension (212/152 mmHg), which may have contributed to the occurrence of intracranial and intraventricular hemorrhage. This report highlights the importance of recognizing vascular abnormalities that may influence clinical presentation and outcomes in patients with hypertensive cerebrovascular events.

CASE

A 54-year-old male presented to the emergency department with the sudden onset of weakness of the extremities. He had a previous history of hypertension, which had remained poorly controlled despite antihypertensive treatment, and a family history of hypertension. The patient had been hospitalized approximately five months earlier due to uncontrolled hypertension. He had a smoking history as an additional cardiovascular risk factor. At presentation, his blood pressure was markedly elevated at 212/152 mmHg, indicating a hypertensive crisis. The patient also had hyperlipidemia and a body mass index (BMI) of 31 kg/m², classified as obesity, which may have contributed to increased cardiovascular risk.

Neurological symptoms at admission included a sudden onset of right-sided weakness with a preserved level of consciousness (Glasgow Coma Scale (GCS) score of 15). A head CT scan performed on the first day demonstrated intracranial hemorrhage in the left thalamus and intraventricular hemorrhage in the posterior horn of the left lateral ventricle **(Figure 1)**, accompanied by enlargement and tortuosity of the intracranial and vertebrobasilar arteries **(Figure 2)**. The right intracranial artery diameter measured 7.9 mm, and the left side measured 7.3 mm. The

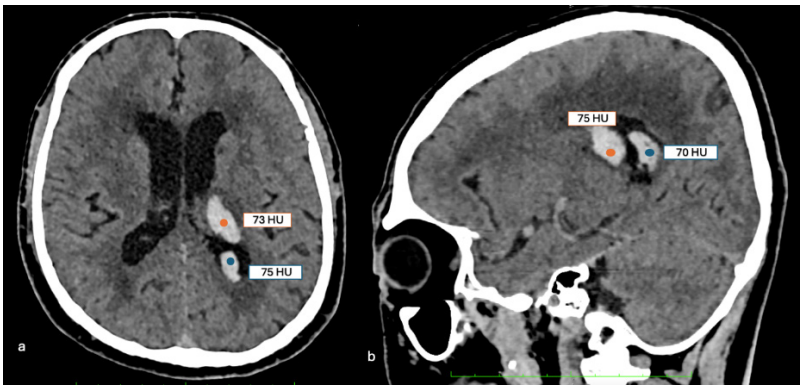

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Figure 1. a) Axial and b) sagittal CT images show hyperdense areas consistent with hemorrhage (50–80 HU/Hounsfield Unit) in the left thalamus (orange) and intraventricular hemorrhage in the posterior horn of the left lateral ventricle (blue).

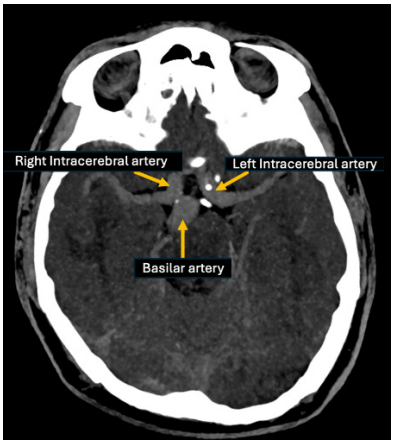

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Figure 2. Axial view showed enlargement of the intracerebral artery and basilar artery.


basilar artery measured 9.2 mm, and the left vertebral artery measured 5.8 mm **(Figure 3)**, with a basilar artery length of 2.8 cm **(Figure 4)**. These findings supported the diagnosis of multiple cerebral dolichoectasia.

He received conservative treatment consisting of antihypertensive and decompression therapy to reduce cerebral edema secondary to hemorrhage. During hospitalization, gradual clinical improvement was observed, accompanied by improvement in neurological symptoms. Blood pressure was successfully controlled to 130/90 mmHg after treatment. No additional neurological deterioration was observed during hospitalization. He was discharged after five days of hospitalization with a stable hemodynamic status and improved neurological symptoms. Follow-up evaluation demonstrated maintained blood pressure control and no evidence of further neurological deterioration.

DISCUSSION

The term "dolichoectasia" derives from the Greek words "dolicos," meaning excessively elongated, and "ectasis," meaning abnormal dilation. Over time, various terms, such as "mega aneurysm," have been used to characterize this vascular condition.[5] Vertebrobasilar dolichoectasia occurs with a prevalence rate of approximately 4.4%, with the basilar artery being the most frequently affected site (40%), cases involving both vertebral arteries along with the basilar artery make up 22%, and those with involvement of only the vertebral arteries constitute 16%.[6] Dolichoectasia commonly occurs in the posterior cerebral circulation but can also appear in the anterior part.[7] Among intracerebral arteries, the basilar artery is most commonly affected, likely because its bifurcation forms an obtuse angle that leads to specific hemodynamic consequences, including the generation of a reflected wave with maximal shear stress.[8] Intracerebral artery dolichoectasia has an estimated prevalence of 0.08% to 6.5% within the general population. Among individuals who have experienced a stroke, the prevalence rises significantly, ranging between 3% and 17%.[9] Diagnostic parameters for this condition typically include a basilar or vertebral artery diameter > 4.5 mm, a deviation > 10 mm from the expected linear trajectory **(Table).**[10]

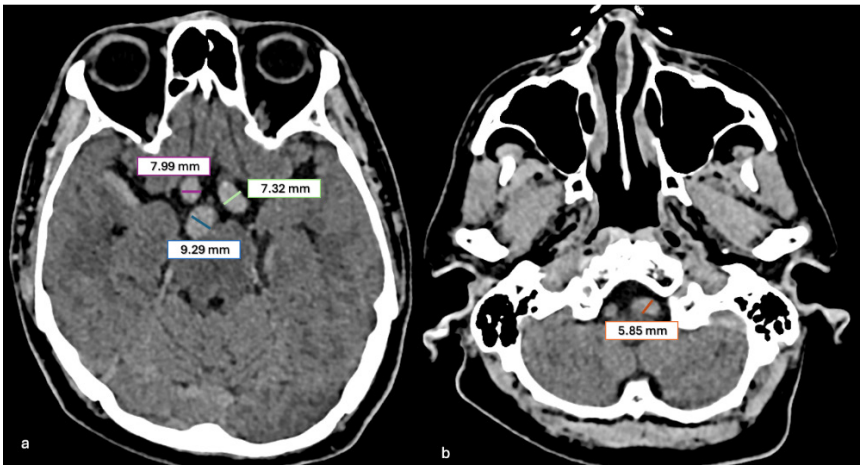

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Figure 3. a) Axial view showed diameter from intracerebral artery (right: +/- 7.99 mm; left: +/- 7.32 mm), basilar artery +/- 9.29 mm; b) Left vertebral artery +/- 5.85 mm.

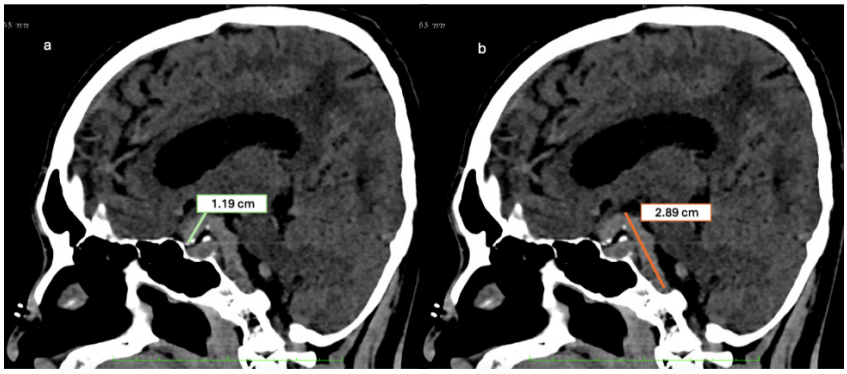

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Figure 4. Sagittal view showed basilar artery length. a) Part one +/- 1.19 cm; b) Part two +/- 2.89 cm.

Table. Diagnostic criteria for basilar artery dolichoectasia based on computed tomography.[11]

Basilar Artery Diameter
- Normal range: 1.9–4.5 mm - Ectasia: diameters greater than 4.5 mm
Basilar Artery Height (Plane of the Basilar Bifurcation)
- 0 : At or below the dorsum sellae - 1 : Within the suprasellar cistern (one cut above the dorsum) - 2 : At the level of the third ventricle floor (one cut above the suprasellar cistern) - 3 : Indenting and elevating the floor of the third ventricle (two or more cuts above the suprasellar cistern)
Basilar Artery Position (Most Lateral Position of the Basilar Artery)
- 0 : Midline throughout - 1 : Medial to the lateral margin of the clivus or dorsum sellae - 2 : Lateral to the lateral margin of the clivus or dorsum sellae - 3 : In the cerebellopontine angle cistern


Diagnostic thresholds for identifying ectasia in arteries other than the basilar artery are defined by specific diameter measurements: an internal carotid artery diameter of 7 mm or more, a middle cerebral artery diameter of 4 mm or greater, and a vertebral artery diameter of at least 4 mm.[6]

Dolichoectasia of the intracranial arteries is an infrequent condition, typically found in older adults and individuals with high blood pressure. The disorder affects the brain's arteries, making them dilated, elongated, and tortuous. It is broadly considered a subtype of arteriopathy. While the presence of atherosclerotic plaques in dolichoectatic arteries has led some to suggest it represents an advanced stage of atherosclerosis, most researchers disagree.[12] This is because key atherosclerotic indicators such as carotid intima media thickness, plaque volume, and stenosis show no significant link to dolichoectasia. Atherosclerosis, by contrast, is defined by damage to the arterial intima and plaque buildup.[8]

Intracranial arterial dolichoectasia is sometimes discovered unintentionally but can also manifest through neurological complications, including ischemic stroke, intracranial hemorrhage, or the compression of nearby neural structures.[9] Intraventricular and intracerebral hemorrhages were also observed in this case, along with calcification of the artery walls and dilatation of the internal carotid, basilar, and vertebral arteries. Given the presence of arteriosclerosis in chronic hypertension, it may reflect a final converging pathway of damage or adaptive changes in the tunica media of the arterial wall resulting from different pathogenic processes, which may involve abnormalities in matrix metalloproteinase (MMP) activity, disruptions in muscle cell integrity, or defects in elastic fiber injury resulting in rupture of dilated vessels leading to intracranial and accompanying intraventricular hemorrhage.[11] The most accepted theory indicates that vertebrobasilar dolichoectasia is triggered by impaired vascular remodeling and abnormal connective tissue composition in the arterial wall, caused by a disruption in the balance of matrix metalloproteinases and antiprotease activity. Pathologically, the vessel wall may show both clot formation and bleeding events.[12] In contrast to atherosclerosis, which is marked by endothelial injury and plaque accumulation, intracranial arterial dolichoectasia primarily affects the tunica media, where disruption of the internal elastic lamina, muscular atrophy, and hyalinization of connective tissues contribute to the vessel's abnormal expansion.[9]

Intracranial arterial dolichoectasia and intracranial atherosclerosis exhibit distinct patterns of vascular remodeling. Dolichoectasia primarily affects the tunica media by loss of elastic fibers and fragmentation of the internal elastic lamina, whereas atherosclerosis targets the intima through lipid infiltration and inflammatory activity.[13] The internal elastic lamina, composed of elastin and collagen, degenerates under prolonged hemodynamic stress, weakening the arterial wall. Intimal thickening often follows as an adaptive structural adjustment. Risk factors contributing to these changes include age, sex, vascular diseases like hypertension, and inherited metabolic abnormalities that affect interstitial vascular development.[7] It has also been observed that the pathophysiological process varies based on the specific elements of the tunica media that are involved. In patients with vascular risk factors, the extracellular matrix is typically affected, whereas in lysosomal disease, the pathology is more closely associated with smooth muscle cell involvement.[8]

Dolichoectasia is frequently asymptomatic and often identified incidentally, particularly in elderly individuals or those with longstanding hypertension. Posterior circulation involvement tends to be less symptomatic than anterior circulation involvement. When symptoms are present, they may include ischemic stroke, cranial hemorrhage, small vessel disease, brainstem or parenchymal compression, and hydrocephalus. Vertebrobasilar dolichoectasia may manifest as various neurological signs, such as cranial nerve paralysis or paresis, hydrocephalus, trigeminal neuralgia, hemifacial spasm, nystagmus, and ataxia due to mass effect from dilated vessels. In contrast, anterior circulation dolichoectasia is associated with seizures, headaches, chiasmal compression and visual field loss, diplopia due to cavernous sinus compression by the dolichoectatic internal carotid artery, unilateral vision loss from supraclinoid segment involvement, hydrocephalus, and dementia. Arterial rupture may lead to intracranial hemorrhage (ICH) and consequent mass effects.[8] Patients experiencing hemorrhage typically present with a sudden onset of intense headache. The bleeding may be attributed to vascular bed damage resulting from vertebrobasilar dolichoectasia in combination with hypertensive atherosclerotic degeneration, which progressively impairs the arteriolar walls.[14] Some research suggests that a higher rate of arterial wall enlargement correlates with an elevated risk of rupture and subsequent infarction.[15]

Managing vertebrobasilar dolichoectasia is particularly difficult due to the absence of a universally accepted treatment strategy, and it typically entails a poor prognosis.[14] The condition is associated with a 5-year mortality rate of 36.2%.[16] Patients who are asymptomatic at diagnosis often have better clinical outcomes, and conservative treatment may be recommended following an evaluation of risks and benefits by medical professionals.[17] In contrast, effective interventions for symptomatic individuals, especially those experiencing ischemia, hemorrhage, or compression, are currently lacking.[14] The best conventional management of dolichoectasia may be the control of arterial hypertension.[15] The prognosis of vertebrobasilar dolichoectasia can be improved through meticulous management of vascular risk factors, especially stringent control of blood pressure. Endovascular procedures may be an option following careful patient-specific evaluation of potential benefits and risks. Advancements in research and techniques are critical for developing more effective treatment approaches.[7]

Several previous case reports have described intracranial hemorrhage associated with dolichoectasia; however, the clinical presentation and management strategies have varied. Kim, *et al*., reported a patient with giant vertebrobasilar dolichoectasia presenting with acute subarachnoid hemorrhage who required intensive management because of the severity of vascular involvement and risk of neurological deterioration. Similarly,


Prasad, *et al*., described vertebrobasilar dolichoectasia with characteristic radiological findings managed conservatively with close monitoring and control of vascular risk factors. In many reported cases, strict blood pressure control remains a cornerstone of management, as no universally accepted treatment strategy currently exists for dolichoectasia itself. Conservative treatment is generally preferred in stable patients, whereas endovascular interventions are reserved for selected symptomatic cases or progressive vascular abnormalities.

The uniqueness of the present case lies in the coexistence of multiple cerebral dolichoectasias involving both intracranial and vertebrobasilar arteries with severe uncontrolled hypertension (212/152 mmHg), obesity (BMI 31 kg/m^2), hyperlipidemia, and smoking history. Although dolichoectasia may have been an incidental vascular finding, the coexistence of multiple cardiovascular risk factors may have created substantial hemodynamic stress on structurally vulnerable vessels, potentially increasing susceptibility to intracranial and intraventricular hemorrhage. In contrast to previous reports that frequently described isolated vertebrobasilar involvement, this case demonstrated diffuse vascular involvement associated with hypertensive hemorrhagic presentation and favorable clinical improvement following conservative management with successful blood pressure control to 130/90 mmHg.

CONCLUSION

This case highlights that although multiple cerebral dolichoectasias may be identified incidentally, their coexistence with severe uncontrolled hypertension and other cardiovascular risk factors may increase vulnerability to hemorrhagic complications. CT imaging plays an essential role in identifying vascular abnormalities and associated intracranial complications, allowing timely diagnosis and appropriate management. Clinicians should maintain awareness of underlying vascular abnormalities in patients with hypertensive cerebrovascular events, while aggressive control of modifiable risk factors such as hypertension, obesity, smoking, and dyslipidemia may help reduce future neurological complications and improve patient outcomes.

Informed Consent

The patient or a family member has provided written or verbal consent for the publication of the manuscript and all identifiable data.

Conflict of Interest

The author declares the absence of any conflict of interest in the conduct of this study.

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Consent Statement

Written consent had been obtained.

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