

# Basilar Rete Mirabile: Case Report

## Baziler Rete Mirabil

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**ABSTRACT** Carotid rete mirabile is a well-defined entity corresponding to a transdural arterial network between the internal and external carotid arteries at the level of the intracavernous internal carotid artery. Some cases of similar arterial networks in the vertebrobasilar system were reported in association with carotid rete mirabile. In this report, we presented a 66 year-old female patient with hemiparesis. Standard digital subtraction angiography of the both carotid and vertebral systems revealed absence of basilar artery and formation of basilar rete mirabile. The patient has been followed-up for one-year under the anti-platelet therapy in the neurological outpatient clinic without episodes of vertebrobasilar system symptoms. This is the first case of case of basilar rete mirabile without carotid rete mirabile in humans due to atherosclerotic vascular structure.

**Key Words:** Basilar artery; congenital; carotid artery, internal; vertebral artery

**ÖZET** Karotid rete mirabile internal ve eksternal karotid arterler arasında özellikle intrakavernöz bölümde gözlenen oldukça iyi bilinen transdural arteriyel ağ yapısıdır. Vertebrobaziler sistemde benzer özelliklere sahip karotid rete mirabile ile ilişkili mirabile olguları bildirilmiştir. Bu çalışmada 66 yaşında sol hemiparezisi olan kadın hastayı sunmaktayız. Bilateral karotid ve vertebrobasiler anjiyografisinde baziler arterin olmadığı ve baziler rete mirabile formasyonu olduğu görüldü. Vertebrobaziler yetmezlik atakları olmadan, antitrombosit tedavi altında, 1 yıl süreyle nöroloji polikliniğinde takip edildi. İnsanlarda aterosklerotik damar değişikliklerine bağlı olarak gelişen, karotid rete mirabile olmaksızın baziler rete formasyonu literatürde bildirilen ilk olgudur.

**Anahtar Kelimeler:** Baziler arter; doğumsal; karotis arter, internal; vertebral arter

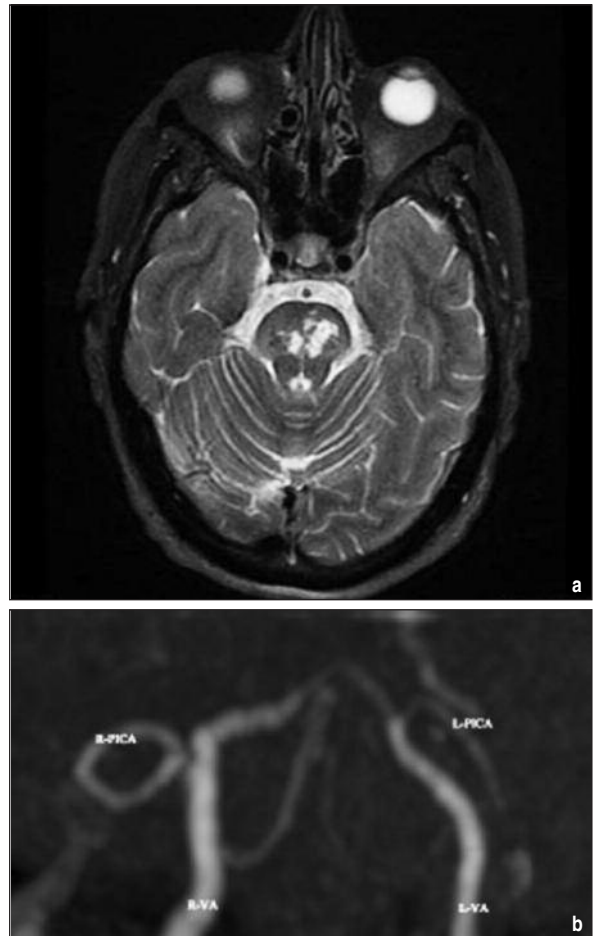
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Carotid rete mirabile (CRM) is a well-defined entity corresponding to a transdural arterial network between the internal and external carotid arteries at the level of the intracavernous internal carotid artery (ICA).<sup>1-3</sup> Although this arterial network system is a physiological condition in some lower mammals, it is rarely observed in humans associated with developmental abnormalities such as agenesis, aplasia or hypoplasias of the ICA.<sup>2,3</sup> Some cases of similar arterial networks in the vertebrobasilar system were reported in association with CRM.<sup>1-4</sup> To our knowledge, few cases of both carotid and basilar rete mirabile (BRM) in humans have been reported in the literature.<sup>1,3</sup> The most common symptoms are vertigo, cranial nerve palsies, motor weakness and alteration in consciousness due to brain stem or thalamic ischemia. The etiology is congenital anomalies of

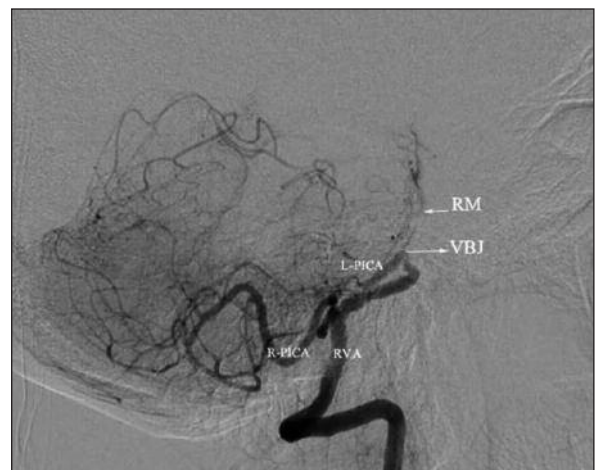
the vessel during the embryological development process in many cases. We report a BRM due to atherosclerotic vascular changes associated with age. A radiological description and a brief explanation for the possible pathogenesis of BRM are presented.

## CASE REPORT

A 66-year-old woman presented with right sided hemiparesis and headache. Past medical history was significant for hypertension and atherosclerotic vascular disease. She was alert and fully oriented with fluent speech. The patient had no neurological abnormalities except minimal right side hemiparesis. Cranial magnetic resonance imaging revealed recent/old ischemic watershed changes in posterior circulation in relation with RM (Figure 1a, b). Bilateral carotid and vertebral artery Doppler ultrasonography revealed echogenic and calcified atherosclerotic plaques causing stenosis of approximately 70% of the left carotid bulb and extending into the left ICA. Standard digital subtraction angiography (DSA) of the arch and both carotid vertebral systems was performed. The left carotid angiography revealed 60% stenosis of the ICA due to atherosclerotic plaque formation. Bilateral vertebral artery (VA) angiography incidentally demonstrated absence of the basilar artery (BA) and both posterior cerebral arteries. An abnormal arterial network at the level of the BA instead of a main trunk and numerous thin vessels around the brain stem were noted (Figure 2). Both posterior communicating arteries were not evident and no flow from the anterior circulation to the vertebrobasilar system was observed on brain magnetic resonance angiography. The antero-posterior right vertebral artery angiography revealed a right VA, an absence of BA and normal posteroinferior cerebellar arteries (PICA) (Figure 3). A complete arterial check-up of arteries was done (renal, coronary, eye arteries) to exclude a more widespread disease (e.g. pseudoxanthoma elasticum). There was no another anomaly. The patient has been followed-up for one-year under the antiplatelet therapy in the neurological outpatient clinic without episodes of vertebrobasilar system symptoms.

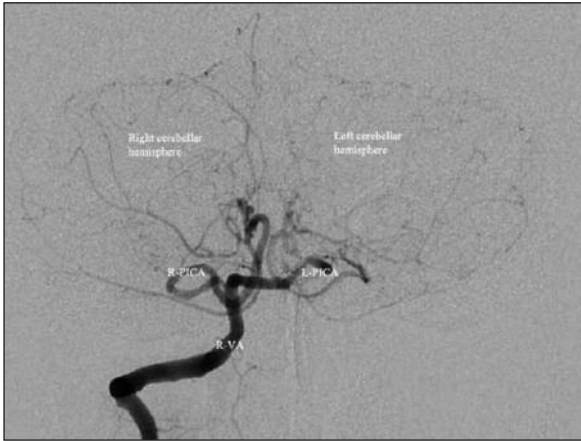


**FIGURE 1:** Axial T2-weighted cranial MRI (a) and magnetic resonance angiography (b) shows recent/old ischemic watershed changes in pons in relation with basilar rete mirabile. While vertebral artery and vertebrobasilar junction are clearly seen in magnetic resonance angiography, basilar artery is absent.



**FIGURE 2:** Lateral projection of the right vertebral angiography shows an abnormal arterial network at the level of BA instead of a main trunk (white arrow), as well as numerous thin vessels around the brain stem.

L-PICA: Left posteroinferior cerebellar artery; R-VA: Right vertebral artery; R-PICA: Right posteroinferior cerebellar artery; VBJ: Vertebrobasilar junction.



**FIGURE 3:** The frontal projection of the right vertebral angiography shows both posteroinferior cerebellar arteries were normal in their own course; cerebellar hemispheres were supplied mainly by the PICAs and absent of basilar artery. L-PICA: Left posteroinferior cerebellar artery; R-VA: Right vertebral artery; R-PICA: Right posteroinferior cerebellar artery; VBJ: Vertebrabasilary junction.

## DISCUSSION

Carotid rete mirabile is formed by collateral anastomosis between both ICA, usually located around the parasellar region. Carotid rete mirabile and absence of BA together corresponds to a rare association.<sup>2,3</sup> Our patient seems to be the first reported case of BRM without an associated developmental ICA anomaly. Although an exact cause for these types of congenital, developmental anomalies (e.g. ICA absence) has not been established, they probably represent the sequel of an

insult to the developing embryo.<sup>4</sup> Late regression of embryonic vessels can lead to regression of a given artery. The absence of a given artery precursor may, therefore, cause that embryonic vessels (branchial and segmental arteries) give rise to collateral vascularization. In this situation, rete mirabile can be formed to reconstitute regressed segments involving the path of former embryonic arteries. Late regression of embryonic vessels is commonly the accepted theory for the etiopathogenesis of ICA rete formation.<sup>4-6</sup> As proposed by Sahin et al., the potential trigger causing late regression of both ICA and BA should be same, and so the corresponding formation of both ICA and BA rete.<sup>3,5</sup>

As a conclusion, it seems that the trigger is causing only formation of intracranial BA rete, instead of a rete involving the “transdural” segments of ICA. In the presented case, We think that BRM formation was occurred as a result of chronic atherosclerotic and occlusive vascular changes. Basilar artery occlusion was well tolerated consisting of dense collateral vessels which seem like rete formation in angiography.

Although the precise etiopathogenesis remains unknown, this particular type of rete mirabile might have been the result of chronic atherosclerotic and occlusive vascular changes and should be keep in mind for differential diagnosis.

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