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Short Communication

How Much We Know about Dolicoarteriopathies

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Abstract

Vertebral and carotid artery dolicoarteriopathies, including elongation, kinking, and coiling, are linked to various cerebrovascular dysfunctions. Kinking, categorized by Metz, et al. is graded by angle severity: Grade 1 (90° - 60°), Grade 2 (60° - 30°), and Grade 3 (< 30°). In Grades 2 and 3, reduced blood flow heightens ischemic risk, contributing to hemodynamic instability and cerebrovascular insufficiency. While most symptomatic cases undergo endovascular or surgical correction, some patients with severe kinking remain asymptomatic, questioning current understanding. In 150 cases of carotid or vertebral artery kinking, we observed stenosis in symptomatic patients, differing from the expected arterial enlargement seen in dolicoarteriopathies. This suggests two potential kinking types: stenotic and enlarged. A notable case presented bilateral Grade 3 internal carotid artery kinking, with right-sided stenosis and cerebral hypoperfusion, yet left-sided transient ischemic attacks occurred. This finding challenges existing classifications and suggests further investigation is warranted.

Vertebral artery and carotid artery dolicoarteriopathies, encompassing elongation, kinking, or coiling of the vessel, have been identified as contributors to a spectrum of cerebrovascular dysfunctions. [1,2] Kinks are classified according to Metz et al., classification according to the severity of the angle [3]. (Grade 1: 90° - 60° (mild kinking), Grade 2: 60 - 30 (moderate kinking), Grade 3 < 30° (severe kinking)). Especially, in grade 2 and 3 dolicoarteriopathies, there is a reduction in blood flow, which escalates the risk of ischemic events [4]. Such vascular anomalies can lead to hemodynamic disturbances and are implicated in vertebrobasilar and cerebrovascular insufficiency pathophysiology. These vascular aberrations can disrupt hemodynamic stability. Endovascular or surgical procedures are tailored to address these specific vascular anomalies present in dolicoarteriopathies, offering alternative avenues for restoring cerebral hemodynamics and alleviating the associated neurological symptoms [5-7].

However, in clinical practice, most of us have seen that some patients with grade 2 or 3 kinking have no neurological

symptoms. After operating over 150 cases due to carotid or vertebral artery kinking we have observed that in all of these symptomatic cases, the kinking area was stenotic. All surgeries were performed by the senior surgeon, with informed consent obtained from all participants. The local ethics committee approved the study, documented under approval number 2/12 dated 03.30.2022. From the literature, we know that in dolicoarteriopathies the arteries are enlarged even in kinking cases. But in our cases they were stenotic. Therefore in our operations, we used a technique that has been used for the first time in dolicoarteriopathies. After arteriolysis (releasing the artery from surrounding fibrotic tissue and thickened adventitia) we cut the sympathetic fibers around the vessel under microscopic magnification which we named perivascular sympathectomy [8,9]. The dilatation of the vessel with this technique showed us that the main pathology was outside the vessel (Figure 1) This observation raises an important question do at least kinkings apart from dolicoarteriopathies, have two types stenotic and enlarged?

In one case (Figure 2) the patient had grade 3 kinking in both Internal Carotid Arteries (ICA) at the same level, but interestingly right ICA was stenotic, but the left was not. The patient had cerebral hypoperfusion on the right side, but not on the left, and experienced 3 times left-sided Transient Ischemic Attacks (TIA).

Conclusion

Dolicoarteriopathies, particularly severe forms of kinking, have long been associated with reduced cerebral blood flow and increased ischemic risk. However, our observations challenge the prevailing understanding that these vascular anomalies primarily involve arterial enlargement. In a series of 150 cases, we found that symptomatic patients often exhibited arterial stenosis at the kinking site, which was corrected with a new technique named perivascular sympathectomy, suggesting the existence of two distinct types of kinking: stenotic and enlarged. This finding is further supported by a case of bilateral Grade 3 internal carotid artery kinking, where only the stenotic side caused hypoperfusion despite identical anatomical presentations. These results highlight the need for re-evaluating the clinical approach to dolicoarteriopathies, particularly regarding the differentiation of kinking types, and suggest a potential shift in treatment strategies based on

hemodynamic profiles rather than anatomical classification alone.

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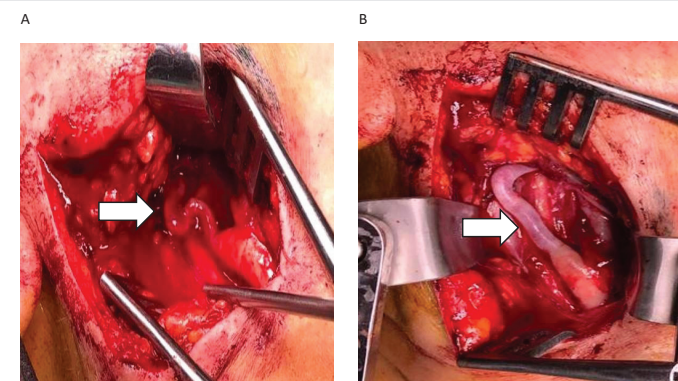


Figure 1A,B: A: Intraoperative view after arteriolysis, the arrow shows the kinking and stenosis at the right internal carotid artery. B: Intraoperative view after perivascular sympathectomy, the arrow shows the dilatation at the right internal carotid artery.

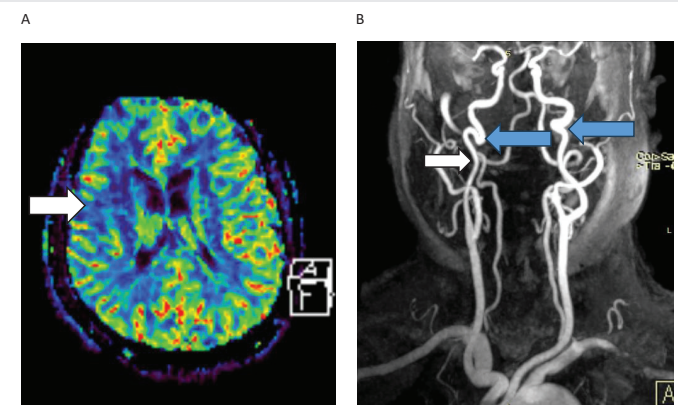


Figure 2A,B: A: Magnetic perfusion image showing right-sided hypoperfusion with white arrow. B: Magnetic neck angiography showing distal cervical internal carotid artery grade 3 kinking at both sides but with shown with blue arrows, stenosis at the right side shown with white arrow.

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