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Research Article

Hexafurcation of Basilar Artery in a Black Kenyan Population

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Abstract

Pattern of terminal branching of the basilar artery may influence predisposition to atherosclerosis and aneurysms. Knowledge of unusual patterns is also important in interpretation of extent of stroke and during neuroradiological and neurosurgical procedures at basilar artery termination. Two hundred brains of black Africans were studied for pattern of variant termination. We observed two cases of unusual termination: two hexafurcations. All these cases were associated with variant origin of superior cerebellar and thalamoperforator arteries. This suggests that variant termination of basilar artery may include hexafurcation consequent to unusual origin of superior cerebellar and thalamoperforator arteries. Neurosurgeons, neurophysicians, neuroradiologists should be aware of such strange terminal branching pattern if they are to avoid inadvertent vascular injury. We recommend preoperative evaluation of the region before surgery.

Keywords: Basilar artery; Hexafurcation; Africans; Atherosclerosis

Introduction

The Basilar Artery (BA), usually terminates by dividing into two posterior cerebral arteries [1,2]. Variant terminations described include double posterior cerebral arteries and common trunks for Posterior Cerebral Arteries (PCA) and Superior Cerebellar Arteries (SCA) trifurcation, quadrifurcation and pentafurcation [3-5]. Such variant branching patterns of arteries predisposes them to atherosclerosis and aneurysms [6,7], and may complicate surgery at basilar bifurcation angle and clivus [8]. The abnormalities may also alter the relationships with and compress occulomotor nerve [9]. There are, however, few reports on variant termination of the basilar artery. We recently reported up to 5 branches. In all cases of trifurcation, qudrifurcation and pentafurcation, the variation was due to duplication and rostral shift of superior cerebellar artery [4]. Potentially, more than five branches is possible but hitherto unreported in spite its importance. This study, therefore investigated the pattern of termination of the basilar artery in a black Kenyan population, for cases where there were more than five terminal branches.

Materials and Methods

Two hundred brains were examined. The arachnoids matter was gently peeled off to expose the basilar artery in its entire length. Pia matter, veins and small perforating arteries were sacrificed to clarify the pattern of termination. The termination was examined further for unusual terminal branching pattern. The arteries given off just before terminal bifurcation, which coursed laterally to ramify over the superior surface of cerebellar hemispheres, were identified as Superior Cerebellar Artery (SCA). The terminal branches which were joined to internal carotid by posterior communicating were identified as Posterior Cerebral Artery (PCA). Images of these patterns were taken with a high resolution digital camera.

Results

Unusual terminal branching of basilar artery, hexafurcation, whereby the basilar artery gave rise to six unequivocal branches was noted in two cases. In one, there were two superior cerebellar arteries arising from the same point as PCA bilaterally (Figure 1A). In the second one, the unusual rostral superior cerebellar artery was duplicated unilaterally, and one enlarged thalamoperforator arose from basilar bifurcation (Figure 1B).

Discussion

Hexafurcation of basilar artery is hitherto unreported. Such branching patterns are potential sites for development of atheromatous lesions because of complex flow patterns such as recirculation and secondary flow causing abnormal haemodynamic

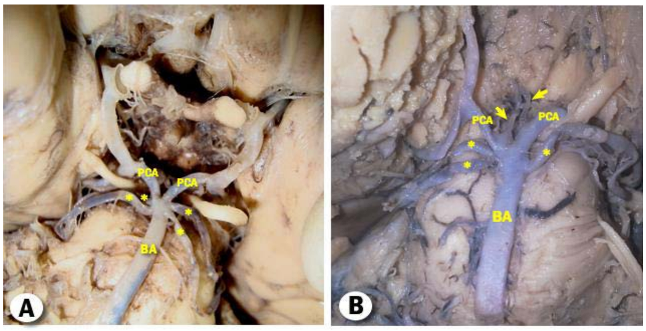

Figure 1A-B: Variant termination of basilar artery in a black Kenyan population.
BA: Basilar Artery; PCA: Posterior Cerebral Artery; TPA: Thalamoperforator Arteries
A) Note bilateral duplication of superior cerebellar artery (asterisk) and narrow bifurcation. B) Note unilateral duplication of superior cerebellar artery (asterisk) and thalamoperforator artery (arrow) arising from basilar artery bifurcation. A second thalamoperforator artery (arrow) arises from PCA.

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events referred to as "disturbed flow" [7,10]. In our recent account of variant termination of basilar artery, the most common cause of variations was additional SCA [4]. We discussed the importance of this pattern. In the current report, duplication SCA is still an important factor. The game changer, however, are the thalamo perforator arteries. These usually arise from the initial segment of posterior cerebral and posterior communicating arteries [11,12]. In the current study, they arose from the basilar bifurcation. This is concordant with isolated reports that 1 - 5 rostral perforators may arise from basilar termination [12,13].

These variations may be attributed to the pattern of embroyological development of basilar artery. This artery initially appears as a plexus of paired anterior longitudinal neural arteries which anatomize into a single basilar artery. These variation may result from defective fusion and remodeling of these arteries [14,15].

Literature is silent on the significance of these variations. Nonetheless, variant branching like trifurcations of other arteries in the brain, say of middle cerebral arteries are favorable lodging sites for cerebral emboli with consequent ischemia of the affected region [16]. Accordingly, the unusual pattern observed in the present study implies that in case of basilar artery thrombosis, embolic occlusion of the branches is most likely to occur. Knowledge of these variations is important to enable neuroradiologists and neurosurgeons, surgeons safely diagnose as well as plan and execute interventions for disorders at basilar bifurcation. For example, execute vascular by – pass and shunting for treatment of stenosis, aneurysms and A - V malformations [17].

Conclusion

Variant termination of the basilar artery may include hexafurcation consequent to unusual origin of superior cerebellar and thalamoperforator arteries. Physicians, surgeons and radiologists should be aware of the unusual terminal branching patterns when managing posterior circulatory stroke or other posterior cranial fossa pathologies. We recommend preoperative evaluation of the region before surgery.

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