Trifurcation of basilar artery

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Abstract

Variant termination of basilar artery influences occurrence of atherosclerosis and aneurysms, and is also important during cerebrovascular surgery and interventional neuroradiology at the basilar bifurcation, interpeduncular fossa and clivus. There are, however, hardly any reports on these patterns. Usually basilar artery bifurcates at the upper border of pons into two posterior cerebral arteries better known as bifurcation pattern. In the present variation trifurcation of basilar artery was noticed with occurrence of common trunk of origin for superior cerebellar and posterior cerebral artery which represents a rare anatomical variation. Anticipation of this variation is important during neuroradiology, cerebrovascular surgery and interpretation of posterior circulatory stroke.


Key words [basilar artery] [variations] [termination]

Introduction

The anatomy of the posterior circulation is very complex and variable. The basilar artery which forms the spine of posterior cerebral circulation usually terminates by dividing into two posterior cerebral arteries [1]. Basilar termination is the most frequent site of aneurysm [2]. The variations may also alter the relationships with and compress oculomotor nerve [3]. There are, however, few reports on variant termination of the basilar artery. These variations are related to the pattern of origin of superior cerebellar artery [4]. Trifurcation of basilar artery is very rarely reported and the knowledge of this variation might be important clinically in cerebellopontine angle and clivus surgery.

Case Report

The variation was encountered during a preliminary stage of a study on the cerebral arterial territory in 30 cadaveric brain specimens. In present report, trifurcation of basilar artery was noticed (Figure 1).

One branch continued as common stem for posterior cerebral artery and superior cerebellar artery of right side and the origin of superior cerebellar artery was seen from P1 segment instead of directly arising from basilar artery. One branch was seen to be a direct continuation of basilar artery and it gave origin to left posterior cerebral artery. One branch was the superior cerebellar artery of left side.

Discussion

Pattern of basilar artery termination influences occurrence of aneurysms and atherosclerosis [5] and may complicate surgery at basilar tip and clivus [6]. Bifurcation of basilar artery is an important determinant of the initial course of the superior cerebellar artery, which is most consistent artery in the posterior circulation in terms of origin and location. It usually originates bilaterally from the distal portion of the basilar artery as a single main trunk. Whereas normal posterior cerebral artery arises at the bifurcation of the basilar artery, is joined by the posterior communicating artery, and is divided into four segments (P1-P4) throughout its course [7]. In present case, the origin of right superior cerebellar artery from P1 segment of the posterior cerebral artery instead of basilar artery, gives appearance of trifurcation of basilar artery as shown in Figure 1. Nonetheless, trifurcation 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 [8]. Accordingly, trifurcation observed in the present case implies that in case of basilar artery thrombosis, embolic occlusion of the branches is most likely to occur. This
variation is hardly reported in literature and Caruso et al. [9] considered it as a rare variation.

A brief review of the embryogenesis of the cerebral circulation may be helpful to understand this rare variation. In 4 mm embryos, the carotid system supplies the forebrain and contributes to the perfusion of the hindbrain via primitive segmental arteries. The vertebral arteries develop from a pair

of primitive longitudinal arteries connected laterally to the primitive hindbrain plexus (stage 1 of Padget) [10]. Soon after (stage 2 of Padget), fusion ofplexiform bilateral longitudinal arteries forms a single basilar artery. And the caudal portions of well defined internal carotid channels anastomose with the cranial parts of the longitudinal neural arteries via posterior communicating arteries which further continued as posterior cerebral artery [10]. If full development is not completed, variations will occur, which will play an important role in the presence of aneurysmal vascular pathology [9].

We propose the following ontogenetic interpretations for this variant: 1) Lack of normal fusion of the basilar artery at the origin of the superior cerebellar artery during development of the basilar artery from the primitive neural arteries. 2) The posterior cerebral artery, which connects to the carotid system and primitive neural arteries, anastomose with the basilar artery caudally at point lower than the normal site. Hence, the origin of the superior cerebellar artery from the posterior cerebral artery is most probably associated with the unusual development of the distal basilar region during embryogenesis.

Thus, a descriptive knowledge of the anatomy of this area is important during neuroradiology, cerebrovascular surgery and interpretation of posterior circulatory stroke.

References