

Original Research Article

The formation of basilar artery and its significance

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Abstract: Vertebro-basilar artery supplies the 20% of the blood supply of the brain. The formation of basilar artery is unique in our body system; it forms the important part in the posterior circulation. The aim of the study is to observe and record the length, the angle of formation of basilar and diameter of vertebral artery and compare the results with significance in the course of basilar artery. The study was done in 50 adult cadaveric human brains from Department of Anatomy, Vinayaka Missions Medical College, and Karaikal. The length and angle was measured using Digital Vernier caliper and Goniometer. The normal level of formation is 62%, angle of formation is between 40° to 90°, and the unequal diameter of right and left vertebral artery was observed in 22 specimens. The difference in diameter is one of the main factors for the formation of bending in basilar artery. And, these variations in the curvature of basilar artery is very important for clinical investigation and surgery.

Keywords: basilar artery, vertebral artery, length of basilar artery, angle of formation, diameter of vertebral artery

INTRODUCTION:

The basilar artery is formed by the union of the right and left vertebral arteries at the level of pontomedullary junction. It runs over the ventral surface of the pons in the shallow groove and terminates in the upper border of the pons by dividing into right and left posterior cerebral arteries [1]. The normal formation of the basilar artery is more essential for the posterior circulation. Even a short hindrance of basilar artery for more than 7 minutes can cause severe and irreversible damage to the cells of the brain. Moreover, it is that variation in the morphology of basilar artery can be the etiological factor for many pathological conditions like atherosclerosis, infarcts, leading to stroke [2] and even trigeminal neuralgia. The aim of the study is to document the formation of basilar artery based on the level, angle of formation and the diameter of vertebral artery, also to determine the possible relationship between level, angle and diameter with the bending of basilar artery. As the basilar artery plays an important role in the posterior circulation, we undertook the study to ascertain the significance of the basilar artery.

METHODS:

The study was conducted in 50 adult human cadaveric brain specimens from the Department of Anatomy, Vinayaka Mission's Medical College, and

Karaikal for a period of eight years. The specimens are well preserved and kept in 10% formalin. Using magnifying hand lens, the diameter was measured using the Digital Verniercaliper (sensitivity: 0.01mm) and the angles were measured using the Goniometer. The variation in the formation of basilar artery are noted and photographed. The data obtained was tabulated. Institutional Ethical Committee of Vinayaka Mission's Medical College and Hospital, Karaikal, approved the study.

RESULTS:

The formation of basilar at the Pontomedullary junction is seen in 62%, above the ponto medullary junction is 16% and 22% below the junction. The angle of formation is between the 40° to 90°.

The vertebral artery with symmetrical diameter is observed in 28 specimens (56%) and asymmetrical is observed in 22 specimens (44%).The larger left vertebral artery is seen in 17 specimens in which 13 specimens is showing bending towards right side. Large right vertebral is seen in five specimens of that 3 brain specimens are bend towards left side.

DISCUSSION:

The level of formation of basilar artery determines the length of basilar artery. In our study, it

was same as the studies done by Harish Wakhede *et al.*; [3].

Table 1: Variation in the level of formation of basilar artery

| Level of formation | Vare A.M and Bansal[4] | Padmavathi.G[5] | Hosapatna Mamatha [2] | Harish A Wankhede [3] | Present study |
|---|------------------------|-----------------|-----------------------|-----------------------|---------------|
| At Ponto-medullary junction(P-M Junction) | 79.4% | 44.4% | 65% | 62.50% | 62% |
| Above P-M junction | 4.5% | 16.6% | 10% | 25% | 16% |
| Below P-M Junction | 16% | 38.8% | 25% | 12.25% | 22% |

The angle of formation of basilar artery by Padmavathi *et al*[5] is ranged between 50° to 90°, Hosapatna Mamatha *et al.*[2] is 45° to 70°, and Pai BS *et al*[6] was 40° to 80° degrees, and our study it is 40° to

90°. It has been hypothesized that the haemodynamic factors at the arterial bifurcation plays a vital role in the formation of aneurysm [7].

Table 2: variation in the formation of vertebral artery

| Diameter of vertebral artery | Padmavathi <i>et al.</i> [5] (54 specimens) | Iqbal [8] (50specimens) | Harish A Wankhede <i>et al.</i> [3] (40 specimens) | Present study (50 specimens) |
|------------------------------|---|-------------------------|--|------------------------------|
| Lt VA>Rt VA | 35 | 14 | 29 | 15 |
| RtVA<LtVA | 06 | 8 | 9 | 5 |
| RtVA=LtVA | 7 | 28 | 2 | 28 |
| Hypoplastic RtVA | 3 | 3 | - | 2 |
| Hypoplastic LtVA | 2 | 2 | - | - |

The difference in diameter of vertebral artery is seen in 22 specimens and the bending of basilar artery was observed in 15 specimens. Remaining seven brain specimens though there is difference in diameter of vertebral artery the basilar was running straight.

The bending or curvature of basilar artery is due to many factors:

According to Poiseulle’s law, the flow rate is proportional to the fourth power of radius. The difference in diameter of vertebral artery is the main contributor for the moderate to severe basilar artery bending. Hence, the diameter of the vessel is essential factor of blood flow [9].

It is the bending of basilar artery was mainly due to unequal blood flow from right and left vertebral artery which plays a significant haemodynamic factor in determining the curvature of basilar artery and due to traction of pontine branches it can leads to development of acute infarcts in the vertebrobasilar circulation [10].

The flow of blood in basilar artery due to unequal size of vertebral artery in the chronic process can induce curvature in basilar arterial wall, which can lead to atherogenesis leading to ischaemic stroke in the vertebrobasilar system [11]. The curvature of basilar

artery was directionally opposite to dominant vertebral artery.

CONCLUSION:

In this study, we able to suggest that it is not the angles between the vertebral arteries are not the main factor to cause the bending of basilar artery. It is mainly due to difference in size of the vertebral artery, which is the significant factor in determining the deviation of basilar artery. The knowledge and understanding of the course of the arterial supply of the brain are very important for Neurosurgeons, Radiologists for providing competent prognosis of the disease in the affected area of brain.

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