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Morphological assessment of the basilar artery in human cadavers from West Bengal population

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Abstract
The anatomical variations of the basilar artery (BA) can cause loss of memory and depression besides causing transient ischemic attacks, atherosclerosis and cerebral infarction based on its area of blood supply. Hence the present study was planned for morphological assessment of basilar artery in human cadavers from north Indian populations.
The study was conducted on the 20 brain specimens from adult human cadavers were obtained in Department of Anatomy in ICARE Institute of Medical Sciences and Research, West Bengal. The area of the circle of Willis was cleaned after dissection by carefully removing the overlying meninges without damaging any of the vessels, thus exposing the BA. The arteries and their branches were painted red and allowed to dry for a period of time. The approval of the Institutional Committee was taken prior the conduct of the study.
The morphological aspects of the BA in the local population were highlighted in this cadaveric study. Detailed knowledge of the course of the BA would help neurosurgeons safely diagnose, as well as plan and execute vascular bypass and shunting procedures for the treatment of stenosis, aneurysms and arteriovenous malformations in the posterior cranial fossa.

Keywords: basilar artery, vertebral artery, level of formation, level of termination

Introduction
The basilar artery (BA) is part of the posterior cerebral circulation. It artery arises from the confluence of the left and right vertebral arteries at the base of the pons as they rise towards the base of the brain. The basilar artery runs cranially in the central groove of the pons towards the midbrain within the pontine cistern. It travels within this groove from the lower pontine border adjacent to the exit of the abducens nerve to the upper pontine border and the appearance of the oculomotor nerve. It bifurcates at the upper pontine border [1].
In human anatomy, the basilar artery is one of the arteries that supplies the brain with oxygen-rich blood. The two vertebral arteries and the basilar artery are sometimes together called the vertebrobasilar system, which supplies blood to the posterior part of the circle of Willis and joins with blood supplied to the anterior part of the circle of Willis from the internal carotid arteries.

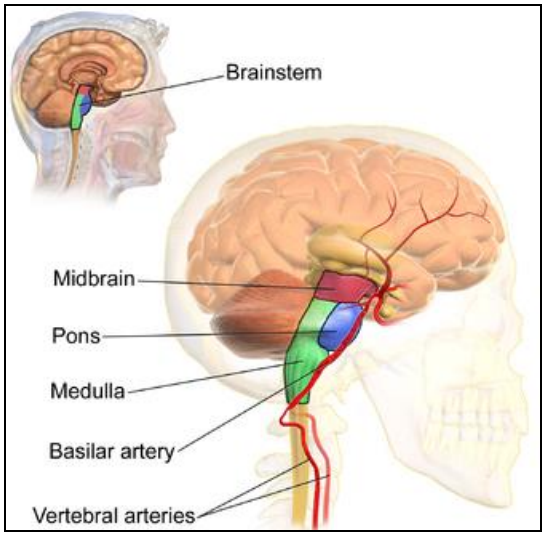

Fig 1

The basilar artery arises from the confluence of the two vertebral arteries at the junction between the medulla oblongata and the pons between the VIth cranial nerves. It ascends superiorly in the basilar sulcus ventral to the pons and divides at the pontomesencephalic junction into the paired posterior cerebral arteries close to the pituitary stalk.

Its branches can be divided into two groups:

- Para median perforating arteries arising either directly from the dorsal surface or from short circumferential arteries running around and into the pons supplying the corticospinal tracts and vital deep nuclei.
- Two or three paired long circumferential branches [2].
  - The internal auditory or labyrinthine artery, which may arise directly from the basilar artery in about 15% of people, but more commonly as a branch from.
  - The anterior inferior cerebellar artery (supplying the inferior and middle cerebellar peduncles of the cerebellum) and the adjacent hemisphere).
  - The superior cerebellar artery.

The clinical presentation of basilar artery occlusion (BAO) ranges from mild transient symptoms to devastating strokes with high fatality and morbidity. Often, non-specific prodromal symptoms such as vertigo or headaches are indicative of BAO, and are followed by the hallmarks of BAO, including decreased consciousness, quadriparesis, pupillary and oculomotor abnormalities, dysarthria, and dysphagia. When clinical findings suggest an acute brainstem disorder, BAO has to be confirmed or ruled out as a matter of urgency. If BAO is recognised early and confirmed with multimodal CT or MRI, intravenous thrombolysis or endovascular treatment can be undertaken. The goal of thrombolysis is to restore blood flow in the occluded artery and salvage brain tissue; however, the best treatment approach to improve clinical outcome still needs to be ascertained [3].

The anatomical variations of the BA can cause loss of memory and depression besides causing transient ischemic attacks, atherosclerosis and cerebral infarction based on its area of blood supply. Hence the present study was planned for morphological assessment of basilar artery in human cadavers from north Indian populations.

Methodology

The study was conducted on the 20 brain specimens from adult human cadavers were obtained in Department of Anatomy in ICARE Institute of Medical Sciences and Research, West Bengal. The area of the circle of Willis was cleaned after dissection by carefully removing the overlying meninges without damaging any of the vessels, thus exposing the BA. The arteries and their branches were painted red and allowed to dry for a period of time. The approval of the Institutional Committee was taken prior the conduct of the study.

Following parameters were studied

- Formation of the basilar artery (BA) by the vertebral artery (VA).
- Level of formation in relation to the pontomedullary junction (P-M junction).
- Level of termination of the basilar artery in relation to the midbrain-pons junction (MB-Pjunction).

Results & Discussion

The data regarding the BA artery from the 20 brain specimens from adult human cadavers were collected and presented as below. The data regarding the Formation of the basilar artery (BA) by the vertebral artery (VA); Level of formation in relation to the pontomedullary junction (P-M junction) and Level of termination of the basilar artery in relation to the midbrain-pons junction (MB-P junction) is collected and presented as below.

Table 1: Variation in formation of the basilar artery

Formation of Basilar artery	Number of specimens
Left VA greater than Right VA (V0)	16
Right VA greater than Left VA (V1)	2
Right VA equal to Left VA (V2)	2
Right VA hypoplastic (V3)	0
Left VA hypoplastic (V4)	0
Total	20

Table 2: Variation in the level of formation of the basilar artery.

Variation in the level of formation	No. of Cases
At P-M junction	13
Above P-M junction	5
Below P-M junction	2
Total	20

Table 3: Variation in the level of termination of the basilar artery.

Level of termination	No. of Cases
At MB-P junction	10
Above MB-P junction	6
Below MB-P junction	4
Total	20

Table 4: Variation in the basilar artery.

Variation in the basilar artery	No. of Cases
Normal or straight or sagittal	11
Bent or curved	7
'S' shaped or tortuous	1
Fenestration or islet formation or segmentation	1
Total	20

Many variations in position of arteries of the vertebro-basilar system and the loop formation are quoted in the literature, but the exact cause is not known. Variations are noted in the formation of the basilar artery. In the present study and study done by the Padmavathi *et al.* (2011) [4] shows that in majority of specimens larger left vertebral artery and the smaller right vertebral artery contributes to formation of the basilar artery. But Pai *et al.* (2007) [5] found higher number of samples in which right and left vertebral artery were of equal size contributing to the basilar artery formation. Also hypo plastic vertebral arteries were also noted by Vare and Bansal (1970) [6] and Padmavati *et al.* (2011) [4] in their studies.

When one vertebral artery is at retic and atherothrombotic lesion threatens the origin of the other, the collateral circulation, which may also include retrograde flow down the basilar artery, is often insufficient. In this setting, low-flow transient ischemic attacks (TIAs) can occur [7].

Level of formation of the basilar artery was also variable. In present study and study done by Vare and Bansal (1970) [6] majority of cases (65%) shows level of formation were at the pontomedullary junction. But in contrary to this Songur *et al.* (2008) [8] shows formation below the pontomedullary junction was more common (67%). While the study done by Padmavati

et al. (2011) [4] shows almost equal distribution of formation at the ponto-medullaryjunction (44.4%) and below the ponto-medullaryjunction (38.9%). Atheromatous lesions can occur anywhere along the basilar trunk but are most frequent in the proximal basilar and distal vertebral segment [7]. The bifurcation regions of the major human cerebral arteries are vulnerable to the formation of saccular aneurysms [9]. So, knowledge of variation in the level of formation of the basilar artery will help in proper approach to the treatment of atheroma's and aneurysms.

Level of termination of the basilar artery, the point where it gives its terminal branches whichisusually posterior cerebral arteries. Termination at the interpeduncular fossa or the midbrain pons junction was found in 88% cases by Rand (1978) [10] and in 92% cases by Smoker *et al.* (1986) [11]. Padmavathi *et al.* (2011) [4] found termination at midbrain-pons junction in 44.4%cases, above junction in 29.6% cases and below junction in 38.9% cases. In present study termination was more common at midbrain pons junction.

Variations were seen in the morphology of the basilar artery. Normally the basilar artery has straight or sagittal course but variations which are quoted in the literature include artery bettor curved on one side, fenestrated or partial or segmental duplication, "S" shaped or tortuous, complete duplication. The "S" form cannot be considered a deformity of the old age as it had often been observed in the angiograms of young patients as well [12]. Segmental duplication of the basilar artery, own their clinical interest to the possible association with aneurysms localized at the junctions of the fenestrated segments [13].

Conclusion

The morphological aspects of the BA in the local population were highlighted in this cadaveric study. Detailed knowledge of the course of the BA would help neurosurgeons safely diagnose, as well as plan and execute vascular bypass and shunting procedures for the treatment of stenosis, aneurysms and arteriovenous malformations in the posterior cranial fossa.

References

1. https://radiopaedia.org/articles/basilar-artery
2. Byrne, James. Chapter 2. Cranial arterial anatom. Tutorials in endovascular neurosurgery and interventional neuroradiology. Berlin: Springer, 2012, 37-38.
3. https://www.thelancet.com/journals/laneur/article/PIIS1474-4422(11)70229-0/fulltext
4. Padmavathi G, Rajeshwari T, Niranjana Murthy KV. Study of the Variations in the Origin and Termination of Basilar Artery. Anatomica Karnataka. 2011; 5(2):54-59.
5. Pai BS, Varma RG, Kulkarni RN, Nirmala S, Manjunath LC, Rakshith S. Microsurgical anatomy of the posterior circulation. Neurology India. 2007; 55(1):31-41.
6. Vare AM, Bansal PC. Arterial pattern at the base of the human brain. Journal of the Anatomical Society of India. 1970; 19(3):71-78.
7. Braunwald E, Hauser SL, Fauci AS, Longo DL, Kasper DL, Jameson JL. Cerebrovascular Disease. In: Harrison's Principles of Internal Medicine; Volume 2. 15th edition. McGrawHill Publisher, 2003, 2369- 2391.
8. Songur A, Gonul Y, Ozen OA, Kucuker H, Uzun I, Bas O, Toktas M. Variations in the intracranial vertebrobasilar system. Surgical and Radiological Anatomy. 2008; 30(3):257-264.
9. Canham PB, Finlay HM. Morphometry of Medical Gaps of Human Brain Artery Branches. Stroke Journal of the American Heart Association. 2004; 35:1153-1157.
10. Rand RW. Microneurosurgery. The C. V. Mosby Company; 2 nd edition; Chapter 19: Microsurgical anatomy of the circle of Willis, 1978, 278- 324.
11. Smoker WR, Price MJ, Keyes WD, Corbett JJ, Gentry LR. High- resolution computed tomography of the basilar artery: 1. Normal size and position. American Journal of Neuroradiology. 1986; 7:55-60.
12. Luzsa G. X-ray Anatomy of the vascular system. Butterworths & Co. (Publishers) Ltd. Blood vessels of the neck and the head, 1974, 134-139.
13. De Caro R, Serafini MT, Galli S, Parenti A, Guidolin D, Munari PF. Anatomy of Segmental duplication in the human basilar artery. Possible site of aneurysm formation. PubMed- indexed for MEDLINE. 1995; 14(6):303-9.