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Variations in the length of basilar artery In relation to different age groups

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Abstract

Context: *Basilar artery is one of the main arteries that supplies the posterior portion of brain- occipital lobe, temporal lobe, cerebellum, mesencephalon, thalamas, pons and medulla. So the area supplied by basilar artery is also called posterior cerebral circulation. Basilar artery is the most important artery in the posterior circulation. Basilar artery, supplies the anatomical structures within the posterior cranial fossa of brain. The Circle of Willis is the principal arterial anastomotic trunk of brain formed by anastomosis between the branches of internal carotid arteries and terminal branch of basilar artery. It is responsible for collateral circulation of brain, specially of old people, who have reduced blood supply to brain due to senile arteriosclerosis. Cerebrovascular diseases due to basilar artery is more common in men than women. Thrombosis in basilar artery causes devastating effect like coma, flaccid quadriplegia, areflexia, complete anesthesia, pin point pupil and hyperpyrexia. Basilar artery related clinical conditions are, posterior circulation stroke, migraine, tumor, aneurysm, and arteriovenous malformation (AVM), revascularization procedure etc. Anatomy of basilar artery and its branches are very complex and variable. So, detailed morphological knowledge is essential for proper diagnosis and treatment of neurological disorders.*

Objective: *To identify variations in the length of basilar artery in relation to advancing age.*

Study Design: *A cross-sectional descriptive type of study.*

Place & period of Study*: The study was carried out in the Department of Anatomy, Dhaka Medical College, Dhaka, from January 2010 to December 2010.*

Materials*: 70 postmortem basilar arteries were collected from unclaimed dead bodies that were under examination in the morgue of Department of Forensic medicine, Dhaka Medical College Dhaka. The study was approved by the Ethical Review Committee (ERC) of Dhaka Medical College.*

Methods: *The samples were divided into three different age groups i.e. Group A (15 -30 years), Group-B (31-45 years) and Group-C (46-60 years). After fixation of the whole of the human brain with formalin, the basilar artery and its branches were collected along with the brainstem by giving a incision on middle cerebellar peduncle & thus separated from cerebellum. The moisture over the arteries were removed by using filter paper. Length of the basilar artery was measured by using a digital slide caliper.*

Results: *The mean ± SD length of the basilar artery was found 23.92 ± 1.35 mm in group A, 24.44 ± 1.33 mm in group B & 25.69 ± 2.24 mm in group C. The highest value was found in group C and the lowest one was found in group A. The differences between group A and group C and group B and group C were statistically significant ($p<0.05$).*

Conclusion: *Present study showed that there was gradual increase in length of basilar artery with advancing age which was statistically significant in different age groups ($p<0.05$). Further studies to find out the cause and functional / clinical correlations of this variation are recommended.*

Key Word: *Length, basilar artery, digital slide caliper, filter paper.*

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Introduction:

Basilar artery is one of the main arteries that supplies the posterior portion of brain, and the area supplied by basilar artery is also called posterior cerebral circulation.[1] Basilar artery is the most important artery in the posterior circulation.[2] Basilar artery is formed by the union of right and left vertebral arteries at the lower border of the pons or mid medullary level.[1,3,4] Then it courses upwards along 'basilar groove' on the anterior surface of the pons, and it ends at the upper border of pons by bifurcating into two posterior cerebral arteries.[5] The posterior cerebral artery, branch of basilar artery completes an arterial polygon called the 'circle of Willis', which is the principal arterial anastomotic trunk of brain.[1] Normally little blood flows around this circle, if one major vessel occluded the communicating arteries may allow critically important anastomotic flow and prevent neurological damage.[6] The most frequent and severe atherosclerotic (degenerative proliferative) change occur in upper and lower part of basilar artery and the first part of the posterior cerebral artery. Severe narrowing of vessels sufficient to cause vascular insufficiency occurred in 2% of case of age 30-40 years and in as many as 6-8% in patient from age 60-70 years[1]. Anatomical variation occasionally occurs in basilar artery and its branches. Most frequent anatomical variation of basilar artery is short segments of duplication or island formation. The superior cerebral artery may be multiple.[7] The proximal and mid basilar arteries are the most common sites of stenosis and most often cause infarction in the pons.[8] Aneurysm often develops at the site of branching of basilar artery and near the arterial circle and they can rupture or leak causing subarachnoid hemorrhage.[9] Cerebrovascular disease was found 22% in the year 2004 in Mymensingh Medical College Hospital.[10] Stroke due to basilar artery comprises approximately 10% to 15% of all stroke, more common in man than woman. Structures commonly affected by basilar artery infraction are the brain stem (60%) and cerebellum (50%). Basilar artery related clinical condition such as posterior circulation stroke, migraine, aneurysm and atherosclerotic changes are very common throughout the world. Anatomy of the basilar artery and its branches in Bangladeshi people are necessary for neurosurgeon, neurologist for proper diagnoses and treatment of cerebrovascular disease, aneurysm, tumour, epilepsy, migraine and other form of vascular anomalies.

Materials & Methods

Materials

The present study was performed on 70 post mortem basilar arteries of different age groups collected from unclaimed dead bodies that were under examination in the morgue of Department of Forensic Medicine, Dhaka Medical College, from January 2010 to December 2010. The study was approved by the Ethical Review Committee (ERC) of Dhaka Medical College. After legal formalities and requisite permission from the Department of Forensic Medicine, the whole brains were collected within 24-36 hours of death. Soon after collection, each sample was gently washed with tap water on a dissection tray. Blood and blood clots were removed. After collection of whole brain, 100ml of 40% formaldehyde solution was injected by using a 50cc syringe into the brain through the surfaces (superolateral and inferior surfaces). Then it was preserved in 40% formaldehyde solution (Origin Germany) for 15 days. After 15 days the present study was done with these fixed specimens.

Methods

Place and duration of study: This study was carried out in the Department of Anatomy, Dhaka Medical College, Dhaka, Bangladesh, from January 2010 to December 2010. During collection of the samples appropriate age, sex and the cause of death were noted from morgue's record book and the samples were tagged bearing code numbers for subsequent identification immediately.

Grouping of the samples: The samples were grouped as follows according to age; the collected samples were divided into three groups according to Khalil.[11] Detailed grouping and distribution of samples were shown in Table I.

Table-I

Grouping of sample of the present study (n=70)

Group	Age range (in years)	Number
A	16 – 30	18
B	31 – 45	42
C	46 – 60	10

Observation of length of basilar artery: Formalin fixed brain was washed with plain tap water to remove excess formalin and was kept on metallic tray. After fixation of the whole of the human brain, the basilar artery and its branches along with right and left vertebral arteries were collected by the following steps. First, the base of the brain along with brain stem in each specimen was cleaned. Basilar artery with its branches and vertebral artery were identified. Arachnoid mater was removed from artery and area around it to observe the basilar artery more accurately and to measure the different variables. Length of basilar artery was measured by using digital slide calipers.[12] The length of basilar artery measured from formation of basilar artery to termination of basilar artery by digital slide caliper and noted.

Results

Table – II

Length of basilar artery in different age groups

Age group	Length (mm) (Mean±SD)
A	23.92±1.35
(n=18)	(22.76-28.43)
B	24.44±1.33
(n=42)	(22.02-29.25)
C	25.69±2.24
(n=10)	(23.06-31.23)
P value	
A vs B	>0.10^{ns}
A vs C	<0.01**
B vs C	<0.05*

Figures in parentheses indicate range. Comparison between age groups done by One way ANOVA (PostHoc), ns = not significant, **/*** = significant

Group A : Age 16-30 years
Group B : Age 31-45 years
Group C : Age 46-60 years

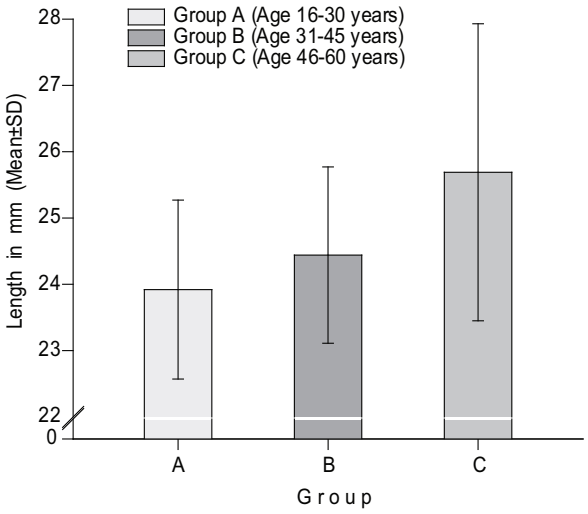

Fig.-1: *Length of basilar artery in different age groups*

Group A : Age 16-30 years
Group B : Age 31-45 years
Group C : Age 46-60 years

Discussion

Present study showed a gradual increase in length with advancing age which was significant in different age groups ($p<0.05$). In the present study the mean±SD of length of the basilar artery was found 23.92±1.32 mm in group A, 24.44±1.33 mm in group B and 25.69±2.24 mm in group C. Pai et. al[5] studied 25 cadavaric specimens, they found the mean length of the basilar artery was 24.9mm and with increasing age the basilar artery becomes more tortuous and elongated. The mean values were almost similar to the present study.

Conclusion

In the present study, the length of basilar artery was found to be increased with advancing age which was statistically significant in different age groups. Further studies to find out the cause and functional / clinical correlations of this variation are recommended.

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