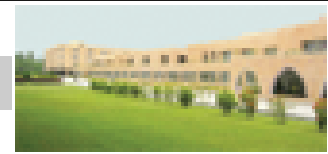


Original Article



Transverse Diameter of Cerebellum: Is There Any Age and Sex Related Change Among Bangladeshi People

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Abstract

Background: Cerebellum is ovoid in shape, but is constricted in the median plane, flattened from above downwards and widest from side to side. The cerebellum occupies the posterior cranial fossa, where it is covered by the tentorium cerebelli and lies behind the fourth ventricle, the pons and the medulla oblongata. **Objective:** The study was done to assess the transverse diameter of cerebellum in relation with age and sex in Bangladeshi people. **Materials and Methods:** A cross sectional descriptive study was performed on 60 (32 of male and 28 of female) postmortem. The specimens were collected from morgue in the department of Forensic Medicine, Mymensingh Medical College by purposive sampling technique. All the specimens were grouped into four categories: group A (20 to 29 years), group B (30 to 39 years), group C (40 to 49 years), group D (50 to 59 years). Dissection was performed according to standard autopsy techniques. Transverse diameter of cerebellum was measured with the help of slide caliper. For statistical analysis, differences between age groups were analyzed by using unpaired student's 't' test. **Results:** The mean (\pm SD) transverse diameter of cerebellum was 10.53 ± 0.55 cm in group A, 10.09 ± 0.51 cm in group B, 10.03 ± 0.44 cm in group C, 9.72 ± 0.40 cm in group D. The mean differences of the transverse diameter of cerebellum between groups A & C, A & D, A & B, B & D were statistically significant, differences between B & C, D & C were non significant. **Conclusion:** The study would help to increase the information pool on the transverse diameter of cerebellum of Bangladeshi people.

Keywords: Cerebellum, Transverse diameter, Cadaver, Age, Bangladeshi people.

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Introduction

The cerebellum (L. cerebellum = little brain) is the largest part of hindbrain and second largest part of brain as a whole.¹ Cerebellum is ovoid in shape, but is constricted in the median plane, flattened from above downwards and widest from side to side. The cerebellum occupies the posterior cranial fossa, where it is covered by the tentorium cerebelli and lies behind the fourth ventricle, the pons and the medulla oblongata.² The cerebellum helps in maintaining equilibrium, muscle tone and adjusts coordination of skillful volitional movements by regulating the grade of muscle tension between the agonist and antagonist muscle. Cerebellum also receives information concerning balance from the vestibular nuclei and concerning sight through the tectocerebellar tract and also concerned with the smooth performance of skilled acts by coordination of movements. All this information is fed into the cerebellar

cortical circuitry by the mossy fibers and the climbing fibers and converges on the Purkinje cells.³ Disease processes affecting the cerebellum or its connections lead to incoordination. Movements of the eyes, speech apparatus, individual limbs and balance are usually affected, which results in nystagmus, dysarthria, in coordination, and ataxia. However, although cerebellar lesions may initially cause profound motor impairment, a considerable degree of recovery is possible. There are clinical reports that the initial symptoms of large cerebellar lesions (caused by trauma or surgical excision) have improved progressively over time.⁴ There is a limitation of published work on morphological variations of the transverse diameter of cerebellum of Bangladeshi people. We mainly depend on foreign text and literatures. However, we need our own standard baseline from which we can compare the morphological parameter like

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transverse diameter of cerebellum of our own population with those of Western and other Asian people. Therefore, it has been designed to study the transverse diameter of cerebellum to see the variation with age and sex in Bangladeshi people and find out any kind of relation between weight and transverse diameter of cerebellum.

Materials and Methods:

Specimen containing hindbrain (cerebellum, pons and medulla oblongata) were collected from Bangladeshi cadaver of both sexes, age ranging from 20 to 59 years from autopsy laboratory of the Department of Forensic Medicine of Mymensingh Medical College, Mymensingh, Bangladesh from October, 2016 to March, 2017. All the collected specimens were from medico-legal cases. Samples were collected within 12 hours of death that showed no sign of putrefaction. Gross and fine dissection was carried out to study the different morphological parameters and fixed in 10% normal saline for 7 days and for proper fixation of central part of cerebellum, fixative was also injected through superior and inferior surface of cerebellum and tagged by a piece of waxed cloth which bear an individual serial number. For convenience of differentiating the changes of transverse diameter of cerebellum in relation to age, collected specimens were divided into four groups: group A (20 to 29 years), group B (30 to 39 years), group C (40 to 49 years), group D (50 to 59 years). The present study was done with these fixed specimens in spite of some hardening and shrinking brought about by fixation. These could not be avoided in case of the brains, because in fresh state, they were too soft to handle. Brain took one week to get sufficiently hard to allow normal handling and dissection to be carried out. Transverse diameter of cerebellum was measured from the most bulging point on the right side to the most bulging point on left side by using handmade slide caliper and was expressed in cm (Figure 1). All data collected from specimens of each cadaver were recorded in the pre designed data sheet, analysis by SPSS program and compared with the findings of other national and international studies and standard text books.



Fig 1: Photograph Showing Procedure of Measurement of the Transverse Diameter of the Cerebellum

Results:

The mean (±SD) transverse diameter of cerebellum was 10.53 ± 0.55 cm, 10.09 ± 0.51 cm, 10.03 ± 0.44 cm, 9.72 ± 0.40 cm in group A, B, C, D respectively. It was observed that the mean transverse diameter of cerebellum gradually decreased with increases of age. The maximum mean transverse diameter of cerebellum was 10.53 cm in group A and the minimum was 9.72 cm in group D. The mean differences of the transverse diameter of cerebellum between groups A and C, A and D were statistically highly significant at p < .001 but differences between A and B, B and D were statistically significant at p < .05, differences between B and C, D and C were non significant at p > .05 (Table I & II).

Table I: Transverse Diameter of Cerebellum in Different Age Groups

Age Group	Number of specimen (n=60)	Mean ± SD in cm minimum-maximum
A (20 to 29 Years)	19	10.53 ± 0.55 (9.4-11.4)
B (30 to 39 Years)	16	10.09 ± 0.51 (9.4-11)
C (40 to 49 Years)	14	10.03 ± 0.44 (9.4-10.8)
D (50 to 59 Years)	11	9.72 ± 0.40 (9.18-10.4)

Table II: Comparison of transverse diameter of cerebellum in different age groups

Comparison between age groups	Mean Difference	Std. Error Difference	t	P	Level of significance
A & B	0.43257	0.17999	2.403	0.022	Significant
B & C	0.06518	0.17411	0.374	0.711	Nonsignificant
A & C	-0.49774	0.17854	-2.788	0.009	Highly signific
A & D	-0.80995	0.1899	-4.265	0	Highly signific
B & D	0.37739	0.18215	2.072	0.049	Significant
D & C	-0.31221	0.16982	-1.838	0.079	Non significant

Table III depicts that the maximum mean (±SD) transverse diameter of cerebellum in group A 10.65 ± 0.58 cm in male and minimum mean (±SD) in group D 9.70 ± 0.54 cm in female. The mean transverse diameter of cerebellum was higher in male than female. Variable analysis shows that there was no significant difference in mean transverse diameter of cerebellum between sex groups (Table III).

Table III: Transverse Diameter of Cerebellum in Different Sex Groups

Age Group	Sex	Number of specimen (n=60)	Mean ± SD in cm
A (20 to 29 Years)	Male	8	10.65 ± 0.58
	Female	11	10.44 ± 0.54
B (30 to 39 Years)	Male	9	10.11 ± 0.54
	Female	7	10.07 ± 0.50
C (40 to 49 Years)	Male	8	10.03 ± 0.41
	Female	6	10.03 ± 0.52
D (50 to 59 Years)	Male	7	9.73 ± 0.35
	Female	4	9.70 ± 0.54

Table IV: Comparison of transverse diameter of cerebellum between sexes

Comparison between sex in age groups	Mean Difference	Std.Error Difference	t	p	Level of significance
A	0.21364	0.25811	0.828	0.419	Non significant
B	0.03968	0.26335	0.151	0.882	Non significant
C	-0.00833	0.24694	0.034	0.974	Non significant
D	0.03357	0.26217	0.128	0.901	Non significant

In the present study, transverse diameter of cerebellum showed significant positive correlation with weight of cerebellum where, $r = + 0.417$, correlation was significant at the 0.01 level (Figure 2).

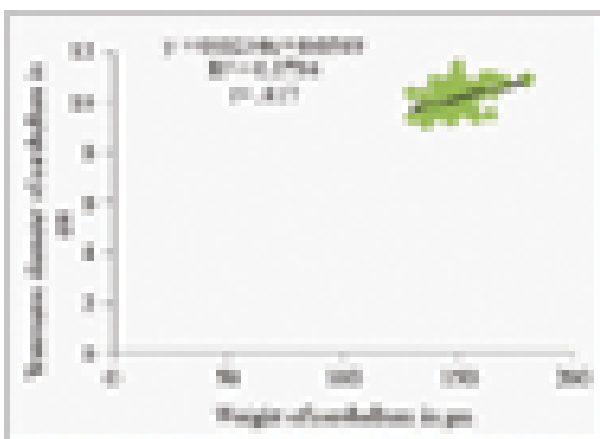


Fig 2: Scatter Diagram Showing Correlation between Weight of Cerebellum and Transverse Diameter of Cerebellum

Discussion

The mean (±SD) transverse diameter of cerebellum was 10.53 ± 0.55 cm, 10.09 ± 0.51 cm, 10.03 ± 0.44 cm, 9.72 ± 0.40 cm in group A, B, C, D respectively (Table I). It was observed that the mean transverse diameter of cerebellum decreased with increases of age. The maximum mean transverse diameter of cerebellum was found in group A and minimum in group D. The mean differences of the transverse diameter of cerebellum between groups A and C, A and D were statistically highly significant at $p < .001$ but differences between A and B, B and D were statistically significant at $p < .05$, differences between B and C, D and C were statistically non significant at $p > .05$ (Table II).

The width of the right and left cerebellar hemisphere was described by Yeasmin as 4.52 ± 0.43 cm and 4.42 ± 0.48 cm in group A (20-29 years), 4.66 ± 0.36 cm and 4.57 ± 0.34 cm in group B (30-39 years) and 4.33 ± 0.27 cm and 4.32 ± 0.26 cm in group C (40-49 years) and 3.89 ± 0.27 cm and 3.80 ± 0.31 cm in group D (above 50 years).⁵ Finding of present study was higher than above mentioned author. In present study, transverse diameter of cerebellum was gradually decreased with increases of age. Similar observations were made by Solov'e.⁶

Haque found that the mean transverse diameter of the cerebellum was 5.5 cm in group A (28-42 weeks of gestation), 11 cm in group B (0-30 years) and 10.2 cm in group C (30-60 years).⁸ The finding of the present study was within range to the finding of corresponding age groups of Haque.⁷

Pal et al. found the mean (± SD) breadth of the cerebellum was 9.25 ± 0.55cm.⁸ Finding of present study was higher than above mentioned author.

Conclusion

From the present study, it was concluded that maximum transverse diameter of cerebellum was in group A and minimum was in group D. It was observed that the mean transverse diameter of cerebellum gradually decreased with increases of age. So the transverse diameter of cerebellum showed significant positive correlation with weight of cerebellum.

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