

Study on Weight of Cerebellum in Bangladeshi Cadaver

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Abstract

Context: Cerebellum is involved in the maintenance of balance and posture, coordination of voluntary movements, motor learning and cognitive functions. The weight of the human cerebellum at birth is only a fraction of the adult weight then weight increases up to certain age and decreases in old age. So, the present study was performed to observe the weight of the cerebellum in different age groups of Bangladeshi cadaver which will serve as a baseline data for clinicians regarding management of neurological disorders in our country.

Materials and Methods: A cross sectional, analytical type of study was carried out in the department of Anatomy, Mymensingh Medical College, Mymensingh from April' 2009 to September '2009. A total of 63 cerebellums were collected from unclaimed Bangladeshi cadavers aged between 5 to 60 years and from dead fetuses obtained from caesarian section aged between 34 wks to 41 wks of gestation. The collected sample was grouped into three age groups like Group A (34 to 41 weeks of gestation), Group B (5 to 30 years) and Group C (31 to 60 years). Each cerebellum was weighed by means of a scientific balance.

Results: The mean (\pm SD) weight was 17.91 ± 3.05 gm in Group A, 125.91 ± 15.24 gm in Group B and 115.29 ± 18.06 gm in Group C.

Conclusion: The present study shows that the mean weight of the cerebellum increases with age upto certain level then slightly decreases in the late age.

Key words: cerebellum, weight, Bangladeshi cadaver.

Introduction:

Cerebellum unconsciously controls the smooth contraction of voluntary muscle and carefully coordinates their action¹. The cerebellum is the portion of brain lying behind and below the cerebrum, it serves to coordinate both voluntary movements and muscle functions in the maintenance of normal posture².

Cerebellum is the largest part of hindbrain, situated in the posterior cranial fossa, behind the pons and the medulla oblongata^{4,5,6,7}.

It contains more nerve cells (neurons) than all the rest of the brain combined, on an average 50 billion neurons^{5,7}. The total number of neurons in human cerebellum during development decreases significantly from early maturity to old age.⁸ Studies of the structural-functional organization of different parts of the cerebellum continue to be relevant. The variety of cerebellar functions and the conditions associated with their impairments have led to multilateral studies of this organ. The neuronal organization of the cerebellum has been studied in detail by a number of authors. However, despite the significant number of reports addressing the structural organization of the cerebellum, most of these have been performed on animals but weight of the cerebellum in humans remains inadequately studied. It has been observed by various workers that dimensions of different organs in Bangladeshi population vary from those of Western population. With the above evidences, the aim of the present work was done on weight of cerebellum to make a standard for Bangladeshi population.

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Materials and Methods:

The study was done by examining 63 (sixty three) cerebellum out of them 40 postmortem human cerebellum collected from Bangladeshi cadavers of both sexes (male 25 and female 15) age ranging from 5 to 60 years and 23 cerebellums from caesarian section of dead fetuses of both sexes (male 14 and female 9) age ranging from 34 wks to 41 wks. of gestation. Specimens were collected from dead bodies autopsied on different dates from April'2009 to September' 2009 at the autopsy laboratory of department of Forensic Medicine and Gynaecology and Obstetrics Department of Mymensingh Medical College, Mymensingh. Grossly injured cases involving head-neck region and cerebellum of decomposed bodies were excluded. The specimen was labeled with a specimen number, recording age and sex of the cadaver and then fixed in 10% formalin solution, by floating freely in a suitable container with a lid. The specimen was allowed to fix for a period of one or two weeks. The present study was done with these fixed specimens in spite of some hardening and shrinking of tissue brought about by fixation. These could not be avoided at the brains, because in fresh state, they were too soft to handle. The collected sample was grouped into three age groups like Group A (34 to 41 weeks of gestation), Group B (5 to 30 years) and Group C (31 to 60 years). Each cerebellum was weighed by means of a scientific balance. Before weighing

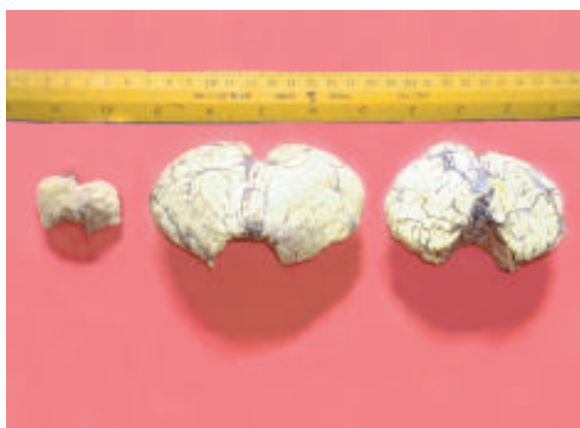


Figure 1: Photograph of cerebellum A=group A (34 to 41 weeks of gestation), B=group B (5 to 30 years) and C=group C (31 to 60 years)

the specimen was dried with tissue paper. Cerebellar weight was expressed in grams (gm).

Ethical clearance: This work was approved by the Ethical Review Committee (ERC) of Mymensingh Medical College, Mymensingh.

Results:

In this study, significant differences were observed in weight of cerebellum in different age groups but no significant difference was observed between sexes. The details of observations and measurement are shown in Figure- 1,2 and Tables I, II.

The maximum weight of the cerebellum was 22 gm group A, 148 gm in group B and 146 gm in group C respectively.

The minimum weight of the cerebellum was 10 gm in group A, 87 gm in group B and 79 gm in group C respectively.

The mean (\pm SD) weight was in Group A 17.91 \pm 3.05, B 125.91 \pm 15.24 and C 115.29 \pm 18.06 gm respectively (Table-1, Figure-2). It was also observed that the mean weight of the cerebellum increased with age upto certain level then slightly decreased in the older age Group C.

The mean weight was maximum in Group B (125.91gm) and was minimum in Group A (17.91gm).

The mean difference of the cerebellar weight between Groups A&B, A&C was statistically highly significant but difference between B&C was statistically significant at < 0.05 level. There was no significant difference of the cerebellar weight between male and female of Group A, B & C.

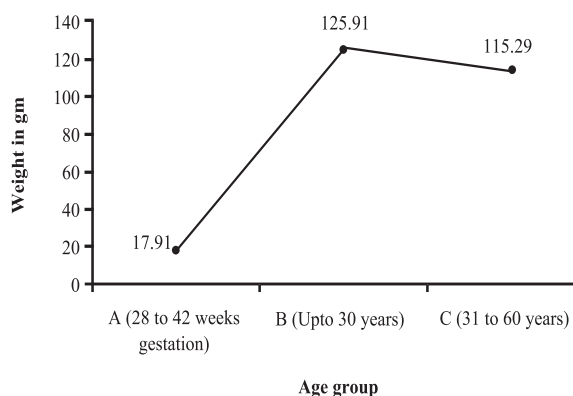


Fig.-2: Line diagram showing mean weight of whole cerebellum in different age groups

Table I
Weight of the Cerebellum in Different Age Groups

Age Groups	Number of specimens	Weight (gm) Mean \pm SD (Minimum – Maximum)
A(28-42 weeks of gestation)	23	17.91 \pm 3.04(10 – 22)
B(Upto 30 years)	23	125.91 \pm 15.24(87 – 148)
C(31 to 60 years)	17	115.29 \pm 18.06(79 – 146)

Comparison of weight among the age groups

Comparison between group	Mean Difference	Std. Error	P	Level of significance
A B	108.00	3.907	.000	highly significant
A C	97.38	4.237	.000	highly significant
B C	10.62	4.237	.015	significant

P < .001 is considered as highly significant

P < .01 is considered as moderately significant

P < .05 is considered as significant

P = or > .05 is considered as not significant

Table II
Mean Weight of Cerebellum in Different Sex

Age Groups	Sex of the person	Number of specimens	Mean weight in gm	(\pm)SE
A(28 to 42 weeks of gestation)	Male	14	12.21	1.41
	Female	9	19.00	0.90
B(Upto 30 years)	Male	13	125.69	4.81
	Female	10	126.20	4.09
C(31 to 60 years)	Male	12	118.75	4.05
	Female	5	107.00	11.33

Comparison of weight between both sexes

Age Groups	Mean difference between sex	Std. Error difference	t	p	Level of significance
A	1.79	1.28	1.41	.175	Not significant
B	0.51	6.56	0.08	.939	Not significant
C	11.75	9.46	1.25	.233	Not significant

Table-II depicts that the mean weight of cerebellum was higher in female of Group A (19 \pm 0.90 gm) and Group B (126.20 \pm 4.09 gm) than that of in male of Group A (12.21 \pm 0.84 gm) and Group B (125.69 \pm 4.81 gm) and was statistically not significant, where for Group A t = 1.41 and p = .175 and for Group B t = .08 and p = .939 but the mean weight of cerebellum was higher in male in Group C (118.75 \pm 4.05 gm) than that of in female Group C (107.00 \pm 11.33 gm) and was statistically not significant, where for Group C t = 1.25 and p = .233

Discussion:

The present study was designed to study the weight of cerebellum. The study was done by examining 63 (sixty three) cerebellum out of them 40 postmortem human cerebellum collected from Bangladeshi cadavers of both sexes (male 25 and female 15) age ranging from 5 to 60 years and 23 cerebellums from caesarian section of dead fetuses of both sexes (male 14 and female 9) age ranging from 34 wks to 42 wks. The collected specimen was grouped into three age groups like Group A (34 to 42 weeks of gestation), Group B (5 to 30 years) and Group C (31 to 60 years) and two sex group (male and female).

In the present study, it was found that the mean (\pm SD) weights of the cerebellum were in Group A (28 to 42 weeks of gestation) 17.91 ± 3.05 , Group B (upto 30 years) 125.91 ± 15.24 and Group C (31 to 60 years) 115.29 ± 18.06 gm respectively.

The weight of the cerebellum described by Chaurasia⁵ and Sing⁹ as 150 gm in adult male; it forms 1/8 part of the cerebrum in adults; and 1/20 part of cerebrum in infants. Here the author did not mention the age of the study population of adult. If each of the value is taken as the normal adult value, it is nearly similar to Group B and Group C, that is the range of the finding of the present study correspond with the finding of the above mentioned authors and the value of the newborn is nearly similar to Group A. But the mean value of the present study was less than the value described above by authors. Pal et al¹⁰ studied on 6 (six) Indian cadavers and found the mean weight (\pm SD) of cerebellum in man was $125.5 (\pm 6.89)$ gm. which value was similar to Group B of the present study. Dekaban and Sadowsky¹¹ showed in their studies that there was a decrease in brain weight within the age interval of 30 to 90 years of age which is similar to present study.

Dekaban and Sadowsky¹¹ showed in their studies that mean brain size (weight or volume) is 9-12% larger in men than women. In this study it was also seen that weight of the cerebellum in male (84.62 ± 52.67 gm) was heavier than that of female

(82.00 ± 52.13) but statistically this difference was not significant.

Conclusion:

Cerebellar weight increases with age upto certain level and then decreases with age.

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