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Original Research Article

MORPHOMETRIC STUDY OF POSTERIOR HORN OF LATERAL VENTRICLE AND ITS CORRELATION WITH AGE AND SIDE: A CT STUDY

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ABSTRACT

Enlargement of lateral ventricle is most striking feature after sixth decade of life. Regression of brain is normal ageing process. But there are marked individual variations in this process. Lateral ventricular contours are relatively constant, except for the occipital horns. Two major changes that may occur in elderly individual without neurologic deficits is enlargement of ventricles and cortical atrophy. This study is focusing on the changes in posterior horn of lateral ventricle in different age groups. Aim of this study is to statistically analyse the length of the posterior horn of lateral ventricle in human and to correlate the changes in relation to age and side. *Method:* The CT images of 150 adult individuals (age group 20-80yrs) was studied in both males and females. Length of posterior horn of lateral ventricle was measured using dicomworks software. *Result:* Mean value of length of the posterior horn increases on both sides as the age increases. Values are larger in 61-80 years. In relation to the side, the length of posterior horn is greater on the left side as compared to the right side.

KEY WORDS: CT Images, Lateral Ventricle, Cortical Atrophy, Posterior horn.

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INTRODUCTION

Cerebrospinal fluid filled ventricular system is an essential part of the brain. The volume, shape and size of this ventricular system remain more or less constant and various pathologies directly or indirectly affect them [1].

In literature it has been mentioned that there is great variety and asymmetry in the size of the ventricular system [2]. Counters of the lateral ventricles are relatively constant, except for the occipital horn which may show asymmetry and unilateral or bilateral absence [3].

The complex shape of the ventricular system and the considerable degree of normal variation, particularly of the occipital horns, make measurement of its size extremely difficult [4].

The thorough knowledge of the age related normal changes that occur in the brain is Required before any abnormal findings are analysed. As age advances, the brain undergoes many gross and histopathological changes with regression of the brain tissue leading to enlargement of the ventricles. To understand these changes the knowledge of normal morphometry and size of normal ventricular system of the brain is important [5]. The size of CSF spaces (ventricles and subarachnoid spaces) increases with age (Nagata, Basugi, Fukshima et al 1987). Most planimetric studies have demonstrated changes

in ventricular size to be greatest beginning after about age 60 years [6].

Enlargement of posterior horn is seen in some patients with history of recurrent fall.In this cases changes in the gray and white matter in the parieto-occipital regions and ventricular expansion are associated with disintegration of the visuospatial and attentional mechanisms, compromising safe navigation and mobility, and increasing the risk of falls [7]. The range of changes in ventricular size of brain encountered in routine clinical practices can mislead most of the physicians and surgeons while making a decision. However, in some conditions precise measurements may be required.

Knowledge of age related changes in ventricular system of brain is important for radiologists to make diagnosis of ventricular enlargement Aim of this morphometric study was to analyse the length of posterior horn and to find its correlation with age and side.

MATERIALS AND METHODS

This was a radiological anatomy study. CT scan images of 150 individuals was studied. CT scan of patients was performed on "Philips Brilliance Slice 64 Multidetecter Spiral Computed Tomography" machine with scanning time of 12-15 seconds and slice thickness of 2mm at the Radiology department of Tertiary Health Care Centers Mumbai. CT scans of patients in the age group of 20-80 years in which the ventricles were reported as normal by radiologist were studied. CT scan of the patients with history of local mass lesion, cerebral infarction, hydrocephalus, previous intracranial surgery were excluded from the study.

Data was grouped into three age group 20-40 years,41-60 years and 61- 80 years. Procedure was explained to the patient. Patient was asked to remove metallic items (e.g. earrings, hair pin) and dentures and then positioned on CT table. Patient was placed in a supine position on CT table and was positioned so that there was no rotation or tilt of midsaggital plane. Measurement were taken on axial section of CT images using Philips Diacom Works Software.

The length of the posterior horn was measured on axial CT image showing trigone and tip of posterior horn. Length was measured from anterior wall of trigone upto tip of posterior horn. Section showing maximum length was chosen for measurement.

RESULTS

Table 1: Comparison of length of posterior horn (mm) on right side in different age groups.

Length of post horn (mm) on right side	N	Mean	SD	Median	IQR	Oneway ANOVA test	
20 to 40 Yrs	52	24.16	1.49	24.55	2.08	F Value	P Value
41 to 60 Yrs	59	25.86	1.3	26	1.4	60.842	0
61 to 80 Yrs	39	27.14	0.97	27.2	1.2	Diff is sig	

Graph 1: Comparison of length of posterior horn (mm) on right side in different age groups.

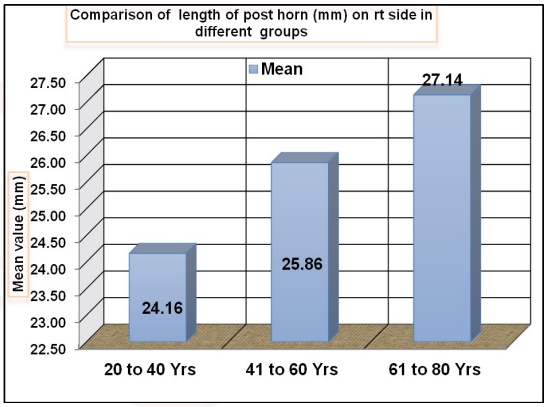


Table 2: Comparison of length of posterior horn (mm) on left side in different age groups.

Length of post horn (mm) on left side	N	Mean	SD	Median	IQR	Oneway ANOVA test	
20 to 40 Yrs	52	25.76	1.53	26.2	2.1	F Value	P Value
41 to 60 Yrs	59	27.17	1.07	27.2	1.2	79.166	0
61 to 80 Yrs	39	29	0.9	29	1.6	Diff is sig	

Graph 2: Comparison of length of posterior horn (mm) on left side in different age groups.

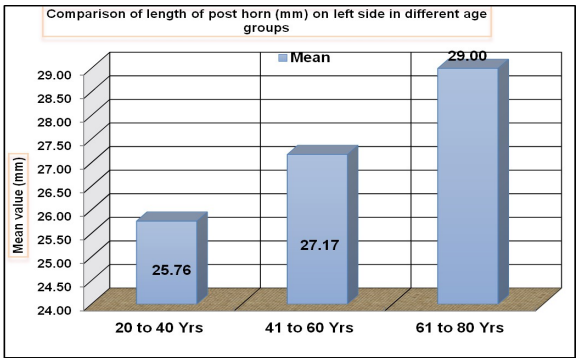


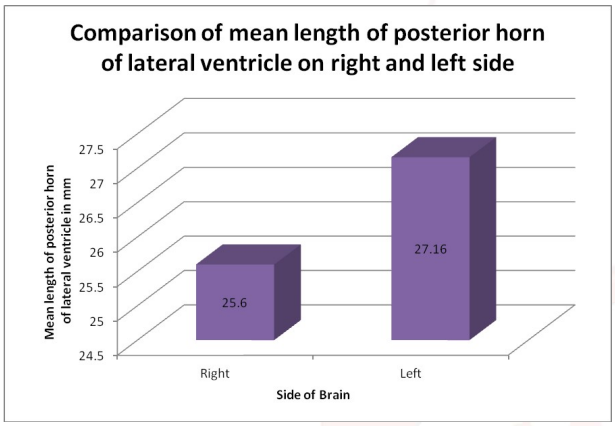
Table 3: Comparision of length of posterior horn on right and left side.

Parameters (mm)	Rt side					Left Side					Unpaired T Test	P Value
	N	Mean	SD	Median	IQR	N	Mean	SD	Median	IQR		
length of post horn	150	25.6	1.74	25.8	2.13	150	27.16	1.74	27.25	2.03	7.73	<0.001

Mean length of posterior horn on right side is larger in 61-80 years(27.14±0.97). The difference is statistically significant.

Mean length of posterior horn on left side is larger in 61-80 years 29.00± 0.90.The difference is statistically significant.

Above table no 1 and 2 suggest that mean value of length of the posterior horn increases on both sides as age increases. Values are larger in 61-80 years Difference is statistically significant.



The mean length of the posterior horn (mm) on right side is 25.60±1.74, on left side is 27.16±1.74. The difference is statistically significant.

Fig. 1: Length of posterior horn on left side in 60 year male patient.

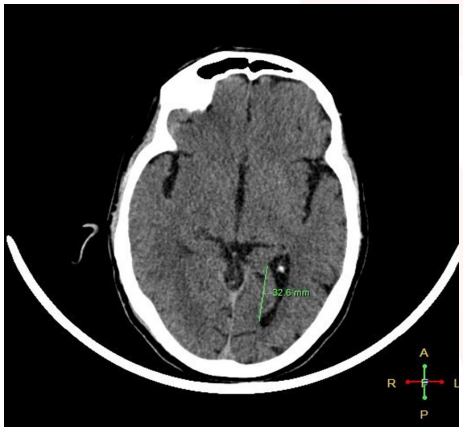


Fig. 2: Length of the posterior horn on right side in 47 year male patient.

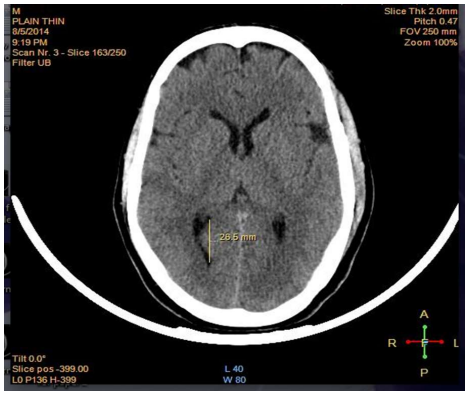
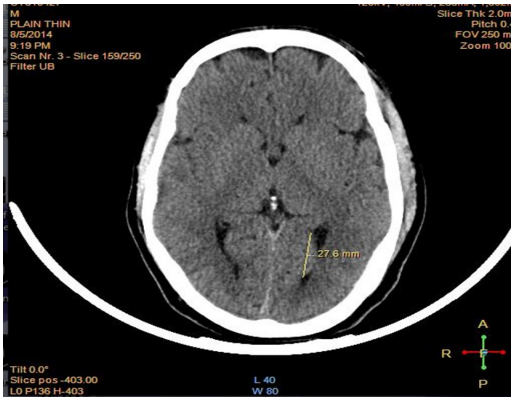


Fig. 3: Length of the posterior horn on left side in 47 year male patient.



DISCUSSION

Gradual enlargement of the ventricles takes place during life because of general cerebral atrophy. In other words, if a person 15 years of age presents cerebral ventricles of the size which is normal at the age of 60, these ventricles should be considered abnormally large. The size and shape of the ventricles normally vary within certain limits in different individuals of the same age [8].

Symmetrical dilatation of lateral ventricles were classified into three types by morphometry of lateral ventricles: anterior horn predominant type (31 cases), diffuse type (36 cases), posterior horn predominant type (41 cases). Posterior horn predominant type has a tendency to occur in congenital anomalies and premature brain damage, and anterior horn predominant type in infantile brain damage. This disproportional dilatation of anterior or posterior horns suggests a vulnerability of periventricular structure in developing brain [9].

Neuroepithelial cysts in the lateral ventricles are often located in the trigone area,temporal horn or posterior horn. Because these cysts are located in the lateral ventricles they block the cerebrospinal fluid circulation route, thereby producing elevated intracranial pressure. Therefore, surgery is required [10].

Knowledge of normal variations in ventricular morphological features is important in endoscopic neurosurgery [11].

Enlargement of the posterior horns of the lateral ventricles is seen in some cases with the history of recurrent falls. . Changes in the gray and white matter in the parieto-occipital regions and ventricular expansion in these cases are

associated with disintegration of the visuospatial and attentional mechanisms, compromising safe navigation and mobility, and increasing the risk of falls [7].

Posterior horn of the lateral ventricle is usually diamond shape or square in outline and it has been observed that the two lateral ventricles may be asymmetrical. Considering the fact that the two lateral ventricles may be asymmetrical, the amount of CSF in each of them would also alter because of the change in the volumetric capacity. The volumetric changes in lateral ventricles has been found in diseases like schizophrenia.

The knowledge of the normal and abnormal anatomy of the lateral ventricles, especially the posterior horn, which is adjacent to a very important functional area, may be useful while diagnosing any visual disturbances, schizophrenia and other psychotic disorders. It may also be helpful for neuro-surgeons operating on the brain and the radiologists performing MRI and CT scans for diagnostic purpose [12].

From table no 1 and 2 it can be concluded that the mean value of length of the posterior horn increases on both sides as age increases. Values are larger in 61-80 years. Difference is statistically significant.

Increasing ventricular size with increasing age has been noted by other investigators Roberts MA, Caird F.I. (1976) [13] Hann FJY et al (1976) [14], Barron SA et al (1976) [15], Haug G (1977) [16], Gyldensted C et al (1977) [17], Hughes CP et al (1981) [18],. Our data also support the tendency for greater increase in the size of lateral ventricle in the elderly as found by Barron SA et al (1976) [15]. According to Glydensted C. et al (1977) [17], Takeda and Matsuzawa et al (1985) [19], and D'Souza e Dias Medora C. et al (2007) [20] the left lateral ventricle was larger than the right one.

The present study also found the same result for the length of posterior horn of lateral ventricle in relation to side. In relation to side mean length of posterior horn was more on left side than right side. The difference is statistically significant.

CONCLUSION

Present study has made an attempt to define morphometric measurement of length of posterior horn of lateral ventricle of brain and to find its changes in relation to age and side. This data will be helpful to neurosergons, radiologist and clinician for making the diagnosis.

Conflicts of Interests: None

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