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Anatomy & Physiology: Current Research

Research Article

Morphometric Study Of Third Ventricle Of Brain In Normal Individuals by Commputed Tomography at University of Gondar comprehensive Specialized Hospital, Gondar, Northwest Ethiopia, 2019

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ABSTRACT

A cross-sectional prospective study design was carried outfrom April, 2019 to August, 2019. The study participants were assessed by using a structured questionnaire and checklists. The data were entered into EPI INFO version 7 and then transferred into SPSS version 20 for analysis. Age and sex with the height and diameter of third ventricle were assessed by Pearson's product-moment correlation coefficient. ANOVA (mean difference between age groups) were performed. The p-value less than 0.05was considered as statistically significant. The mean third ventricle heightwere13.57mm, 13.52mmand diameter were2.98mm, 2.56mm, in males and females respectively. In relation to gender, the measurement of the third ventricle was greater in males as compared to females.

Keywords: Ketogenic die; Diabetes Mellitus; Metabolic syndrome

INTRODUCTION

The human brain is not only one of the most important organs in the human body; it is also the most complex and not yet fully understood [1].As aging advances, the brain undergoes many gross and histopathological changes with regression of the brain tissue leading to the enlargement of the ventricles [2]. The third ventricle is a slit like cleft between the two thalami. It communicates anteriorly with the lateral ventricles through the interventricular foramina (of Monro) and posteriorly with the fourth ventricle through the cerebral aqueduct (of Sylvius) [3]. There wasscarcity of literatures in the morphometric study of third ventricle in radiology practice of Ethiopian and currently the used reference values were drawn from other populations and races that have different epidemiological, demographic and anatomical distribution Besides, Radiologists were frequently faced with problems of deciding whether ventricles are within subjective decision based on experience [4]. Furthermore, Ventriculomegaly is a clinically important finding that associates with a number of diseases [5]. The third ventricles is enlarging in a variety of clinical conditions: such as schizophrenia, hydrocephalus, tumors, and as well as aging which could lead to dementia [6-7]. There were lacking evidence to date from available literature and in radiology practice of the ranges of the sizes of third ventricle for the adult Ethiopians [8]. Therefore, in order to assess the extent of ventriculomegaly in all disease conditions affecting the size of third ventricle, it is greatest important to know the normal size of third ventricle in Ethiopia. This research will be significant in terms of practical contribution to the existing body of research knowledge. Since the information, known regarding the size measurements of the third ventricle is limited and no work has been done in Ethiopia, the present study will be very important to shade alight for further research.

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Received: October 10, 2020; **Accepted:** October 25, 2020; **Published:** January 31, 2021

Citation: Assefa Agegnehu (2020) Morphometric Study Of Third Ventricle Of Brain In Normal Individuals by Commputed Tomography at University of Gondar comprehensive Specialized Hospital, Gondar, Northwest Ethiopia, 2019. Anat Physiol 11:337.

MATERIALS AND METHODS

This prospective study was comprised of data collected from subjects under computerized tomographic evaluation of Adults between May 2019 and August, 2019 at University of Gondar comprehensive specialized Hospital, Department of Radiology. Ethical clearance was obtained from the University of Gondar Research and Publication Office, ethical review committee. Official letter was submitted to University of Gondar hospital, Department of Radiology. Study subjects were informed about the purpose of the study and its procedure. Informed verbal consent was obtained from each individual at the time of data collection. The subjects were examined using GeneralElectric GE(Brightspeed4slices) with5mm slicethickness CT scannerfor head and brain imaging due to different client compliant.The study subjects had no history of cerebral infarction, local mass lesions, probable communicating hydrocephalus, alcoholism, drug abuse, trauma or previous intra-cerebral surgery. Besides this, sex, ageand other demographic features of subjects were documented. The patient was placed in a supine position on the CT table and was positioned so that there was no rotation or tilt of midsagittal plane. Measurements were taken on the axial section of CT images using Radi AntiDiacom Works Software. The maximum third ventricular width (FIGURE 1) and the maximum third ventricular height (FIGURE 2) were measured in mm. The measurements wereperformed byradiologist residants. Cross checking numerical values were done at least three times while recording and transferring to the statistical software package for social sciences (SPSS). The collected data were checked for completeness, accuracy and clarity before analysis. The data were entered epinfo version 7 and analyzed using the IBM SPSS Statistics, version 20. The means (± standard deviation), ranges, minimum, maximum, and the 95% confidence intervals for the mean (in order to include the true population, mean in 95% of the cases) were calculated. P-Value less than 0.05 is considered as statistically significant. The measurements of third ventricle were compared with the age. Differences of continuous variables between two independent groups were assessed with the 2-tailed t-test [9-10]

Prior to diagnosing abnormal enlargement of the third ventricle, clinician should know its normalmorphometry. As age advances, the brain undergoes many gross and histopathological changes with regression of the brain tissue leading to enlargement of the ventricles. So, knowledge of the age-related changes thatoccur in the brain is required before any abnormal findings are analyzed. In the current study, thethird ventricle width wasranged from (2.12-7.32) mm in males and from (1.86-6.76) mm in females meanwhile, the range of third ventricular diameter was from (8.23-18.12) mm in males and from (6.85-16.48)mm in females. this finding was less than previously reported by Saudi Arabia. This may be due to a smaller sample size compared to the current study; however, the general trend that third ventricle sizes in males were larger than those in females was confirmed [11]. In addition, the third ventricle sizes in males were larger than those in females. This finding were also in agreement with studies done in Zimbabweans in which compared to women, the size of the third ventricle was larger in men. Eleven normal subjects studied earlier by India reported a mean third ventricle width of 4.06 mm which was larger than the mean diameter of 2.92 mm observed in the current study; this may be due to a small sample in their study [12]. In relation to the side , the size of third ventricle is greater on the left side as compared to the right side Comparisons could be made between HIV positive and negative patients in future studies. In addition, when compared with previous studies mostly conducted in developed countries, the samples of the current study were drawn from a narrow population of patients attending a university of Gondar comprehensive specialized hospital for diagnostic. In addition, both current and the said previous studies CT scan findings were sampled from people who had health complaints warranting CT scan evaluation of the brain, i.e. headaches. Although the results of the current study can be useful as baseline results for future prospective studies. Thus, the findings from this study require care when being extrapolated to the generality of the Ethiopian population. Therefore, it recommended that future studies need to target healthy people carefully selected from the normal population of Ethiopians and compared with that of patients with neurological disorders.

RESULTS

Socio-demographic characteristics of patients One hundred and sixty-five (84females; 50.91%) patients having a mean age of 40.80 ± 18.06 years (18-79) years at presentation were recruited for the study based on inclusion criteria. Out of the included patients, 75 (45.5) of them were within the age group of 18-30. Regarding the residence of the participants, 141 (85.45) were from rural. The majority, 152 (92.12) of participants were orthodox. Concerning the ethnicity of the participants,159 (96.36) were Amhara. The transverse diameter of third ventricle indicated gradual increment from the age group of (31-40) years to the age greater than 50 years. The maximum mean of third ventricular height was obtained in the age group of 41-50 years (Table 1).

The ventricular system of the brain is a cavity of the brain. In this study, it was observed that diameter of thirdventricle was2.98 mm, 2.86 mm in males and females respectively. The third ventricle size were larger in males.

The size of third ventricle increased in age of adult subjects in both male and female. There was a statistically significant weakpositive correlationbetween the age of the subjects and third ventricle size (r=.203, P=0.009, r=.184, p=0.018 for third ventricle transverse diameter, andheight respectively .The study provided useful morphometric data about the third ventricle while diagnosing, hydrocephalus, schizophrenia, psychotic disorders and other pathologies.

Table 1: Blood glucose (mg/dl) and Insulin (IU/ml) in adult male albino rats subjected to different treatment

		G1	G2	G3	G4	G5
Glucose (mg/dl)	Mean ± S.E	90.7 ± 0.63a	204.9 ± 1.03b	107.3 ± 0.76c	119.3 ± 0.63d	128.8 ± 0.42e
	%	--	125.9	18.3	31.5	42.0
Insulin(IU/ml)	Mean ± S.E	20.4 ± 0.50a	12.4 ± 0.34b	22.3 ± 0.47c	17.0 ± 0.21d	14.2 ± 0.39e
	%	--	-39.2	9.3	-16.7	-30.4

Each value represented means of 10 records ± S.E.
a,b,c,d.e means comparison between all groups which the groups have the same letter mean there is no significance difference and which have different letter mean there is a significance change.
%: Percent of changes from control values**.**

Table 2.: Histopathological results of the pancreas

	Pancreatic islets				**Ducts**	**Exocrine area**	**BV**
	Islet size	Cellularity	Beta cells	Capillaries			
Group 1	0	0	0	0	0	0	0
Group 2	+	+	+	+	0	0	+
Group 3	+	+	+	+	0	0	+
Group 4	0	+	+	+	0	0	0
Group 5	0	0	0	+	0	0	+
Islet size:	0: Average	+: Small	++: Atrophied				
Cellularity:	0: Average	+: Hypocellular	++: Acellular				
Beta cells:	0: Average	+: Few/apoptotic	++: Necrotic/absent				
Capillaries:	0: Average	+: Mildly dilated	++: Markedly dilated/congested				
Ducts:	0: Average	+: Dilated	++: Atrophied				
Exocrine area:	0: Average acini	+: Small acini	++: Atrophied acini				
Interstitial BV:	0: Average	+: Mildly dilated	++: Markedly dilated/congested				

human is associated with increased susceptibility to either insulin- induced hypoglycemia or fasting- induced hypoglycemia [10]. The Ketogenic diet significantly decrease blood glucose level and give excellent glycemic control in this study, High-fat, low-carbohydrate KD have been associated with beneficial effects on pancreatic endocrine cells and glucose metabolism on the long term this was evidenced by increased insulin concentrations as evidenced by Gupta et al, [11]. This response could be the result from beta cell activation, an increase of cell number, or a combination of these two mechanisms. Hypoglycemic effect of KD may resulted from decreased glucagon levels that have been observed by Granados et al, [12]. Gupta et al, explained hypoglycemic effect of KD by decreased glucagon levels that lead to less gluconeogenesis from the liver, which may prevent hyperglycemia in KD-fed mice[11]. The results in this study strongly proved that long-term KD leads to increase of insulin sensitivity[13]. Interestingly, there were no great differences in pancreatic histological structure between KD groups that indicate the high fat diet is not harmful on pancreatic endocrine cells. Our finding is agreed with study of Blagosklonny, et al [14]. Purhonen et al, found that consuming KD leads to adaption of brain to utilize alternative energy substrates as well as to reduced hepatic glycogen content [15]. Long-term KD leads to decrease plasma cholesterol, LDL and triglyceride levels [16]. In our study, decrease plasma cholesterol, LDL and triglyceride levels were observed after 12 week of diet. Like fasting, KD may cause the symptoms of starvation pseudo-diabetes as remembered by Blagosklonny et al [14], they also said that starvation pseudo-diabetes is beneficial and is not type 2 diabetes. Thus, the warning that KD may cause type 2 diabetes in humans is not justified and contradicts what is observed in clinical practice[14]. where benefits of the diet appeared to strongly outweigh the challenges with positive health results after starting the KD, which were all related to their primary goals such as improved glycemic control [17], correct dyslipidemia [18], and weight loss [7]. The long-term safety and efficacy of the KD in individuals with diabetes remains unknown notably its effect on cardiovascular risk factors and frequency of hypoglycaemia [19]. Our histological finding is extremely reassuring as the effects on the pancreas, liver and kidneys are very simple, this were agreed with finding of Blagosklonny et al [14, 20]**.**

CONCLUSION

A classical Ketogenic diet is very-low-carbohydrates, this diet is

more efficiently in the this study than other types of diet as increase total carbohydrate lead decrease ketosis and this leads to the loss of the desired effect of KD.

ACKNOWLEDGEMENT

We would like to thank Prof. Dr. Mohammad Adel Shalaby Abdel- Latif, Professor of Medical Physiology, Faculty of Medicine, Al- Azhar University (Cairo) for his patience, constant support and inspiration during the research, as well as Prof.Dr. ALI Khalil, Prof.Dr.Khaled Ahmed Abd El-Sater**.**

CONFLICT OF INTEREST

The authors declare that they have no competing interest.

FINANCIAL SUPPORT

This study was funded by Department of physiology, Faculty of Medicine, Al-Azhar University, Assuit, Egypt. Without any particular role in the study design, recruitment of individuals, dataanalysis or writing of the report.

AUTHOR'S CONTRIBUTIONS

Nour El-Deen A Mansour A, and Abdallah M. involved in the study concept, design and recruitment of animal, induction of diabetes and follow up, and contributed to data acquisition; Ali A and Abdallah M. performed the biochemical tests; Nour El-Deen A and Gad-Allha. A performed statistical analysis and designed the figures; Nour El-Deen. A and Abdallah A. performed data interpretation; Abdallah. A, Nour El-Deen. A, Mansour A, and Gad-Allah 2 A wrote the manuscript; all the authors reviewed the manuscript and finally approved it for submission.

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