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Original Research Paper

Anatomy

EVALUATION OF LENGTH AND VOLUME OF PINEAL GLAND IN DIFFERENT AGE GROUPS OF MALE POPULATION BY 3D CT SCAN.

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ABSTRACT Introduction:The human pineal gland, a part of the diencephalon, is a small neuroendocrine organ that has a function in the circadian rhythm by the secretion of melatonin neurohormone.It is a circumventricular organ because of its deep location in the subarachnoid cistern surrounding the surface of the third ventricle.From ancient times many scientists (e.g. Galen, Avicenna) have examined the pineal gland. Descartes in his studies located the human soul in this structure.Nowadays, the number of papers concerning the pineal gland is increasing.The gland through its hormone (melatonin) influences many functions of the human body, like circadian rhythm, mood, psychiatric disorders, sexual maturation, reproduction and ageing. **Material and Method:**The study group consisted of consisted of 73 male patients age range from 21–79 years who had undergone cranial 3D CT scan studies at R.D. Gardi Medical College & Ujjain Charitable Hospital & Research Center Ujjain, Department of Radiology over a period of One and half years. All images were obtained with a 3D CT Scan Machine 128 slice of Wipro G Company. **Results:**In our study significant difference was found in the volume between 31-40 and 41-50and >50 agegroups ($p<0.05$). No significant difference was found in the parameters length and volume between <30 and >50 age groups ($p>0.05$). No significant difference was found in the parameters length and volume between 31-40 and >50 age groups ($p>0.05$).

KEYWORDS : Pineal gland, 3D CT scan, pineal gland morphometry

Introduction:

The human pineal gland, a part of the diencephalon, is a small neuroendocrine organ that has a function in the circadian rhythm by the secretion of melatonin neurohormone.[1] It is a circumventricular organ because of its deep location in the subarachnoid cistern surrounding the surface of the third ventricle.[2,3]Pineal gland is a midline cone-shaped reddish grey structure occupying the vertical groove between the two superior colliculi below the splenium of corpus callosum.[4] Descartes in his studies located the human soul in this structure.[5] Nowadays, the number of papers concerning the pineal gland is increasing.[6] The gland through its hormone (melatonin) influences many functions of the human body, like circadian rhythm, mood, psychiatric disorders, sexual maturation, reproduction and ageing.[7]Although pineal gland weight and volume vary greatly in respect of time, age, and physiological condition, the mean weight of the adult human pineal gland is generally 50 to 150 milligrams.[8]

It has been stated that the pineal gland grows in size from birth until two years of age and then remains constant between 2 to 20 years of age.[9] Formerly, it was believed that the pineal gland played an important functional role in the onset of puberty.[10,11] Some autopsy studies have reported that the average size of the pineal gland is 7.4mm in length, 6.9mm in width, and 2.5mm in height.[12] Interestingly, Tapp and Huxle reported a gradual increase in the size of the pineal gland from puberty to old age in humans.[13]

Material and Method:

Approval of institutional Ethical committee: The research protocol was approved by institutional ethics committee version no 224 date 16.06.2012

Patient Population-This is a retrospective study, was carried out at Chandrikaben Rashmikant Gardi hospital, Ruxmaniben Deepchand Gardi Medical College, Ujjain; Madhya Pradesh (India). It is 600 bedded private tertiary care teaching hospitals.The study group consisted of 73 male patients age range from 21–79 years who had undergone cranial 3D CT scan studies at R.D. Gardi Medical College, Ujjain.

Inclusion Criteria: -patient who give consent andage range: 21–79 years.

Exclusion Criteria:-patients were excluded if there was a history of pineal tumor, cyst, or dysfunction, if there was any brain abnormality adjacent to the pineal gland , patients with any known endocrinologic disorder or malignant tumor as well as those who were undergoing radiation therapy or chemotherapy or if the required images were missing or destroyed.

Image Acquisition: -data collection had done by picture archiving and communication system (PACS) computer records of all patients who undergo cranial 3D CT scan. All images were obtained with a 3D CT Scan Machine 128 slice of Wipro G Company.In this study, the pineal boundary was exactly identified on the sagittal sections taken in addition to coronal and axial views.Antero-posterior dimension was measured in the sagittal view and vertical and transverse dimensions were measured in coronal and axial views.

Volume Estimation-It is done by using planimetry, which involves manually tracing the boundaries of objects of interest on images of sections, is the most commonly used technique for estimation of volume.[14]

The volume (V) was calculated according to the formula:
$V = 1/2 \times H \times L \times W$.[15]

Observation and results: statistical analysis was done by using appropriate software.We use statistical tools like mean,

SD, t-test, diagrams, one way analysis of variance for comparing different parameters of pineal gland with respect to sex and age groups.

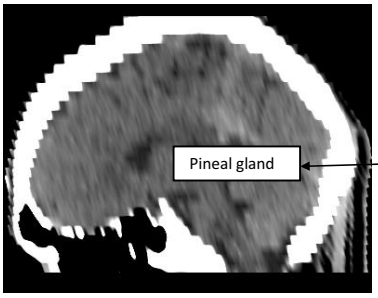

Image No. 01: CT scan head-sagittal section.

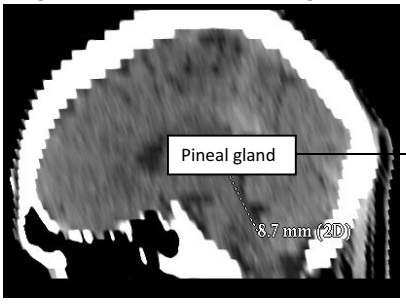

Image No. 02: CT scan head (Sagittal section) showing length of pineal gland.

Table No. 01: Pineal gland length, width, thickness and volume mean values in age related groups in males.

Variable	Age	n	Mean	Std. Deviation	p Value
Length	<30	19	7.0516	0.13570	0.206
	41-50	18	7.1394	0.26278	
Width	<30	19	6.7074	0.25203	0.835
	41-50	18	6.7250	0.25862	
Thickness	<30	19	4.1037	0.20318	0.026*
	41-50	18	3.9317	0.24462	
Volume	<30	19	194.07	11.98839	0.259
	41-50	18	188.81	15.75813	

Table No. 02: Mean and significant values of Pineal gland length and volume in age groups (<30 & 41-50) in males.

Variable	Age	N	Mean	Std. Deviation	p Value
Length	<30	19	7.0516	0.13570	0.206
	41-50	18	7.1394	0.26278	
Volume	<30	19	194.07	11.98839	0.259
	41-50	18	188.81	15.75813	

In above mentioned table no significant difference was found in the parameters length and volume between <30 and 41-50 age groups (p>0.05).

Table No. 03: Mean and significant values of Pineal gland length and volume in age groups (<30 &>50) in males.

Variable	Age	n	Mean	Std. Deviation	p Value
Length	<30	19	7.0516	0.13570	0.056
	>50	16	7.2231	0.34752	
Volume	<30	19	194.07	11.98839	0.218
	>50	16	200.26	17.06996	

In above mentioned table no significant difference was found in the parameters length and volume between <30 and >50 age groups (p>0.05).

Table No. 04: Mean and significant values of Pineal gland length and volume in age groups (31-40 & 41-50) in males.

Variable	Age	n	Mean	Std. Deviation	p Value
Length	31-40	20	7.1095	0.26265	0.728
	41-50	18	7.1394	0.26278	
Volume	31-40	20	202.24	20.24290	0.030*
	41-50	18	188.81	15.75813	

In above mentioned table, significant difference was found in the volume between 31-40 and 41-50 age groups (p<0.05).

Table No. 05: Mean and significant values of Pineal gland length and volume in age groups (31-40 &>50) in males.

Variable	Age	n	Mean	Std. Deviation	p Value
Length	31-40	20	7.1095	0.26265	0.271
	>50	16	7.2231	0.34752	
Volume	31-40	20	202.24	20.24290	0.757
	>50	16	200.26	17.06996	

In above mentioned table no significant difference was found in the parameters length and volume between 31-40 and >50 age groups (p>0.05).

Table No. 06: Mean and significant values of Pineal gland length and volume in age groups (41-50 &>50) in males.

Variable	Age	n	Mean	Std. Deviation	p Value
Length	41-50	18	7.1394	0.26278	0.431
	>50	16	7.2231	0.34752	
Volume	41-50	18	188.81	15.75813	0.050*

In above mentioned table, significant difference was found in the volume between 41-50 and >50 age groups (p<0.05). No significant difference was found in the parameters length between <30 and 41-50 age groups (p>0.05)

Discussion:

To the best of my knowledge only single study (Golan et al. 2002) have been done previously on morphometric parameters of pineal gland and this was a cadaveric study.[16] Pineal gland remained the organ of interest for the different researchers since the historical time but still we don't have a common consensus about its parameters with age in human being.Golan et al16observed that the lowest average length of pineal gland was in the group of 41–50 years. The highest was found in the group of 31–40 years.Maximal mean value appeared in the group of 31–40 years. In the group of 31–40 years the average volume of the pineal gland was the lowest. The highest mean volume was observed in the 31–50 years group.

In our study we find the lowest mean length (7.05mm) of pineal gland in the age group of <30 years in males. The highest mean length (7.22mm) was found in the age group of >50years. In the age group of 41-50 years the average volume (188.81mm^3) of the pineal gland was the lowest in males. The highest mean volume (202.24mm^3) was observed in the 31-40 years age group in males.

Summary & conclusion: The conclusions of present study are that Pineal gland mean length gradually increased with age. The volume of gland slightly increased up to the age of 40 years with age and then there is fall in 41-50 years age groups, then again increase in volume was noted. There was significant difference in length (p<0.01) and volume (p<0.05) between different age groups. In females significant difference was found for the parameter length with respect to age groups (p<0.01).

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