

“MORPHOMETRIC PARAMETERS OF PINEAL GLAND IN DIFFERENT AGE GROUPS AND AGE RELATED CHANGES IN PARAMETERS BY 3D CT SCAN”.

Anatomy

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ABSTRACT

Introduction: The human pineal gland, is part of the diencephalon, it's a small neuro endocrine organ that play important role in the circadian rhythm by the secretion of melatonin neuro hormone. Pineal gland is 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 related to the pineal gland is increasing in number. 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 100 patients (age range: 21–79 years, average 39.69 SD 13.84 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: Significant difference was found in the thickness between <30 and 41-50 age groups ($p < 0.05/0.026$), significant difference was found in the thickness between 31–40 and 41–50 age groups ($p < 0.05/0.012$). No significant difference was found in the width among different age groups.

KEYWORDS

Pineal gland, 3D CT scan, pineal gland morphometry.

INTRODUCTION:

The human pineal gland, is part of the diencephalon, it 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-

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 100 patients (age range: 21–79 years) who had undergone cranial 3D CT scan studies at R.D. Gardi Medical College Ujjain.

INCLUSION CRITERIA: - patient who give consent and age 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:-

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.

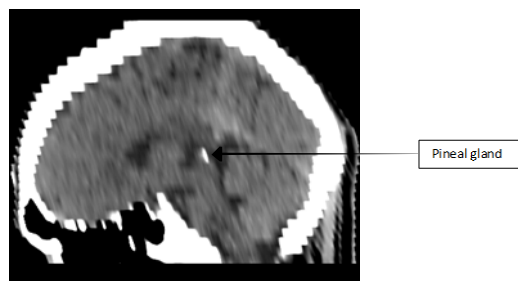


Image No. 01: CT scan head-sagittal section.

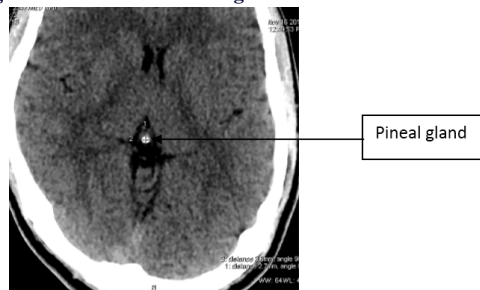


Image No. 02: CT scan head (axial section) showing width & thickness of pineal gland.

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.

Table No. 01: Frequency distribution of male & female according to age groups.

Sex	Age group				Total
	<30	31-40	41-50	>50	
Female	9	6	8	4	27
Male	19	20	18	16	73
Total	28	26	26	20	100

we include 100 patients age range 21–79 years in which 28 patients belong to age less than 30 year, 26 patients belong to age group 31 to 50 year and 20 patients belongs to age more than 50 year.

Table No. 02: One way ANOVA for different parameters of male with respect to age groups.

Variable	Source	Sum of Squares	Df	Mean Square	F	Sig.
Width	Between Groups	0.758	3	0.253	2.164	0.100
	Within Groups	8.059	69	0.117		
	Total	8.818	72			
Thickness	Between Groups	1.196	3	0.399	4.056	0.010*
	Within Groups	6.780	69	0.098		
	Total	7.976	72			

For comparing all age groups parameters in males we apply one way ANOVA technique. In the ANOVA table significant difference was found for the parameter thickness with respect to age groups ($p < 0.05/0.010^*$).

Table No. 03: One way ANOVA for different parameters of female with respect to age groups.

Variable	Source	Sum of Squares	Df	Mean Square	F	Sig.
Width	Between Groups	.307	3	0.102	1.387	0.272
	Within Groups	1.696	23	0.074		
	Total	2.003	26			
Thickness	Between Groups	0.249	3	0.083	1.219	0.325
	Within Groups	1.563	23	0.068		
	Total	1.812	26			

For comparing all age groups parameters in females we apply one way ANOVA technique. No significant difference was found in width, thickness with respect to age groups ($p > 0.05$).

Table No. 04: Pineal gland length, width, thickness and volume mean values in age related groups.

Age group (in years)	n	WIDTH		THICKNESS	
		Mean	SD	Mean	SD
<30	28	6.738	0.2772	4.108 ¹	0.1942
31-40	26	6.740	0.4745	4.187 ³	0.4330
41-50	26	6.732	0.2415	3.915 ³	0.2897
>50	20	6.869	0.2696	4.001	0.2309

No significant difference was found in the width among different age groups. Significant difference was found in the thickness between <30 and 41-50 age groups ($p < 0.05$), significant difference was found in the thickness between 31-40 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.¹⁴ 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. In our study, we observed the highest mean width in >50 years and lowest in 41-50 years age group. The highest mean thickness in 31-40 years and lowest in 41-50 years age group.

Summary & conclusion:

The conclusions of present study are that Pineal gland, width of the gland is increased up to the 40 years then it slightly decreased with age. There is no particular pattern of the thickness, as it first increased with age and then decreased. In males significant difference was found in the width between 41-50 and >50 age groups ($p < 0.05$). NO significant

difference was found in width, thickness and with respect to age groups.

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