

Magnetic resonance imaging evaluation of pituitary gland height and shape in relation to age and sex

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Abstract

Introduction: Magnetic Resonance Imaging (MRI) is the most suitable modality for the evaluation of pituitary gland pathologies. Knowledge of the normal dimensions of the pituitary gland is needed to differentiate normal from abnormal cases. Size of the gland especially height varies according to age group and also gender. The reference values are helpful for evaluating pituitary gland especially in borderline cases in whom dynamic post contrast studies are needed for further evaluation. Hence we conducted a study to formulate the normal data for different age groups. **Aim of the study:** Aim of the study is to evaluate the size and shape of pituitary gland according to different age groups on MRI. **Materials and Methods:** This was a retrospective study of 200 patients who had undergone brain MRI from July 2018 to October 2018. Patients with sellar or parasellar pathologies and endocrine disorders were excluded from the study. Mid sagittal T1 weighted images were analysed for size and shape of the gland. **Results:** Study included 110 males and 90 females. The patients were divided into different age groups from 0 to 10 years, 11-20 years, 21-30 years, 31-40 years, 41-50 years, 51-60 years and 61 years and above. Mean height of pituitary gland in our study was 5.42 mm. Maximum height was found in 11-20 years age group. After 11-20 years age group, gradual decline in the height was noted. Minimal increase in the elderly age group was also seen. Most common shape of the pituitary gland was flat in our study. **Conclusion:** Knowledge of pituitary gland height in different age groups is helpful in distinguishing normal from abnormal gland. Normal data of the study is useful for the same.

Key Word: Height, MRI, pituitary gland, shape

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INTRODUCTION

Pituitary gland is the major endocrine gland of the human body which is located in the sella turcica of middle cranial fossa. Anatomically it is divided into larger anterior pituitary gland (adenohypophysis) and smaller posterior

pituitary gland (neurohypophysis). MRI is the investigation of choice for the evaluation of the pituitary gland because it carries no radiation exposure and allows multiplanar scans of better contrast resolution than computed tomography (CT) without bony artefacts¹. The dimensions of pituitary gland varies according to each age group and gender. The signal intensity and shape of the gland on MRI changes at different stages of life². Posterior pituitary gland appears hyperintense on T1 weighted images while anterior pituitary gland appears isointense on T1 weighted images. Physiological hypertrophy of the gland is seen during puberty, pregnancy and lactation³. Usually, subjectively we can differentiate normal from abnormal pituitary cases. However in patients with hormonal disorders, especially borderline cases, radiologists face dilemma in calling pituitary gland as normal, hypoplastic or hypertrophic. In such cases,

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patients are subjected to extra investigations for evaluation of the pituitary gland. To avoid this, we need to have a reference values of normal pituitary gland size for particular age and gender. The purpose of this study is to formulate the normal data for size, particularly the height of the normal pituitary gland in our region.

MATERIALS AND METHODS

This was a retrospective study done in the department of radiology of a tertiary care teaching hospital. Study consisted of total of 200 patients who had undergone Magnetic Resonance Imaging (MRI) from July 2018 to October 2018. Patients with hormonal disorders or sellar or parasellar pathologies were excluded from the study. Empty sella patients with height of pituitary gland measuring less than 2 mm were also excluded from the study. MRI was performed using GE signa excite 1.5 T scanner. All the patients underwent plain MRI of the brain using head coil. Sagittal T1 weighted images were

analyzed for the dimensions of pituitary gland. The parameters for sagittal MRI were TE value of 9.7ms, TR of 1474ms, matrix of 320 x 192, FOV of 25 x 25, slice thickness of 6 mm with interslice gap of 2 mm. Mid sagittal T1 weighted images were reviewed to look for height of pituitary gland. Height was measured from the superior aspect to inferior aspect of gland on midsagittal T1 weighted images Figure 1. We also evaluated the shape of the gland and categorized into flat Figure 2, convex [Figure 3] and concave shape. All the patients were divided into to different age groups from 0-10, 11-20, 21-30, 31-40, 41-50, 51-60, and 61 years and above. The variations in the pituitary height according to the age groups were obtained. Measurements were noted in mean ± SD in the scale of mm. Data analysis was done by SPSS. To test the relation between the mean heights with different age groups, ANOVA test was used. A P value of less than 0.05 was considered significant.



Figure 1:

Figure 2:

Figure 3:

Mid sagittal T1 weighted image showing the measurement of height of pituitary gland.

Mid sagittal T1 weighted image showing the flat shape of pituitary gland. Also notice the bright signal of posterior pituitary gland.

Convex shape of the pituitary gland is demonstrated on this midsagittal T1 weighted image.

RESULTS

Out of the 200 patients included in the study, 110 were males (55%) and 90 (45%) were females. In 110 male cases majority were in 0 to 10 years age group i.e. 43(39.1%) followed by 11-20 years age group (13.6%) whereas among females, majority were from 0 to 10 years age group i.e. 27(30%) followed by 31-40 years age group (18.9%). The variables are shown in table number 1.

Table 1: Distribution of patients according to age and gender

Age group in years	Males		Females	
	Frequency	Percent	Frequency	Percent
0 to 10	43	39.1	27	30.0
11 to 20	15	13.6	15	16.7
21 to 30	10	9.1	10	11.1
31 to 40	14	12.7	17	18.9
41 to 50	7	6.4	9	10.0
51 to 60	8	7.3	8	8.9
> 60	13	11.8	4	4.4
Total	110	100.0	90	100.0

In the present study the mean height of pituitary gland in 11-20 years age group among males was 5.40±1.20 mm while in females it was 6.45±1.55 mm. This difference in mean height was statistically significant with a P value of less than 0.05. This difference in male and female cases in other age groups was not significant. This is shown in table number 2

Table 2: Showing mean pituitary heights comparison in different age groups and in both the sex.

Age group in years	Sex	Mean height (mm)	SD	p	Inference
0-10	Males	4.51	1.00	0.18	Not significant
	Females	4.22	.64		
11 to 20	Males	5.40	1.20	0.043	Significant
	Females	6.45	1.55		
21 to 30	Males	5.71	1.12	0.75	Not significant
	Females	5.86	1.04		
31 to 40	Males	5.70	1.36	0.28	Not significant
	Females	6.22	1.11		
41 to 50	Males	5.89	.85	0.54	Not significant
	Females	5.64	.86		
51 to 60	Males	5.95	.79	0.3	Not significant
	Females	5.35	1.17		
61 and above	Males	5.71	.83	0.81	Not significant
	Females	5.63	.31		

The mean the height of pituitary gland was more in 31- 40 years age group (5.99± 1.23) followed by 11-20 (5.96±1.48) and 41-50 years age group (5.77±0.84). When the mean pituitary height of all age groups was compared together by applying one way ANOVA test, there was significant difference at each age group as shown in table number 3.

Table 3: Showing the mean values of pituitary height in different age groups.

Age Group in years	N	Mean	SD	F	p	Inference
0to10	65	4.38	.88	14.07	0.0001 (<0.001)	Highly significant
11to20	32	5.96	1.48			
21to30	20	5.78	1.06			
31to40	27	5.99	1.23			
41to50	19	5.77	.84			
51to60	14	5.61	1.04			
61 and above	23	5.69	.71			
Total	200	5.36	1.25			

Flat shaped pituitary gland was the most common type seen in 95 patients (47.5%). Next most common shape was convex seen in 63 patients (31.5%). Concave shape was seen in 42 patients (21%).

DISCUSSION

In our study maximum height of pituitary gland was seen in teenage group, i.e. 11to20 years age group. After that as the age increases, there was gradual reduction in the height. The mean pituitary height was more in females than in the males in majority of the age groups. This is similar to the study done by Yadav *et al*⁴. According to the study done by Argyropoulou *et al*⁵ there is increase in the height of the pituitary gland with age except during the first year of life. Increase in the height of pituitary gland during puberty is a normal physiological change^{6,7}. In our study mean height of pituitary gland in 0to10 year age group was 4.47. This is in accordance with the study done by Argyropoulou *et al*⁵ and Denk *et al*⁸. With increasing age, there is diminution in the height of pituitary gland^{7, 9,10}. In our study also, we found that the mean heights of pituitary gland decreased as the age advances. The variations in the height of pituitary gland may be due to change in the hormonal levels in the body which in turn varies according to age. The increase in pituitary gland height during puberty may be related to

augmented production of Luteinizing hormone levels during this time of growth. The height of pituitary gland reduces with age because of the senile atrophy of the gland and change in the hormonal levels. However there might be increased height of pituitary gland in elderly patients because of the absence of negative feedback from the target organs^{6,11}. In our study maximum height of 6.24 mm was seen in 11to20 years age group which is in accordance with the study done by Suzuki *et al*¹². The most common shape of pituitary gland was flat in our study which is similar to that found in Yadav *et al*⁴. Convex shape was seen more in the younger age group and concave shape was seen in elderly patients. Limitations of the study were retrospective design of the study and relatively less sample size.

CONCLUSION

Dimensions of the pituitary gland, predominantly height changes with age. There are less age related effects on the pituitary width or length. Hence knowledge of pituitary gland height in different age groups is helpful in

distinguishing normal from abnormal gland. In our study we tried to formulate the data according to different age groups in our region. This data is definitely helpful to physicians whenever they encounter patients with physiologic hyperplasia of pituitary gland whose symptoms mimic that of pituitary tumour.

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