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Radiology

Characterization of the Pituitary Gland Shape with MR Imaging

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Abstract		Original Research Article

Magnetic Resonance Imaging (MRI) is the standard tool for the imaging of pituitary gland. *The aim* of the study was to characterize the shape of the pituitary gland in relation to age and sex. *Methodology:* A cross sectional prospective analytical study of the pituitary glands of Sudanese people, the data was collected from 301 Sudanese subjects (123 males' percent 40.9% and 178 females' percent 59.1%) who underwent MRI examination for brain. *Results* the females gender are the big frequency distribution than males among study sample. The convex shape appear in females more than males in the age group 20-29 years old the concave shape appear in age group between 40-49 and 50-60, the flat appear in age group 20-29, partial empty in age group 30-39, the only one empty case appear in female in age group 40-49. *Concolusion* the pituitary gland can be accurately determined by using MRI and should be correlated with the patient's age and sex for further correlation.
Keywords: Pituitary gland, magnetic resonance imaging, age, gender.

INTRODUCTION

The pituitary gland was first described anatomically by a Belgian scientist Andreas Vesalius in 1543.It is a small-sized gland with master functions; hence, its size and morphology have been a source of interest for many researchers. Sometimes in imaging, one takes a quick look at the contour of the superior surface of the pituitary gland or the size of the sella turcica as an indication or suggestion of enlargement of the gland. However, this would be misleading as the shape of the superior surface of the normal gland could either be flat, concave, or convex, depending on the hormonal status, age, sex, and even race of the individual. Also, the size of the bony sella is not a sensitive indicator of pituitary gland abnormality since an empty sella can lead to an enlarged fossa. Hence, there is a need for quantitative assessment. Magnetic resonance imaging (MRI) presently supersedes computerized tomography (CT) and plain radiographs in the investigation of the sella, parasellar, and suprasellar regions. MRI allows detailed visualization of the anterior and posterior lobes, pituitary infundibulum, optic chiasma, and other parasellar structures [1].

The coronal image is considered the best single view for imaging the pituitary gland, while the sagittal image best assesses the relationship of the midline structures [2].

The pituitary gland is the master endocrine gland of the human body. It controls other glands and secretes important hormones. Evaluation of pituitary size shape is the most important factors for the diagnosis of its pathology. Pituitary adenomas especially the microadenomas are diagnosed mainly with the information of pituitary size and its configuration. [3].
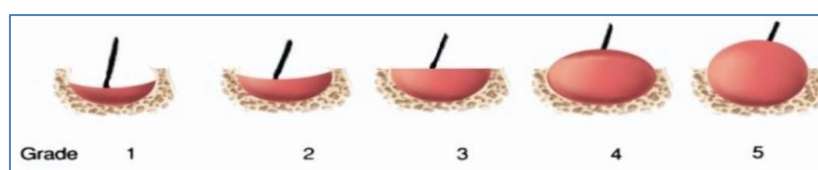

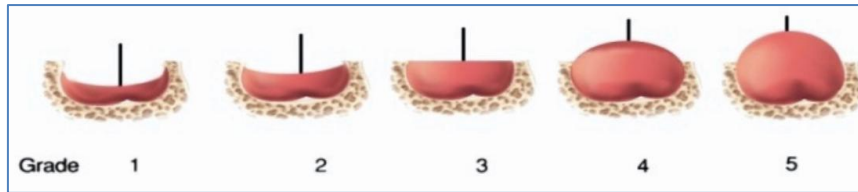**Fig-1: Scheme grade score for the shape evaluated in sagittal views**

Fig-2: Scheme grade score for the shape evaluated in coronal views [4].

Grade 1 (G1) call "Concave", Grade 2 (G2) call "Concave" (different than G1, less than center of gland 2 mm.), Grade 3 (G3) call "Flat", Grade 4 (G4) up more Grade 3 (but less than 2 mm.) call "Convex", Grade 5 (G5) call "Convex" (rather round shape). C. Keanninsiri1,

MATERIALS AND METHODS

A cross sectional prospective analytical study of the pituitary glands of Sudanese people, the data were collected from 301 Sudanese subjects (123 males' percent 40.9% and 178 females' percent 59.1%) who underwent MRI examination for head at the Radiology and Imaging Department in the modern medical center during the period from 2015 to 2020.

Shape variation of the pituitary gland

The data that display in mid sagittal image (close to mid sagittal plane) .Shapes of pituitary gland is:
a) Convex when the upper surface of P.G was convex (rather round shape)
b) Concave when the upper surface of P.G was concave.
c) Flat when the upper surface of P.G was flat.
d) Partial empty (PE) when the high of gland will be 3-4mm.
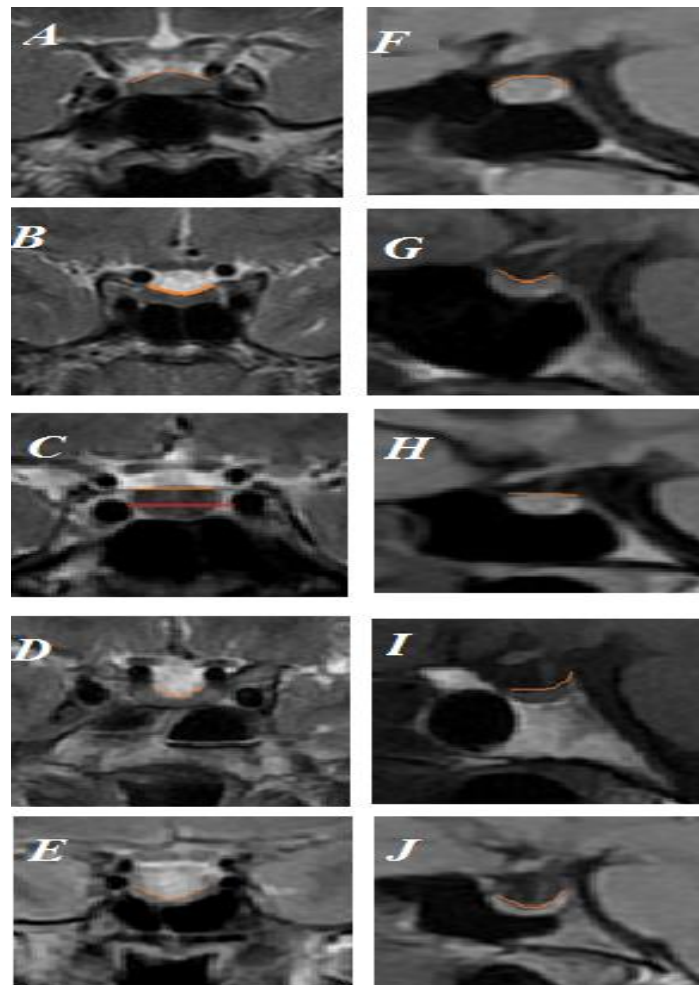e) Empty sella will be when gland high less than 2mm.

Fig-3: MR images shows the five shapes of pituitary gland convex, concave, flat, partial empty and empty sella respectively (A-D coronal sections)and(F-J sagittal sections)

RESULTS

In this current study, we analyzed the MRI scans of 301 patients of 20 years and older; 40.9% are males (n = 123) and 59.1% females (n = 178) represented in fig-4.
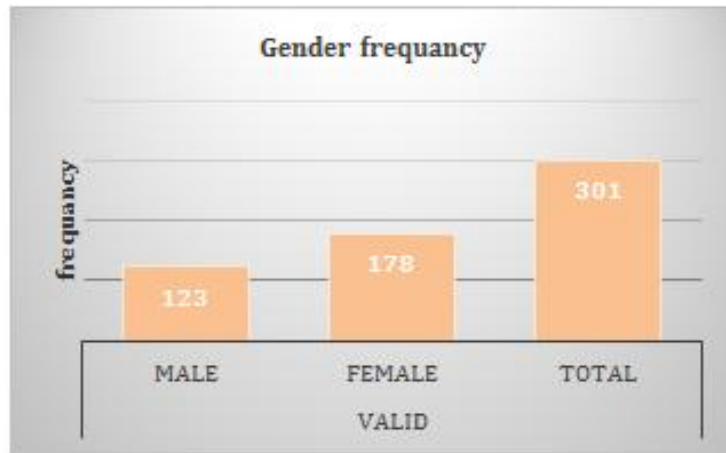

Fig-3: Distribution of participants' sex in the sample

The samples were divided according to gender into 4 age groups: 20–29 years, 30–39, 40-49 and 50-60. Table 1 shows the frequency distribution cross-tabulation.

Table-1: Distribution of participant's age groups and sex in the sample

Age group	gender	count	frequency	percent
20-29	male	49	126	41.9
	female	77		
30-39	male	26	63	20.9
	female	37		
40-49	male	18	45	15.0
	female	27		
50-60	male	30	67	22.3
	female	37		
total		301	301	100

Table-2: Shape of pituitary frequency distribution with the gender in the sample

		Frequency		Percent	Cumulative Percent
Convex	male	50	127	41.9	42.2
	female	77			
Concave	male	34	80	26.4	68.8
	female	46			
Flat	male	25	57	18.8	87.7
	female	32			
	Total	**264**			
PE	male	14	36	11.9	99.7
	female	22			
	Total	**300**			
E	male	0	1	.3	100.0
	female	1			
total		**301**		100	100

Table-3: Shape of pituitary frequency distribution within age group in the sample

			Shape					Total
			convex	concave	flat	PE	E	
age group	20-29	Count	83	20	21	2	0	126
		% of Total	27.7%	6.7%	7.0%	0.7%	0	42.0%
	30-39	Count	17	18	13	15	0	63
		% of Total	5.7%	6.0%	4.3%	5.0%	0	21.0%
	40-49	Count	8	21	8	7	1	45
		% of Total	2.7%	7.0%	2.7%	2.3%	0.3	15%
	50-60	Count	19	21	15	12	0	67
		% of Total	6.3%	7.0%	5.0%	4.0%	0	22%
Total		Count	127	80	57	36	1	301
		% of Total	41.9%	26.4%	18.8%	11.9%	0.3	100.0%

DISCUSSION

MRI usages are more effective than other imaging methods in visualizing the soft tissue like pituitary gland MR findings .This study focused mainly on the pituitary gland shape in relation with age and sex

In this study, the authors reported MRI data on measured the shape of pituitary gland in participants. There were 40.9% are males (n = 123) and 59.1% females (n = 178)represented in figure 3 their age was range from (20–60 years).Table 1 give the summary of the frequency distribution of sex with age group, the females gender are the big frequency distribution than males.Table2 shape of pituitary frequency distribution, the shape of pituitary gland can affect some variable because of that we divided the cases according to the shape and analytic according to this divided in some relation variable. the total cases was 301 when excluded the one empty sella it will be 300 and when excluded the 36 partial empty the cases was be 264 the convex shape are the high frequency distributed and it appear in female more than male by 42.2% concave, flat, PE and E are the lower appear respectively.

Table 3 distribution the frequency of age group with pituitary shape, in age group 20-29 the convex shape appear in high frequency, concave appear in age group between 40-49 and 50-60,the flat appear in age group 20-29,PE in age group 30-39, the only one empty case appear in female in age group 40-49.

Previous studies have highlighted different changes in the shape of the upper surface of the pituitary gland at various stages of life, which also indicate the consequent change in hormonal levels [2] Results of the present study in agreement with previous studies.

Our result was that the convex shape was the high-frequency percentage 41.9% then concave in

26.4%, flat 18.8, partial empty 11.9%, empty sella by 0.3% respectively, the empty sella were seen in one patient in the age above 40 years we detect it in one female 43years old, these results were consistent with Samuel M. et al. [5], who detect that the larger gland was seen in the younger women and convex shape are the highest shape count in younger women. And the worth noting are these frequencies of shapes in our study are the same frequency distribution in the gender variable female and male, convex, concave, flat, PE, and empty sella respectively.

The convex shape appears higher frequently in the younger age group 20-29 then in the age group 50-60, 30-39 lastly in the age group 40-49. The concave shape appears more frequency in the age group 20-30, its frequency ware convergent in all age groups. the flat shape appears in more frequently in the age group 20-29, partial empty was appear in the middle age group 30-39 by a percentage of 5%from total percentage of partial empty shape 11.9% and it appears in females more than male. The decline in the pituitary upper surface due to age may explain the process of aging similar finding was achieved by Tika R Lamichhane et al. [6], who reported that a higher frequency of convex upper border in female than in male in Nepalese population so that the flat shape is higher in male. Also, S. C. Sanjay et al. [7] noted that the gland was more convex globular in the younger age group in female 58.30%, flat 3.1% then concave 11.10% and it was in the same order with age increase This is, however, contrary to the finding by Pratiksha Yadav1 et al. [8] who found that in all the age groups and both the sexes, the most common shape was flat, which was seen in 46%of people followed by convex in 31.2%, concave shape in 22.8%.

Also, C. Keanninsiri1 et al. [4], reported that the most frequency grade shape of the upper surface of the pituitary gland was the type of "flat" in male all age groups and in female groups except age group (11-20

years), which higher frequency type of "convex". As we said depends on the upper surface for that it has a correlation between it and depth (height).

CONCLUSION

The pituitary gland can be accurately determined by using MRI and should be correlated with the patient's age and sex for further correlation. The convex shape appears in high frequency in relation to other shapes IN THE FEMALES age group of 20-29 year old.

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