Correlation of Duration of Symptoms with Pituitary Adenoma Volume

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Abstract

Background: Patients with pituitary adenoma usually come to attention either with visual disturbances or symptoms secondary to the secretory nature of the tumor. Thus, the symptomatology related to pituitary lesions could be secondary to mass effect or functional secondary to the hypo or hypersecretion of hormonal substances.

Objective: The study was conducted to identify the relationship between lesion volume and the duration of symptoms.

Methods: The study included 70 patients whose data were collected in a retrospective manner. Data was collected via outpatient and in-patient admission record systems, of the patients with pituitary adenoma presenting to the neurosurgical unit of Liaquat National Hospital, Karachi, between 2012-20. The volume of the pituitary adenoma was calculated based on the formula of volume ½ (length x breadth height). All adenomas were divided into three categories, based on volume.

Results: A total of 70 patients of either gender the age of 17 to 74 were included. Among 70 patients, 2(2.9%) of patients were found with volume <0.52cm^3, 42(60%) with 0.52-8.16 cm^3 and 26(37.1%) with >8.16 cm^3.

No significant association was found between the symptom duration and volume of the adenoma.

Conclusion: The relationship of volume with the duration of symptoms in pituitary patients was found insignificant. This could be attributed to multiple factors. Even trivial symptoms like headaches and visual problems should be sought after by a trained professional.

Keywords: *Pituitary, macroadenoma, volume, MRI, non-functioning pituitary adenoma, visual disturbances, optic apparatus.*

INTRODUCTION

The pituitary gland comprises of two parts, adenohypophysis, and neurohypophysis also referred to as the anterior and posterior pituitary glands. It is located in the sellaturcica with cavernous sinuses on either side and charism anteriorly. Adenohypophysis constitutes 80% of the gland volume whereas neurohypophysis accounts for the rest of 20%. Growth hormone, aderenocorticotropic hormone, thyroid stimulating hormone, and gonadotropins are all released by the anterior pituitary, whereas the posterior pituitary stores and releases oxytocin and vasopressin which are released by the hypothalamus.

Pituitary tumours make up 10-20% of all primary intracranial tumours, and 30% of pituitary adenomas are functional adenomas. Endocrine symptoms are typically present in functioning tumours. Except for prolactinomas, surgery is the primary form of treatment for the majority of these tumours. The method of surgery most frequently employed is transsphenoidal surgery (TSS). The majority of pituitary adenomas, 30–40% of them, are non-functioning pituitary adenomas (NFPAs). Due to their mass effect, NFPAs are known to produce major clinical symptoms such as vision impairment and pituitary insufficiency [1]. To alleviate the mass impact and decompress the pituitary gland and optic system, the gross total resection (GTR) of NFPAs should be attempted [2].

The rationale of the study was to evaluate the varied symptoms the patients with pituitary adenoma present with and the difference in the course of action for functioning and non-functioning tumors.

The objective of our study was to correlate the volume of the pituitary adenoma with the duration of the onset of symptoms.

METHODS

Retrospective data analysis was done on pituitary adenoma patients who visited the neurosurgery department of Liaquat National Hospital in Karachi between 2012 and 2020. Data was collected *via* outpatient and in-patient admission record systems. A total of 112 patients were evaluated, of which we had complete data of 73 patients included in the study.

Symptom duration was evaluated based on clinical history. Based on the symptomatology, a pre-operative MRI brain with the pituitary protocol was performed in all patients and relevant hormonal levels. Volume was calculated using the standard formula - ½ (length x width x height). Based on this, the patients were categorized into three groups, micro-tumor (volume < 0.52cm^3), macro tumor (volume 0.52- 8.16cm^3), or giant tumor

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(volume > 8.16cm^3). In order, to further stratify the results the duration of symptoms was divided into 3 subgroups (6 months, 7-12 months, and >12 months, respectively).

STATISTICAL ANALYSIS

A statistical package for social sciences (SPSS) version 25 was used to examine the data. For quantitative data, mean and standard deviation were calculated, and for qualitative variables, frequency, and percentage were. Fisher's exact test was used to stratify qualitative characteristics to determine how these modifiers affected the research groups. P<0.05 was seen as a significant value.

RESULTS

A total of 70 patients of either gender the age of 17 to 74 were included in the study to analyze the relationship between the volume of pituitary adenoma and the duration of symptoms related to the disease.

Out of 70 patients, 35 were male, and the mean age of patients was 43.77±13.37 years, while the mean duration of symptoms was 16.21±21.54 months, ranging from 1 month to 102 months. Half of the patients were from the age group 31 to 50 years. There were 25(35.7%) patients with functional tumors and 45(64.3%) with non-functional tumors. In our study, the mean volume of pituitary adenoma was 8.28±7.12 cm^3. Among 70 patients, 2(2.9%) of patients were found with volume<0.52cm^3, 42(60%) with 0.52-8.16 cm^3 and 26(37.1%) with >8.16 cm^3.

Detailed characteristics of the study population are presented in Table **1**.

We found a significant association of volume with gender (p=0.006), while an insignificant association was found with duration (p=0.731) and tumor type (p=0.736). Detailed results of the association of volume are presented in Table **2**.

Table 1: Descriptive statistics of the study population.

Variables	N (%)
Age (years)	
Mean±SD	43.77±13.37
Groups	
≤30	16(22.8)
31-50	35(50)
>50	19(27.1)
Volume (cm^3)	
Mean±SD	8.28±7.12
Groups	
<0.52	2(2.9)
0.52-8.16	42(60)
>8.16	26(37.1)
Symptom Duration (months)	
Mean±SD	16.21±21.54
Groups	
≤6	34(48.6)
7-12	14(20)
>12	22(31.4)
Gender	
Male	35(50)
Female	35(50)
Tumor	
Functional	25(35.7)
Non-Functional	45(64.3)
Tumor Functional Type (n=25)	
Acromegalic	8(32)
Cushing	3(12)
Prolactinoma	13(52)
Thyroid	1(4)
SD: Standard Deviation	

Table 2: Association of volume with gender and tumor variables.

Variables	Volume N (%)			P-Value
	<0.52 cm^3	0.52-8.16 cm^3	>8.16 cm^3	
Gender				
Male	1(50)	15(35.7)	19(73.1)	0.006*
Female	1(50)	27(64.3)	7(26.9)	
Duration (months)				
≤6	2(100)	18(42.9)	14(53.8)	0.731
7-12	0(0)	9(21.4)	5(19.2)	
>12	0(0)	15(35.7)	7(26.9)	
Tumor				
Functional	1(50)	16(38.1)	8(30.8)	0.736
Non Functional	1(50)	26(61.9)	18(69.2)	
Fisher Exact test was applied.				
A P-Value≤0.05 is considered significant.				
*Significant at 0.05 level.				

DISCUSSION

Pituitary adenomas (PAs), which arise from adenohypophysis, are rather common intracranial malignancies. Despite having benign histology, the majority of these tumours can have aggressive clinical and radiological behaviour that is defined by rapid development, gross tissue invasion, resistance to

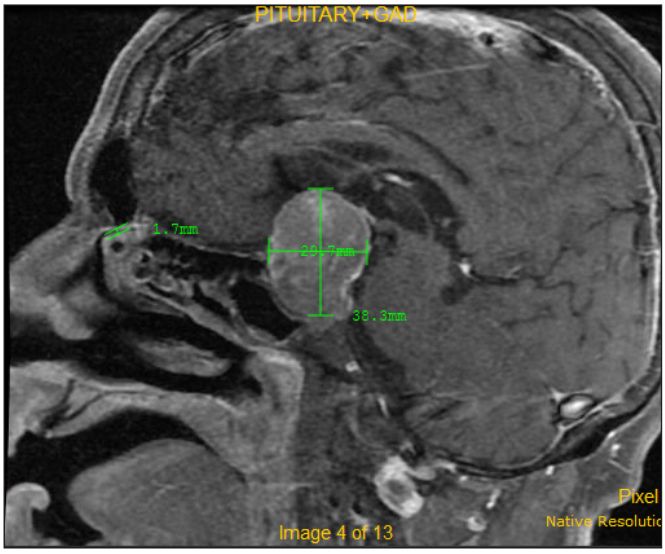

Fig (1): Sagittal T1WI showing pituitary macroadenoma measuring 38.2mm x 29.7mm.

treatment, or early recurrence following treatment [3] (**Fig. 1**).

As a typically benign tumor, intervention is usually guided by the development of clinical symptoms as opposed to tumor volume specifically. On analysis of the 70 patients, no significant correlation of volume with the duration of symptomatology was seen. It may be attributed to a multitude of factors. Initially, patients with non-secreting tumors usually have headaches, which is a very meagre symptom and is not always investigated in the general population. In countries like Pakistan, where health facilities have a significant disparity between rural and urban populations, and due to lower literacy rates, lack of awareness, and rightful investigation of even menial symptoms, to date remains a dilemma.

Headache is a very common symptom of pituitary disease. It is reported to be present in more than a third of all patients with pituitary adenomas. The three common types of headaches associated with pituitary are migraine-like, tension-type, and cluster-like headaches. The implicated causes of headaches in patients with pituitary adenomas are numerous. It could be due to the size, traction, or displacement of intracranial pain-sensitive structures such as blood vessels, nerves, or dura, cavernous sinus invasion [4].

According to the research of 517 patients, between 11% and 15% of patients had headaches regularly. These patients were largely examined for the early symptoms that led to the diagnosis of a pituitary adenoma [5]. Non-functioning pituitary adenomas are typically present inadvertently or as a result of the tumor's bulk effect [6, 7].

The widespread usage of MR imaging and incidental detection of pituitary lesions on head imaging done for unrelated indications has significantly increased throughout the world. Though there remain places where patients do not seek help for common symptoms, they aren't identified early until there is a significant neurological deficit, like decreased vision and even complete visual loss.

In our study, while assessing the relationship of volume with the duration of symptoms, we could not find any significant relationship between them. The majority of patients presented with the symptoms of visual disturbances, either loss of near complete vision or total absence gradually progressing over the years. Out of the 25 functional tumors, 13 were prolactinomas, and the patient did have symptoms of secondary amenorrhea, but their average duration of symptoms was no less than 6-8 months, minimal [8].

Pamela *et al.*, In her study of 269 patients, suggested that 48.7% of patients with clinically non-functioning pituitary adenomas presented incidentally, with symptoms of hypopituitarism which might have been picked up earlier and resulted in prompt diagnosis of the same [9].

CONCLUSION

The relationship of volume with the duration of symptoms in pituitary patients was found insignificant. This could be attributed to multiple factors. The most common presentation in these patients are headaches and visual disturbances and the same was reflected in our patient population.

ETHICAL APPROVAL

It is a retrospective data analysis therefore no approval is required.

CONSENT FOR PUBLICATION

Written informed consent was taken from the participants.

AVAILABILITY OF DATA

The authors unanimously confirm that data supporting the results of this study are available in the article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR'S CONTRIBUTION

All the authors contributed equally to the publication of this article.

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