Clinical Presentation of Patients with Pituitary Tumour and its Correlation to Magnetic Resonance Imaging: An Observational Study

ABSTRACT

Introduction: Pituitary tumours are common intracranial tumours affecting mainly the 4th to 7th decade of life. A detailed understanding of these pituitary tumour patients, especially regarding their clinical and MRI profile would help in its early detection. It also helps in deciding upon further management (medical or surgical or radiation), thus helping in improved outcome.

Aim: To find out the common clinical presentations and the MRI findings of pituitary tumour.

Materials and Methods: A cross-sectional observational study was carried out among 88 patients admitted with diagnosis of pituitary tumour in a tertiary care center from 1st June 2018 to 30th September 2019. The study involved initial clinical assessment followed by MRI brain of all the patients included in the study. To find out relationship between imaging findings and clinical symptoms statistical analysis was done.

Results: The most common clinical presentations were headache in 55 patients (commonly throbbing type in frontal region) and visual field defects in 52 patients (uni/bitemporal hemianopia). A 51 (58%) patients had suprasellar extension and 35 (39.8%) patients had tumour already progressed to parasellar extension at time of detection of adenoma. Most of the patients detected with pituitary tumours (i.e., 63.6%) had grade two invasion. Four incidental adenomas were detected and none of them had parasellar extension. Among 35 patients with parasellar extension, 27 (77.1%) patients had visual disturbance. In 45 (51.1%) patients without parasellar extension had no sellar floor involvement. Visual disturbance was significantly associated with the parasellar extension of the tumour.

Conclusion: Headache and visual field defects were the most common clinical presentation among pituitary tumour patients. Patients with tumours having parasellar extension are more likely to have visual disturbance than with patients having only suprasellar extension. Radiologically, pituitary tumours tend to expand only into suprasellar area, then it involves the parasellar area, followed by sellar floor which occurred last.

INTRODUCTION

About 10% of intracranial tumour are constituted by pituitary tumours. The most common type of pituitary disorder is pituitary adenoma [1]. Based on type of hormone secreted and primary cell of origin, pituitary adenomas are classified into non-functioning and functioning adenomas [2]. Pituitary tumours can also be categorised based on their size. If the tumour is more than or equal to 10 mm, it is considered a macroadenoma; if it is smaller than 10 mm, it is considered a microadenoma. Macroadenomas are less common than microadenomas (42.6% v/s 57.4%) [3].

Pituitary tumour clinical presentations include signs and symptoms due to mass effect, hypersecretion of pituitary hormones, under secretion of pituitary hormones, features of pituitary apoplexy and incidental detected tumours [Table/Fig-1] [4-30]. These tumours are classified according to extension and invasion using Modified-Hardy Classification System [31]. The most common age group affected are from forth to seventh decade of life [32].

A clear understanding regarding various clinical presentation of pituitary tumour help in its early detection and treatment. Magnetic Resonance Imaging (MRI) is the imaging investigation preferred for pituitary tumours because of its better soft tissue contrast. MRI also provides important information regarding the gland and the adjacent visual field defects in 52 patients (uni/bitemporal hemianopia). A 51 (58%) patients had suprasellar extension and 35 (39.8%) patients had tumour already progressed to parasellar extension stage at time of detection of adenoma. Most of the patients detected with pituitary tumours (i.e., 63.6%) had grade two invasion. Four incidental adenomas were detected and none of them had parasellar extension. Among 35 patients with parasellar extension, 27 (77.1%) patients had visual disturbance. In 45 (51.1%) patients without parasellar extension had no sellar floor involvement. Visual disturbance was significantly associated with the parasellar extension of the tumour.

Conclusion: Headache and visual field defects were the most common clinical presentation among pituitary tumour patients. Patients with tumours having parasellar extension are more likely to have visual disturbance than with patients having only suprasellar extension. Radiologically, pituitary tumours tend to expand only into suprasellar area, then it involves the parasellar area, followed by sellar floor which occurred last.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Clinical presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass effect</td>
<td>Headache, visual disturbance (uni/bitemporal hemianopia, blurred vision), vomiting, imbalance, urinary incontinence, memory impairment, 3rd, 4th, 5th and 6th cranial nerve palsy (ptosis, facial numbness, lateral rectus palsy, double vision), CSF rhinorrhoea [8-10]</td>
</tr>
</tbody>
</table>

**Table/Fig-1**: Showing clinical presentations of pituitary tumours [6-30].
anatomical structures. This helps in planning medical or surgical or radiation treatment for the patient.

The study was conducted to find out the common clinical presentations and imaging findings in pituitary tumour patients and also to find out the association between extension and invasion of tumour to clinical symptoms. Current literature does not give much information regarding prediction of growth pattern of pituitary tumours using imaging. Knowledge about growth pattern in pituitary tumours is very useful in treatment planning. This study was also aimed to predict the growth pattern in pituitary tumours. The results from the study may help in early detection of pituitary tumour. This may help in early and effective treatment of these tumours.

MATERIALS AND METHODS

A prospective observational study was carried out in a tertiary care center from 1st June 2018 to 30th September 2019, among patients admitted to Department of Neurosurgery with diagnosis of pituitary tumour. After obtaining Ethical Committee approval (Institutional Review Board Number: 139/2018).

Sample size calculation: Formula for sample size:

\[ n = \frac{Z^2 \times PQ}{d^2} \]

Where, \( Z \) = 1.96, \( P \) = prevalence of various types of pituitary tumour (percentage of nonfunctioning pituitary tumour) = 40.6%, \( Q \) = (1-P) = 59.4% , \( d \) = absolute precision = 10% [33]

\[ N = 1.96^2 \times 0.406 \times 0.594 \times 10 = 92.64 \]

Inclusion criteria: Diagnosed cases of pituitary tumour by neurosurgeon or neurologist or radiologist were included in this study.

Exclusion criteria: Cases without proper documentation of clinical presentation and cases without proper imaging studies were excluded in this study.

Study Procedure

The study involved assessment of clinical profiles of all pituitary tumour patients admitted in the neurosurgery ward. This included checking of the following symptoms and signs- headache, visual disturbance, vomiting, imbalance, urinary incontinence, memory impairment, cranial nerve palsies, infertility, amenorrhoea, decreased libido, galactorrhea, Cushing’s disease, acromegaly, hyperthyroidism, hypopituitarism, features of pituitary apoplexy and asymptomatic (incidentally detected tumours). This was followed by MRI, to classify tumour according to its extension (suprasellar and parasellar extensions) and invasion (size of tumour and involvement of sellar floor) using Modified Hardy Classification system [Table/Fig-2] [31].

STATISTICAL ANALYSIS

Microsoft Excel software was used to enter the data which was collected. The statistical analysis was done using version 16.0 Statistical Package for the Social Sciences (SPSS) software. Analysis was done to find out the relationship between extension and invasion of tumour to clinical symptoms. Numerical data was represented as mean±SD, whereas percentages were calculated for categorical data. Cross tabs and Chi-square test were used to compare numerical and categorical variables respectively. Probability ≤0.05 was considered statistically significant.

RESULTS

The most common age group of presentation was between 41-50 years (28.4%). The age of presentation ranged from 13-82 years, with mean age of presentation 51.23±13.72 years [Table/Fig-3]. Among the 88 patients in study population, 32 (36.4%) were males and 56 (63.6%) were females. Among females, 33 (59%) patients were from the age group of 41-60 years. Male to female ratio was found to be 4:7.

The common clinical presentations were headache and visual disturbance seen in 55 (62.5%) and 52 (59.1%) patients respectively [Table/Fig-4]. Hormone hypersecretion was seen in 33 (37.5%) patients, whereas 55 (62.5%) patients had either normal or low hormone levels.

### Table/Fig-5: Distribution of clinical presentations (data not mutually exclusive).

<table>
<thead>
<tr>
<th>Clinical presentation</th>
<th>Number of patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>55 (62.5%)</td>
</tr>
<tr>
<td>Visual disturbance</td>
<td>52 (59.1%)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>26 (29.5%)</td>
</tr>
<tr>
<td>Imbalance</td>
<td>12 (13.6%)</td>
</tr>
<tr>
<td>Memory impairment</td>
<td>6 (6.8%)</td>
</tr>
<tr>
<td>Urinary incontinence</td>
<td>5 (5.6%)</td>
</tr>
<tr>
<td>Acromegaly</td>
<td>4 (4.5%)</td>
</tr>
<tr>
<td>Symptom of apoplexy</td>
<td>4 (4.5%)</td>
</tr>
<tr>
<td>Incidental</td>
<td>4 (4.5%)</td>
</tr>
<tr>
<td>Cranial nerve palsy</td>
<td>3 (3.4%)</td>
</tr>
<tr>
<td>Infertility/Amenorrhoea</td>
<td>3 (3.4%)</td>
</tr>
<tr>
<td>Galactorrhoea</td>
<td>1 (1.1%)</td>
</tr>
<tr>
<td>Loss of libido</td>
<td>1 (1.1%)</td>
</tr>
<tr>
<td>Cushing’s disease</td>
<td>1 (1.1%)</td>
</tr>
<tr>
<td>Hyperthyroidism</td>
<td>1 (1.1%)</td>
</tr>
<tr>
<td>Hypopituitarism</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

In the study, only two patients were found without suprasellar extension. A 51 (58%) patients had suprasellar extension (i.e., stage A, B and C). A 35 (39.8%) patients had already progressed to parasellar extension stage (i.e., stage D and E) at time of detection of adenoma [Table/Fig-5]. Most of the patients detected with pituitary tumour (i.e., 63.6%) had grade 2 invasion (sella normal or focally expanded tumour <10 mm) [Table/Fig-5].
In the study, four incidental adenomas were detected and none of them had parasellar extension, which was found to be statistically significant. Among 35 patients with parasellar extension, 27 (77.1%) patients had visual disturbance, which was of statistical significance. In 45 (51.1%) patients without parasellar extension had no sellar floor involvement which was found to be statistically significant [Table/Fig-6].

![Table/Fig-6](https://www.ijars.net) | Distribution of study population based on extension and invasion of tumour.

In the study, four incidental adenomas were detected, of which one had no suprasellar extension and three had suprasellar extension. But none of them were having parasellar extension, which was found to be statistically significant. This suggests that patient with parasellar extension of pituitary tumour rarely remain asymptomatic. A 10-12% of patients in the series by Molitch ME were incidentally detected tumours (diagnosed by routine MRI, which showed subtle signal intensity changes in pituitary gland) [35].

In this study, the radiological classification of lesions was done based on Wilson's Modification of Hardy's classification. Regarding extension of tumour, the most common radiological extension was stage B which included 24 patients (27.2%). This was followed by 19 patients each in stages A and D. A 51 (58%) patients had suprasellar extension (i.e., stage A, B and C). A 35 (39.8%) patients had already progressed to parasellar extension stage (i.e., stage D and E) at time of detection of adenoma. Only two patients were found without suprasellar extension. Ramakrishnan VR et al., in their study on 106 patients, had reported suprasellar extension in 67% patients [36].

Regarding sellar floor invasion, most of the patients (i.e., 63.6%) were detected to have grade 2 invasion (sella normal or focally expanded tumour <10 mm). Whereas Grade 1 invasion (sella normal or focally expanded, tumour 10 mm) was found only in 8% patients. A 25 (28.4%) patients had sellar floor erosion (grade 3 and grade 4). Similar percentages were reported in the study by Scheithauer BW et al., in 1996 among 365 pituitary tumour cases which estimated rate of gross invasion by pituitary adenomas as approximately 35% [37].

In patients without parasellar extension (51), 26 had no visual disturbance. But among 35 with parasellar extension, 27 (77.1%) had visual disturbance. Pituitary macroadenoma with suprasellar extension usually develop superior temporal quadrantopia, but this is often neglected by the patients and when patient presents with visual disturbance, tumour would have extended to parasellar areas and may also have involved other cranial nerves [38]. This might explain the reason for statistically significant relationship between parasellar extension and visual disturbance.

In this study, when sellar floor involvement was compared with parasellar extension, 45 (51.1%) patients without parasellar extension (i.e., stage 0, and stage A, B, C) did not have sellar floor erosion (i.e., Grade 1 and 2). Where as 19 (21.5%) patients had both parasellar extension and sellar floor erosion. Again 35 (39.8%) patients had parasellar extension, whereas 25 (28.4%) patients only had sellar floor erosion. These findings were found to be statistically significant. This means initially pituitary tumours tend to expand only in suprasellar area without involving the parasellar region or sellar floor. But as it starts to expand further, parasellar extension tend to occur first, and sellar floor involvement occurs last. This may be explained by the...
mechanical property of bone which is hard to erode, hence supra and parasellar extension may occur earlier than sella floor erosion.

Limitation(s)
The study had more number of patients with non functioning adenomas, due to bias in admission (as most of the functioning adenomas like prolactinomas where managed medically on outpatient basis).

CONCLUSION(S)
The most common clinical presentations were due to mass effect (as majority of the patients in the study population had non functioning adenomas), which were headache and visual disturbance. Most common type of extension of pituitary tumour detected by imaging was Stage B (Anterior recess of 3rd ventricle obliteration). Most common type of invasion detected in imaging was Grade 2 (sella enlarged, Tumour ≥10 mm). Patients with tumours having parasellar extension rarely remain asymptomatic. In patients with tumours having parasellar extensions are more likely to have visual disturbance than with patients having only suprasellar extension. Initially, pituitary tumours tend to expand only in suprasellar area without involving the parasellar region or sellar floor. Further expansion results in parasellar extension first followed by sellar floor involvement.

REFERENCES

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