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Original Research Article

Multiplanar MRI imaging of sellar and parasellar lesions with clinical and pathological correlation

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ABSTRACT

Background: Sellar and parasellar/ juxtasellar regions are complex areas of the brain, hold delicate neurovascular structures. A number of diseases that affect the pituitary-hypothalamic axis can have profound clinical, endocrinological as well as neurological consequences. Aim of this retrospective study was to identify the MR imaging characteristics and epidemiology of sellar and suprasellar lesions, to correlate the MRI findings with histopathological findings and to highlight the diagnostic superiority of MR imaging.
Methods: Author studied the records of 65 patients with sellar and suprasellar lesions for which preoperative MR imaging films or reports were available. Radiological appearances were correlated with intraoperative findings and post-operative histopathology.
Results: Majority of patients in this study belonged to the age group 21-40 years. Most common mass lesion found was pituitary macroadenoma comprising 58% of the total cases. The accuracy of MRI in diagnosing macroadenomas are 96.80%. MR was 87.50%accurate, in diagnosing craniopharyngioma. MR was 100% in diagnosing meningioma in our study.
Conclusions: MRI is the modality for characterizing sellar and suprasellar lesions, morphology of lesions, nature of contrast material enhancement and extent of lesions. Hence MRI is the modality of choice for diagnosing sellar and suprasellar masses with high accuracy.

Keywords: Craniopharyngioma, Macroadenoma, Magnetic resonance imaging, Meningioma, Sellar region, Parasellar region

INTRODUCTION

The sellar and parasellar region is an anatomically complex area that represents a crucial crossroads for important adjacent structures, with a variety of nonneoplastic and neoplastic lesions occurring in this confined space and for diagnosis require advanced neuroimaging modalities.[1] Non-neoplastic lesions like granulomatous and inflammatory lesions, infections including bacterial abscesses, and developmental and vascular diseases are the different types of possible lesions.[2] Sellar and parasellartumors are not uncommon clinical disorders accounting for 15 to 20% of all intracranial tumors. Neoplastic lesions can be benign or malignant such as pituitary adenomas, cystic tumors, germ cell tumors, gliomas, lymphomas, meningiomas, and metastatic tumors.[3]

Symptoms of presentation for these lesions vary and depend on the involvement of specific anatomical landmarks. Manifestations due to endocrine dysfunction or mass effect with compressive sysmptoms such as headache or visual symptoms are the different types of clinical presentation. Extensive knowledge on sellar and parasellar anatomies along with the use and interpretation of various imaging modalities are necessary to reach the

correct diagnosis of sellar and parasellar lesions and to offer the appropriate therapeutic approach including surgery, radiotherapy, and primary or adjuvant medical treatment including replacement of endocrine deficits.[4] Certain imaging findings for these lesions may provide important information to determine the use of surgical versus nonsurgical techniques and the extent of resection.

Magnetic Resonance Imaging (MRI) is the gold standard imaging modality to characterize such lesions due to superior soft- tissue contrast differentiation, availability of advanced sequences offering high spatial resolution, and nonexistence of ionizing radiation, thus allowing accurate visualization of mass effects on neighbouring soft tissues.[5] Although pituitary adenomas are the most frequently encountered sellar mass lesions, other etiologies should be considered in the differential diagnosis of a sellar mass.[6] Precise imaging with high contrast and topographic resolution is critical in visualizing this small volume area to determine both location and specific characteristics of masses, which are important for diagnosis.[7]

With this above background, the present study was conducted to evaluate the MRI imaging findings in sellar and juxtasellar lesions to find out the radiological diagnostic superiority of MRI.

METHODS

All the studies were done with Siemens 1.5 T SOMATOM MRI equipment. Material consists of 65 patients were referred from various departments mainly from the department of Neurology and Endocrinology on the basis of their clinical presentation with suspected pituitary lesion for MRI of the brain during the period June 2015 to January 2018 SRMC radiology department. Both plain and contrast MRI were done.

Inclusion criteria

- Suspected pituitary lesion
- Patients of both male and female sex
- Age group of 10 to 80 years

Exclusion criteria

- Patients with sellar and parasellar region lesions who did not receive MRI scan

Detailed scrutiny of the images was done and tabulated. The basic radiological features taken into consideration were: Morphology, Signal intensity, Contents, Mass effect, Bony changes, and pattern of enhancement.

RESULTS

The observations of these 65 patients were compiled and analyzed. All age group patients ranging from 10-80 years were included in the study. Majority of patients in this study belonged to the age group 21-40 years 40% (Table 1). Males predominated in this study constituting 60% of the total study population (Table 2).

Table 1: Distribution of patients in relation to age.

Age	No of persons (Nos)	Percentage (%)
0-20	11	17
21-40	26	40
41-60	19	29
>60	9	14

Table 2: Distribution of patients in relation to sex.

Sex	Number
Male	38
Female	23
Children	4

The commonest symptom was headache followed by visual disturbance, cranial nerve palsy and endocrine symptoms and rare presentation were seizure attack, and CSF rhinorrhea. Surprisingly major percentage of patients were asymptomatic especially where the lesions were purely intra sellar (Table 3).

Table 3: Distribution of symptoms.

Symptoms	No of cases	Percentage (%)
Asymptomatic	18	32
Headache	16	24
Visual defect	9	16
Endocrine disturbance	6	12
Seizure attack	3	6
Craniai nerve palsy	4	8
CSF rhinorrhoea	1	2

The common pathological lesion as per our study is pituitary macroadenomas (30%) microadenomas (16%) Cystic lesions like Rathke's cleft cyst or arachnoid cyst, empty sellar syndrome (16%) remaining where non-neoplastic lesions include pituitary hyperplasia, Rathke's pouch cyst, intra cranial arterial aneurysm (Table 4).

The imaging findings were very typical in most of the cases and MRI imaging proves very useful and accurate in detecting the diagnosis. In a few rare cases where findings were equivocal differentiated diagnosis was offered. The pathological lesions are tabulated. Rare pathological lesions are tabulated for completion and to look for in equivocal cases. CT was done only in certain cases where author had to confirm the pressure of calcification, bony erosion.

After histopathological correlations, MRI imaging for pituitary adenoma, craniopharyngioma, showed 96.80%, 87.50% of diagnostic accuracy, respectively. All the meningioma cases (2 out of 2 cases) hyperplasia (4 out of 24 cases), and metastatic (2 out of 2 case) had 100%

accuracy for the MRI diagnosis when finally correlated with histopathological examination (Table 5).

Table 4: Distribution of MRI diagnosis.

Diagnosis	No of cases	Percentage (%)
Normal	3	5
Microadenoma	8	12
Macroadenoma	24	36
Craniopharyangioma	8	12
Empty sella syndrome	7	10
Pituitary gland hyperplasia	4	5
Rathke's pouch cyst	2	3
Pituitary haemorrhage	2	3
Para sellar meningioma	2	3
Fatty infiltration	1	1
Metastatic malignancy	2	3
Aneurysm	2	3

Table 5: MRI diagnosis vs HPE diagnosis.

Type of lesions	MRI diagnosis	Histo-pathology	Accuracy
Adenomas	32	31	96.80%
Craniopharyngioma	8	7	87.50%
Meningiomas	2	2	100.00%
Pituitary gland hyperplasia	4	4	100.00%
Metastatic lesion	2	2	100.00%

This study was extremely useful to the neurosurgeon in the diagnosis, treatment options, histological correlation and follow up study. MR evaluation of sellar and parasellar lesions were done for patients referred with sellar pathology lesions and also for asymptomatic who were incidentally found to have a sellar lesion.

DISCUSSION

The sellar and parasellar regions hold complex neurovascular structures. Understanding the anatomy can help in developing a differential diagnosis and in correlating the clinical manifestations. MRI provides detailed information about the contents of the sellar and parasellar regions.

Generating differential diagnoses can be difficult because of the complexity of the structures in the sellar and suprasellar region. Dividing this region into the pituitary fossa, cavernous sinuses and the suprasellar cisterns can be helpful. However, many disease processes can involve multiple components of the sellar and parasellar region and it can sometimes be difficult to delineate the origin of large neoplasms and extensive disease processes. Identification of normal structures, such as the pituitary gland, in relation to the pathology can be helpful to determine the etiolog.[8]

MRI is the mainstay in the neuroimaging assessment of most capability, tissue characterization (Lipids, paramagnetic and diamagnetic elements, and tissue cellularity) ability to detect hemorrhage, necrosis, solid or cystic components within the tumor, absence of bone artifacts, and not having the hazards of radiation. Thus, this study was undertaken to determine the distribution, morphology, and tissue character of pathologies of the sellar and juxtasellar regions and correlation of the MRI findings.[9] Sellar and suprasellar are basically divided into pituitary lesions and nonpituitary/ nonadenomatous lesions with the pituitary adenomas being the most common accounting for 90% of the cases.[5,6] Pituitary tumors/ ademomas represent 10%-15% of all intracranial masses based on imaging parameters, rather than a pathological diagnosis or due to the reporting of miscellaneous masses including empty sellar syndrome and ectopic pituitary tissue. Which are diagnosed only by imaging and would not have been identified in a surgical or pathological series.[6]

Dedicated pituitary MRI is the preferred diagnostic imaging modality for evaluation of sellar and parasellar tumours, including adenomas. In particular, when functioning adenomas are suspected, a dynamic pituitary MRI, which obtains images within seconds after gadolinium contrast injection, may be more useful because it has higher sensitivity than other imaging modalities for detecting small microadenomas.[8] However, small incidental lesions of little or no clinical significance visualized on dynamic pituitary MRI may be misinterpreted as the pathological source of excess hormonal secretion during evaluation of patients for Cushing's disease or acromegaly given lower specificity vs. Conventional MRI.[8] However, our calculation of the specificity of pituitary MRI is likely limited due to under estimation of true negative values because there are few conditions in which clinicians would obtain pathology results of the pituitary mass when a normal pituitary gland is reported on MRI.

Lesion confined to the pituitary gland particularly small size may be asymptomatic. Large lesions may result in signs and symptoms of mass effects, particularly raised intracranial pressure, and headache is the most common manifestation.[10] Headache (78%), followed by visual disturbances (76%) is the most common symptom in our study, and other complaints are hormonal imbalance leading to amenorrhea, galactorrhea, and acromegaly and mass effect causing seizures, hemiparesis, and vomiting, these findings are similar to the study, and done by famine et al. Which reported headache and visual deficits to be the most common presentations. They found a higher rate of headache occurrence for non-adenomatous lesions than both non-functioning and functioning ademomas ($p<0.001$). Metastatic involvement of the pituitary has been reported to account for 12–25% of all non-adenomatous pituitary lesions.[11] However, authors observed lower rate (0.3%), with one cases of breast and one due to lung cancer. This lower incidence may be due

to our screening method and possibly having excluded patients with metastases if they had been imaged with brain MRI or positron emission tomography/CT. Furthermore, most cases of pituitary metastases are clinically silent and diagnosed at autopsy.[12]

Clinically presenting nonfunctioning pituitary adenomas are typically, although not always, macroadenomas, and patients frequently present with symptoms related to mass effects, such as headache, visual disorders, and/or cranial nerve dysfunction.[13,14] These tumors can also come to medical attention as an incidental finding when MRI is performed for unrelated signs and symptoms.[15] Less frequently, as a distortion and compression of the pituitary stalk and /or hypothalamus results in an increase in serum prolactin level or anterior pituitary hormonal deficiencies which is the endocrine abnormality in patients with large non-functioning adenoma.[14] Nonfunctioning pituitary adenoma lacks endocrine symptoms such as hormone hypersecretion and is mostly diagnosed and postoperatively monitored via imaging examinations, such as enhanced MRI.[16] Features of pituitary apoplexy may occur, i.e., involvement of pituitary stalk, optic chiasma, having infarction and presentation of sudden visual loss, and acute severe headache MRI is useful in detecting hemorrhagic infarction in such cases. Sellar lesions with large termporal lobe extensions may be associated with partial complex seizures, and we found seizures in two cases with extensive lesions involving the temporal lobe. Cranial nerve palsies may occasionally occur due to large expanding sellar mass.[10]

CONCLUSION

A seen earlier, the sellar and the para-sellar region hold complex neurovascular structures MRI is the investigation of choice for the evaluation of the hypothalamopituitary lesions. MRI helps in the relationship of the pituitary gland with the adjacent anatomical structures to plan successful surgery or medical treatment. The most recent advancement in the field of pituitary imaging is the use of intraoperative MRI during endoscopic pituitary surgery. It provides better visualization of the intra and parasellar anatomy facilitating complete resection of the tumor. It can beautifully demonstrate the nerve compression and the residual tumor.

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