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Research Article

Radiopathological correlation of sellar and suprasellar masses: our experience

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ABSTRACT

Background: The area immediately around the pituitary, the sellar and parasellar region is an anatomically complex area that represents a crucial crossroads for important adjacent structures. A number of diseases that affect the pituitary-hypothalamic axis can have profound clinical, endocrinological as well as neurological consequences. Aim of the study was to identify the MR imaging characteristics of sellar and suprasellar masses, to correlate the MRI findings with histopathological findings and to calculate the diagnostic accuracy of MR imaging.
Methods: We reviewed the records of 116 patients with sellar and suprasellar masses 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 operated was pituitary macroadenoma comprising 58% of the total cases. The accuracy, sensitivity and specificity of MRI in diagnosing macroadenomas are 86%, 88%, and 83% respectively. MR was 93% accurate, 85% sensitive and 95% specific in diagnosing craniopharyngioma. MR was 93% accurate, 80% sensitive and 95% specific in diagnosing meningioma.
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, sensitivity and specificity.

Keywords: MRI, Magnetic resonance imaging, Macroadenoma, Meningioma, Craniopharyngioma

INTRODUCTION

The area immediately around the pituitary, the sellar and parasellar region is an anatomically complex area that represents a crucial crossroads for important adjacent structures.[1]

A number of diseases that affect the pituitary-hypothalamic axis can have profound clinical, endocrinological as well as neurological consequences. Various neoplastic conditions include pituitary adenoma/apoplexy, meningioma, hypothalamic glioma, craniopharyngioma, rathke's cleft cyst, germinoma, teratoma, metastasis, leukemic infiltration, lymphoma, and langerhans cell histiocytosis. Accurate diagnosis prior to any intervention is essential as the treatment of choice will be different for each disorder, particularly in the case of sellar and suprasellar tumours. In the majority of parasellar tumours, a multimodal therapeutic approach is frequently necessary including surgery, radiotherapy, primary or adjuvant medical treatment and replacement of apparent endocrine deficits.

Recent advances in neuroimaging help the radiologists and neurosurgeons to study the pituitary region in greater detail. Magnetic resonance imaging (MRI) is the imaging

modality of choice for evaluating hypothalamic-pituitary-related endocrine diseases.

METHODS

116 patients with sellar and suprasellar masses who had been operated in our institution from January 2010 to December 2015 were retrospectively analysed in our study and an analysis to assess the concordance of radiology (MRI) with final histopathology report was done.

Based on the MR imaging characteristics of the different sellar-suprasellar masses, compared to the intraoperative and histopathological findings, diagnostic accuracy of MRI was calculated.

The basic radiological features taken into consideration were: Margins, Signal intensity, Contents, Mass effect, Bony changes, and Pattern of enhancement. Later on patients were operated, biopsy material was sent for histopathological evaluation.

Previously elsewhere diagnosed patients, the patients having recurrence or the patients undergoing chemoradiotherapy for any sellar/suprasellar tumors were excluded from our study.

RESULTS

The observations of these 116 patients were compiled and analyzed, comprising of 68 MR Imaging diagnoses of Macroadenomas, 28-craniopharyngiomas and 20 Juxta/parasellar meningiomas. Majority of patients in this study belonged to the age group 21-40 years (Table 1). Females predominated in this study constituting 60% of the total study population (Table 2).

Table 1: Age distribution in sellar-suprasellar tumors.

Age in years	No. of cases	Percentage (%)
0-20	15	13
21-40	48	42
41-60	38	32
>60	15	13
Total	116	100

Table 2: Sex distribution.

Sex	No. of cases	Percentage (%)
Male	46	40
Female	70	60
Total	116	100

Commonest overall sellar/suprasellar mass on MRI was pituitary macroadenoma (58%). Out of 68 MRI diagnosis of macroadenoma, 8 cases turned out to be other lesions on HPE, i.e. 4 meningiomas and 4 craniopharyngiomas. Out of 20 MRI diagnosis of meningioma, 4 cases turned out to be macroadenoma on HPE.

Table 3: Contrast enhancement characteristics.

Enhancement characteristics	No. of cases	Percentage (%)
Homogeneous	87	75
Heterogeneous	29	25
Total	116	100

Table 4: Tumour characteristics.

Characteristics	No. of Cases	Percentage (%)
Calcification	33	28%
Cysts	15	13%
Hemorrhage/necrosis	19	16%

Table 5: Involvement of adjacent structures.

Structures	No. of Cases	Percentage (%)
Optic chiasm compression	72	62%
Cavernous sinus invasion	40	35%
Bone erosion	9	7%

Table 6: MRI diagnosis vs HPE diagnosis.

Lesion	No of cases	
	MRI diagnosis	HPE diagnosis
Pituitary macroadenoma	68	60
Meningioma	20	16
Craniopharyngioma	28	24

Out of 28 MRI diagnosis of Craniopharyngioma, 3 cases turned to be macroadenoma and one case turned out to be astrocytoma on HPE (Table 6). The accuracy, sensitivity and specificity of MRI in diagnosing macroadenomas are 86%, 88%, and 83% respectively (Table 7 and 8).

Table 7: Accuracy of MRI in diagnosing pituitary macroadenoma.

MRI Diagnosis	Macroadenoma	Other	Total
Macroadenoma	60	8	68
Other	8	40	48
Total	68	48	116

Table 8: Accuracy of MRI in diagnosing pituitary macroadenoma.

Parameter	Percentage
Sensitivity	88.2%
Specificity	83.3%
Positive predictive value	88.2%
Negative predictive value	83.3%
Accuracy	86.2%

Table 9: Accuracy of MRI in diagnosing craniopharyngioma.

MRI Diagnosis	Cranio-pharyngioma	Other	Total
Craniopharyngioma	24	4	28
Other	4	84	88
Total	28	88	116

Table 10: Accuracy of MRI in diagnosing craniopharyngioma.

Parameter	Percentage
Sensitivity	85.7%
Specificity	95.4%
Positive Predictive Value	85.7%
Negative Predictive Value	95.4%
Accuracy	93.1%

The next most common tumoral lesion detected in our study was craniopharyngiomas which constituted 24% of total patients. MR was 93% accurate, 85% sensitive and 95% specific in diagnosing craniopharyngioma. Meningioma was seen in 17% of total cases on MRI (Table 9 and 10).

MR was 93% accurate, 80% sensitive and 95% specific in diagnosing meningioma (Table 11 and 12). MRI is the modality for characterizing sellar and suprasellar lesions, morphology of lesions, nature of contrast material enhancement and extent of lesions.

Table 11: Accuracy of MRI in diagnosing meningioma.

MRI Diagnosis	Meningioma	Other	Total
Meningioma	16	4	20
Other	4	92	96
Total	20	96	116

Table 12: Accuracy of MRI in diagnosing meningioma.

Parameter	Percentage
Sensitivity	80%
Specificity	95.8%
Positive Predictive Value	80%
Negative Predictive Value	95.8%
Accuracy	93.1%

Figure 1 shows pituitary macroadenoma coronal (left) and sagittal (right) gadolinium enhanced T1-weighted MR images show well-defined multilobulated solid mass extending into the suprasellar region, with non-visualisation of posterior pituitary bright spot and infundibulum .There is displacement/ compression of optic chiasm and tumoral recesses of the third ventricle. There is abnormal expansion of the right cavernous sinus associated with scalloping of the sellar floor inferiorly.

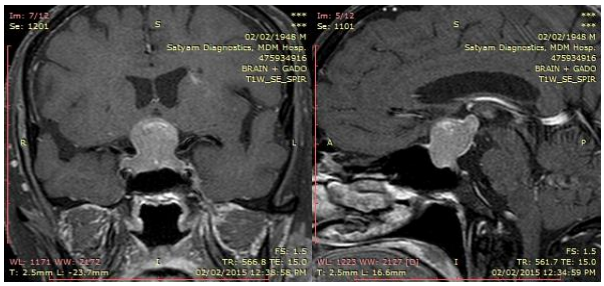

Figure 1: Pituitary macroadenoma.

DISCUSSION

The diagnosis of sellar and suprasellar pathologies even after decades of advances, still remains the most difficult because of its intricate anatomy and diverse pathology. Lesion morphology, signal intensity, and contrast enhancement pattern are taken into consideration when characterizing masses with MRI; however, even if the data are evaluated together, there can still be difficulties in the differentiation of various sellar and suprasellar pathologies.

The major aim of this retrospective study was to describe MR imaging characteristics of the tumors of the sellar and suprasellar region; to correlate the MRI findings with histopathological findings and to assess the diagnostic accuracy of MRI in characterization of sellar suprasellar lesions. In the present study, most commonly mass lesions were encountered in 21-40 years age group patients. Females predominates present study constituting 60% of the total study population. These observations are in concordance with study done by Banna et al.[2] In their prospective study they encountered maximum number of patients in fourth decade, and with female preponderance.

The most common mass lesion detected in our study was pituitary adenoma comprising 58% of the total cases. This is similar to the experience of Benjamin et al and Johnsen et al.[3,4]

Pituitary macroadenomas

In the present study, on MRI there were 68 patients of pituitary macroadenomas out of the total 116 cases. On T1W images 75% macroadenomas were isointense to grey matter, and (17%) were hyperintense. The hyperintensity on T1WI in 17% cases was found to be due to presence of hemorrhage in macroadenoma. After the contrast administration, 70% showed homogeneous enhancement.

Our findings were also similar to results of Johnsen et al, which showed 82% lesions were isointense and 18% of the lesions were showing hemorrhage within the macroadenoma.[4] Patients underwent surgery and

histopathological correlation was obtained. Of the 68 radiologically diagnosed macroadenomas, 60 cases on histopathologically turned out to be the same. 8 were wrongly diagnosed. 4 were meningioma and other 4 were craniopharyngioma because of their overlapping morphological characteristics on MRI. MR was thus 86% accurate, 88% sensitive and 83% specific in diagnosing macroadenoma.

Craniopharyngioma

In the present study, there were 28 patients of craniopharyngiomas which constituted 24% of total patients. Bimodal age distribution was seen. Out of the 28 cases, 19 (68%) were mixed solid cystic lesions and 9 (32%) were cystic in appearance. In solid-cystic cases cystic component was iso to hyperintense on T1W and T2W images. Solid component was iso to hypointense on T1W and isointense on T2W images. Solid lesions showed mixed signal intensity on T1W and T2W images and calcification was seen in 18 cases. On post contrast study, cystic component showed peripheral enhancement and solid portion showed heterogeneous enhancement.

Present findings were similar to results of Johnson et al, they found out 60% of the cases were mixed in appearance.[4] Of the 28 radiologically diagnosed craniopharyngiomas, 24 cases on histopathologically turned out to be correct. 4 were misdiagnosed. Three cases were misdiagnosed as macroadenoma and other one was pilocytic astrocytoma because of its overlapping morphological characteristics on MRI. MR was thus 93% accurate, 85% sensitive and 95% specific in diagnosing craniopharyngioma.

Meningiomas

There were 20 cases of meningiomas which constituted 17% of total cases on MRI. Isointensity on T1- and T2-weighted images is a characteristic signal intensity feature of meningiomas. In the present study, we found 85% meningiomas to be isointense on T1W and T2W images. Taylor et al found that 91% of meningiomas were isointense on T1 and 55% were isointense on T2W.[5]

In contrast, 70% of macroadenomas were isointense on T1W, while only 40% of macroadenomas showed isointensity on T2W. This led to finding that T2W signal intensity may be an important point to distinguish between the adenoma and meningioma. The tumours showed marked, uniform enhancement which was in accordance with Donovan J et al who reported homogeneous enhancement in 94% of sellar meningiomas.[6]

In the present study hyperostosis was present in 12 (60%) cases of meningiomas. Taylor et al found out that hyperostosis was seen in 34% of cases of meningiomas involving the sella.[5] Hyperostosis remains highly specific for meningioma. Dural tail enhancement or the meningeal sign is commonly associated with meningiomas but is not entirely specific.

In present study 40% cases showed dural tail sign. No other tumour showed this sign. Johnsen et al also found presence of dural tail sign in 57% cases of meningioma and in no other lesion.[4] Of the 20 radiologically diagnosed meningiomas, 16 cases on histopathologically turned out to be the same. 4 were misdiagnosed. In three cases, the tumours were primarily located in sella and showed suprasellar and parasellar extension.

No hyperostosis, peritumoral edema or calcification was seen. They showed few foci of cystic degeneration. They were labelled as macroadenomas. MR was thus 93% accurate, 80% sensitive and 95% specific in diagnosing meningioma.

CONCLUSION

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, sensitivity and specificity.

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