



MRI EVALUATION OF SELLAR AND PARASELLAR LESIONS

Radio-Diagnosis

Dr. Hiral Chaudhari

Assistant Professor, Dept. of Radiology, Government Medical college, Surat.

Dr. Paresh Patel

Assistant Professor, Dept. Of Radiology, Surat Municipal Institute Of Medical Education And Research.

Dr. Kaushik Chaudhari

Consultant Radiologist, Horizon Scan, Zenon Complex, Khatodara.

ABSTRACT

Sellar and parasellar regions of brain are most complex region of brain, hold delicate neurovascular structures. A number of disease that affect pituitary hypothalamic axis have profound clinical, endocrinological as well as neurological consequences. Aim of study was to identify MRI characteristics of lesions and to correlate with histopathological findings.

KEYWORDS

Magnetic resonance imaging, craniopharyngioma, Macroadenoma, meningioma, sellar , parasellar region.

INTRODUCTION

The sellar and parasellar region is an anatomically complex area that represents a crucial adjacent structures examples: orbits, cavernous sinus and its content, suprasellar cistern and its contents, polygon of willis, hypothalamus through the pituitary stalk and dural reflections forming the diaphragm sellae and the walls of the cavernous sinuses. The value of Magnetic Resonance Imaging (MRI) for assessing Sellar and parasellar regions was quickly recognized and has evolved rapidly after that. Pituitary tumors account for up to 15% of all intracranial masses and pituitary adenomas are reported to account for 90% of sellar and parasellar lesions. Clinically active pituitary adenomas occur at a prevalence of 1:1064 to 1:1288 to the general population¹. Other sellar lesions include nonneoplastic cystic lesions, germ cell tumors, gliomas, lymphomas, meningiomas, metastatic tumors, vascular lesions, granulomatous and inflammatory lesions, and infections including bacterial abscesses as well as pituitary hyperplasia². However, further evaluation of these small incidentalomas (<10 mm) may not be cost effective, especially if they are asymptomatic³. The advantages of MRI over CT include superior soft tissue contrast, absence of beam hardening artifacts, absence of ionizing radiation and ability to acquire images in multiple planes – axial, coronal, and sagittal or any degree of obliquity.

AIMS AND OBJECTIVES

- Detection and characterization of sellar and parasellar lesions.
- To differentiate between benign and malignant lesions of sellar and parasellar regions.
- To study the role of gadolinium in detection and characterization of sellar and parasellar lesions.
- To compare the MRI findings with histopathological findings.
- To define the MRI criteria for the diagnosis of cavernous sinus invasion by lesions in these locations.
- To highlight the importance of MRI in clinically silent as well as lesions in post-operative and post treatment patients.

MATERIALS AND METHODS

During the period of June 2019 to November 2020, a prospective study of 50 patients was carried out in New Civil Hospital, Surat. Patients were scanned on 1.5 Tesla Philips MRI system. All patients were seen by appointment, except for the emergency cases. They were advised to come on empty stomach for at least four hours. Relevant history of illness and significant clinical findings of all patients were recorded. Previous investigations (x-rays, CT-Scans etc.) were reviewed. Most of the patients were taken for examination without any pre-medication. In cases of uncooperative patients and few children, sedatives were used under the supervision of the anesthetist. Dynamic Contrast enhanced scans were performed wherever indicated.

OBSERVATION AND ANALYSIS

The present study included 50 cases of sellar and Para sellar lesions, which was carried out at our Institute. Following observations made according to age, sex, site, symptoms and MRI appearance of the

tumors and the study data were analyzed.

FINAL DIAGNOSIS AND FREQUENCY OF DISTRIBUTION

Sr. No	Final diagnosis	Total No. Of Patients	Percentage of tumors
1.	Pituitary Macroadenoma	11	22 %
2.	Pituitary Microadenoma	10	20 %
3.	Craniopharyngiomas	7	14 %
4.	Meningiomas	4	8 %
5.	Epidermoid	1	2%
6.	Histiocytosis – X	1	2%
7	Rathke's cleft cysts	2	4 %
8	Gliomas	3	6 %
9	Primary Skull base mass lesion	2	4%
10.	Colloid Cyst	2	4 %
11.	Direct extension from near by lesions	3	6 %
12.	Metastasis to the sellar region	4	8 %

Out of total 50 patients, most common lesion was Pituitary Macroadenoma (11 cases), followed by, Pituitary Microadenoma (10 cases) and Craniopharyngioma (7 cases), Meningiomas (4 cases), Metastases to the sellar region accounts for (4 cases) and direct extension from near by lesion (3 cases). Sellar and parasellar glioma is found in 3 cases while Rathke's cleft cysts, colloid cyst and Primary skull base mass lesion was found in 2 cases each. Single case each of epidermoid and Histiocytosis-X is noted.

PITUITARY ADENOMA

Macro Vs Microadenoma And Overall Percentage

Pituitary Adenoma	No. of case	Percentage	Overall percentage
Macroadenoma	11	52.38	22
Microadenoma	10	47.62	20

Age Distribution Of Pituitary Adenomas

Age Distribution (yrs)	Number Of Cases	Total (21)	Percentage
0-10	0		0
11-20	2		9.52
21-30	3		14.28
31-40	8		38.09
41-50	7		33.33
51-60	1		4.76

Gender Distribution Of Pituitary Adenomas

Sex	No. of cases (total no. 21)	Percentage
Male	7	33.33
Female	14	66.66

STUDY BY DAVID E. JOHNSON ET.AL¹. of 131 patients of sellar and juxta sellar lesions Most common lesion was pituitary macroadenomas followed by pituitary micro adenomas and meningiomas .

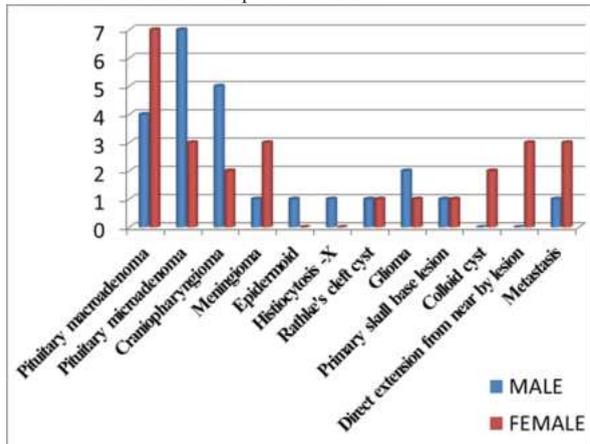
AGE DISTRIBUTION

Sr. No.	Type of tumor	1-10	11-20	21-30	31-40	41-50	51-60	61-70
1.	Pituitary Macroadenoma	-	-	2	4	4	1	-
2.	Pituitary Microadenoma	-	2	1	4	3	-	-
3.	Craniopharyngiomas	4	3	-	-	-	-	-
4.	Meningiomas	-	-	1	2	1	-	-
5.	Epidermoid	-	-	-	1	-	-	-
6.	Histiocytosis – X	1	-	-	-	-	-	-
7.	Rathke's cleft cysts	-	-	-	-	1	1	-
8.	Gliomas	1	2	-	-	-	-	-
9.	Primary Skull base mass lesion	1	-	1	-	-	-	-
10.	Colloid Cyst	-	-	-	-	2	-	-
11.	Direct extension from nearby lesions	1	1	-	1	-	-	-
12.	Metastasis to the sellar region	1	-	-	1	1	1	-

In my study largest age group was 31-40 - 13 cases and 41-50 years - 12cases, followed by 1-10 - 9 cases, 11-20 years - 8 cases. 5 patients in 21-30 and 3 patients in 51-60 years age group. Youngest patient was 4 year old having recurrent retinoblastoma in Right orbit with spread to sellar region along optic tract and the eldest patient was 59 years old patient of breast malignancy with pituitary metastasis. Pituitary Macro adenoma was found to be more common in the 4th to 5th decades where as Craniopharyngiomas, Histiocytosis –X and Gliomas was found to be more common in a little younger age group mainly 1st and 2nd decades

GENDER DISTRIBUTION

In my study there were 20 male and 30 female patients out of total 50 patients with sellar-Parasellar masses. It was found that the incidence of Pituitary Macroadenoma , Microadenoma are more common in females compared to males and Craniopharyngiomas , Gliomas are more common in males compared to females



JAY JAGANNATHAN, ET.AL⁵ concluded Craniopharyngiomas account for the overwhelming majority (~ 90%) of neoplasms arising in the pituitary region with no apparent predilection for either sex. While in my study Craniopharyngiomas are more common in males. Male to female ratio is 2:1.

Schaller B Et Al⁶, concludes that incidence of prolactinomas are more common in females than men in his study.

SITE DISTRIBUTION

Site	No. of patients	Percentage
Purely Sellar	9	18
Sellar and parasellar	41	82

In the study of 50 patients, purely sellar lesion was seen in 9 patients, while 41 patients have both sellar and Para sellar involvement.

SIGNAL CHARACTERISTICS

Image sequence	Signal intensity	Percentage
T1	Hypointense	70
	Hyperintense	18
	Isointense	12
T2	Hypointense	0

	Hyperintense	82
	Isointense	18
FLAIR	Completely suppressed	6
	Partially suppressed	14
	Not suppressed	80

In this study; most of tumors were hypo intense on T1-weighted images and hyper intense on T2-weighted images.

On FLAIR sequences most of the tumors were not suppressed (80% of the cases). and rest were partially suppressed (14 % of the cases).

Some tumors were heterogeneous in signal intensity. 18 % tumor show hyper intensity on T1W images, most of these lesions are Meningioma, craniopharyngioma and Rathke's cleft cyst.

Microadenoma are most common lesion which appears isointense on T2W images .

FARBICE BONNEVILLE, MD ET AL, ELABORATES⁷ spectrum of normal and abnormal causes of hyperintensity in sellar lesion on T1W images. Normal Causes of T1 Signal Hyperintensity are Posterior lobe of pituitary gland, fatty bone marrow , Pathological lesions that causes hyperintensity on T1W sequence is Chronic hemorrhagic Adenoma , Aneurysm , Rathke's cleft cyst ,Craniopharyngioma, Chordomas , Meningiomas and Dermoid cyst . Lesion in my study which are hyperintense on T1W images are Meningiomas, craniopharyngioma and Rathke's cleft cyst , which correlate with above mentioned article findings .

POST CONTRAST ENHANCEMENT

Post contrast	Percentage	
Homogeneity	Homogeneous	48
	Heterogeneous	52
Strength	Mild	60
	Moderate	34
	Strong	6

Majority (52 %) of the lesions were heterogeneously enhancing while rest (48 %) were homogeneously enhancing. On strength wise there were 60 % of mild enhancing lesions, 34% moderately enhancing and 6% were strongly enhancing lesions.

ERICH STEINER, M.D. ET.AL⁸ concludes that Gd-DTPA improved the sensitivity of MR imaging of pituitary adenomas as 10% of the adenomas were detected *only* in the enhanced images.

MARGINS OF THE TUMOR

Margins	Percentage
Well-defined	60
Ill-defined	40

Out of total 50 cases there were 60 % of the cases in which the lesions were having well-defined margins while 40 % of the lesions were having ill-defined margins. Metastasis, direct extension from near by malignant mass and Craniopharyngiomas among most common lesion showing ill defined margins. Pituitary adenomas , meningiomas ,Rathke's cleft cyst and colloid cyst usually show well defined margins.

EXTENT OF THE LESION

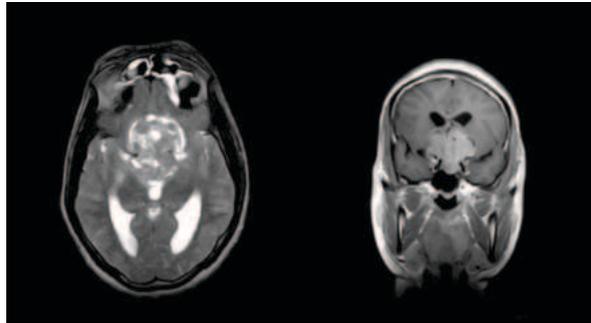
Extension of the lesion	Percentage
Supra-Sellar cistern	80
Cavernous Sinus	42
Sphenoid sinus	14
Optic chiasm	44
Clival erosion	6

Most (80%) of tumors showed supra sellar extension. Around 42 % lesions invaded the cavernous sinus and encased ICA. 14 % cases show inferior extension into sphenoid sinus. Optic chiasm is involved by 44% of the lesions, majority of them are macroadenomas. Clivus erosion is noted in skull base primary and metastatic disease and accounts for 6%.

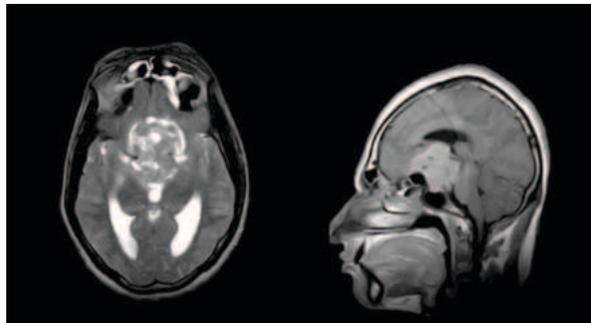
Yoko Nakasu et. Al,⁹ prospectively analysed enhancement pattern of the dura around sellar tumours with particular attention to the involvement of the cavernous sinus. Durall enhancement was seen on MR images in 36.5% of the patients with parasellar tumours.

DISCUSSION

The present study included 50 cases of sellar and Para sellar lesions, which was carried out at our Institute. Out of total 50 patients, most common lesion was Pituitary Macroadenoma, followed by, Pituitary Microadenoma and Craniopharyngioma, Meningiomas, Metastases to the sellar region accounts for and direct extension from near by lesion. Sellar and parasellar glioma is found in 3 cases while Rathke's cleft cysts, colloid cyst and Primary skull base mass lesion was found in 2 cases each. Single case each of epidermoid and Histiocytosis-X is noted. In my study largest age group was 31-40 consisting 13 cases and 41-50 years consisting 12cases, followed by 1-10 consisting 9 cases, 11-20 years consisting 8 cases There were 5 patients in 21-30 and 3 patients in 51-60 years age group.



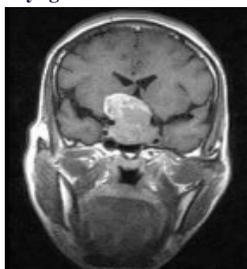
T2W AXIAL POST CONTRAST (CORONAL)



POST CONTRAST (AXIAL) POST CONTRAST (SAG)

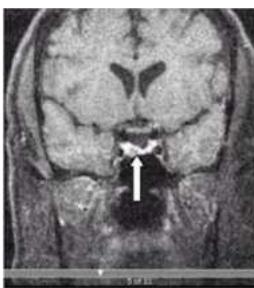
MULTILOBULATED MASS LESION IS NOTED IN SUPRASELLAR REGION EXTENDING TO SELLA WITH CYSTIC COMPONENT

Case No. 1 Craniophryngioma



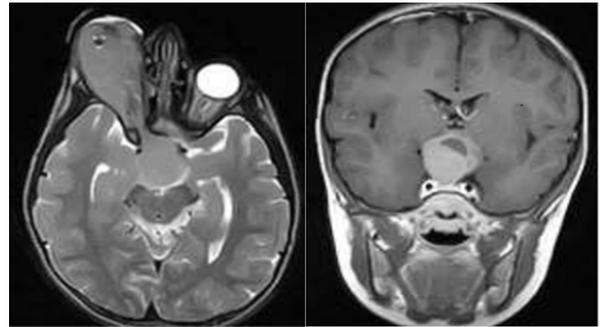
Post Contrast T1W Coronal Image Shows A Large Well Defined Heterogenous Enhancing Mass Lesion In Sellar Region Extending Into Supra Sellar Region Typical "Figure Of 8" Appearance

Case No. 2 Macroadenoma

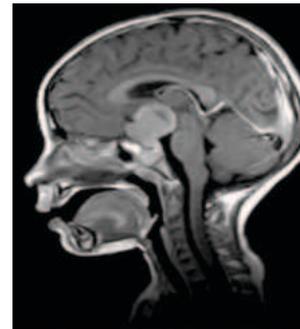


T1W Coronal Post Contrast Image Shows A Smallrelatively Non Enhancing Mass Lesion In Sellar Region

Case No. 3 Microadenoma



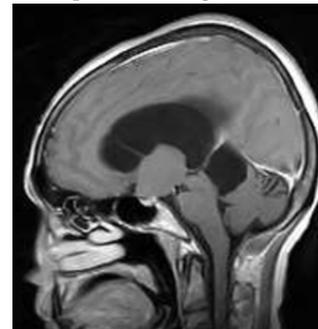
T2W POST CONTRAST CORONAL



POST CONTRAST SAGGITAL

There Is Intense Enhancing Lesion With Internal Necrotic Component In Left Orbit Which Shows Extension In Sellar And Supra Sellar Region.

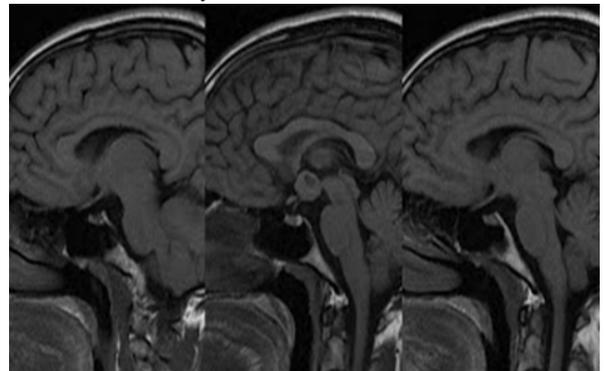
Case No: 4 Retinoblastoma Extending Into Sellar Supra - Sellar Region



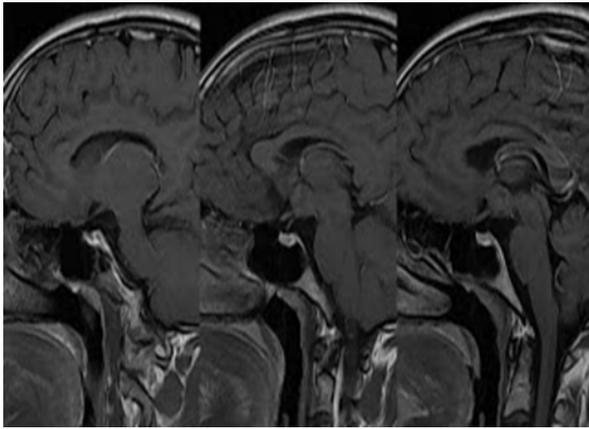
Post Contrast Saggital

There Is Well Defined Non Enhancing Lesion In The Region Of Third Ventricle Near The Foramen Of Monro Leading To Moderate Hydrocephalus.

Case No : 5 Colloid Cyst



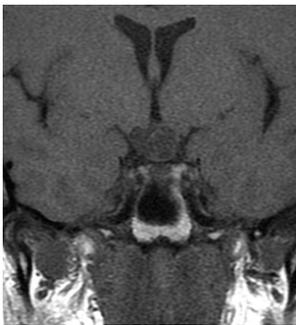
T1W (SAGGITAL)



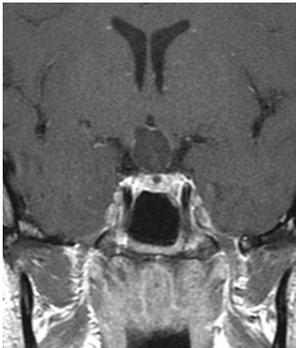
Post Contrast T1W (SAGGITAL)

MILD ENHANCING LESION IN SUPRASSELLAR CISTERN, S/O HYPOTHALAMIC GLIOMA

Case No : 6 Hypothalamic Glioma



T1W (CORONAL)



Post Contrast T1W (SAGGITAL)

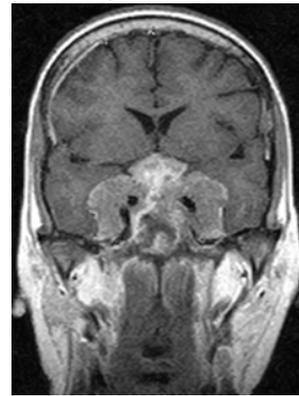
MINIMAL PERIPHERAL ENHANCING LESION IS NOTED IN SUPRASSELLAR REGION, S/O CYSTIC LESION (EPIDERMOID CYST)

Case No : 7 Epidermoid Cyst



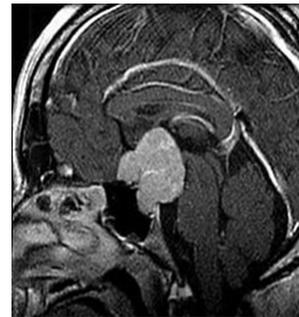
T2W (SAGGITAL)

Case No. 8 Rathke's Cleft Cyst

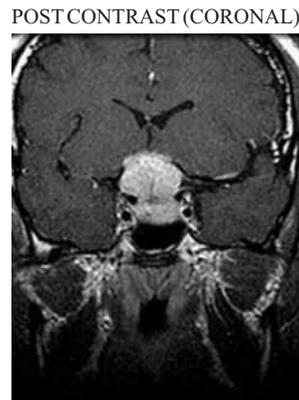


POST CONTRST (CORONAL)

Case No: 9 Sellar Metastasis



POST CONTRAST (SAGGITAL)



POST CONTRAST (CORONAL)

Case No: 10 Tuberculam Sellae Meningioma

SUMMARY AND CONCLUSION

Total 50 patients of Sellar and Parasellar lesions were studied using 1.5 Tesla MRI scanner.

Pituitary Adenomas were found more commonly comprising 21 out of 50 cases. They were more common in fourth and fifth decade of life. Females were commonly affected than males by Pituitary Adenomas. Most common presenting symptom was Headache followed by visual problems and endocrinopathies. Majority of the tumors were having well-defined margins. Pituitary Macro adenoma (11 out of 50) is most common mass lesion seen in sellar region which extends into supra sellar region. Incidence of surrounding involvement was quite high in Pituitary Macroadenomas. MRI is highly sensitive in detection of extension and involvement of the surrounding tissues by the Pituitary Macroadenomas. Pituitary microadenoma (10 out of 50) is 2nd most common lesion in sellar region. Craniopharyngioma (7 out of 50), Meningiomas (4 out of 50), Metastases to the sellar region accounts for (4 out of 50) and direct extension from near by lesion (3 out of 50). Sellar and parasellar glioma is found in (3 out of 50) while Rathke's cleft cysts, colloid cyst and Primary skull base mass lesion was found in (2 out of 50). Single case each of epidermoid and Histiocytosis-X is noted.

Summary:

MRI is the modality of choice for characterizing sellar, parasellar lesions, morphology of lesions, nature of contrast material enhancement and extent of lesions. Hence MRI is the modality of choice for diagnosing sellar and parasellar masses with high accuracy.

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