Original Article

Distinguishing sellar and suprasellar masses: A CT scan approach

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Abstract

Background: The differential diagnosis of sellar and suprasellar masses by CT scan is pivotal due to the anatomical complexity and varied pathologies involved. Accurate characterization through radiological imaging plays a crucial role in guiding management decisions and improving patient outcomes.

Objective: To distinguish sellar and suprasellar masses through CT imaging in symptomatic patients, emphasizing key radiological features, diagnostic considerations, and management implications.

Methods: This study was carried out in the Department of Radiology and Imaging with collaboration with the Department of Neurosurgery, in tertiary care hospital from July 2004 to June 2005. Patients with suprasellar masses who had undergone CT scan before surgery and histopathological examination post operatively were included in this study irrespective of age and sex. Total 60 patients, age ranging between 7 and 55 years were included in the study.

Results: Majority of people presented with headache 93.3% followed by visual problem in 78.3% cases. Among radiologically diagnosed sellar/suprasellar masses 60% were pituitary adenoma and histopathological data 51% pituitary adenoma.

Conclusion: CT scanning is indispensable in distinguishing sellar and suprasellar masses, aiding in precise diagnosis and management planning. Awareness of characteristic imaging features facilitates timely intervention, ensuring optimal patient care and outcomes in this complex anatomical region.

Keywords: Sellar mass, Suprasellar mass, CT scan, Pituitary adenoma

Introduction:

The evaluation of sellar and suprasellar masses poses a significant diagnostic challenge due to the wide array of potential differential diagnoses and the critical anatomical structures involved. These masses can arise from various origins including pituitary adenomas, craniopharyngiomas, meningiomas and metastatic lesions among others, each necessitating distinct management strategies and prognostic implications. The advent of computed tomography (CT) scanning has revolutionized the detection and characterization of these lesions, providing crucial insights into their size, morphology, and surrounding tissue involvement.

By examining specific characteristics such as per description size, enhancement patterns, calcifications, and surrounding tissue involvement, CT imaging plays a crucial role in narrowing down the differential diagnosis and facilitating timely intervention. Though the superiority of MRI over CT is well known, MRI is expensive and limited availability, hence CT remains the most widely used form of neuroimaging for diagnosis of brain tumours.[1]

CT scanning is a fundamental imaging modality in the initial evaluation of sellar and suprasellar masses due to its widespread availability, rapid acquisition time, and ability to provide detailed anatomical information. Contrast-enhanced CT scans enhance the delineation of vascular structures and can highlight certain features of masses that aid in the differential diagnosis. The interpretation of these scans requires a nuanced understanding of normal anatomy, pathological processes, and imaging artifacts to accurately diagnose and guide subsequent management. Subdividing sellar/juxtasellar lesions into intra, supra and juxtasellar masses facilitates diagnosis although some disease processes involve more than one area.[2]

Pituitary adenomas represent the most common sellar masses encountered clinically, with varying hormonal activity and growth patterns influencing their radiological appearance on CT scans. These benign neoplasms can range from microadenomas (<10 mm) to macroadenomas (>10mm), often demonstrating homogeneous enhancement with contrast due to their vascular supply.

In contrast, craniopharyngiomas, derived from remnants of Rathke's pouch, typically exhibit calcifications and cystic components on CT imaging, distinguishing them from other sellar masses.

Meningiomas, arising from arachnoid cap cells, may also involve the sellar and suprasellar regions, displaying dural tail sign and hyperostosis on CT scans.

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Differentiation of suprasellar masses by computed tomography criteria depends on intrasellar extension, patterns of calcification and enhancement, associated bony reaction, and cystic changes. In the case of a homogeneously enhancing suprasellar mass that does not exhibit any of these differentiating findings, separating a suprasellar meningioma from a large suprasellar pituitary adenoma has been quite difficult.[3]

Sellar and suprasellar tumours constitute about 25% of total intracranial mass lesions, 50% of them are pituitary adenomas, 25% are craniopharyngiomas and 10% meningiomas.[4]

Metastatic lesions to the sellar and suprasellar regions represent a diagnostic challenge, often presenting with variable enhancement patterns and multiple lesions in different anatomical locations. CT imaging plays a critical role in identifying these lesions, guiding further workup for primary malignancies elsewhere in the body. Other less common entities such as lymphomas, germ cell tumors, and infectious processes may also manifest as sellar and suprasellar masses, each necessitating a tailored diagnostic approach based on CT findings.

CT imaging serves as an indispensable tool in the differential diagnosis of sellar and suprasellar masses, offering valuable insights into the anatomical localization, structural characteristics, and tissue involvement of these lesions. By carefully analyzing radiological features and integrating clinical data, radiologists and clinicians can collaboratively formulate an accurate diagnosis and initiate appropriate management strategies. This study will delve into the nuances of sellar and suprasellar masses on CT scans, highlighting key diagnostic considerations and management implications to enhance clinical decision-making and patient outcomes.

Materials and Methods:

The study was carried out in the Department of Radiology and Imaging with collaboration of the Department of Neurosurgery, in tertiary care hospital from July 2004 to June 2005. Total 60 patients were included in this study.

Inclusion criteria included patients with suprasellar masses who have undergone CT examination before surgery and histopathological study post operatively. Patients were selected irrespective of age and sex. Patients who have not undergone operative treatment, those cases where histopathological reports were not available and drop out cases were excluded from this study.

The patients were evaluated by CT scan with contrast and expert opinion taken in every cases. Patient was followed up to completion of surgery. Specimen was sent for histopathological examination.

Results:

Table 1: Distribution of patients of CT scan with symptoms (N=60)

Presenting symptoms	Frequency	Percent
Headache	54	90
Visual problem	47	78.3
Amenorrhoea,galactorrhoea	3	5.0
D.I	4	6.7
Seizure	2	3.3
Ptosis and Ophthalmoplegia	2	3.3
Impaired consciousness	2	3.3
Poor development of secondary sexual character	7	11.6
Growth retardation	6	10.0
Gynaenocomastia and erectile dysfunction	4	6.7
To and fro movement of head	1	1.7
Diplopia	2	3.3
Hypothalamic feature	3	5

Majority of people presented with headache (90%) and visual impairment (78.3%) followed by endocrine deficiency (11.6%). Seizure, Ptosis and ophthalmoplegia, impaired consciousness, diplopia each were present in 3.3% cases as shown in Table 1.

Table 2: Distribution of radiological diagnosis of tumours (N=60)

Radiological Diagnosis	Frequency	Percent
Pituitary adenoma	36	60
Craniopharyngioma	10	16.67
Supra and parasellar meningioma	8	13.34
Hypothalamic glioma	2	3.3
Suprasellar arachnoid cyst	1	1.67
Suprasellar epidermoid	1	1.67
Parasellar schwannoma	0	0
Metastasis	1	1.67
ICA aneurysm	1	1.67
Total	60	100

Table 2 shows among radiologically diagnosed sellar/suprasellar masses, 60% were pituitary adenoma,16.67% craniopharyngioma, 13.34% meningioma, 3.3% hypothalamic glioma and 1.67% of each arachnoid cyst, epidermoid, metastasis and ICA aneurysm each.

Table 3: Distribution of histopathological data (N=60)

Histopathology	Frequency	Percent
Pituitary adenoma	31	51.6
Craniopharyngioma	11	18.3
Adamantinomatus	8	13.3
Papillary	2	3.3
Normal brain tissue	1	1.6
Meningioma	10	16.6
Meningiotheliomatous	5	8.3
Transitional	2	3.3
Fibrous	2	3.3
Psammomatous	1	1.6
Hypothalamic glioma	3	5
Low grade	2	3.3
Oligodendroglioma	1	1.67
Arachnoid cyst	1	1.67
Epidermoid cyst	1	1.67
Schwannoma	1	1.67
Metastasis	1	1.67
ICA aneurysm	1	1.67
Total	60	100

Among the 60 patient's histopathological data 51.6% pituitary adenoma which was highest, 18.3% craniopharyngioma, 16.6% meningioma 13.3% adamantinomatus, 8.3% meningiotheliomatous, Hypothalamic glioma 5%, papillary, Transitional, Fibrous, Low grade are 3.3% each and rest Psammomatous, Oligodendroglioma, Arachnoid cyst, Epidermoid cyst, Schwannoma, Metastasis and ICA aneurysm 1.6% each.

Discussion:

Majority of people presented with headache (93.3%) and visual impairment (78.3%) followed by endocrine deficiency. Seizure, Ptosis and ophthalmoplegia, impaired consciousness, diplopia each were present in 3.3% cases. The endocrine deficiencies include poor development of secondary sexual character, amenorrhoea, galactorrhoea, growth retardation, gynaecomastia and erectile dysfunction (Table 1).

Among radiologically diagnosed sellar/suprasellar masses, 60% were pituitary adenoma,16.67% craniopharyngioma,13.34% meningioma,3.3% hypothalamic glioma and 1.67% of each arachnoid cyst, epidermoid, metastasis and ICA aneurysm (Table 2).

Among the 60 patient's histopathological data 51% were pituitary adenoma which was highest, 18% craniopharyngioma, 13% Adamantinomatus, Papillary 3.3%, Normal brain tissue 1.6%, 16% meningioma,8.3% Meningiotheliomatous, 3.3% Transitional, 3.3% Fibrous, Low grade and rest Psammomatous 1.6%, Oligodendroglioma (1.6%), Arachnoid cyst (1.6%), Epidermoid cyst (1.6%), Schwannoma (1.6%), Metastasis (1.6%) and 1.6% ICA aneurysm (Table 3).

The diagnosis of sellar lesions involves a multidisciplinary effort, and detailed endocrinologic, ophthalmologic and neurologic testing are essential.[5] The most prevalent cause of a tumor in the sella is pituitary adenomas. These tumors produce their symptoms by interference with hormonal functions, compression of the optic chiasma and nerves, or discovered incidentally by imaging procedures done for other reasons.[6] Pituitary adenomas can just affect the sella, but they can also spread inferiorly into the sphenoid sinus, laterally into the cavernous sinuses, and suprasellarly toward the optic chiasm. Adenomas will expand the sella in 94% to 100% of instances. The sella can expand in up to 50% of nonadenomatous tumors, including cysts with Rathke's cleft, meningiomas, and craniopharyngiomas.[7-8] Therefore, the only diagnostically useful factor for a nonpituitary lesion is the absence of sellar enlargement.

Craniopharyngiomas are slow growing tumours, in which the symptoms are related to impingement on adjacent structures, such as hypothalamus, pituitary gland or optic chiasm or the third ventricle and foramina of Monroe with the production of obstructive hydrocephalus.[8]

Meningiomas in the suprasellar and parasellar regions are found in adults. They produce bone reaction with hyperostosis and may cause expansion of underlying sphenoid sinus. They produce symptoms by compression of adjacent structures, such as optic chiasm and optic nerve.[8]

Nonpituitary sellar masses can have other wide range of differential diagnoses, such as vascular lesions, granulomatous, infectious, and inflammatory processes, gliomas, cell rest tumors, and metastatic tumors.

CT still provides some advantage over MR imaging in detecting the presence or absence of tumoral calcification and in the evaluation of bony anatomy. Calcification suggests craniopharyngiomas, meningiomas, chordomas, teratomas, gliomas, or an aneurysm, but pituitary adenomas may also contain calcifications. Erosion of the floor of the sella can be seen with adenomas, intracavernous aneurysms, meningiomas of the middle fossa, Rathke's cleft cyst, arachnoid diverticula, and elevated intracranial pressure from any source.[9] When multiple cut CT has been negative, further diagnostic studies have proved unrewarding. When CT has been positive, additional studies have been required in some cases to rule out aneurysm prior to craniotomy.[10]

Since adenoma cannot always be distinguished from another intrasellar mass, angiography to demonstrate tumor angioarchitecture may be needed to characterize some neoplasms or to confirm an intrasellar aneurysm.[11]

Headache is a common and disabling aspect of pituitary tumour. Chronic migraine, episodic migraine, stabbing headache, cluster headache are predominant complaints.[12] Increased intracranial pressure symptoms and signs could indicate tumours such as craniopharyngioma, meningioma, or germinoma. When ventricular dilatation is caused by big tumors, headache is frequently a major symptom. Patients with intrasellar or suprasellar cysts, as well as inflammatory diseases too small to increase intracranial pressure, may also experience headaches. These patients may have headaches due to diaphragmatic dysfunction or irritation of the parasellar dura.[12]

Visual loss is a common presenting complaint with sellar/parasellar lesions which is similar to present study because of the proximity of the optic nerves, chiasm, and optic tracts to the sella turcica. Because visual loss may be insidious in onset and progress slowly, severe deficits frequently are present before the patient seeks medical attention. In children, in particular, severe visual loss as a result of optic nerve compression by lesions such as craniopharyngiomas may occur before a vision problem is noticed. The particular visual field loss may provide some clue as to the nature of the lesion. Lesions anterior to the chiasm, such as meningiomas of the optic nerve sheath, can produce unilateral visual loss, whereas lesions compressing the visual system more posteriorly along the optic tract, such as meningiomas or aneurysms, can produce homonymous hemianopsias that are characteristically incongruous. Visual deficits from chiasmal tumors may manifest as visual field defects, visual loss, diplopia, nystagmus and visual hallucinations.[13]

Functioning pituitary adenoma can cause amenorrhoea, galactorrhoea, growth retardation, sterility, erectile dysfunction etc. Similar to pituitary adenomas, several nonpituitary sellar and parasellar tumors can exhibit anterior pituitary hormone failure symptoms. Gonadal dysfunction, secondary hypothyroidism, and, less frequently, clinical adrenal cortical insufficiency is among these symptoms. When lesions compress the pituitary, hypothalamus, or infundibulum, children may exhibit growth failure and absence of secondary sexual development.

Clinical diabetes insipidus at presentation is highly suggestive of a nonpituitary etiology of a sellar or parasellar mass. Diabetes insipidus may result from involvement or compression of the pituitary stalk, hypothalamus, or paraventricular region of the third ventricle by the lesion. Vasopressin deficiency may be partial or transient in some patients because regeneration of the vasopressin-containing neurohypophyseal fibers may occur. In addition, the apparent spontaneous improvement of diabetes insipidus in some patients may coincide with the development of hypopituitarism. The syndrome of inappropriate antidiuretic hormone secretion leading to potentially severe hyponatremia may also occur in patients with nonpituitary sellar and parasellar lesions.

Preoperative differentiation of the histological aetiology of masses involving the sella turcica and suprasellar region is of profound clinical importance because it determines the use of surgery versus non-surgical techniques, a transsphenoidal versus an intracranial surgical approach and the degree of resection.[14]

Conclusion:

In conclusion, the differential diagnosis of symptomatic sellar and suprasellar masses by CT scan is a complex yet vital aspect of clinical practice, necessitating a nuanced understanding of anatomical structures, pathological processes, and radiological findings. CT imaging remains integral in the initial evaluation, offering detailed insights into lesion morphology, enhancement patterns, and surrounding tissue involvement. The ability to distinguish between various entities such as pituitary adenomas, craniopharyngiomas, meningiomas, and metastatic lesions is crucial for guiding appropriate management strategies and optimizing patient outcomes. Continued advancements in imaging technology and interdisciplinary collaboration will further enhance our ability to accurately diagnose and manage these challenging conditions, ultimately improving the quality of care for patients with sellar and suprasellar masses.

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