Original Article

An Insight Into Pituitary Fossa Lesions: A Single Institutional Experience

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ABSTRACT

Introduction: The complex placement of the sellar region and the various native tissues provide a fertile ground for the development of spectrum of non-neoplastic and neoplastic lesions in this area.

Methods: The prospective study of two years in a tertiary care hospital was conducted. A total of 67 specimens of sellar and parasellar region were received from the neurosurgery department for intraoperative as well as histopathological diagnosis. Squash cytology was utilised for rapid intraoperative consultation.

Results: Pituitary adenomas were the most common tumours followed by craniopharyngiomas.

Conclusion: Multidisciplinary approach of radiology, neurosurgery and pathology helps in arriving at the right conclusion and diagnosis in central nervous system lesions.

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Introduction

The anatomical placement of the sellar region is an important factor for varied differential diagnosis of the pathological lesions of this area. The complex localisations and vicinity of important anatomical landmarks like optic chiasma is primarily an important cause of disability in patients. The classification of tumours of sellar region is enumerated in Table 1. Pituitary adenomas (PA) constitute 10% to 15% of all intracranial neoplasms. The genesis is not known exactly. Most PAs are sporadic but association with multiple endocrine neoplasia (MEN) type 1 is identified in 2.7% of individuals.[1]The family history is encountered in 5% cases. Clinically, PA can be functional or non-functional depending on their behaviour. Radiologically, PAs are classified by their size based into microadenoma (less than <10 mm) or macroadenoma (equal or greater than ≥10 mm). Histologically, they used to be classified as either basophilic, acidophilic or chromophobic on basis of Hematoxylin and Eosin (H&E) staining, which is not used in this era. Functionally, PAs can be classified depending on the hormones elaborated by them, detected immunohistochemically and serologically (Table 2). WHO classifies pituitary tumours as typical and atypical adenomas and pituitary carcinoma. In addition to symptoms produced by hormone secretion, the localisation and size of the tumour in pituitary fossa also leads to pressure symptom like diminuition of vision, vision loss, bitemporal hemianopia, headache, loss of visual acuity and pituitary insufficiency (hypopituitarism)[2] Radiology is an important tool in determining the location, size and extent of the tumour. Magnetic resonance imaging (MRI), on T1 weighted imaging, shows hypointense tumour whereas on T2 imaging, isointense to grey matter and diffusely hyperintense and show moderate to strong post contrast enhancement. PA is classified as adenomas into 0 of 4 grades (0–IV) based on radioanatomical findings.[3] The tan brown colour of PA is characteristic. Being soft in consistency, they are spread easily during squash cytology done for intraoperative diagnosis. The squash cytology shows monolayer sheets of uniform cells with moderate cytoplasm, round nuclei, delicate stippled chromatin and inconspicuous nucleoli. The histological examination shows a tumour arranged in sheets or papillary or trabecular pattern. The cells may be acidophilic, basophilic or chromophobic. The typical PA is generally mitotically inactive. The PA showing increased mitosis and Ki67 index with p53 overexpression can be labelled as atypical adenomas. The tumours infiltrating the bone, the cavernous sinus, diaphragm sellae can be labelled as infiltrative PAs. Pituitary carcinomas are very rare tumours elaborating prolactin as well as ACTH commonly.[4] Mere presence of local invasion, cellular atypia or increased mitosis cannot differentiate infiltrative PAs from pituitary carcinoma.[4] The sole presence of metastasis is only confirmatory of carcinoma. The incidentally detected PAs during imaging performed for some unrelated cause or at autopsy are called as incidentalomas. Pituitary apoplexy is a condition that occurs when pituitary adenomas suddenly haemorrhage internally, causing a rapid increase in size or when the tumour outgrows its blood supply which causes tissue necrosis and subsequent swelling of the dead tissue causing visual loss and sudden onset headache. Spindle cell oncocytoma is a very rare subtype of primary tumour of adenohypophysis, the diagnosis of which is largely based on the pathologic characteristics of the tumour.

Craniopharyngiomas (CP) represent 1–2% of all intracranial neoplasms and about 10% of the tumours of the sellar region.[5,6] They show bimodal sex distribution and also present with pressure symptoms or endocrinologic abnormalities. On neuroimaging, CPs are typically calcified, solid or cystic (or mixed solid-cystic) lesions that have a complex lobular appearance. On gross pathological examination, they exhibit mixed solid-cystic appearance. The cut surface shows cysts (containing dark greenish-brown liquid resembling machinery oil) and secondary changes such as fibrosis, calcification, ossification and the presence of cholesterol-rich deposits. CP is difficult to spread on squash smears. The cytology shows sheets of closely packed epithelial cells with clear spaces, resembling transitional or stratified squamous epithelium. The histological examination of CP is characterised by islands of densely packed squamous epithelium in cords, lobules and irregular trabeculae bordered by palisaded columnar epithelium along with intermingled stellate reticulum. Nodules of "wet keratin" are present. Cystic cavities containing squamous debris are lined by flattened epithelium. The surrounding gliosis may be evident in case of infiltration. The sella turcica can harbour other neoplasms derived from bone, meninges, neural tissue and nasal sinuses like plasmacytoma, giant cell tumour of bone, chordoma, meningioma, schwannoma, haemangiopericytoma and salivary gland tumours.[7]The metastatic tumours to pituitary gland account for only 1% of cases. Metastases of breast, lung or gastrointestinal carcinoma are often encountered at autopsy.

With thourough understanding of features of all these lesions, histopathologist plays an important role in the definitive intraoperative or post operative diagnosis of lesions in this complex area.

Materials and Methods

This was a prospective study of sixty seven patients with sellar and suprasellar lesions operated at a tertiary care

hospital in Mumbai, India. The clinically and radiologically suspected and histologically confirmed cases of sellar and parasellar tumours were enrolled in the study. The study was approved by the institutional ethics committee of the instituition. The details of the each patient were taken from medical records i.e. age, gender; clinical presentation, radiological evaluation (MRI and/or CT scan), location, brain infiltration and recurrence were noted. Intra-operative consultation was done by squash smears for which sample was received in isotonic normal saline or wet guaze as early as possible from the operating room to avoid artifacts. Squash diagnosis was noted and was correlated with final histology. Both squash cytology and histological sections were viewed by experienced pathologists.

In all cases, specimen if remaining after squash cytology as well as those received following surgery were fixed in 10% buffered neutral formalin for 24 hours. The received specimen, fragmented or in toto, whole tissue was submitted for processing. The paraffin embedded blocks were cut into 4-5 micron sections and stained with routine Haematoxylin and Eosin stain (H&E). The reticulin stain was done wherever needed to differentiate between hyperplasia and adenoma.

Results

The prospective study over a period of two years conducted in a tertiary care hospital. A total of sixty seven cases were studied. The lesions of sellar, suprasellar and parasellar lesions were as shown in Table 3. The commonest age group affected was 31-40 years (34.15%) followed by 41-50 years group (26.83%). Headache was the commonest symptom seen in 75.60% cases followed in close frequency by visual disturbances seen in 68.30% cases. Symptom related to hormonal disturbances (amenorrhoea, galactorrhoea, menstrual irregularity) was seen in about 21.96% cases (9.76, 2.44, 9.76% respectively). Majority were non-functioning adenomas (63.41%) (Table 4). Prolactin was secreted by most functioning PAs. 8 cases out of 41 were recurrent contributing to 19.51%. The radiology, cytology and histology of the PA was characteristic (Figure 1,2 & 3).

CP contributed 4.35% of all intracranial neoplasms and 5.48% of all extra-axial lesions. The younger age group was commonly affected from 11-30 years (28.57%). 12 out of 21 cases were males. 18 out of 21 presented with headache (85.71%), 12 out of 21 presented with visual disturbances (57.14%). 3 cases out of 21were recurrent contributing to 14.28%. The radiology showed a solid cystic lesion (Figure 4). The squash smear cytology showed squamous epithelium with keratin (Figure 5) while histopathology confirmed the diagnosis (Figure 6).

Four cases of meningiomas were diagnosed with varied histological (meningothelial, papillary, psammomatous and metaplastic) pattern in our study (Figure 7). The squash cytology was 100% sensitive and specific in such cases. A single case of lymphocytic hypophysitis was also seen (Figure 8).

Discussion

The PAs are the most common tumours of the sellar region which was also seen in our study. They constituted 61.19% of all tumours followed by CP (31.35%). The findings were in accordance with Saegeret et al[9] reported who found 86.64% of PA in sellar neoplasms and Valassi et al[10] who stated it as 15% of all intracranial neoplasms and Cho et al.[11] In present study, most common affected age group was 31-40 years constituting 34.15% cases. Cases in 3th and 5th decade contributed 73.17% (30 out of 41) while Arvind Rishi et al [12] who found 50.6% cases in 3rd to 5th decade. The mean age in present study was 40.26 years which was in concordance with findings of John et al [13], Rishi A et al [12] and Alma Ortiz plata et al [14] who found it as 44.9 years, 46.2 years and 41.4 years respectively. In present study 7.31% cases were less than 20 years of age. In a study done by Mindermann and Wilson et al [15] less than 6% cases were below 20 years of age, while in a study

Table 1: Tumour and tumour like lesions in pituitary gland and sellar region[7]

Tumours of anterior pituitary	Pituitary adenoma, Atypical pituitary adenoma Pituitary carcinoma, Spindle cell oncocytoma
Tumours and tumour like lesions of non-pituitary origin	Craniopharyngioma , Meningioma, Langerhans cell histiocytosis, Metastasis, Chordoma.
Inflammatory lesions	Lymphocytic hypophysitis, Granulomatous hypophysitis, Sarcoidosis.
Cystic lesions	Rathke's cleft cyst, Arachnoid cyst Epidermoid / dermoid cyst

Table 2: Classification of pituitary adenoma[8]

Adenoma type	Hormone
Lactotrophic adenoma	Prolactin (PRL)
Somatotrophic adenoma	Growth hormone(GH)
Mixed lactotrophic&somatotrophic	PRL/GH
Corticotrophic	Adrenocorticotrophic Hormone (ACTH), Endorphins
Gonadotropic adenoma	Follicle Stimulating Hormone (FSH), Leutinising Hormone (LH)
Thyrotropic adenoma	Thyrotropin Stimulating Hormone (TSH)
Pluerihormonal adenoma	GH, PRL, TSH
Silent subtype	-
Null cell adenoma	-

Table 3: Lesions of sellar, suprasellar and parasellar regions (n=67)

Lesions	No.	%
Pituitary adenoma	41	61.19
Craniopharyngioma	21	31.35
Meningioma	04	5.97
Lymphocytic hypophysitis	01	1.49

Table 4: Incidence of functioning and non-functioning pituitary adenoma

	Normal (Non-functioning)	Deranged (Functioning)	
No. of cases	26	Growth hormone	02
		Prolactin	09
		TSH	02
		ACTH (Cortisol)	02
Total	26		15
%	63.41		36.59

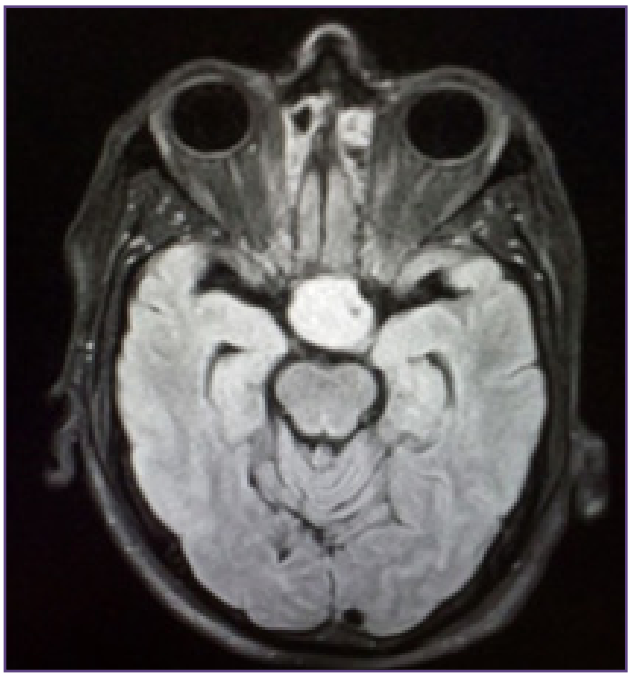

Fig. 1: T2 weighted coronal MRI image shows a well defined, solid intensely enhancing sellar mass (pituitary adenoma).

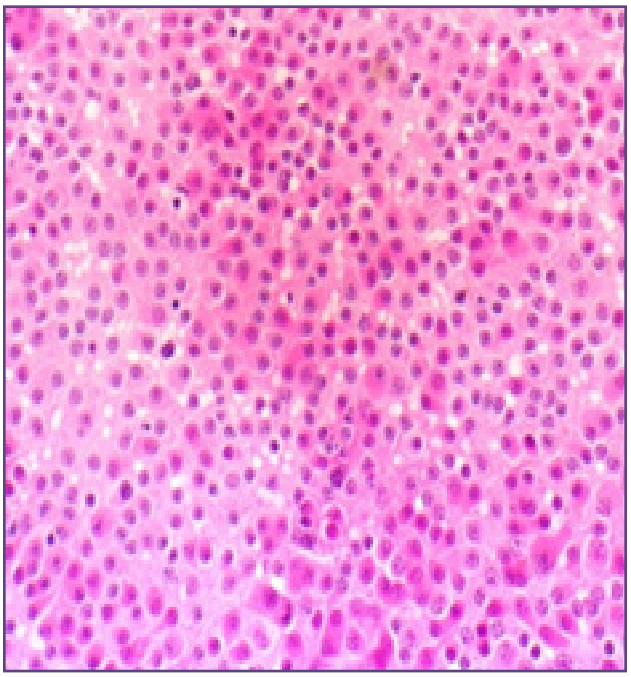

Fig. 2: Pituitary adenoma (Squash smear) - Shows monolayer sheets of monotonous cells having round nuclei with speckled chromatin (H&E, X 400).

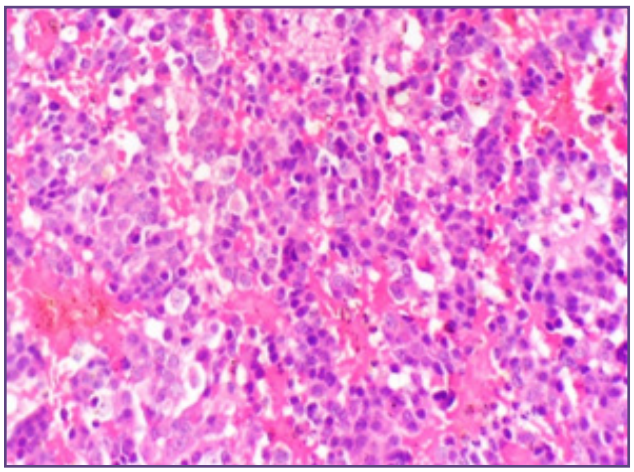

Fig. 3: Pituitary adenoma – Shows sheets & nests of tumour cells having round nuclei with speckled chromatin (H&E, X 400).

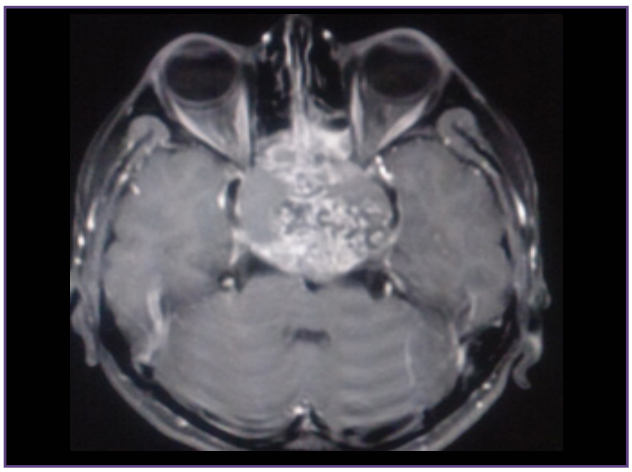

Fig. 4: T2 weighted coronal MRI image shows a solid-cystic intensely enhancing sellar mass (craniopharyngioma).

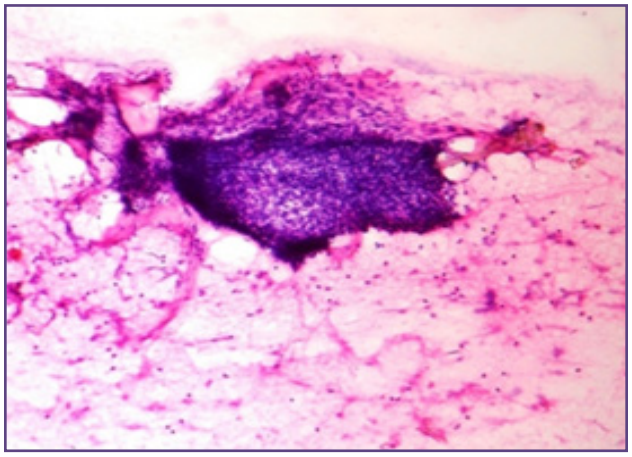

Fig. 5: Craniopharyngioma (Squash smear) - Shows sheets of epithelial cells against keratinous background (H&E, X100).

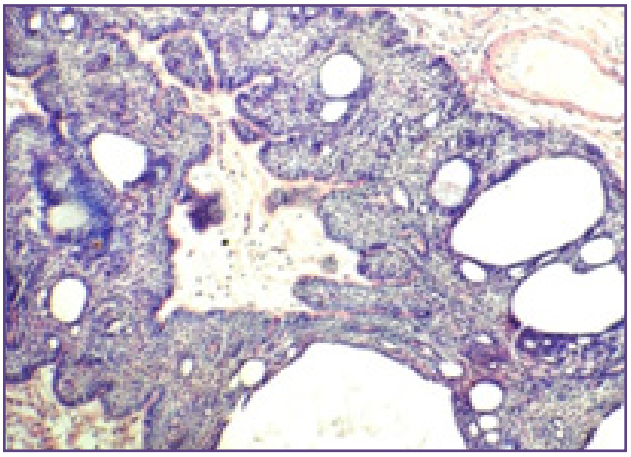

Fig. 6: Craniopharyngioma - Shows cystic spaces along with sheets of squamous epithelium bordered by palisaded columnar epithelium (H&E, X100).

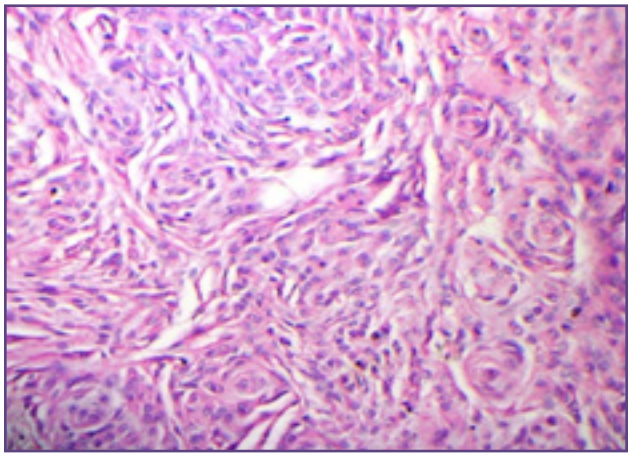

Fig. 7: Meningioma – Shows characteristic whirling pattern of arrangement of cells. (H&E, X100).

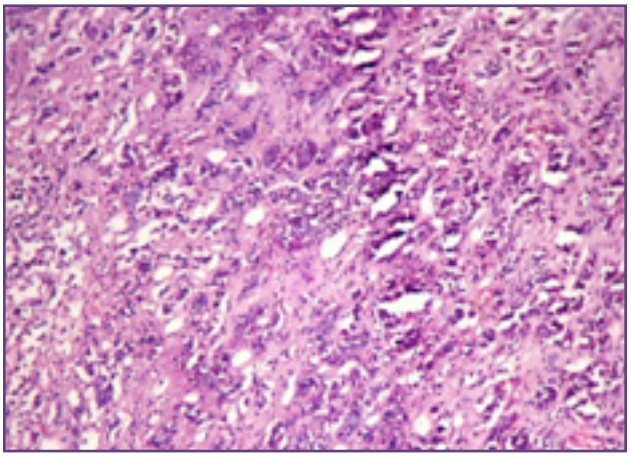

Fig. 8: Lymphocytic Hypophysitis – Dense infiltration of lymphocytes and plasma cells in the pituitary gland. (H&E, X100).

done by Plata et al [14] 9.8% cases were less than 20 years of age. In a present study female cases contributed 41.46% while studies done by John et al [13] showed 55% and Daly AF et al [16] which showed 67.6% female cases. In present study, most common presenting symptom was visual disturbances in 80.49% of cases, followed by headache in 68.29% cases. In a study done by John et al [13] visual disturbances were seen in 94.4% cases while headache was present in 75.3% cases. Study done by Paulo Andrade de Mello et al [17] showed visual disturbances in 87.3% of cases and headache in 70% cases. In present study about 63.41% pituitary adenomas were non-functioning. This correlated with the studies done by John et al [13] in which 77.3% were non-functioning, Rishi et al [12] (51% non-functioning) and Paulo Andrade de Mello et al [17] (60.6% non-functioning). In the present study, out of 36.59% of functioning adenoma, prolactin secreting adenoma were the most common contributing to 21.95% cases. This finding was correlated with Matshana Kennedy John et al[13] in which it was 14.7%. In present study 90.24% were macroadenoma while Alma Ortiz plataet al [14] showed 80% macroadenomas. In general tumour size correlated with functional activity. Non-functioning are usually diagnosed as macroadenomas due to absence of clinical manifestations which allow tumour growth over a period of time. The squash cytology correlated with histology in all cases except that of a case of pituitary apoplexy. The case of lymphocytic hypophysitis was diagnosed on intraoperative squash cytology which was overdiagnosed as pituitary adenoma on radioimaging. Frequency of recurrence varies between 19 to 34% in different studies.[18]In our study recurrent cases contributed 19.51% while in Alma Ortiz plata et al [14] 29.4% cases were recurrent. CPs represent 1–2% of all intracranial neoplasms and about 10% of the tumours of the sellar region.[5] In present study CP was second most common neoplasm of sellar region contributed to 31.35% of sellar neoplasms and 4.35% (21 out of 383) of all intracranial neoplasms. In the present study headache was seen in 85.71% and visual disturbances in 61.90% of cases of CP. In a study done by Jennifer L Shin et al [19] 67% of the cases were having visual disturbances. In our study most of the cases are seen in 2nd -3rd decade with slight male preponderance while Jennifer L Shin et al [19] found most cases in later half of 3rd decade with no gender bias. The squash smears were diagnostic in all but one case where the diagnosis of epidermoid cyst was offered. 3 out of 21 cases were recurrent contributing 9.52%.

Role of Pathology

The pathologist has a prime role in the intraoperative diagnosis of the lesion when the surgeon has to decide the further plan of surgery. The squash smears have become a useful tool in giving prompt opinion about the nature of the lesion. Pituitary adenomas can be reliably differentiated from inflammatory and cystic lesions, like lymphocytic hypophysitis and Rathke's cleft cysts in our study. However, the pathologist needs to be trained with pathological aspects of various central nervous system tumours. These smears had a fairly acceptable correlation with histology in our cases.

Conclusion

PA constituted 8.49% of all intracranial neoplasms and 61.19% cases of sellar tumours in the study over a period of two years. Majority were non- functioning adenomas and seen in young adults. CP was second commonest (31.35%) tumour in the region, also found in young adults. The squash smear cytology correlated well with histology in 97.56% cases in cases of PA and 95.24% cases of CP. Four cases of meningiomas and a single case of lymphocytic hypophysitis were diagnosed.

Acknowledgment

Nil

Source of Funding

Nil

Competing Interest

Nil

LIST OF ABBREVIATIONS USED

PA	-	Pituitary Adenoma
CP	-	Craniopharyngioma
H&E	-	Haematoxylin and eosin
CNS	-	Central nervous system
CT	-	Computerised tomography
MRI	-	Magnetic resonance imaging
WHO	-	World Health Organisation
PAS	-	Periodic acid Schiff
GH	-	Growth hormone
ACTH	-	Adrenocorticotrophic hormone
PRL	-	Prolactin
FSH	-	Follicular stimulating hormone
LH	-	Luteinizing hormone
TSH	-	Thyroid stimulating hormone
hpf	-	High power field
N/C	-	nuclear to cytoplasmic ratio

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