Article published online: 2022-07-10

Pituicytoma: A Report of Two Cases and Literature Review

K. Giridharan[1] C. T. Unais Mohammed[1] M. K. Saranraj[1] Mangaleswaran Balamurugan[1]

[1] Department of Neurosurgery, Apollo Specialty Hospitals, Nandanam, Teynampet, Chennai, Tamil Nadu, India

Indian J Neurosurg 2023;12:174–179.

Address for correspondence K. Giridharan, MBBS, Department of Neurosurgery, Apollo Specialty Hospitals, 320, Anna Salai, Nandanam, Teynampet, Chennai 600035, Tamil Nadu, India (e-mail: doctorgiri2004@gmail.com).

Abstract

Introduction Pituicytoma is a rare form of primary benign tumor of the neurohypophysis and infundibulum. There have been 140 reported cases in world literature that could be found in our search. Here we discuss about the presentation, radiological features, treatment, histopathology, and immunohistochemical markers of two cases, along with a brief review of literature.

Materials and Methods A 48-year-old female presented with headache and painless visual loss for 4 years. Examination revealed bitemporal hemianopia and normal fundus. Hormonal profile was normal. Magnetic resonance imaging (MRI) showed $2.6 \times 2.8 \times 3.3$ cm, thin-walled, cystic sellar and suprasellar lesions stretching the optic chiasm superiorly. Endoscopic transnasal, transsphenoidal gross total excision was done. Histopathological examination (HPE) and immunohistochemistry (IHC) were suggestive of pituicytoma. A 55-year-old male presented with intermittent headache and vomiting for 3 months. Examination was unremarkable. Hormonal profile was normal. MRI showed lobulated mass of size $1.4 \times 1.9 \times 2.0$ cm, arising from anterior pituitary and extending to the suprasellar cistern. Lesion was hyperintense in T1-weighted and heterointense in T2-weighted images, and Fluid attenuated inversion recovery images (FLAIR) with homogenous contrast enhancement pushed the optic chiasm superiorly. Endoscopic transnasal partial excision of the lesion was done. HPE and IHC were suggestive of pituicytoma.

Results Total number of cases was 142, of which 71 were males (50%) and 71 were females (50%). Age ranged between 7 and 83 years (mean 49.2, median 48). Brain imaging was available in 110 cases. Size of the lesion varied from 4 to 72 mm (mean 27 mm). Location was either pure sellar (24.3%) or with extension into the suprasellar cistern (34.3%) and/or the cavernous sinuses (7.1%). Lesions in MRI were solid (84%) with few areas of cystic changes, while contrast enhancement of solid portion was in 92% (homogenous in 80% and heterogeneous in 20%) of the cases. One case showed features of hemorrhage while no case showed calcification. Treatment was primarily surgical (120 out of 130 cases): transsphenoidal excision in 70% of the cases and craniotomy and excision in 30%. Preoperative embolization of arterial feeders was done in two cases and postoperative radiation was given in one case. Gross total resection

Keywords

- pituicytoma
- sellar and suprasellar lesions
- WHO grade I tumor

article published online
July 10, 2022

DOI https://doi.org/10.1055/s-0042-1750740.
ISSN 2277-954X.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

was done in 46.3%, subtotal resection in 40%, partial resection in 12.6%, and biopsy was done in 1.1% of the cases in the study. Follow-up ranged from 2 to 134 months (average 31.2, median 19). Recurrence or regrowth was documented in 23 patients, treatment in 18 patients, and resurgery was done in 12 cases, followed by radiotherapy in 5. In six cases, radiotherapy was used in isolation. Improvement in the visual deficit was seen in 26 patients, and remained unchanged in 3. Among the patients with preoperative endocrine dysfunction, 10 improved while 11 suffered a worsening. Ten patients had new postoperative endocrine alteration. Only one fatal case was registered.

Conclusion Pituicytoma is a rare World Health Organization grade I tumor of the sellar and suprasellar region, presenting with varied clinical, radiological, and hormonal features. Histopathology and immunohistochemistry form the mainstay in diagnosis. Surgical excision with transsphenoidal approach is ideal. Prognosis in general is good after surgical resection alone or in conjunction with radiotherapy.

Introduction

Pituicytoma is a rare form of primary benign tumor of the neurohypophysis and infundibulum.[1] There have been 140 reported cases in world literature that could be found in our search. Here we discuss about the presentation, radiological features, treatment, histopathology, and immunohistochemical markers of two cases, along with a brief review of literature.

Case Report

Case 1

A 48-year-old female, with known hypertension and hypothyroidism, presented with history of insidious onset and gradually progressive headache for 4 years. History of bitemporal, painless, gradually progressive visual field restriction for the past 4 years, was not associated with any deviation of eyeball or double vision. There was no history suggestive of hormonal deficiency or excess of it, or other cranial nerve involvement or spino-motor system involvement. Examination revealed normal visual acuity, bitemporal hemianopia, and normal fundus with no other cranial nerve or spino-motor system deficit or features of hormonal imbalance.

Bitemporal hemianopia was confirmed in perimetry. Hormonal profile was normal. Magnetic resonance imaging (MRI) showed $2.6 \times 2.8 \times 3.3$ cm, well-circumscribed, thin-walled, cystic sellar and suprasellar lesions. The cyst wall was hypointense on T1-weighted (T1W) and T2-weighted (T2W) images, while the cyst followed cerebrospinal fluid (CSF) signal intensity in all sequences with no diffusion restriction, and no enhancement of Gadolinium contrast. Anterior and posterior pituitary were seen along the posterior and inferior walls of the cyst whereas the pituitary stalk was not seen separately. Optic chiasm was stretched and displaced superiorly. The lesion was causing expansion of the sella, partially effacing the third ventricle above, abutting the cavernous sinus and supra clinoid Internal carotid arteries (ICAs) on either side, as shown in ►**Fig. 1**.

Endoscopic transnasal, transsphenoidal aspiration of cyst and gross total excision of the wall were done. Cyst fluid showed inflammatory cells composed of neutrophils and few monocytes. Histopathological examination (HPE) showed loose bundles and fascicles of spindly cells with indistinct cytoplasm and spindly nuclei. Many of the cells showed abundant granular brownish pigmentation. Mitotic figures were hard to find and there was no necrosis or features of hemorrhage.

Immunohistochemistry (IHC) of tumor cells showed positivity for Glial fibrillary acidic protein (GFAP) (weak), thyroid transcription factor-1 (TTF-1: nuclear), S-100 protein (diffuse), H3K27me3, B-cell lymphoma 2 (BCL-2) (weak), and vimentin (diffuse). H3K27m, Olig-2, synaptophysin, Cluster of differentiation 56 (CD-56), and Epithelial membrane antigen (EMA) were negative. Ki67 proliferation index was 1%. IHC images are shown in ►**Fig. 1**.

Histopathology and IHC confirmed the diagnosis of pituicytoma. This type of completely cystic and relatively avascular pituicytoma is quite rare.

Case 2

A 55-year-old male presented with the history of insidious onset, gradually progressive, bifrontal, mild-to-moderate intensity headache, and intermittent episodes of vomiting for 3 months. There was no history of visual disturbance or other cranial nerve involvement or hormonal imbalance. Endoscopic transnasal surgery was attempted elsewhere and was abandoned in view of profuse intraoperative bleeding. Examination showed normal visual acuity, no restriction of visual field, and normal fundus with no other cranial nerve or spino-motor system deficit or features of hormonal imbalance. Visual acuity and visual field by perimetry were normal. Hormonal profile was normal.

MRI showed a well-defined, lobulated, $1.4 \times 1.9 \times 2.0$ cm mass, arising from anterior pituitary and extending to the suprasellar cistern. Lesion was hyperintense in T1W images, and heterointense in T2W images and Fluid attenuated inversion recovery images (FLAIR). There was focal area of gradient hypointensity at the superior part suggestive of

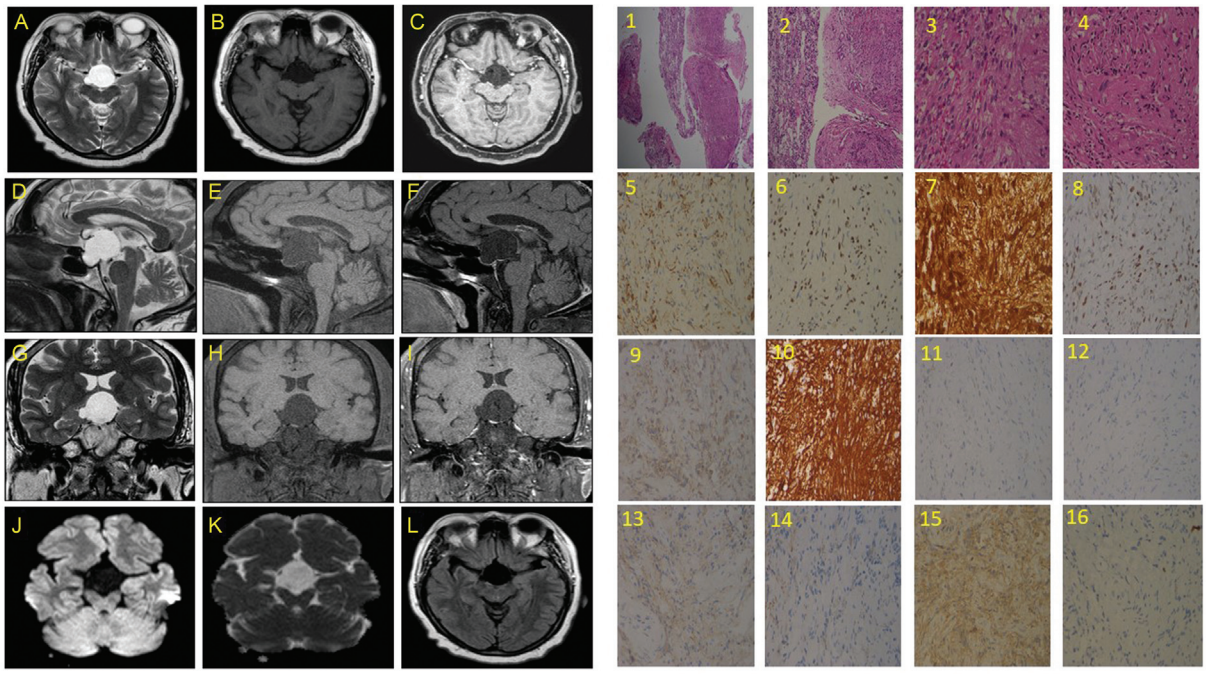

Fig. 1 Magnetic resonance imaging, histopathological examination, and immunohistochemistry of case 1: (**A**) T2-weighted (T2W) axial, (**B**) T1-weighted (T1W) axial, (**C**) contrast axial, (**D**) T2W sagittal, (**E**) T1W sagittal, (**F**) contrast sagittal, (**G**) T2W coronal, (**H**) T1W coronal, (**I**) contrast coronal, (**J**) diffusion-weighted imaging axial, (**K**) Apparent diffusion coefficient (ADC) axial, and (**L**) *FLAIR* axial. (**1**) and (**2**) histopathological appearance in low-power view, (**3**) and (**4**) histopathological appearance in high-power view, (**5**) GFAP positive (weak), (**6**) thyroid transcription factor-1 positive (nuclear), (**7**) S-100 protein positive (diffuse), (**8**) H3K27me3 positive, (**9**) BCL-2 positive (weak), (**10**) vimentin positive (diffuse), (**11**) H3K27m negative, (**12**) Olig-2 negative, (**13**) synaptophysin negative, (**14**) CD-56 negative, (**15**) EMA negative, and (**16**) Ki67 proliferation index.

hemorrhage. The lesion showed homogenous contrast enhancement. There was mass effect over the optic chiasm, which was pushed superiorly. No extension into the cavernous sinus or orbit was noted, as shown in ►**Fig. 2**.

Endoscopic transnasal, transsphenoidal subtotal resection (STR) of the lesion was done. Intraoperatively, the lesion was extremely fibrous and vascular. There was no intraoperative CSF leak. HPE showed cellular neoplasm composed of interlacing bundles and fascicles of spindle cells with focal nuclear palisading. The cells showed indistinct cytoplasm with spindly nuclei. Many of the cells showed intracytoplasmic pigmentation. There was no evidence of necrosis, and mitotic figures were hard to find.

IHC showed positivity for synaptophysin, vimentin, S-100 (weak), CD-56 (patchy), BCL-2 (weak), and Cluster of differentiation-68 (CD-68) (cytoplasmic), and negative for cytokeratin, chromogranin, GFAP, EMA, D2–40, and Sex determining region Y box 10 (SOX-10), while Ki67 was 2 to 3% suggestive of pituicytoma. ►**Fig. 2** shows the IHC images.

Discussion and Literature Review

Liss and Kahn first coined the term pituicytoma in 1958.[2] It has been interchangeably called as pituicytoma, choristoma, myoblastoma, granular cell tumor, pilocytic astrocytoma, posterior pituitary astrocytoma, and infundibuloma in various literatures. Hurley, in 1994, brought some clarity by describing them as nonpilocytic tumors and also gave their MRI characteristics.[3] Brat et al gave the pathological criteria for diagnosis of pituicytoma in 2000.[4] It was included in World Health Organization (WHO) 2007 classification as a benign sellar astrocytic neoplasm (grade I). In the WHO 2016 and 2017 classifications of tumors of central nervous system, it was individually classified as a WHO grade I tumor among tumors of the sellar region.[5,6] "Pituicytes," a group of specialized glial cells present in the neurohypophysis and infundibulum, are believed to be the cell of origin of these tumors. Five types of pituicytes are described—clear, dark, ependymal, oncocytic, and granular—based on ultrastructure by Takei et al in 2005.[7] Pituicytoma is believed to arise from the clear and dark cell types, while granular cell tumor arises from granular type and fusocellular oncocytoma arises from oncocytic type. Immunohistochemical positivity for Thyroid transcription factor 1 (TTF-1) in these tumors supports this hypothesis.[5] Alternate belief is that pluripotential stromal adenohypophyseal cells, or folliculostellate cells, undergo neoplastic transformation leading to various types of primary pituitary tumors including pituicytoma.[8]

Epidemiology

Highlights of the data in literature have been summarized in ►**Table 1**. There was no gender predilection—total number of cases reported to date including ours was 142, of which 71 were males (50%) and 71 were females (50%). Age ranged between 7 and 83 years (mean 49.2, median 48).

Brain imaging was available in 110 cases. Size of the lesion varied from 4 to 72 mm (mean 27 mm). Location was either pure sellar (24.3%) or with extension into the suprasellar cistern (34.3%) and/or the cavernous sinuses (7.1%). Imaging

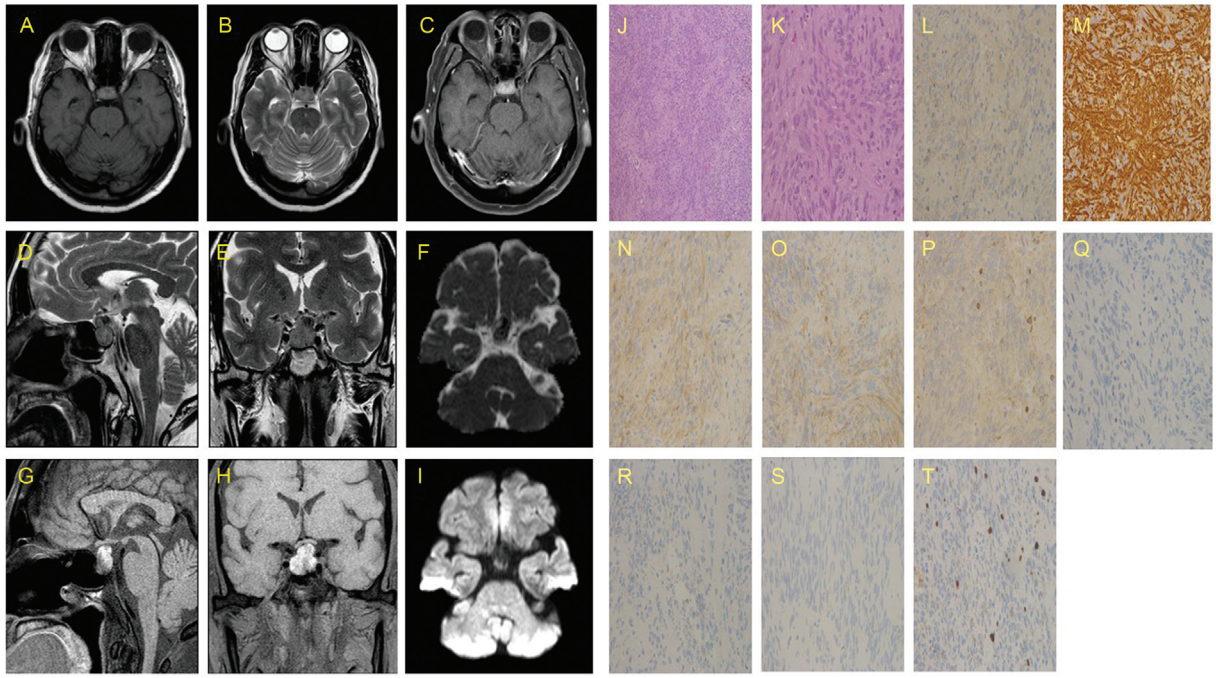

Fig. 2 Magnetic resonance imaging, histopathological examination, and immunohistochemistry of case 2: (**A**) T1-weighted (T1W) axial, (**B**) T2-weighted (T2W) axial, (**C**) contrast axial, (**D**) T2W sagittal, (**E**) T2W coronal, (**F**) ADC axial, (**G**) contrast sagittal, (**H**) contrast coronal, (**I**) diffusion-weighted imaging axial, (**J**) histopathological appearance in low-power view, (**K**) histopathological appearance in high-power view, (**L**) synaptophysin positive, (**M**) vimentin positive, (**N**) S-100 positive (weak), (**O**) thyroid transcription factor-1 positive, (**P**) CD-56 positive (patchy), (**Q**) cytokeratin negative, (**R**) chromogranin negative, (**S**) GFAP negative, and (**T**) Ki67 proliferation index.

Table 1 Analysis of available literature

S. no.	Criteria	Distribution
1.	**Gender**	
	Male	71 (50%)
	Female	71 (50%)
2.	**Age**	
	Range	7–83 years
	Mean	49.2 years
	Median	48 years
3.	**Symptoms**	
	Visual disturbance	71 cases
	Headache	60 cases
	Endocrine abnormality	35 cases
	Giddiness	12 cases
	Imbalance while walking	8 cases
4.	**Endocrine abnormality**	
	Hypopituitarism	32 cases
	Stalk effect	33 cases
	Diabetes insipidus	10 cases
	ACTH excess	6 cases
	Sleep disturbance + appetite irregularities	18 cases
5.	**Size**	
	Range	4–72 mm

(*Continued*)

Table 1 (*Continued*)

S. no.	Criteria	Distribution
	Mean	27 mm
6.	**Location**	
	Pure sellar	24.3%
	Suprasellar extension	34.3%
	Cavernous sinus extension	7.1%
7.	**Image features**	
	Solid with few cystic changes	84%
	Contrast enhancement of solid portion	92%
	Homogenous	80%
	Heterogeneous	20%
	Hemorrhage	3%
8.	**Preoperative provisional diagnosis**	
	Pituitary adenoma	71%
	Craniopharyngioma	19%
	Meningioma	7%
	Pilocytic astrocytoma	1%
9.	**Management**	
	Surgical	130 cases (93%)
	Endoscopic transnasal excision	70%
	Craniotomy and excision	30%
	Preoperative embolization	1.5%
	Postoperative radiotherapy	0.7%
	Surgery for recurrence	8 cases (6%)
	Nonsurgical	10 cases (7%)
10.	**Resection**	
	Gross total resection	46.3%
	Subtotal resection	40%
	Partial resection of tumor	12.6%
	Biopsy	1.1%
11.	**Complications**	32 cases
	New onset or worsening of endocrine dysfunction	11 cases
	Worsening of vision	6 cases
	Transient nerve deficit	3 cases
	CSF fistula	3 cases
	Metabolic syndrome	2 cases
	Deep vein thrombosis	1 case
	Subdural empyema	1 case
	Hydrocephalus	1 case
	Intralesional hematoma	1 case
	Seizures	1 case
	Carotid pseudoaneurysm	1 case
	Mortality	1 case

Abbreviations: ACTH, adrenocorticotropic hormone; CSF, cerebrospinal fluid.

features included predominantly solid (84%) lesion with few areas of cystic changes. Contrast enhancement of solid portion was in 92% (homogenous in 80% and heterogeneous in 20%) of the cases. One case showed features of hemorrhage while no case showed calcification. Provisional diagnosis was pituitary adenoma (85 cases) followed by craniopharyngioma (35 cases), meningioma (7 cases), pilocytic astrocytoma (2 cases), and optic-hypothalamic glioma (1 case). Treatment was primarily surgical (120 out of 130 cases): transsphenoidal excision in 70% of the cases and craniotomy and excision in 30%. Preoperative embolization of arterial feeders was done in two cases and postoperative radiation was given in only one case. Gross total resection (GTR) was done in 46.3%, STR in 40%, partial resection in 12.6%, and biopsy was done in 1.1% of the cases in the study. Tumor was predominantly soft (74.6%) and had substantial bleeding at resection (88.2%). Follow-up ranged from 2 to 134 months (average 31.2, median 19). Recurrence or regrowth was documented in 23 patients. Treatment in 18 of them was described. Resurgery was done in 12 cases, followed by radiotherapy in 5. In six cases, radiotherapy was used in isolation.

Improvement in the preoperative visual deficit was seen in 26 patients, while in 3 it remained unchanged. Among the patients with preoperative endocrine dysfunction, 10 improved while 11 suffered a worsening. On the other hand, 10 patients presented a new postoperative endocrine alteration. Only one fatal case was registered, although the cause of death was not specified.

Conclusion

Pituicytoma is a rare WHO grade I tumor of the sellar and suprasellar region, which can present with varied clinical, radiological, and hormonal features, closely mimicking pituitary adenomas. HPE and IHC form the mainstay in diagnosis. Surgical excisions ranging from biopsy to GTR have been described, with transsphenoidal approach being the most popular one. Prognosis from the available literature seems to be good with good progression-free and overall survivals in majority of the cases after surgical resection alone or in conjunction with radiotherapy.

Conflict of Interest
None declared.

References

1 Parkhi M, Gupta K, Dhandapani S, Salunke P. Pituicytoma in a young male and review of literature. Neurol India 2021;69(06): 1870–1872
2 Liss L, Kahn EA. Pituicytoma, tumor of the sella turcica; a clinicopathological study. J Neurosurg 1958;15(05):481–488
3 Hurley TR, D'Angelo CM, Clasen RA, Wilkinson SB, Passavoy RD. Magnetic resonance imaging and pathological analysis of a pituicytoma: case report. Neurosurgery 1994;35(02):314–317
4 Brat DJ, Scheithauer BW, Staugaitis SM, Holtzman RNN, Morgello S, Burger PC. Pituicytoma: a distinctive low-grade glioma of the neurohypophysis. Am J Surg Pathol 2000;24(03):362–368
5 Shibuya M. Welcoming the new WHO classification of pituitary tumors 2017: revolution in TTF-1-positive posterior pituitary tumors. Brain Tumor Pathol 2018;35(02):62–70
6 Louis DN, Perry A, Reifenberger G, et al. The 2016 World Health Organization Classification of Tumors of the Central Nervous System: a summary. Acta Neuropathol 2016;131(06):803–820
7 Takei H, Goodman JC, Tanaka S, Bhattacharjee MB, Bahrami A, Powell SZ. Pituicytoma incidentally found at autopsy. Pathol Int 2005;55(11):745–749
8 Salge-Arrieta FJ, Carrasco-Moro R, Rodríguez-Berrocal V, et al. Clinical features, diagnosis and therapy of pituicytoma: an update. J Endocrinol Invest 2019;42(04):371–384

