Cerebellar pleomorphic xanthoastrocytoma

Raghavendra Harpanahalli, Bhaskar Suryanarayanan, Minakshi Bhardwaj[1], L. N. Gupta
Departments of Neurosurgery, and [1]Pathology, PGIMER and Dr. RML Hospital, New Delhi, India

ABSTRACT

Pleomorphic xanthoastrocytoma (PXA) is a relatively rare neoplasm predominantly occurring in the supratentorial compartment. Among the unusual locations, cerebellum is the most common with few cases reported in the spinal cord and retina. The infratentorial PXA has a female preponderance, occurs in the fourth decade of life and is composite in 2/3rd of the cases as compared to the supratentorial lesions. Gross total surgical excision is the goal, but is difficult due to the infiltration of the lesion into brainstem/upper cervical cord. Adjuvant radio/chemotherapy for recurrent/progressive/malignant forms have been, reported, but with variable results. This case is of a 25-year-old man who had a cerebellar PXA extending into the upper cervical cord that was sub-totally excised.

Key words: Cerebellum, pleomorphic xanthoastrocytoma, spinal cord

INTRODUCTION

Cerebellar pleomorphic xanthoastrocytoma (PXA) is rare, and only 19 cases have been reported so far [Table 1]. Surgical excision is difficult because of involvement of the brainstem and recurrences have been reported to be more infiltrative and occasionally malignant in nature. The role of adjuvant therapy has not been clearly established for incompletely excised lesions and recurrences without malignant transformation.

CASE REPORT

A 25-year-old man presented with neck pain for 5 years with no radiculopathy and progressive spastic quadriparesis for the past 1 year. Over the past 1 year, he had noticed clumsiness of his hands and minimal deglutition difficulty. Neurological examination revealed downbeat nystagmus, bilateral impaired gag reflexes, quadriparesis (4/5) with brisk reflexes and upgoing plantars. He had bilateral cerebellar dysfunction with impaired posterior column sensation. He had no neurocutaneous markers. Magnetic resonance imaging (MRI) revealed a lesion, which was isointense on T1-weighted and slightly hyperintense on T2-weighted images, situated at the cervicomedullary region [Figure 1]. It was enhancing with contrast with no dural tail. Pre-operatively a diagnosis of a foramen magnum meningioma was made. He underwent a midline suboccippital craniectomy that revealed an intrinsic lesion arising from the cerebellar vermis and extending down into the cervical cord and anteriorly into the floor of the fourth ventricle. It was soft to firm, but at places very tough and gritty. There was an ill-defined plane of cleavage between the lesion and brainstem, hence subtotal decompression was performed. Post-operatively he had a significant improvement in his spasticity, and lower cranial nerve dysfunction improved. Histopathological examination showed cells with abundant vacoulated cytoplasm, multinucleation, coarsely clumped chromatin and intranuclear pseudo-inclusions. Immunohistochemistry revealed CD 34, glial fibrillary acidic protein (GFAP) and S-100 positivity [Figure 2]. He has minimal spasticity, but is ambulant without support and no lower cranial nerve dysfunction. MRI revealed a residual lesion [Figure 1]. His neurological status had remained stable over the last 9 months and has not subsequently reported for follow-up.

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DISCUSSION

PXA accounts for less than 1% of glial tumors. PXA was first described by Kepes *et al*. in 1979.[1] It is characteristically seen in young adults and children. Majority of the lesions are in the supratentorial compartment (98%), temporal lobe being the most common. PXA of the cerebellum (19 cases),[1-4] spinal cord (2 cases)[5] and

Address for correspondence: Dr. Bhaskar Suryanarayanan,
Department of Neurosurgery, PGIMER and Dr. RML Hospital, New Delhi - 110 001, India. E-mail: bhaskar.nsurg@yahoo.com

Table 1: Cerebellar PXA reported till date

Case	Age/sex	Tumor solid/cystic	Treatment	Biopsy	Follow-up	Recurrence
Lindboe *et al*. (1992)***	27/M	Cystic	S/S	GG-PXA	Well/11 months	12 years
Wasdahl *et al*. (1994)	48/F	Solid	S	PXA - Pilocytic astrocytoma	Well/18 months	No
Glasser *et al*. (1995)*	36/F	Solid	S+RT/S	PXA	NA	C/16 years-F
Powell *et al*. (1996)	14/F	NA	S	PXA-GG	NA	NA
Perry *et al*. (1997)	24/F	Cystic	S	PXA-GG	Well/7 months	No
Perry *et al*. (1997)	14/F	Cystic	S+RT+CT/S	PXA-GG	Well/18 months	12 months
Lim *et al*. (1999)	3 months/F	Solid	S	PXA	Well/13/16 months	No
Rosemberg *et al*. (2000)	68/M	Solid	S	PXA	Well/5 months	NA
Evans *et al*. (2000)	60/M	Solid	S+RT	PXA-GG	Well/16 months	No
Reifenberger *et al*. (2003)	NA	NA	NA	NA	NA	NA
Gil Gouvea *et al*. (2004)	40/M	Solid	S and S	PXA-pilocytic astrocytoma	Well/27 months	27 months
Kumar *et al*. (2003)	15/M	Cystic	S	PXA	NA	NA
Naidich *et al*. (2005)	51/F	Solid	B/S+RT/S	PXA-pilocytic astrocytoma	NA	No
Saikali *et al*. (2005)**	36/F	Solid	S/S+RT+CT	PXA-oligodendroglioma	Died 3 years after the first surgery	Yes
Chang *et al*. (2006)	4/F	Cyst	S+RT+CT	PXA-GG	Well/144 months	No
Hamlat *et al*. (2007)	58/F	Solid	S/S+RT+CT	PXA-oligodendroglioma	Died at 17.5 months	8 months
Yeaney *et al*. (2009)	16/F	Solid+cystic	S	PXA	NA	NA
Mano *et al*. (2009)	36/M	Solid+cystic	S	PXA	Well/12 months	No
Gardiman *et al*. (2012)	14/F	NA	S	PXA	NA	NA
Present case (2013)	25/M	Solid	S	PXA	Well/9 months	NA

PXA – Pleomorphic xanthoastrocytoma; B – Biopsy; S – Surgery; RT – Radiotherapy; CT – Chemotherapy; NA – Not available; GG – Ganglioglioma; S/S – Surgery at diagnosis/surgery at recurrence; Well/3 mo – Well at 3 months after last surgery. *Cerebellar PXA 16 years after excision of recurrent frontal PXA treated with surgery and radiotherapy, **Multicentric form-occipital lesion was cystic, but cerebellar lesion was solid, ***PXA was reported as a component of cerebellar ganglioglioma

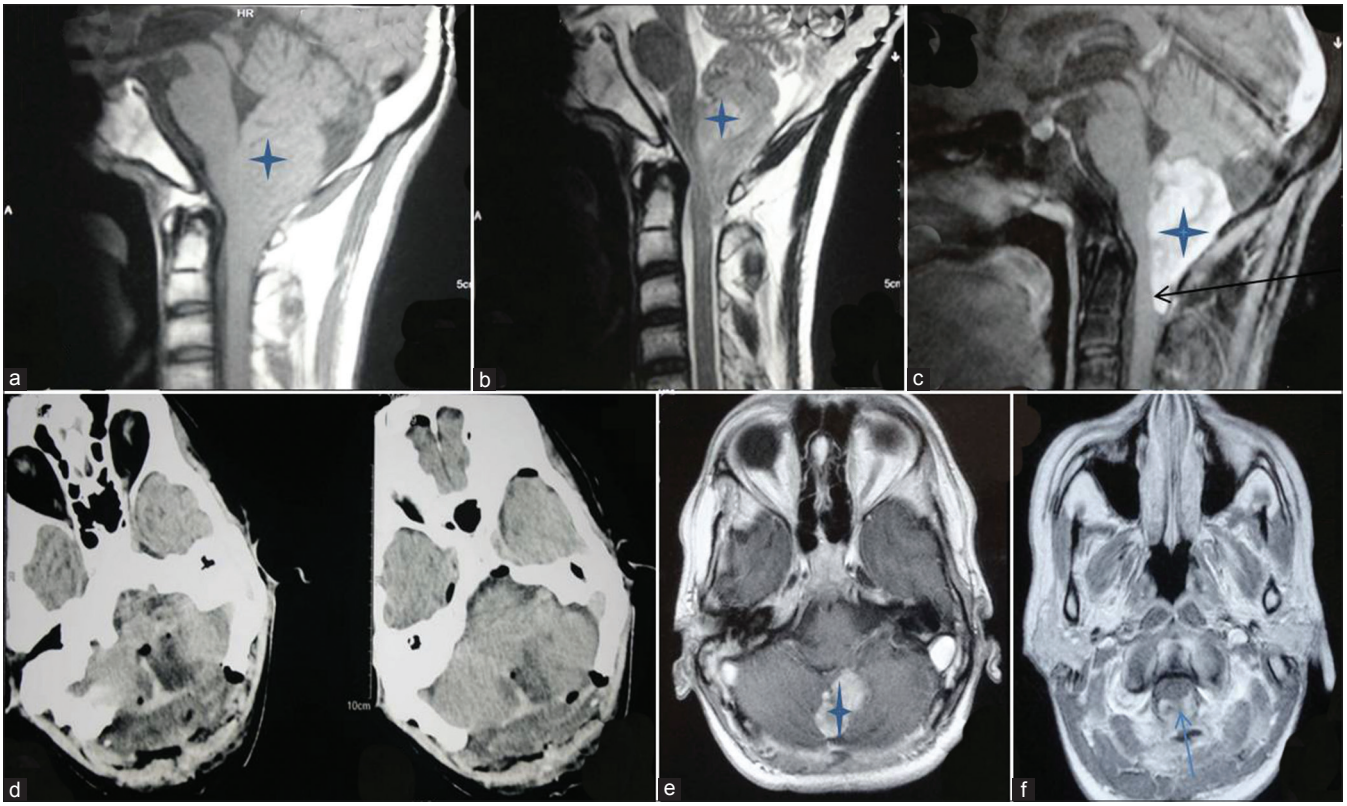

Figure 1: (a-c) Pre-operative magnetic resonance imaging showing the lesion (star) as isointense on T1-weighted and T2-weighted with contrast enhancement respectively. (c) Lesion extending into the upper cervical cord (arrow), (d) Immediate post-operative computed tomography scan magnetic resonance imaging performed 6 months after surgery showing the residual tumor in the (e) Cerebellum (star) and the (f) Upper cervical cord region (arrow)

retina have been reported.[6] PXA is a WHO grade II lesion and if there is significant mitotic activity (5 or more mitoses/10 high power field [HPF]) and/or with areas of necrosis, it can labeled as "PXA with anaplastic

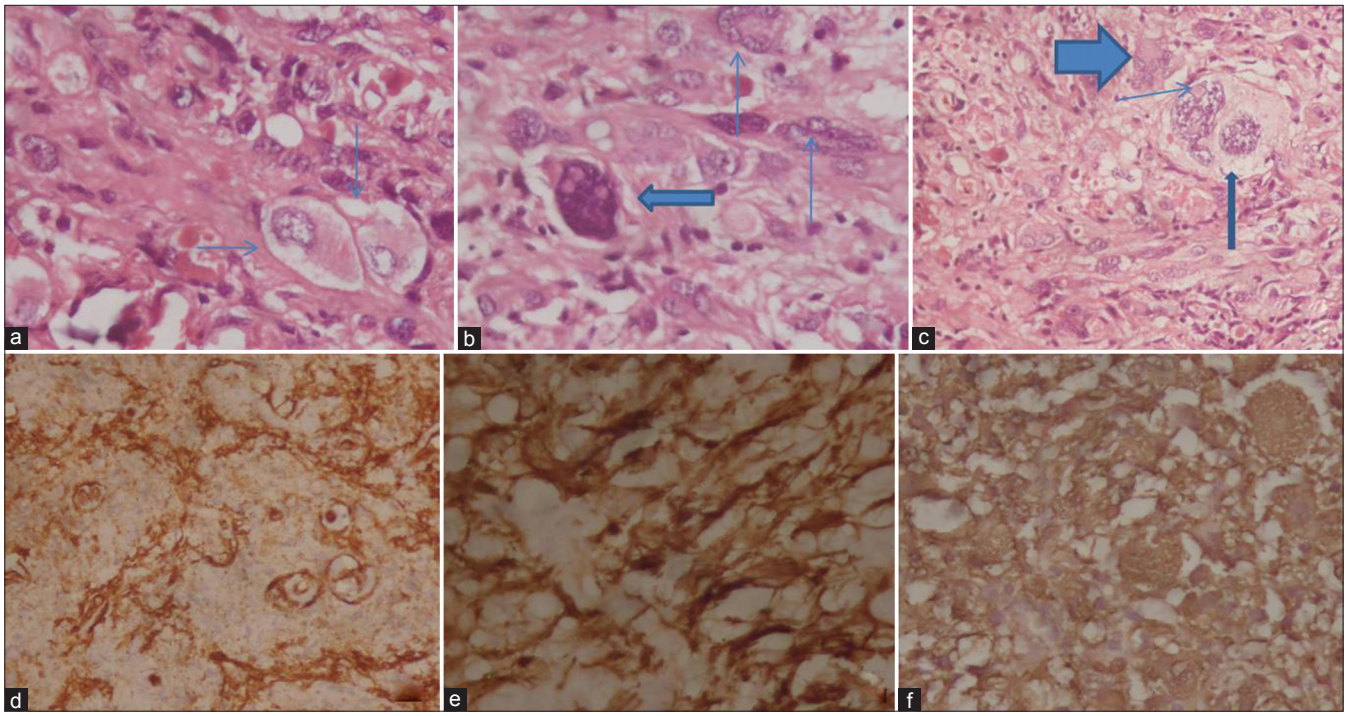

Figure 2: (a) Photomicrograph (H and E, ×20) showing cells with abundant vacoulated cytoplasm (arrows) (b) Photomicrograph (H and E, ×20) showing cells with multinucleation (thin arrows) and coarsely clumped chromatin and intranuclear pseudo-inclusions (thick arrow) (c) Photomicrograph (H and E, ×20) showing multinucleated cell (thickest arrow) and binucleated cell with abundant foamy cytoplasm (thick arrow), intranuclear pseudo-inclusion (thin arrow) (d-f) Photomicrographs (immunohistochemistry, ×20) showing CD 34, glial fibrillary acidic protein and S-100 positivity respectively

features." Before immunostaining (GFAP positive) was available, PXA was considered a mesenchymal neoplasm of the meninges and brain due to the lipidized glial cells resembling "xanthoma" cells and also the fact that many cells produce a basement membrane. PXA comprises of spindle shaped cells, mono and multinucleated giant astrocytes and large xanthomatous cells. Intensely eosinophilic or pale granular bodies, focal collections of small lymphocytes, occasionally plasma cells are also found. Individual tumor cells are surrounded by reticulin fibers highlighted by reticulin stain. Anaplasia, high mitotic (5 or more/10 HPF) and necrosis are usually not seen.

PXA is immunoreactive for GFAP and S-100, thereby supporting astrocytic lineage. However, GFAP immunoreactivity may be highly variable with strong S-100 staining and absent or focal nuclear p53 staining. A subset of PXAs including the ones with ganglion cell component stain for neuronal markers such as synaptophysin and neurofilament. The hematopoetic progenitor cell and vascular endothelial marker CD34 is also expressed. Dysplastic cells in the adjacent cortex may also be noted. Mib-1 labeling index is low (<5%) in grade II lesions. Strong surface and cytoplasmic immunoreactivity with human leukocyte antigen (HLA) class II (DP, DQ, and DR) has been reported in the tumor cells including the large foamy cells, moderate number of granular bodies and focally in reactive macrophages. Similar reactivity of tumor cells and monocytic/macrophage infiltrate of CD68 has been noted. Co-expression of GFAP and CD68 or HLA in the tumor cells emphasizes the phenotypic heterogeneity of PXA.[7]

Non-anaplastic PXA can present with disseminated lesions.[8] Around 15-20% of recurrent tumors undergo anaplastic transformation and the recurrent lesions are more diffusely infiltrative and less pleomorphic.[1] Mitotic index and extent of resection are the two most important predictors of recurrence and survival. PXA can occur at multiple sites simultaneously or concomitantly. It can be associated with neurofibromatosis type 1. There is no specific radiologic feature of PXA. It has been reported that spinal cord PXAs have a relatively more aggressive behavior than at other sites, which necessitates a closer follow-up and adjuvant therapy in case of incomplete resection.[5] The supratentorial location occurs in the early third decade of life, whereas the cerebellar lesions occur a decade later. The infratentorial lesions show a female predominance. The solid masses enhance with contrast with a higher incidence of solid lesions seen in the posterior fossa. The majority of supratentorial PXAs are pure in nature, whereas two-thirds of the infratentorial lesions are composite. The supratentorial lesions are more amenable to gross total excision due

to their being well-encapsulated and peripherally located. This is not the case with infratentorial lesions. In the composite tumors, there is an association with ganglioglioma (most common), malignant astrocytoma, fibrillary astrocytoma, oligodendrogliomas. The role of radiotherapy and chemotherapy in PXA is not clearly established.[9] The benign course of these lesions is rarely complicated by malignant transformation and fatal outcome.[1]

CONCLUSION

Cerebellar PXA has some clinical and pathological differences with the supratentorial lesion. Gross total excision is limited by brainstem infiltration and role of adjuvant therapy is not well-defined.

REFERENCES

1. Hamlat A, Le Strat A, Guegan Y, Ben-Hassel M, Saikali S. Cerebellar pleomorphic xanthoastrocytoma: Case report and literature review. Surg Neurol 2007;68:89-94.
2. Yeaney GA, O'Connor SM, Jankowitz BT, Hamilton RL. A 16-year-old male with a cerebellar mass. Brain Pathol 2009;19:167-70.
3. Gardiman MP, Fassan M, Orvieto E, Iaria L, Calderone M, Mardari R, *et al*. A 14-year-old girl with multiple tumors. Brain Pathol 2012;22:865-8.
4. Mano Y, Kanamori M, Sonoda Y, Kumabe T, Watanabe M, Tominaga T. A case report of cerebellar pleomorphic xanthoastrocytoma. No Shinkei Geka 2009;37:586-90.
5. Nakamura M, Chiba K, Matsumoto M, Ikeda E, Toyama Y. Pleomorphic xanthoastrocytoma of the spinal cord. Case report. J Neurosurg Spine 2006;5:72-5.
6. Zarate JO, Sampaolesi R. Pleomorphic xanthoastrocytoma of the retina. Am J Surg Pathol 1999;23:79-81.
7. Taraszewska A, Matyja E. Immunohistochemical studies in diagnosis of the uncommon cases of tumours of the central nervous system. Folia Histochem Cytobiol 2002;40:207-8.
8. Passone E, Pizzolitto S, D'Agostini S, Skrap M, Gardiman MP, Nocerino A, *et al*. Non-anaplastic pleomorphic xanthoastrocytoma with neuroradiological evidences of leptomeningeal dissemination. Childs Nerv Syst 2006;22:614-8.
9. Sharma A, Nand Sharma D, Kumar Julka P, Kishor Rath G. Pleomorphic xanthoastrocytoma-A clinico-pathological review. Neurol Neurochir Pol 2011;45:379-86.

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