A Rare Case of Sporadic Optic Pathway Glioma in a 7-year-old Female

Gupta S,[1] Sinha U,[2] Raj A[3]

[1]Department of Physiology,
All India Institute of Medical Sciences (AIIMS),
Gorakhpur (Uttar Pradesh), India.
[2]Department of Radio-diagnosis,
[3]Department of Ophthalmology,
All India Institute of Medical Sciences,
AIIMS, Patna, Bihar, India.

Corresponding Author
Sangeeta Gupta
Department of Physiology,
All India Institute of Medical Sciences (AIIMS),
Gorakhpur (Uttar Pradesh), India.
E-mail: drsangeeta77.65@rediffmail.com

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ABSTRACT

Sporadic optic pathway gliomas (OPGs) are uncommon and have greater predisposition to severe clinical presentations and complications. Severe visual impairment is the most frequent presentation. The treatment is based on multiple factors and needs to be individualized. Precise assessment of visual function is one of the important factors to plan the management. We present a case of sporadic OPG in a 7-year-old female with severe visual decline. Visual functions were assessed ophthalmologically and electrophysiologically. Diagnosis was confirmed on the basis of clinical, radiological, histopathological and electrophysiologic findings. Surgical resection was planned owing to the poor visual functions and the mass effects. Patient is on regular follow-ups with no signs of deterioration so far. Appropriate visual assessment is crucial in young children with sporadic optic pathway glioma for planning the mode of treatment. Surgical resection in cases with severe visual impairment is helpful, however, irreversible visual impairment remains irremediable.

KEY WORDS

Optic pathway glioma, Sporadic, Visual

INTRODUCTION

Optic pathway gliomas (OPGs) constitute a challenging group of intracranial and orbital neoplasms.[1,2] They most commonly affect children under ten years old and account for 3 to 5% of childhood central nervous system tumours.[3] Most children diagnosed with OPGs have neurofibromatosis (NF1). The incidence of NF1 in patients presenting with optic nerve gliomas ranges from 10% to 70% (with an overall incidence of 29%).[4,5] When NF-1 is implicated, the RAS pathway is activated via neurofibromin 1 inactivation, resulting in tumour cell proliferation. In contrast, in sporadic OPGs, the most prevalent gene mutation is a BRAF kinase domain duplication, which results in a BRAF-KIAA1549 fusion gene and subsequent activation of the mitogen-activated protein kinase (MAPK) pathway.[6] The term sporadic OPG is reserved for those OPG in children without NF1. Visual dysfunction and proptosis have been reported as common presentations at diagnosis in sporadic OPGs. Thorough neuro-ophthalmic examinations are the gold standard for diagnosis and follow-ups.[7] Notwithstanding, this method is often unreliable in young children. Visual-evoked potentials (VEPs) have been suggested to serve as a useful approach for evaluating optic pathway gliomas in this group of patients. Stability of serial VEPs has often been found helpful in reassuring confirmation of lack of tumour extension.[8]

In the presence of vision loss and severe proptosis, surgery has been recommended to be considered.[9] Surgical management relies considerably on appropriate visual assessment in the young patients. We report such a case of sporadic optic pathway glioma (without NF1) in a female child with severe visual dysfunctions.

CASE REPORT

A 7-year-old girl presented with a sudden diminution of vision for 4 months and a weight gain since the last 1 month. She had also been found to have a headache for a few months. There was no history of trauma, fever or epilepsy. No developmental delay was found. No history of any

significant past illness was found. On examination, the child was found to be obese (BMI: 32) and thelarche was evident. Vitals were normal, Cardiovascular, respiratory and nervous system examination were normal. Haematological findings were normal. Fasting and post-prandial blood sugar was within normal range. Hormonal assays for free T3, T4, TSH, FSH and LH were within normal range. No other endocrinal abnormality was found. Ophthalmological examination revealed bilaterally dilated pupils, poorly reacting to light with afferent pupillary defect (APD) (grade III in right while grade IV in left eye). Fundus examination suggested bilateral optic atrophy. No Lisch nodules were found. Poor cooperation could not reveal accurate visual acuity examination. Absence of perception of light was doubtful. Visual evoked potential (VEP) was, hence, advised for the child to identify the functional abnormalities in the optic pathway. VEP was conducted with both pattern-reversal and flash stimulation. The 10-20 electrode placement was employed for electrode placement (active-Oz, reference-Fz and ground at Fpz.[10]

Visual evoked potential (VEP) findings:

Pattern reversal VEP (PRVEP) demonstrated poorly recordable waveforms in both the eyes (Fig. 1).

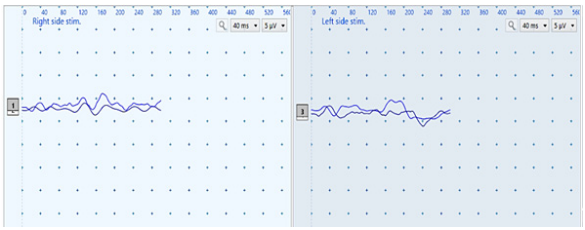

Figure 1. Pattern reversal VEP of the patient showing poorly identifiable/reproducible responses in both the eyes (sensitivity: 5 µv/division, sweep speed: 40 ms/division, Oz-Fz recording)

VEP: Visual evoked potential; µv: microvolt; ms: millisecond.

Flash VEPs, on the other hand, showed recordable VEP in right eye with delayed P100 latency while the waveforms in the left eye were poorly identifiable (Fig. 2).

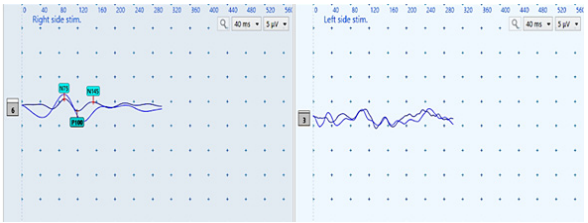

Figure 2. Flash VEP of the patient showing poorly identifiable response in left eye while a recordable and fairly reproducible response with delayed P100 latency in right eye (sensitivity: 5 µv/division, sweep speed: 40 ms/division, Oz-Fz recording)

VEP: Visual evoked potential; µv: microvolt; ms: millisecond.

Brain magnetic resonance imaging (MRI) which remains the gold standard to confirm the diagnosis of optic pathway glioma, was performed.

MRI (Magnetic resonance imaging) brain and MRI orbit findings:

A large extra-axial multilobulated suprasellar solid cystic mass was found in the region of optic chiasma (Fig. 3). Moderate perilesional oedema was found to extend into the third ventricle, intercondylar fossa of midbrain and the prepontine cistern, compressing both foramina of Monro causing hydrocephalus (Fig. 4). On perfusion study, the mass was found to be hypervascular. It was found to encase left internal carotid artery and left middle cerebral artery.

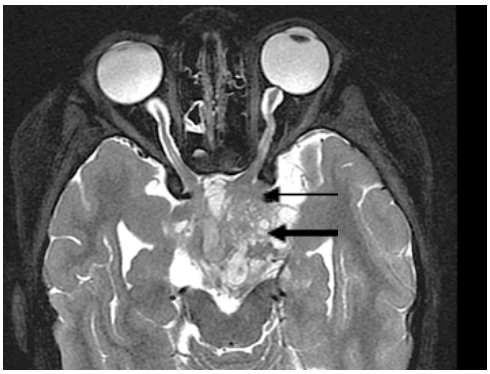

Figure 3. Axial T2FS MRI image of orbit with brain shows a solid cystic mass (thick arrow) in the region of optic chiasma (thin arrow)

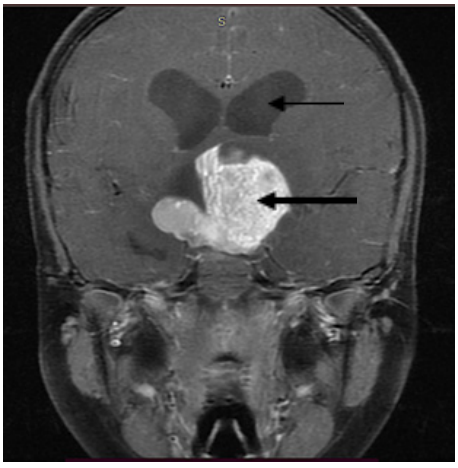

Figure 4. Post contrast MRI image shows intense enhancement of the solid component of the suprasellar mass (thick arrow) with bilateral hydrocephalus (thin arrow)

Neurofibromatosis (NF1) was excluded on the basis of the clinical findings.[11] Biopsy was taken and histological examination was performed which indicated a pilocytic astrocytoma.

Patient received steroids in tapering doses (injection methylprednisolone) and oral prednisolone (Wysolone) to facilitate optic nerve decompression. However, craniotomy with tumour excision was planned in this case. The management plan involving the resection of the tumour was confirmed based on the clinical findings as well as on her visual evoked potentials findings, depicting poor vision. Left pterional craniotomy with transsylvian approach was performed with optic hypothalamic tumour decompression

for the patient. Patient is presently on regular follow-ups. No progression or deterioration was observed up to the present. No focal neurological deficit or infection or new hormone deficiency was found during the course.

DISCUSSION

Optic pathway gliomas (OPG) are uncommon tumours with variable clinical course. OPG without NF1 are rare and often associated with more severe clinical presentation and greater propensity for complications. Severe loss of vision, increased intracranial pressure and fundus abnormalities are more frequent in the sporadic case (without NF1). The present case had poor visual function and signs of increased intracranial pressure. Absence of associated NF1 was ascertained based on the clinical finding.[11] The relative severity of the condition, absence of NF1 and age of presentation were in concordance with sporadic form. Studies based on radiological classification have reported that NF1-negative tumours more commonly involved the central chiasm and hypothalamus. In the present case also, similar involvement in MR scans was evident. However, the child presented with obesity and thelarche which raise the suspicion of endocrinal abnormality. The hormonal assays, however, did not confirm the same. Endocrinal abnormality is a more common presentation in NF1 positive cases.[12]

Management in optic pathway glioma cases needs to be planned on the individual basis. Such cases often require meticulous and adequate management plan. This case underwent resection of the tumour with transsylvian approach after left pterional craniotomy. Hydrocephalus and the mass effect as found in MR finding, favoured the decision. Also, a necessary prerequisite in such cases is to establish the status of visual function of the patient before surgery, as resecting the tumour is frequently associated with deterioration of vision. Visual evoked potentials which are objective tests and can be performed in young and uncooperative subjects, aided in the affirmation of poor vision. Pattern reversal VEPs and flash VEPs both were recorded in the patient. Pattern responses are usually non-recordable in cases of severe reduction in visual acuity, while flash VEPs are found to be preserved even with reduced vision, with delayed P100 latency as the abnormal finding. In this case, a similar poorly recordable PRVEP was found in both the eyes (Fig. 1). Flash VEP demonstrated poorly recordable waveform in left eye, but right eye VEP was recordable with delayed P100 latencies (Fig. 2). Flash VEP, hence indicated visual dysfunction in both the eyes with the possibility of the greater visual loss in left eye. This could be correlated with the MR finding of partial encasement of the left internal carotid artery and the middle cerebral artery by the mass. VEPs have been reported as important investigations in these cases to provide functional information and as a guide for the execution of the treatment.[13,14] These are also useful tests for follow-up where visual loss is unilateral/moderate.

Regarding treatment approach, surgical excision was reported to be favoured over radiotherapy in approximately twice as often, according to a study.[12] Another similar study documented that approximately half of all children experienced a long-term benefit from resection both as primary treatment and as a second-line therapy after failure of primary treatment.[15] In cases with associated NF1, however, disease tend to be diffuse and poorer response to surgery has been documented; furthermore, the disease can spontaneously stabilize at an older age in some cases.[16] In essence, surgical resection has been reported to play an important role in advanced optic nerve gliomas with no visual potential and to treat severe, disfiguring proptosis or painful corneal exposure.[17,18] Long-term follow-up studies have revealed that patients treated with radiotherapy had a significant risk of developing severe complications.[19,20] Despite being the first line treatment, chemotherapy, also lacks the evidence for the effectiveness of carboplatin and vincristine for OPGs in patients without NF1.[21]

Regarding the prognosis, paediatric patients with OPGs have a good overall prognosis for survival.[22] In contrast to the low mortality rate of paediatric OPGs, the rate of visual impairment is high and it is commonly associated with non-NF1 associated OPGs. In the present case, the child had severe visual dysfunctions in both the eyes, as detected by ophthalmological and electrophysiological examination, hence the follow-up after the surgery is being principally focussed to find any focal neurological deficit, infection or hormone deficiency which are some reported complications after resection.[15]

Sporadic optic pathway gliomas which are more frequently associated with severe visual impairment, aggression and complications in young children, necessitate a multidisciplinary approach in diagnosis. Individualised management strategies could be valuable. An adequate assessment of visual function is a requisite in planning the management. Researches to improve the morbidity and visual outcome in this condition are warranted.

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