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Case Report

Radiology Section

Constellation of Imaging Findings in Neurofibromatosis Type 2- A Case Report

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ABSTRACT

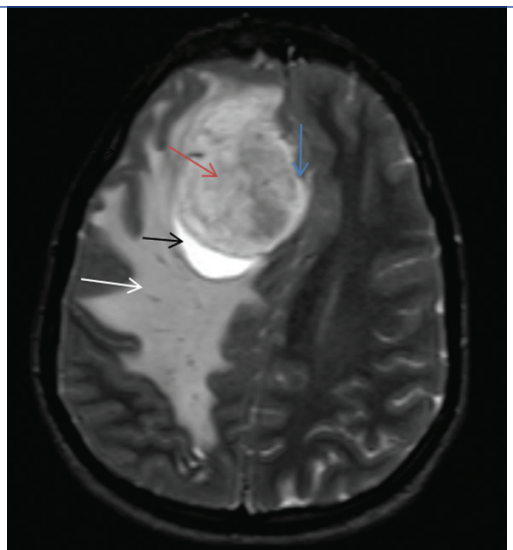
Neurofibromatosis type 2 (NF2), earlier known as bilateral acoustic neurofibromatosis, is an autosomal dominant disorder characterised by the development of multiple tumours. It is caused by mutations in NF2 gene present at the long arm of chromosome number 22 (22q12.2) which encodes for merlin protein (tumour suppressor gene), found in the schwann cells involved in interaction of cell with extracellular matrix after binding with actin or a transmembrane CD44 receptor. NF2 is commonly known by acronym MISME syndrome that stands for Multiple Inherited Schwannomas (MIS), Meningiomas (M) and Ependymomas (E). The diagnosis of NF2 is usually made with the help of Magnetic Resonance Imaging (MRI) in the second or third decade of life, with a peak in the 20s. Along with all these, there should be a first degree relative suffering from NF2. The authors presented a case of 18-year-old boy who was diagnosed with NF2. MRI played a major role in the diagnosis. The patient was managed with symptomatic treatment and is on regular follow-up.

Keywords: Meningioma, Neurofibroma, Schwannoma

CASE REPORT

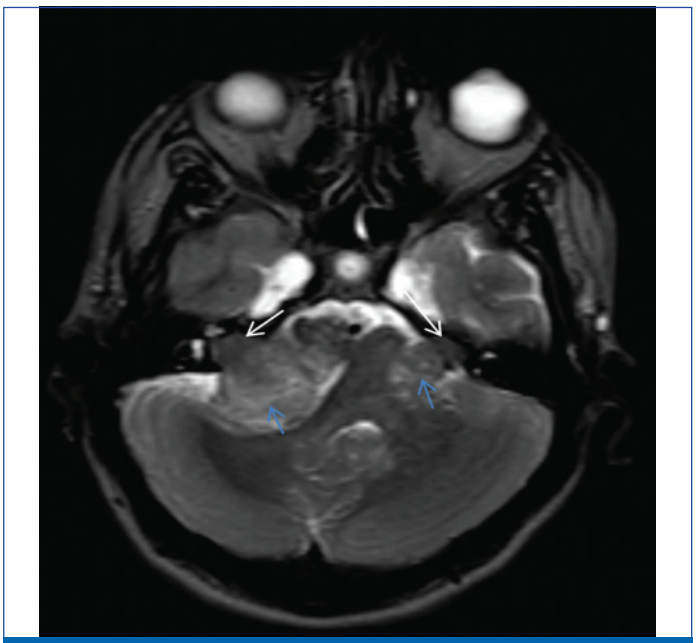
This is a case of 18-year-old boy who presented with a six month history of on and off headache followed by total blindness on left side with decreased acuity on right side and bilateral sensorineural deafness profound on the right side and moderate on the left side. There was no history of fever, eye discharge, earache or ear discharge, or trauma.

Patient underwent plain and contrast MRI of the brain and orbits on a 1.5 tesla MRI superconducting magnet which revealed: Globular, solid extra-axial lesion in relation to the anterior aspect of falx cerebri causing buckling of sulcogyral spaces of right frontal lobe, appearing isointense to gray matter on T1-Weighted Image (T1WI) and hyperintense on T2-Weighted Image (T2W2) images and shows homogenous restriction on Diffusion Weighted Images (DWI) with no blooming on T2-Weighted Fast Field Echo (T2WFFE) images. Cerebrospinal Fluid (CSF) cleft sign was positive [Table/Fig-1]. On postcontrast lesion shows homogenous enhancement with enhancement of overlying dura-(dural tail sign suggesting meningioma).



[Table/Fig-1]: On T2WI axial MRI globular, solid extra-axial lesion (red arrow) was seen in relation to the anterior aspect of falx cerebri causing buckling of sulcogyral spaces of right frontal lobe (blue arrow) appearing heterogeneous hyperintense and shows CSF cleft (black arrow) with the adjacent brain parenchyma. Oedema was noted in surrounding parenchyma (white arrow).

On T2W and Fluid Attenuated Inversion Recovery (FLAIR) images, isointense to hyperintense lesions were noted in bilateral Cerebellopontine (CP) angles causing widening of porus acousticus, extending into internal auditory canal [Table/Fig-2]. The lesion showed no diffusion restriction/blooming with homogenous post contrast enhancement and secondary hydrocephalus, representing bilateral Schwannoma's.

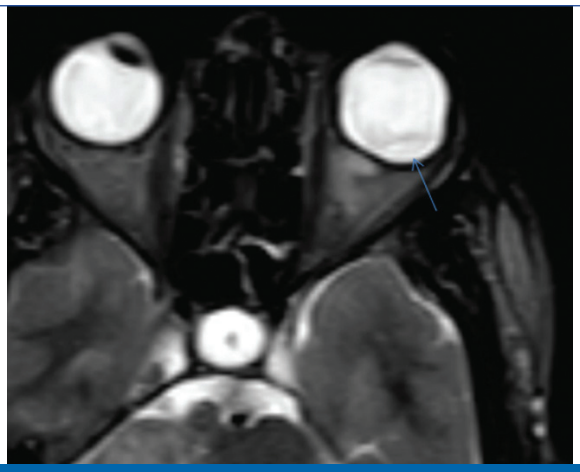


[Table/Fig-2]: On T2WI axial MRI iso to hyperintense lesions in bilateral CP angles (blue arrow) were noted causing widening of porus acousticus, extending into internal auditory canals (white arrow)- bilateral Schwannoma's.

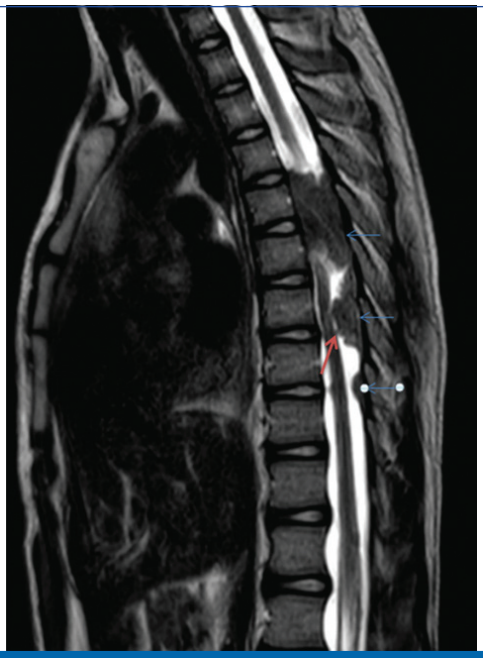
A V-shaped hyperintensity was noted in posterior chamber of left globe, representing retinal detachment [Table/Fig-3]. No mass lesion was seen in relation to optic nerves and optic chiasma. Dumb-bell shaped lesion which was isointense to hypointense on T1W images was seen on left side of neck with suggestion of extension of neural foramina at D1-2 level, likely representing nerve sheath tumour.

Screening of the whole spine MRI showed multiple intradural extramedullary broad based lesions causing effacement of central canal at C6,C7, D2 and L2 levels. The lesions were isointense

to hypointense on T1W images likely representing multiple meningiomas [Table/Fig-4].



[Table/Fig-3]: On T2WI axial MRI, V-shaped hyperintensity (blue arrow) was noted in posterior chamber of left globe, representing retinal detachment.



[Table/Fig-4]: On sagittal T2W MRI spine showed multiple intradural extramedullary broad based lesions (blue arrows) causing effacement of central canal (red arrow) at C6,C7 and D2 levels. representing multiple meningiomas.

Based on these findings the possibility of NF2 was considered. Detailed history taking revealed that the patient's sister and father were a diagnosed case of NF2. Histopathology of the cervical lesion was performed which showed spindle shaped cells representing schwannoma. Histopathology of intracranial and spinal tumours were not performed. The presence of bilateral 8th nerve and left cervical nerve schwannomas, multiple central and peripheral nervous system meningiomas fulfilled the diagnostic criteria for NF2, hence the diagnosis was confirmed. Patient was put on symptomatic management.

DISCUSSION

Neurofibromatosis type 2 earlier known as bilateral acoustic neurofibromatosis, is an autosomal dominant disorder characterised by the development of multiple tumours with the incidence rate between 1/25,000 and 1/40,000. It is caused by mutations in NF2 gene found in the schwann cells [1].

In the present case report patient was diagnosed at age of 18 years. The patient's sister was diagnosed at the age of 20 years and father was also diagnosed at age of 18 years. Pendse NA et al., also described in his study that the diagnosis of NF2 is usually made in the second or third decade of life, with a peak in the 20s [2]. On clinical examination and Brain Stem Evoked Audiometry (BERA) of patient, together they pointed towards involvement of bilateral 8th nerves. The MRI of brain showed bilateral vestibular schwannomas, large meningioma and retinal detachment on left side. Further imaging of spine showed multiple meningiomas. Diagnostic hallmark as described by Hartmann M et al., of this condition included bilateral vestibular schwannomas with multiple benign central and the peripheral nervous system tumours [3]. And also according to the National institute of health NF2 is considered if a patient has [4]:

1. Bilateral acoustic schwannomas
2. Any two or more of the following-

Schwannoma, meningioma, neurofibroma, glioma, juvenile subcapsular lens opacity

Along with all these, there should be a first degree relative suffering from NF2.

In the present case report the patient presented numerous, slow growing central nervous system and peripheral nerve tumours. However no cutaneous lesion was seen in the present case, but was noted in one of his relatives. Clinical features in patient and his relatives presented in before 20 years of age.

The presentation of NF2 differs, but most of the patients (approximately 30-45%) are diagnosed because of symptoms due to involvement of VIII Cranial Nerve (CN) Schwannoma's, as even small CN VIII Schwannoma's are symptomatic. They causes symptoms by compressing adjacent structures as seen in study by Spilberg G et al., [5]. In a case series done Mautner et al., bilateral cranial nerve VIII Schwannoma's were found in 90% of patients and unilateral cranial nerve VIII Schwannoma's were found in 6% of patients [6].

Case studies have been done by authors in order to delineate incidence of the various tumours in cases of NF2. In study done by Aoki et al., [7] MRI examination of brain in 11 patients with NF2, it was seen that, all patients had acoustic Schwannoma's, 8 (81%) had other cranial nerve tumours and six had meningioma's.

The common of spine tumours in NF2 is ependymomas and arises in either the upper cervical cord or the conus medullaris. Meningiomas present as intradural extramedullary neoplasms with broad base towards dura, they are frequently in multiple number and are seen mainly in thoracic spine. Other extramedullary tumours are Schwannoma's, or neurofibromas. These tumours are difficult to differentiate on MR imaging. Mautner VF et al., [8] studied a series of 73 patients with NF2. Spinal tumours were seen on MRI in 89% of the patients. It was seen no all part of the spine showed similar prevalence. Intramedullary tumours were found in 24 patients (33%) (out of which three ependymomas were pathologically proven). Extradural and intradural extramedullary tumours were found in the cervical, thoracic and lumbar spine in 36, 40 and 49 patients respectively. Intradural extramedullary tumours included three categories, meningiomas, Schwannoma's, or neurofibromas. On histopathological correlation there were 10 Schwannoma's, seven meningiomas, and two neurofibromas. Extradural extramedullary tumours were found on MRI in the cervical, thoracic and lumbar spine in 12, 5 and 18 patients, respectively.

Considering both the above mentioned criteria, a diagnosis of NF2 was given for the present case. Because of the multiple intracranial tumours NF2 is also commonly known by acronym MISME syndrome [9].

CONCLUSION(S)

Neurofibromatosis type 2 is an autosomal dominant disorder characterised by the development of multiple tumours. Diagnosis is usually made in second and third decade of life. Bilateral acoustic schwannomas with multiple central and the peripheral nervous system tumours and clinical history points towards diagnosis of NF2.

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