

# Neurofibromatosis, case series and literature review with focus on radiological assessments

Mehdi Zolfagarkhani\*, Zahra Mardanshahi, Hadi Majidi, Elham-sadat Bani-mostafavi and Mehdi Hasanzadeh hosseinabadi

Radiology Department, Mazandaran University of Medical Science, Sari, Iran

*Corresponding author:* Mehdi Zolfagarkhani

**ABSTRACT: Background:** Neurofibromatosis is an autosomal dominant disorder, which means only one copy of the affected gene is needed for the disorder to develop. If only one parent has neurofibromatosis, his or her children have a 50% chance of developing the condition as well. The affected child could have mild NF1 even though inherited from a parent with a severe form of the disorder. **Cases:** Reviewing 2 cases of a family that mother and his sister previously diagnosed. Each son assessment by radiological intervention such as MRI, of course history and clinical assessment at that time be taken. In this report, we were finding ectopic Neurohypophysis in one of the son that it was rare finding in this disease. Also, in this article we review of literature and references.

**Keywords:** Neurofibromatosis, Ectopic Neurohypophysis, Radiological assessment.

## INTRODUCTION

Neurofibromatosis (NF) is an autosomal dominant disease that first was described in 1882 by Friedrich von Recklinghausen (1). This disease refers to a group of genetic disorders that are caused by mutations in the gene Neurofibromin and primary cell growth in nerve tissue (2). Neurofibromin in fact, an interruption in production at the tumor with defect of this disease predisposes a person to develop a variety of tumors. The disease divided into two types, type 1 and 2. Type 1 is also known as Von Recklinghausen's disease, a common disease with a prevalence of about 1 in every 3,000 births occur (3). NF1 is 90% of the NF. Only 50% of NF1 patients have a family history of the disease and spontaneous genetic mutations in other patients might be present (4). Protests disease is highly variable and often appears in childhood and adulthood. In this disease, the central nervous system is involved in 15% of cases (5). There is equal or more than two of the following criteria suggestive of neurofibromatosis type 1. Milk brown spots and freckles (pigmented spots on the skin caused by an accumulation of melatonin is produced) in the axillary and inguinal and hamartoma cornea and multiple neurofibromas of the skin, reducing the level of patient education, optic nerve glioma, relative grade 1 with NF, bone specific lesion (such as a large wing of sphenoid dysplasia) (6). Sarcomata malignant transformation in neurofibromatosis is about 2 to 15 percent. Fast growing primary lesion and internal bleeding are suggestive of malignant transformations. Benign tumors of neurofibromatosis's is called a neurofibrom (7). The tumors in the skin or under the skin touched and gradually grow up and pushed on the vital body tissues. Neurofibroma is usually appearing in childhood, especially in adolescents. However, often the first symptom of this disease is brown spots incidence. The patches do not cause pain or itching or a problem for the patient and may be seen anywhere in the body. Neurofibroma in 3 to 5 percent of cases is likely to become cancerous (8). The severity of the disease varies in a wide range of patients. In some patients, symptoms are very mild and severe in others (9). In the present study, we reported about a family with four members of the class struggle (Mother and two sons and mother's sister) and the significant protests in MRI imaging of the brain and spinal cerebrospinal will give two children. Aunt guys in the imaging of brain and spinal cord lesion was not carried out and therefore not included in this report.

**Patients:** In four members of a family, including two sons with her mother and aunt, mother and aunt during the previous study were diagnosed with NF1, for radiological assessment with MRI of brain and spinal cord for child's,

referred to radiological center of Imam Hospital in sari, Iran. The reason was to see a pediatric urologist because there were brown spots on skin. Symptoms and neurological and cognitive deficits in children's examinations have been seen.

**Case 1:** 4-year-old boy with clinical symptoms of skin and brown spots were referred to the hospital. In examining of the brain and spinal cord with MRI, findings were as follows: In T2WI images with high signal at multiple centers in the basal ganglia on both sides (Lentiform nucleus) and the cerebellum was observed that the lack of quality and value in examining the Post contract T1W. This description is matches with the FSI Non Specific bright object. High Signal focus on Flair image can be seen in the basal ganglia. These lesions called FASI. In T2WI images, an isosignal round in a mass the size of 17 \* 16 \* 15 mm in pedancular cistern that at the check post contracts no escalation was observed but the optic nerve, optic chiasma and optic tract were not any pathologic lesions. Evidences are suggesting a hamartoma tumor (Tauber Syndo) in NF1 (fig.1). In T2WI and FLAIR images, lesions have been seen in inter-peduncular cistern that is consistent with tuber hamartoma. Giant cistern magna is also noteworthy. Ectopic Neurohypophysis was also observed in T1WI sequence. High Signal on T1WI image in the hypothalamus, showed pituitary light in the absence of an anatomical location which is suggestive of Ectopic Neurohypophysis. Other pathological finding wasn't evident in the brain and spinal cord (fig.3).

**Case 2:** The second part of the report is related to 7-year-old son who not showed except brown spots, no other clinical manifestations. In MRI of the spinal cord was not seen the pathological lesions. Focus on multiple sequences T2WI increased signal intensity in the sides of basal ganglia and bending the corpus callosum and cerebellum were observed in the study lacked Post contrast enhancement that is suggestive of FASI. Also, in the Flair images, lesions in the basal ganglia and cerebellum High Signal accordance with the FASI were observed. Also, the multiple lesions was seen in the scalp area (frontotemporal) that in assessment by post contract were highly enhancement was observed that are consistent with subcutaneous neurofibroma. This waste was not mentioned in clinical trials. In T2W1 images, high signal a lesion in left frontal of scalp region was means the palxciform. Other pathological lesion was not seen. Also, in radiological assessment of patients, skeletal lesion was not seen (fig.3 and 4).

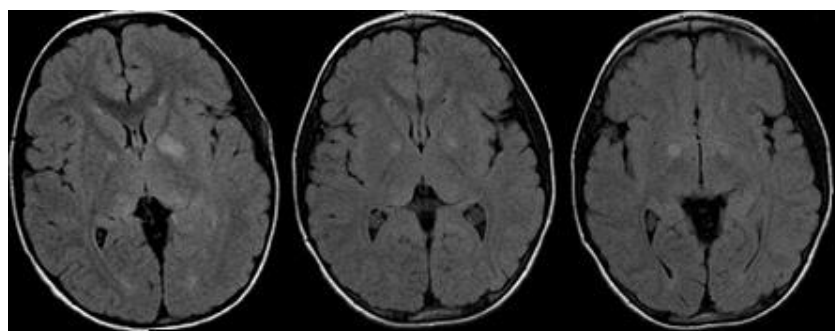


Fig 1. Flair sequence shows symmetrical high signal focus in both basalganglia

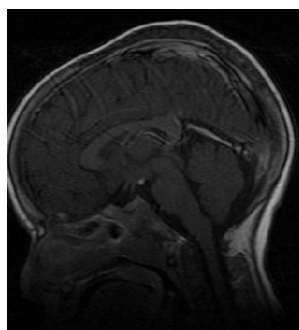


Fig 2. Hypothalamus more compatible of ectopic Neurohypophysis Bright spot is seen at the

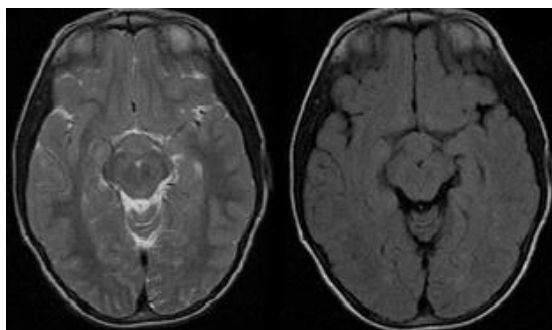


Fig 3. There is a 27\*18 mm measures well defined isosignal lesion anterior to mammillary bodies suggestive of tuber cinereum hamartoma

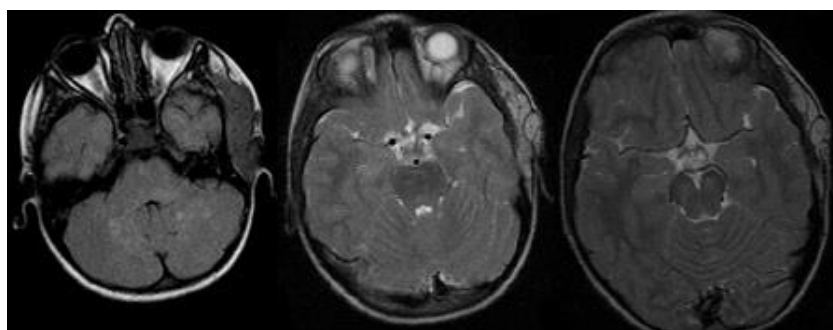


Fig 4. Soft tissue nodules is seen at the left temporal region

**Discussion:** According to global statistics presented in neurofibromatosis, type I gene penetration rate of 100% and mutations, 50% of new cases of disease (10). In the present study, the disease is common in children's mother and aunt, which confirmed the previous findings about the disease. In sun and et al study in 2005 in China founded that in most neurofibromatosis, skin involvement, kidney, brain and Hypermlatonic spots are the most common and earliest lesions (11). In the present study, the cause was referral to a doctor Urologist. This syndrome is a neurogenic tumor in sheaths of nerve cells located along the peripheral nerves and cranial. These tumors is caused in 20% of patients with neurofibromatosis and 2% have their malignant transformation (over age 40 is rare) (5). In this part, we only talk about the neurological and radiological protests (12). Different neurological protests may be seen in NF1 patients, such as acoustic nerve nueronium - tumors of the CNS (gliomas and glioblastomas) - macrocephaly - mental retardation (in 40% of patients) - FASI - extended wing dysplasia in Sphenoid bone- suture defects in lambdoid- calcification in Cortex Dura and finally Moya Moya phenomenon (rare)(13). In radiological science, FASI is clear focus on T2W1 images without enhancement and without the effect of pressure. Most basal ganglia (more important is globus pallidus) - the thalamus - the brain stem (pons) – cerebellum and subcortical white matter takes place. This is the most common findings in nervous system imaging at the NF1 and in 86% of children has been reported (14). This finding on MRI of brain was seen in both Family Guys. But no associated clinical manifestations were observed. The most common findings in imaging of the skull and the meninges is dysplasia in large wing of sphenoid, although it's a rare phenomenon that hypoplasia or aplasia large wing of sphenoid with the movement of the top small wings of the sphenoid can be seen and in X-ray has Harlequin appearance. Sutural defect is another finding that usually happened in left lambdoid (15). The most common abnormal findings on MRI brains of patients with NF1 are numerous small areas with increased signal intensity within the brain in the T2W1 imaging (NF Spot). These lesions can be single or multiple and often bilateral and are without of Mass effect which in this present study, it was obvious. Affected areas include the brain stem, optic radiation, the white matter of the brain, the cerebellum and the Basal ganglia (16). This waste has a low signal on T1WI images, and Contrast enhancement in the presence of low-grade gliomas has to doubt. Other less common findings is areas with increased signal on T1WI in the brain children with NF1. These lesions have smooth margins and such as increased signal intensity lesions in T2WI haven't Mass Effect, edema and Contrast enhancement. The most common neoplasm of the central nervous system in neurofibromatosis patients is LGOPG. Generally 1-3% of patients with NF1 have brain tumors that the most common is vision glioma or parenchyma. Usually these are low grade astrocytoma and have better prognosis than tumors in patients without NF1. It may be multicentric tumors and of course, occur at younger ages than in the normal population. Other areas for gliomas in NF1

patients are including brain, the hypothalamus and third ventricle. There are bilateral optic glioma is Pathognomonic (7). This tumor causes elongation, enlargement and Buckling optic nerve and has dotted i's view in axial images. Tumor can be seen hypo intense on T1WI and Hyper intense in T2WI images. Of course, CSF Expansion in the optic nerve may be present. Gliomas often in the medulla oblongata are observed with infiltrative mass and ill-defined with an increase in variable (7, 12). High grade component showed included central necrosis with the peripheral increases and Restricted diffusion. Hydrocephalus blockers may also is visible because side effects in glioma masses in tektal plate, cerebellum, brainstem and cerebral aqueduct in NF1 patients. Its report showed relationship between brain aneurysm occlusion with NF1, which secondary causes the disease Moya-Moya. Peripheral arterial occlusive wall is caused by proliferation of smooth muscle cells. Due to blockage of blood vessels in the brain, multiple basilar co-lateral of the form and was seen moya-moya on angiography (15). A spinal protest for dural ectasia with enlargement of the spinal canal in NF1 patients is relatively common. Dural ectasia in plain radiography for Scaloping and concavity of the vertebral bodies can be seen in patients. This pathology with MRI and CT myelography confirmed. Benign neurofibroma in NF1 patients are spinal nerve sheath tumors and often seen on the neck and chest (17). In T1WI sagittal images is observed a high signal in a focus on the bottom third ventricle in the absence of posterior pituitary bright spot. This finding was seen in the younger brother, but did not show clinical signs consistent. Check for abnormalities in the pituitary hormone is necessary.

### CONCLUSION

According to the Neurofibromatosis is a genetic disorder inherited autosomal dominant pattern, genetic counseling before marriage and before pregnancy is crucial. Multiple lesions in neurofibromatosis cannot be cured and the patient is extremely problematic. It should also take into account that predisposes patients to malignancy, multiple neurofibromatosis, which itself is life-threatening. Also pay attention to this issue that some clinical symptoms such as brown spots form also occurs in other diseases and should not be immediately confirmed diagnosis.

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