Neurofibromatosis

WHAT IS NEUROFIBROMATOSIS?

Neurofibromatosis is a condition characterized by multiple growths which derive from primitive cells in the body. The growths occur along nerve paths, anywhere in the body. Neurofibromatosis skin lesions are typically flat, pigmented patches but occasionally are elevated flesh-colored bumps [See figure 1].

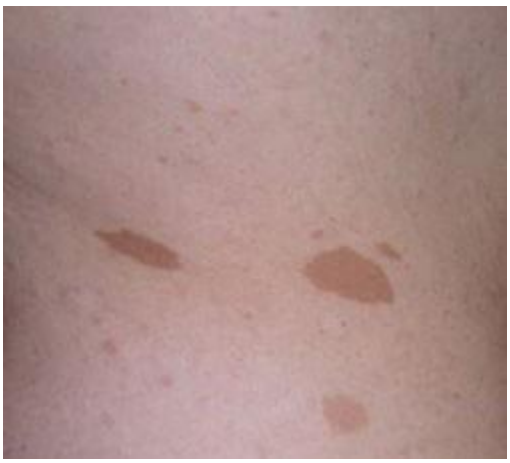

Fig. 1: Cafe au lait spots.

WHY DOES A CHILD HAVE NEUROFIBROMATOSIS?

Neurofibromatosis tends to run in families, although about 50% of cases have no family history; in these cases, the cause is a new mutation. Each child of an involved parent has a 50% chance of developing neurofibromatosis. In neurofibromatosis type I, chromosome 17 is responsible for the disease while chromosome 22 is responsible for neurofibromatosis type II.

HOW COMMON IS NEUROFIBROMATOSIS?

Neurofibromatosis type I is more common than neurofibromatosis type II. About 1 in 3000-5000 has neurofibromatosis type I, while about 1 in 25,000 have type II.

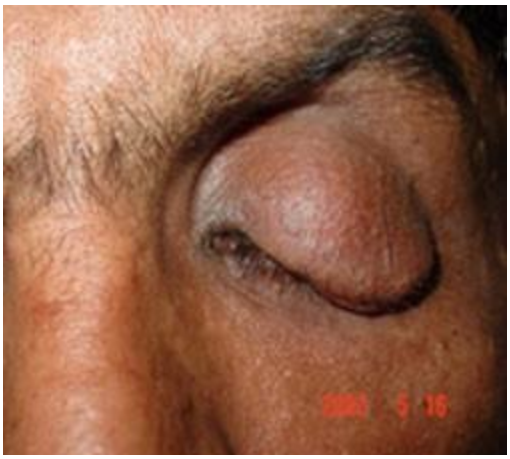

Fig. 2: Eyelid neurofibroma.

WHAT ARE THE FINDINGS IN NEUROFIBROMATOSIS?

Neurofibromatosis type I may affect family members differently. Some family members may have minimal disease, while others may be more severely affected. Some of the characteristic findings are:

Type I

- **Skin findings**: Freckles (cafe-au-lait spots) on the skin. These dark spots are typically greater than 5mm in diameter (often irregularly shaped) and are usually located under the arms, in the bend of the elbow and knee, and around the groin region. The spots tend to increase in size and number during the first 10 years of life. Nodule(s) on the skin may develop at any age [See figure 1].
- **Eye findings**: The eyelids may become thicker and irregularly shaped because of the growth of a neurofibroma [See figure 2]. Children with this eyelid problem are at risk for developing high eye pressure (glaucoma) or lazy eye (amblyopia).
- Pigmented spots on the iris may increase in number over time. These spots are called Lisch nodules and do not affect vision [See figure 3].
- Lesions may occur in the inner layers of the eye (choroid), but do not affect vision.
- The nerve which connects the eye to the brain is the optic nerve. The optic nerve can develop a benign tumor called a glioma in approximately 20% of patients with NF1 [See figure 4]. This tumor may cause vision problems, especially decreased central vision and peripheral visual field defects.

- **Bone findings**: A child with neurofibromatosis may have poor development of arm and leg bones. Also, a bone around the eye (sphenoid) may be poorly developed or absent which can cause the eye to pulsate.
- Other less commonly associated findings: crooked spine (scoliosis), seizures, decreased intellect, large head, malignancy (leukemia, Wilm's tumor, rhabdomyosarcoma, and pheochromocytoma).

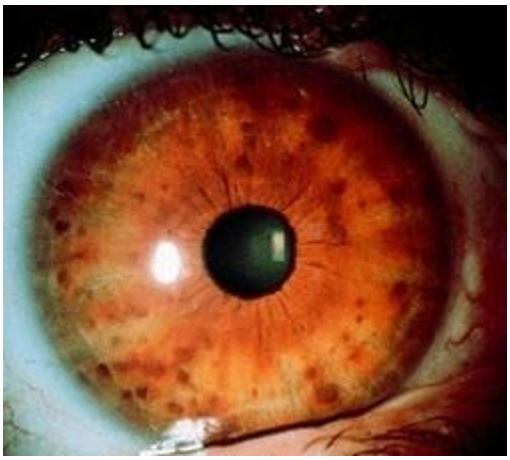

Fig. 3: Iris Lisch nodules.

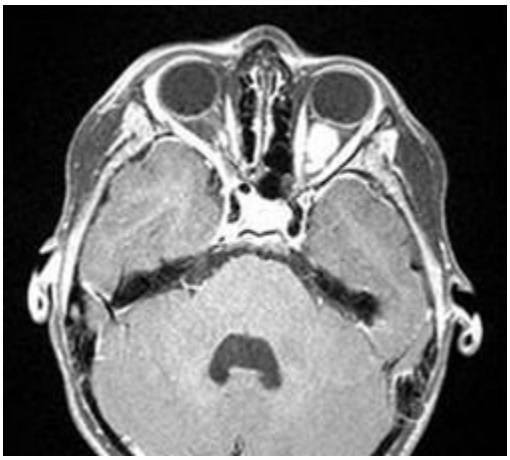

Fig. 4: CT of optic nerve glioma.

Type II

Type II typically presents in the teens or early adulthood with hearing problems due to the development of an ear nerve tumor (acoustic neuroma). Other findings include: problems with balance, early cataract (posterior subcapsular cataract, wedge cortical cataracts), spots on the iris (Lisch nodules), benign

tumors of the retina and retinal pigment epithelium (inner layers of the eye), or other nervous system tumors.

HOW IS NEUROFIBROMATOSIS DIAGNOSED?

Neurofibromatosis may be diagnosed either clinically, based on a constellation of the previously described findings, or by genetic testing. Eye examination is often key to making a clinical diagnosis of neurofibromatosis type 1, due to the presence of Lisch nodules and choroidal nodules that may be identified on specialized imaging of the eye (optical coherence tomography [OCT]).

WHAT TREATMENTS ARE AVAILABLE?

If an eyelid with neurofibroma becomes ptotic and/or excessively large, surgical debulking may be necessary. Surgery for residual ptosis may be required. Unfortunately, the eyelid lesion may recur. Frequently, optic nerve gliomas simply require observation by serial examinations and no intervention is required. Frequent examinations are necessary because progressive vision loss due to the glioma is an indication for treatment. Other indications include increased fluid pressure around the brain (hydrocephalus) or hormonal (pituitary) problems. The first-line therapy for young children is typically chemotherapy. Radiation is another option. Surgery is performed less frequently. Some patients are treated with oral medications called MEK inhibitors that require frequent eye examinations because they can cause swelling inside the inner layer of the eyes (retina).

WHERE CAN I GET MORE INFORMATION ABOUT NEUROFIBROMATOMOUS?

- Contact the Children's Tumor Foundation

ARE THERE ANY RESEARCH STUDIES AVAILABLE FOR CHILDREN WITH NEUROFIBROMATOSIS?

A nationwide, multicenter study on optic pathway gliomas in children with NF1 is currently underway. You may ask your eye doctor if your child is eligible for this study.

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