Neurofibromatosis (Type 2)

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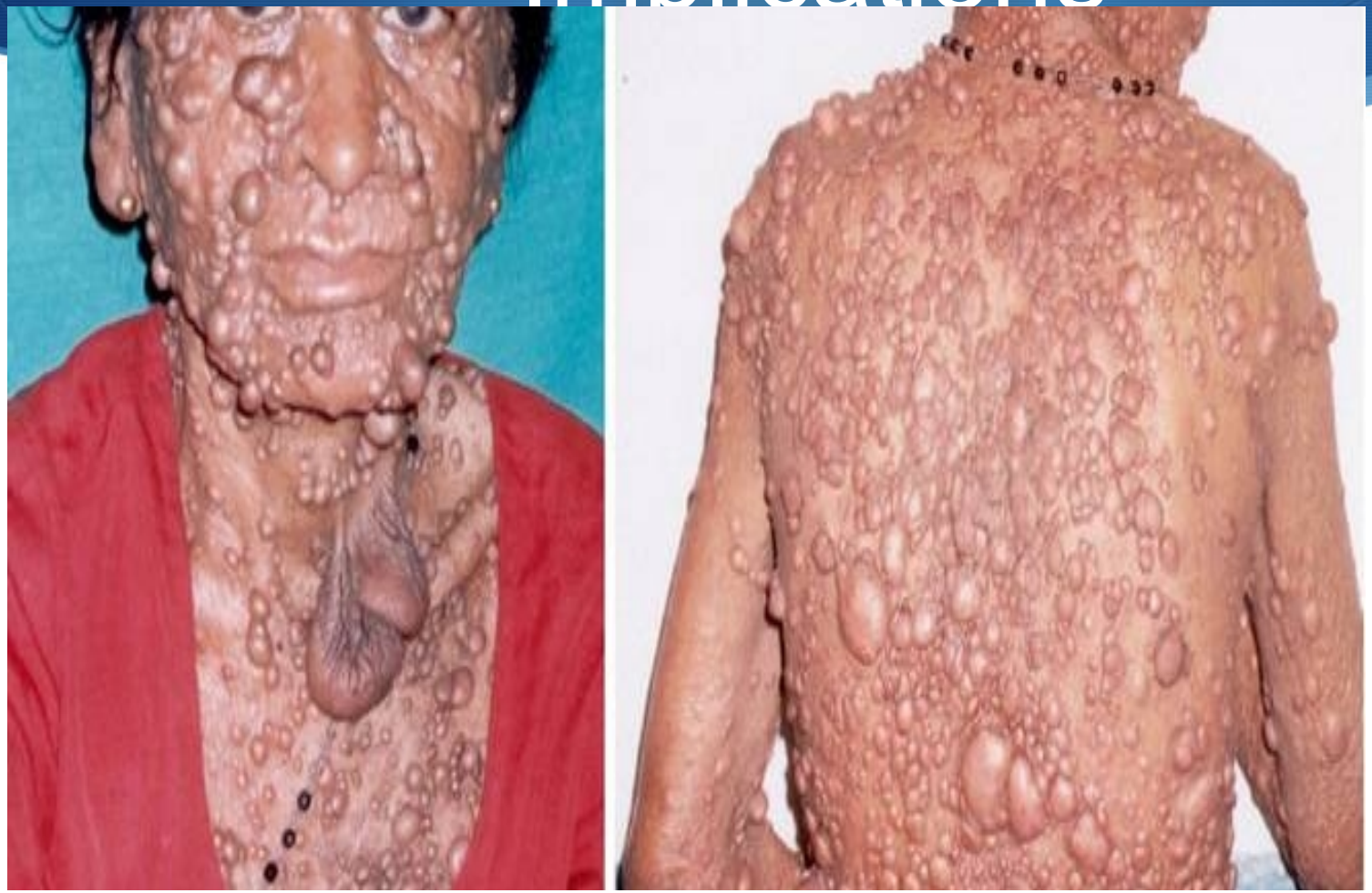
Disease Development

- Disorder marked by growth of noncancerous tumors in nervous system[1]
  - Mostly acoustic neuromas – tumors that develop on nerve between inner ear and brain
  - Tumors also develop on other parts of nervous system, including brain and spinal cord
  - About one in 40,000 people have neurofibromatosis type 2
- Autosomal Dominant[2]
  - People who develop neurofibromatosis are born with a mutated copy of NF1 gene in each cell (2 altered copies of NF2 genes stimulate tumor formation in neurofibromatosis type 2).
  - 50% of cases involve inheritance of altered gene from an affected parent.

Physical and Social Implications



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Classical Diagnosis Methods

- Checking for Clinical Features [3]
  - Bilateral Vestibula Schwannomas (VS)
    - Tumors arise from Schwann cells, which support and insulate nerve cells, and grow on balance and hearing nerves supplying the inner ear
- Early Symptoms[4, 5]
  - Dysfunction in hearing – hearing loss, ringing in the ears (tinnitus), problems with balance and dizziness
    - If these symptoms appear, use thorough ear examination and hearing test (audiogram) to check if symptoms are not indicative of other middle and inner ear problems.
  - Computerized tomography (CT) scans, enhanced with intravenous dye (contrast), and magnetic resonance imaging (MRI) are essential in early detection of vestibular schwannoma and to determine size and location of tumor.

Classical Treatments

- No current medical treatment or drug therapy – only tumor management methods[3]:
  - **Surgical Removal**
    - Most common treatment; however, if tumor is too large, surgical removal may not be plausible due to potential damage to nerves that control facial movement, hearing, and balance.
  - **Radiation Therapy**
    - "Gamma knife" or LINAC (linear accelerator) can reduce tumor size
    - Preferred for older patients, patients with poor medical condition, or patients whose hearing is affected by the tumors
  - **Monitoring**
    - Consistent MRI scans may monitor development of tumors, thus prompting appropriate medical attention.

Novel Diagnostics

- Research shows that NF2 maps to chromosome 22[1]
  - Thought to be “tumor-suppressor gene” – controls cell growth and division and prevent tumor development
  - Mutation in NF2 accounts for clinical symptoms in neurofibromatosis
- Genetic testing for NF2 is available but is only accurate in about 65% of individuals who are tested[4]
  - Prenatal or genetic testing for schwannomotosis currently does not exist.
- A family history of NF2 plus a unilateral vestibular schwannoma before the age of 30 also provides diagnosis[4]

Novel Genomics-based Therapies

- Current research is focused on learning more about the function of the NF2 gene[1]
  - Studies of families with neurofibromatosis type 2 and work with mice models
  - Work on binding partners of NF2 to develop drug-targeted therapies
  - Scientists are currently using gene therapy to create vectors that may contain therapeutic genes, which can then be delivered to specific targets.[6]
    - However, there are still problems with gene therapy, as some viruses may only affect cancerous cells with certain characteristics (i.e. cells that are multiplying)
    - Moreover, safety for this method has not yet been created.

References

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