Is There a Cochlear Phenotype for Neurofibromatosis Type 2-related Schwannomatosis?

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Introduction

- NF2-related Schwannomatosis (NF2-SWN) is a genetic condition characterised by central and peripheral nervous system tumours, and bilateral vestibular schwannomas [1]
- Mutations in the *NF2* gene, lead to the disruption of Merlin, a tumour suppressor protein [2]
- Unresolved aetiology with various theories of pathophysiology
- Symptoms: Progressive sensorineural hearing loss preceding a diagnosis, tinnitus, and vestibular disturbances [3]
- Histopathological reports documented a concurrence of NF2-SWN and otosclerosis [4] [5] [6] [7]

Aim: Investigate the impact of NF2-SWN on cochlear and vestibular tissues, thereby advancing the understanding of the aetiology of the hearing loss

Methods

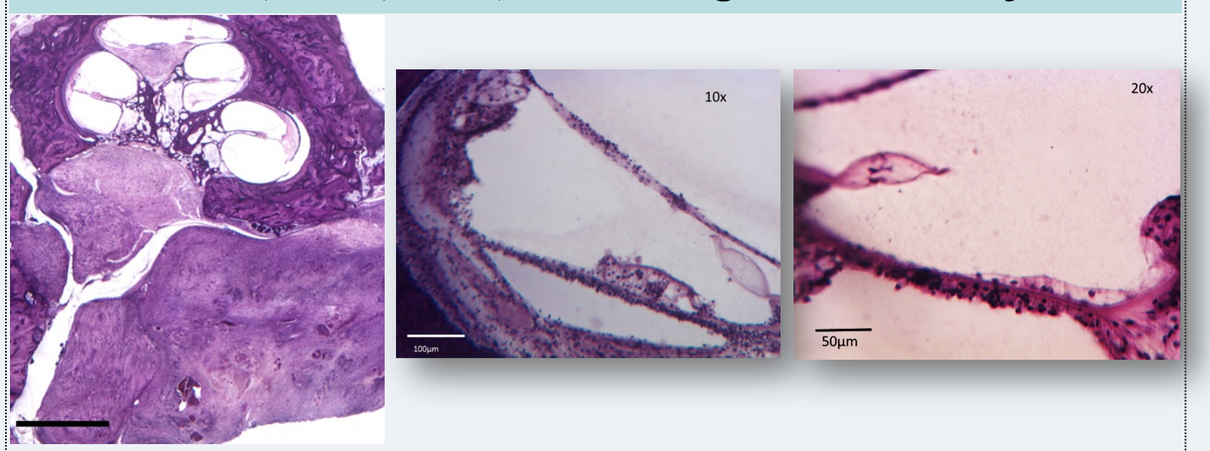
Light microscopy

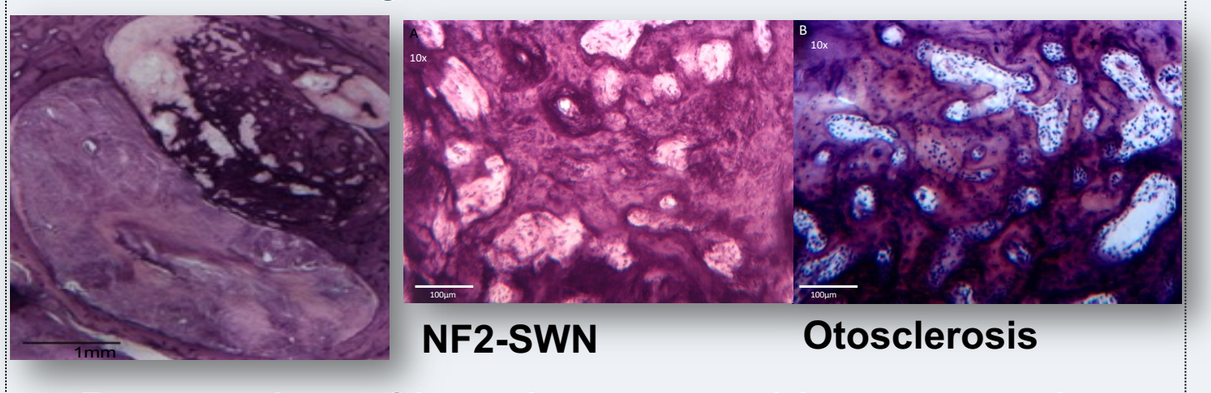
7 patients (13 temporal bones):
3 NF2-SWN, 2 Otosclerosis, and 2 controls

Qualitative assessment, comparative analysis

Results

NF2-SWN, F15, 40Y, Male. Right followed by Left

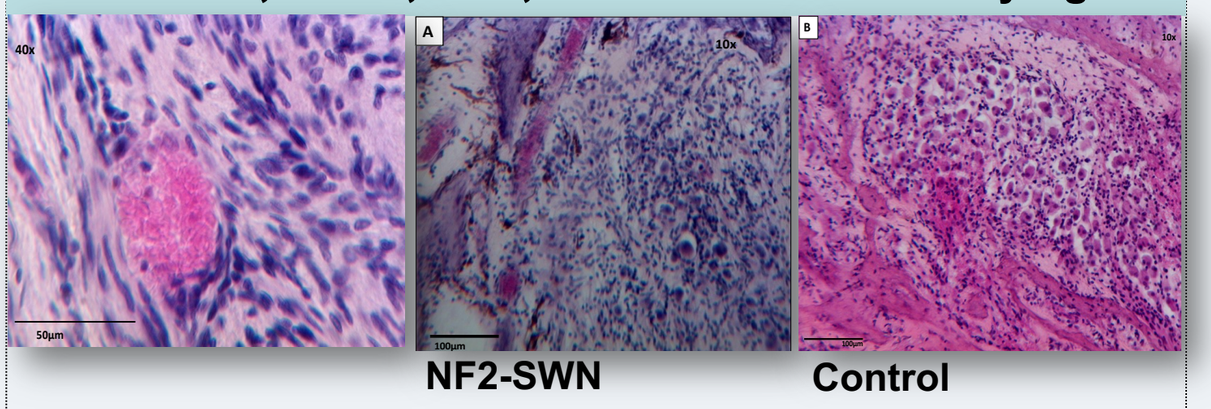




NF2-SWN **Otosclerosis**

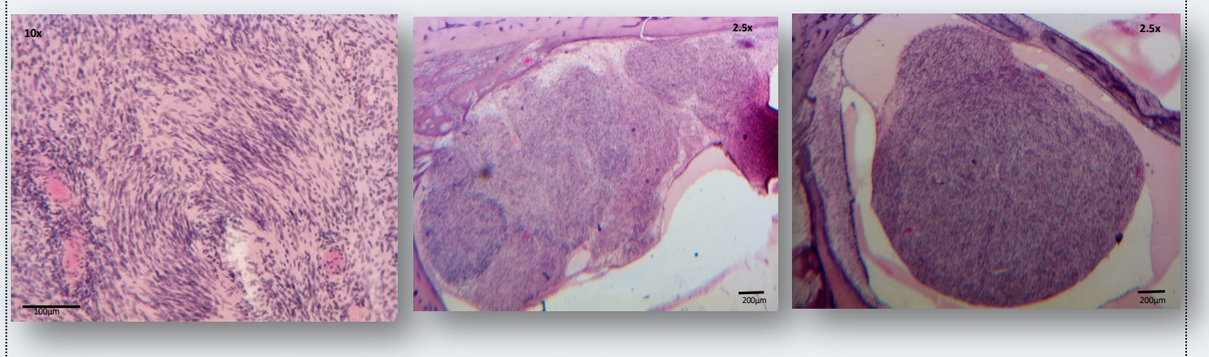
- Destruction of basal turns, and bone growth
- Otosclerotic growth in the cochlea

NF2-SWN, F185, 23Y, Male. Left followed by right



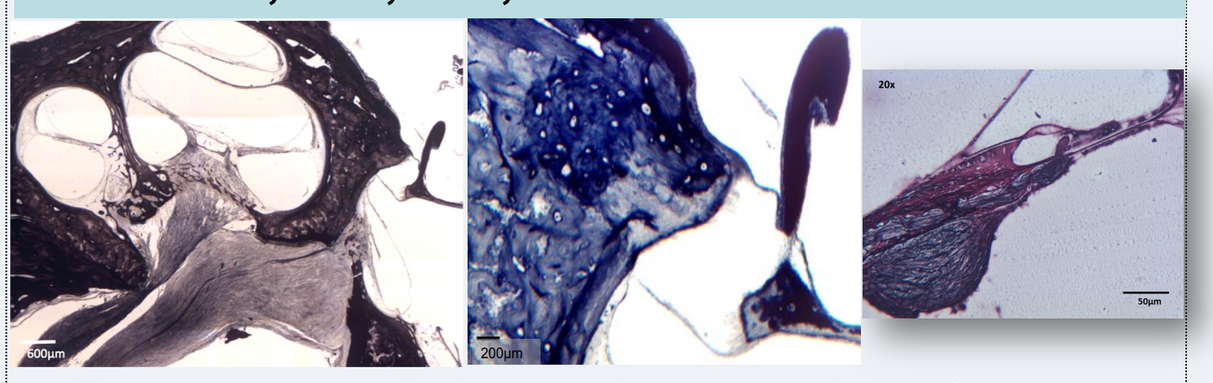
NF2-SWN **Control**

- Cluster of Schwann cells, hyalinization
- Degeneration of spiral ganglion



- Verocay bodies, hyalinization
- Tumour under utricular macula
- Tumour in vestibule

NF2-SWN, F25, 14Y, Female. Left Ear



- Tumour mass in base, degeneration of spiral ganglion
- Otosclerotic focus on Otic capsule and stapes
- Absence of organ of Corti

Conclusions

- ✓ Tumour growth on vestibulocochlear nerves, with Verocay bodies
- ✓ Psammoma bodies and hyalinization indicate blood supply disturbances
- ✓ Variable but extensive cochlear and vestibular involvement, personalised care is required
- ✓ Potential association between otosclerosis and NF2-SWN. Mechanical compression could trigger inflammatory response with compensatory growth

Future Research

- ➢ Developing non-invasive biomarkers for monitoring NF2-SWN progression
- ➢ Further investigation of the link between NF2-SWN and Otosclerosis

References:

[1] Smith, M.J., Bowers, N.L., Bulman, M., Gokhale, C., Wallace, A.J., King, A.T., Lloyd, S.K., Rutherford, S.A., Hammerbeck-Ward, C.L., Freeman, S.R. and Evans, D.G., 2017. Revisiting neurofibromatosis type 2 diagnostic criteria to exclude LZTR1-related schwannomatosis. Neurology, 88(1), pp. 87-92. [2] Tiwari, R. and Singh, A.K., 2023. Neurofibromatosis Type 2. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing. Available at: https://www.ncbi.nlm.nih.gov/books/NBK470350/ [Accessed 1 Aug. 2024]. [3] Roosli, C., Linthicum, F.H. Jr, Cureoglu, S. and Merchant, S.N., 2012. Dysfunction of the cochlea contributing to hearing loss in acoustic neuromas: an underappreciated entity. *Otolaryngology–Head and Neck Surgery*, 33(3), pp. 473-480. [4] de Kleijn, A. and Gray, A.A., 1932. Notes on a case of acusticus tumour in which both auditory nerves were involved by separate growths. *The Journal of Laryngology and Otology*, September. [5] Nam, S.-I., Linthicum, F.H. and Merchant, S.N., 2011. Temporal bone histopathology in neurofibromatosis type 2. *The Laryngoscope*, 121(3), pp.529-533. [6] Clemis, J.D., 1973 The Coexistence of Acoustic Neuroma and Otosclerosis. [7] Marchese-Ragona, R., Marioni, G., Cassano, L., and Martini, A., 2002. Coexisting otosclerosis and acoustic neuroma: Report of a new case and literature review. *The Journal of Otolaryngology*, 31(4), pp.244-247.