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CASE REPORT

Neurofibromatosis type 2 associated with multiple cranial nerve schwannomas: a case report

Kraniyal sinir şivannomlarının eşlik ettiği tip 2 nörofibromatozis: Olgu sunumu

Ahmet Mesrur HALEFOĞLU, M.D.

A 16-year-old male patient complained of right-sided tinnitus and mild deafness of one-month history. He also had a family history of neurofibromatosis type 2 and a history of a prior operation for left vestibular schwannoma a year ago. Otoneurologic examination revealed moderate sensorineural hearing loss. Magnetic resonance imaging demonstrated multiple extra-axial enhancing masses in the vicinity of both hypoglossal nerves, the right vestibular nerve, the left vestibular nerve, the right trigeminal, the left occulomotor and the right abducens nerves. These findings were evaluated as multiple cranial nerve schwannomas. The case was considered a rare manifestation of neurofibromatosis type 2 without any concomitant abnormality in the central nervous system. Symptomatic medical treatment was initiated and the patient was referred to the neurosurgery department.

Key Words: Acoustic nerve/pathology; cerebellar neoplasms/diagnosis/radiography; magnetic resonance imaging; neurilemmoma; neurofibromatosis 2/diagnosis.

On altı yaşında erkek hasta, bir ay önce başlayan sağ taraflı kulak çınlaması ve hafif sağırlık yakınmalarıyla başvurdu. Aile öyküsünde nörofibromatozis tip 2 bulunan hasta bir yıl önce sol vestibüler şivannom nedeniyle ameliyet geçirmişti. Otonörolojik muayenede orta derecede sensorinöral işitme kaybı saptandı. Manyetik rezonans görüntülemede, iki taraflı hipoglossal sinirler, sağ ve sol vestibüler sinirler, sağ trigeminal, sol okulomotor ve sağ abdusens sinirlerin komşuluğunda ekstra-aksiyel yerleşim gösteren, kontrast tutan birçok kitle saptandı. Kitleler kraniyal sinir şivannomu olarak değerlendirildi. Bulgular, eşlik eden herhangi bir santral sinir sistemi anormalliğinin bulunmadığı, nörofibromatozis tip 2'nin nadir görülen bir tablosu olarak kabul edildi. Semptomatik medikal tedaviye başlanan hasta beyin cerrahisi kliniğine sevk edildi.

Anahtar Sözcükler: Akustik sinir/patoloji; serebellar neoplaziler/tanı/radyografi; magnetik rezonans görüntüleme; nörilemoma; nörofibromatozis 2/tanı.

Schwannomas are benign, usually encapsulated tumors composed of neoplastic schwann cells. Most schwannomas are single sporadic benign neoplasms. Bilateral vestibular schwannomas are the classic hallmark of neurofibromatosis type 2 (NF 2), which predisposes patients to multiple schwannomas on cranial, spinal, and peripheral nerves and to intracranial and intraspinal meningiomas and intramedullary ependymomas.[1-4] Neurofibromatosis type 2 affects about one in 50.000 individuals, compared to one in 4.000 for neurofibromatosis type 1 or von Recklinghausen's disease.[5]

◆ *Department of Radiology, Şişli Etfal Training and Research Hospital (Şişli Etfal Eğitim ve Araştırma Hastanesi Radyoloji Kliniği), İstanbul, Turkey.*

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◆ *Correspondence (İletişim adresi): Dr. Ahmet Mesrur Halefoğlu. Birlik Sok., Parksaray Apt., No: 17/4, 34340 Levent, İstanbul, Turkey.*
Tel: +90 212 - 279 56 43 Fax (Faks): +90 212 - 241 50 15 e-mail (e-posta): halefoglu@hotmail.com

Both conditions present with multiple nerve sheath tumors, but the lesions are mostly schwannomas in NF 2,[3,4,6] and neurofibromas in NF 1.[3,6] Neurofibromatosis type 2 is caused by a mutation on chromosome 22.[7]

CASE REPORT

A 16-year-old male patient with a family history of NF 2 and a history of a prior operation for left vestibular schwannoma a year ago applied for routine follow-up examination. He had right-sided tinnitus and mild deafness of one-month history. His audiogram showed moderate sensorineural hearing loss. He was assessed by magnetic resonance imaging (MRI). Sagittal and coronal T_1-, axial and coronal T_2-, axial and coronal FSE IR (Flair), and finally axial and coronal postcontrast T_1-weighted images were obtained following intravenous administration of 11 ml gadolinium DTPA. All images had a field of view (FOV) ranging from 16 to 24 cm with a 512x192 or 256x192 matrix (phase encoding direction x frequency encoding direction). Number of repetitions (excitations) were between 1-3. Slice thickness ranged from 3 to 5 mm. All images were obtained using a head coil by means of a 1.5 Tesla superconducting magnet (GE, Signa, Milwaukee, Wisconsin, USA).

Magnetic resonance images revealed abnormally enhanced masses along the cranial nerves. Masses were seen bilaterally, larger on the right, in the region of the medulla oblongata along the 12th cranial nerves consistent with hypoglossal nerve schwannomas (Fig. 1). There was a 1-cm enhancing mass on both sides involving the internal auditory canal, and some nodular enhancement presumably a small residual tumor due to prior surgery (Fig. 2). These masses were bilateral vestibular schwannomas having characteristic signs of NF 2. Another 3-mm enhancing nodule was noted along the fifth cranial nerve on the right (Fig. 3). Other than these enhancing extra-axial masses, linear enhancement was noted in the vicinity of the right sixth cranial nerve (Fig. 4). The patient was thought to have multiple cranial nerve schwannomas associated with his known NF 2 disease. He had no other cranial or spinal involvement.

Following institution of medical symptomatic therapy, he was referred to the neurosurgery department, where he was followed-up both clinically and by MRI.

DISCUSSION

Definite NF 2 is present in an individual who has bilateral vestibular nerve schwannomas or in an individual who has a first-degree relative with NF 2, is younger than 30 years of age, and presents with

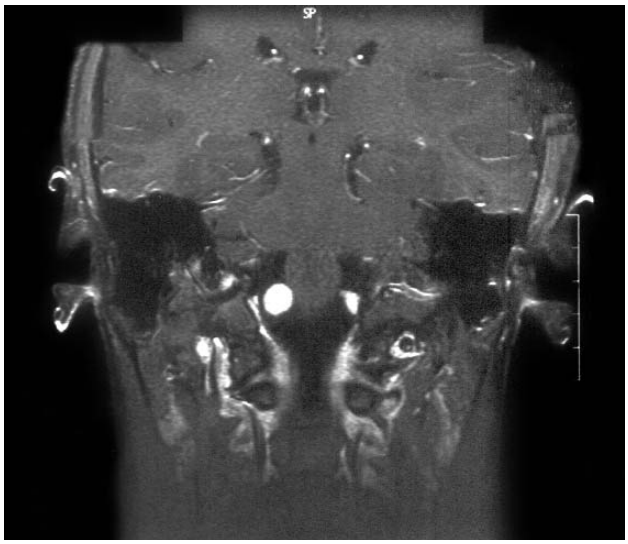

Fig. 1 - *Coronal SE T_1-weighted postcontrast image showing bilateral enhancing masses, larger on the right, adjacent to the medulla oblongata, consistent with hypoglossal nerve schwannomas.*

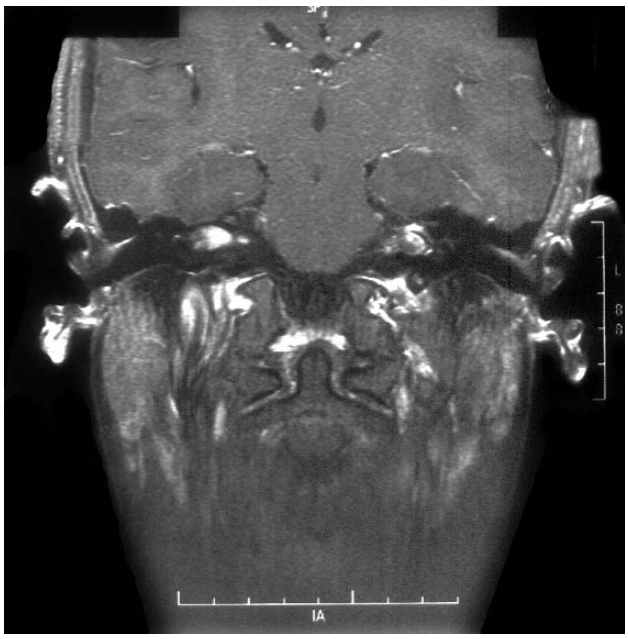

Fig. 2 - *Coronal SE T_1-weighted postcontrast image, showing a 1-cm enhancing mass on the right in the internal auditory canal location representing a vestibular schwannoma, and a small nodular enhancement on the left, in the internal auditory canal presumably a small residual tumor.*

unilateral vestibular schwannoma or two of the following: meningioma, glioma, schwannoma, juvenile posterior subcapsular lenticular opacities, and juvenile cortical cataracts.[8]

Neurofibromatosis type 2 is clinically heterogenous, ranging from the mild Gardner type (late onset; slowly growing vestibular schwannomas; few other tumors) to the aggressive Wishart type (early onset; multiple rapidly growing tumors causing early death).[2,9]

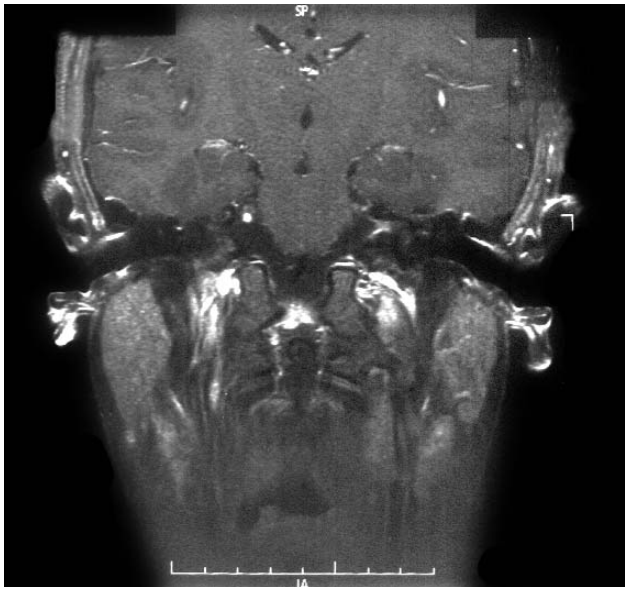

Fig. 3 - *Coronal SE T_1-weighted postcontrast image showing a 3-mm enhancing nodule in the right trigeminal nerve location, consistent with trigeminal nerve schwannoma.*

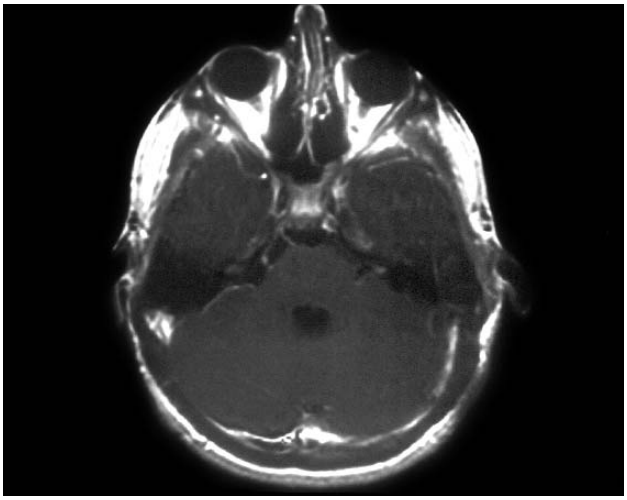

Fig. 4 - *Axial SE T_1-weighted postcontrast image showing linear enhancement along the right abducens nerve region, suggesting abducens nerve schwannoma.*

The mean age is approximately 22 years at the onset of symptoms, and 28 years at the time of diagnosis.[9,10] The mean survival after diagnosis is about 15 years.[2] The natural history of NF 2 is relatively consistent within families, whereas there is a marked interfamilial variation.[2] In about half of the patients, there is no family history, the disease is caused by a new spontaneous mutation.[9,10] The expression of NF 2 seems to be more severe when the mutation is inherited from an affected mother and families with genetic anticipation have been noted.[11,12] The classic diagnostic hallmark of NF 2 is bilateral vestibular schwannomas affecting over 90% of patients. Most schwannomas originate from the vestibular part of the 8th cranial nerve in the cerebellopontine angle cistern and approximately one-third from the spinal nerve roots.[13]

Peripheral schwannomas mostly occur in the head and neck region and the extensor aspects of the extremities,[14] accounting for 10-15% of all schwannomas.[15]

Schwannomas account for 8-10% of all intracranial tumors in adults, with an overall annual incidence of 0.28-1.27/100.000.[16-18]

Neurofibromatosis type 2 schwannomas differ from sporadic schwannomas in many ways. They present at an earlier age and are often multiple. They may show a lobular, "grape-like" growth pattern on both gross and microscopic examination while such patterns are extremely uncommon in sporadic schwannomas. Multiplicity, a lobular growth pattern, and invasiveness are typical features of NF 2 schwannomas.

Unilateral tumors typically arise from the vestibular nerve. The trigeminal nerve (CN 5) is the next most frequently affected cranial nerve. Although isolated schwannomas may occur spontaneously, the presence of an occulomotor, trochlear, or abducens nerve tumor should raise the suspicion of NF 2. Similarly, involvement of more than one nerve warrants a work-up for NF 2.

Schwannomatosis is a recently described clinical entity. Patients with schwannomatosis typically have multiple spinal, peripheral nerve, or subcutaneous schwannomas, without bilateral vestibular schwannomas and the disease is segmental or localized to a certain body part in approximately one-third of the patients.[19,20]

Minamino et al.[21] reported the occurrence of cervical schwannoma in two patients with NF 2 having cervical schwannoma derived from the vagal or hypoglossal cranial nerve.

Suresh et al.[22] described a unique case of multiple cellular and malignant schwannomas of the cranial and spinal nerves in a patient with features of NF 2. The tumors arose from the left optic, bilateral occulomotor, trochlear, abducens and vestibular nerves, the left facial and the spinal lumbar nerve roots.

There have been few reports of patients with NF 2 presenting with schwannomas originating from multiple cranial nerves. Kuchna et al.[23] reported a patient with NF 2 showing bilateral vestibular nerve schwannomas complicated by multiple neurogenic tumors. The presented case is also a rare manifestation of NF 2 accompanied by multiple cranial nerve schwannomas.

Surgical treatment of patients with NF 2 is complex and probably should be limited to specialized centers with experienced neurosurgeons. The results of hearing and the recovery of a severed or sutured facial nerve after removal of vestibular schwannoma are less favorable in patients with NF 2 than those with sporadic unilateral tumors.[24-26] The characteristics and the bilateral nature of the disease makes it difficult to decide for surgery. Samii et al.[26] recommended surgery to achieve two goals: to decompress the brain stem in case of life-threatening bilateral compression, and to prolong the period of cranial nerve function.

An early operation may preserve the patient's hearing from further deterioration, but the operation may also cause immediate hearing loss. The alternative is to wait until the affected ear becomes deaf. The decision is easier in families with known NF 2, as the rate of progression is often similar in family members. Rapid tumor growth and brain stem compression make surgery imperative.

Small vestibular schwannomas can often be resected, with a fair chance of preservation of both hearing and facial nerve function.[9,26] Larger tumors are probably best managed by partial removal with decompression performed when brain stem compression develops.[9,26,27]

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