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Case report

Bilateral inner ear damage after electrical injury: A case report

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ABSTRACT

Electrical injury occurs as a result of direct contact with an electrical source. We present the case of a 62-year-old male patient, an electrician by profession, who was hit by a high-voltage electrical current while working with cables in proximity to a wet floor. The patient suffered from immediate loss of consciousness and five days later he started complaining of slight hearing loss, persistent vertigo, instability and bilateral tinnitus. A thorough audiological and vestibular examination revealed an extensive bilateral vestibulocochlear dysfunction. The exact pathogenetic mechanisms of inner ear dysfunction after electrical injury have not been fully elucidated, although it is believed that there is significant improvement with time. Long-term follow-up, medical assistance and psychological support are crucial factors for the patient management.

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1. Introduction

The use of electricity for domestic and industrial purposes is increasing over the last centuries and, as a consequence, a significant number of electrical injuries are being reported. The estimated mortality rate of electrical injuries in the United States is between 3%–15% [1].

Various injuries have been recorded, with the most frequent being cardiac abnormalities and burns [2]. Neurological and neuropsychological effects have also been reported, including peripheral polyneuropathies, emotional and behavioral sequelae [3,4].

Audiovestibular sequelae of electrical injury due to lightning or electric current are probably much more common than those indicated in the literature [5]. We present a case of electrical injury which resulted in hearing loss, vertigo and imbalance,

focusing on its short- and long-term effects on audiological and vestibular function tests.

2. Case presentation

A 62-year-old male patient was referred to the ENT Department of “AHEPA” University Hospital by a district hospital in Northern Greece after sustaining an electrical injury. The accident happened five days prior to admission. The patient, who is a professional electrician, was mending plug cables kneeled on a wet floor, when he was hit by a current of approximately 1000 V (50 Hz AC current). He described the formation of an electric arch between his right arm and legs. For three seconds he was unable to escape the arch, until his assistant managed to pull him away from the source. A sensation of numbness remained in his right arm and legs, without troubles of mobility.

As the patient suffered from an immediate loss of consciousness, he was initially admitted to the district hospital of his area for cardiac monitoring. No complications were

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observed and he was discharged five days later. When the patient went back home, he started feeling unstable and complained of persistent vertigo. He also described a few episodes of nausea and vomiting. He noticed a mild hearing loss and tinnitus, especially in his left ear. On examination, otomicroscopy revealed normal ear, with no signs of tympanic membrane perforation. Under Frenzel glasses, the patient showed second degree nystagmus towards the right; Romberg and Unterberger tests could not be carried out as he was completely unstable. Tuning fork tests were normal and the pure tone audiogram demonstrated a bilateral symmetrical, moderate threshold elevation particularly in the high frequencies (Fig. 1A). Transient otoacoustic emissions (TEOAEs) were not produced in either ear (Fig. 2). Auditory brainstem responses (ABRs, 120dB SPL click stimulus, rate 11/s) absolute and inter-peak latencies (I–III, III–V, I–V) values were within the normal limits. A directional preponderance to the right was found in the caloric test (42%, normal laboratory values <25%)

(Fig. 3A) and the cervical vestibular evoked myogenic potentials (cVEMPs, 500 Hz positive logon, 130dB SPL, 4 signals/s) (Fig. 3B) were completely absent on both sides. A rotatory pendular test (undamped rotation of 360° in 20 s) was also used. The magnetic resonance imaging (MRI) of the brain did not reveal any significant pathology. He was treated conservatively, with a short course of intravenous steroids and dimenhydrinate without showing any improvement. Moreover, he developed signs and symptoms of depression. Ten days later, his balance was improved and the patient was able to walk independently; he was discharged on a 3-month course of Betahistine (16 mg three times a day). He was also advised to perform Cawthorne–Cooksey exercises at home [6].

On the next follow-up appointment after two weeks, his balance was better, but he still suffered from dizziness, mainly during rotations of the head to the right; he also reported a feeling as walking on “broken tiles”. The nystagmus was less intense, first degree to the right and during Unterberger test he

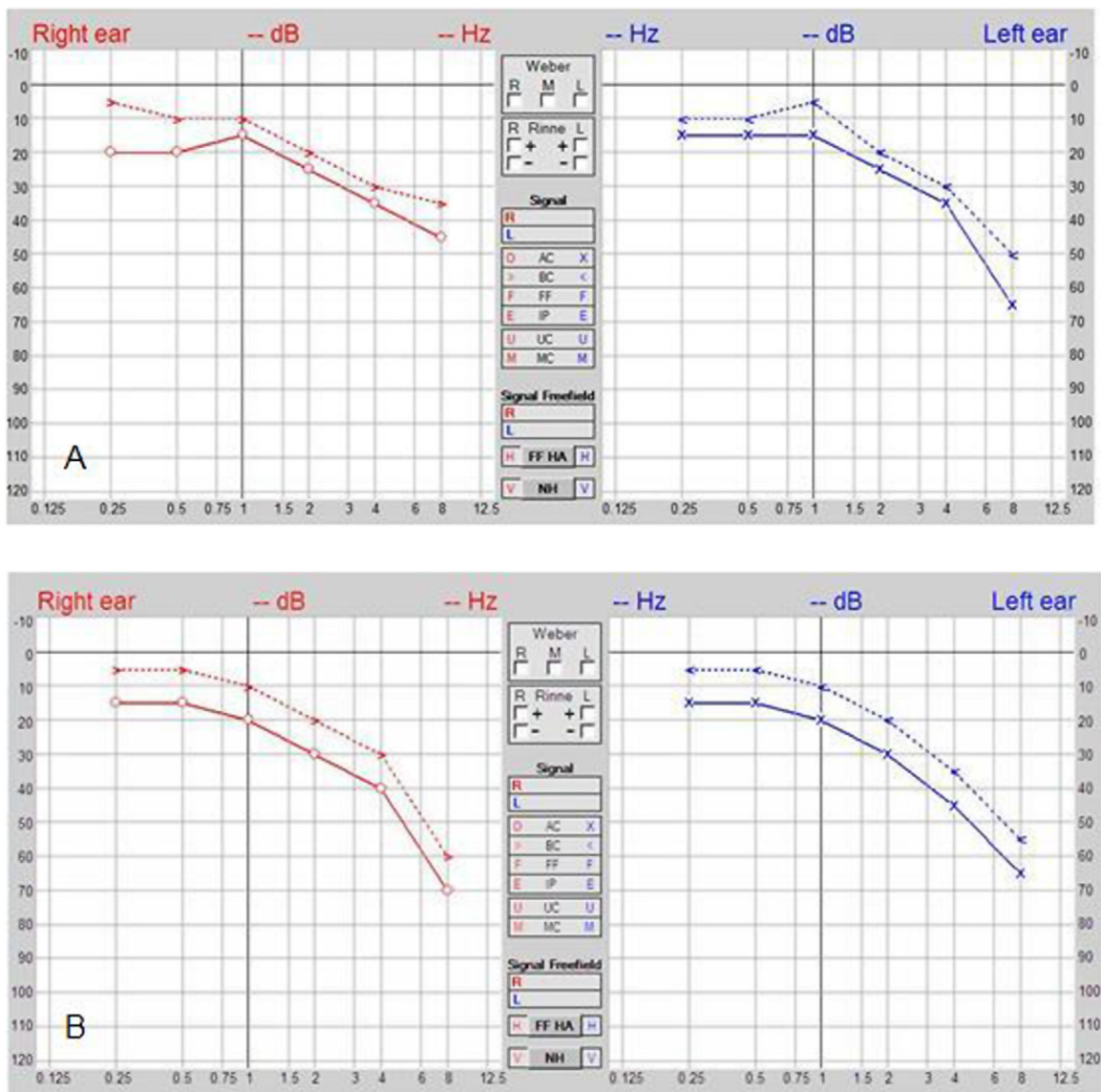


Fig. 1. Pure tone audiogram after electrical injury: Bilateral symmetrical, moderate thresholds elevation, especially at the high frequencies, (A) on admission, (B) slightly higher one year later. -o-, -x-: air thresholds for right and left ear, respectively. ->-, -<-: bone thresholds for right and left ear, respectively.

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