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IMPORTANCE OF IMMUNOLOGIC AND VIRAL ETIOLOGY IN THE PATIENTS WITH SUDDEN SENSORINEURAL HEARING LOSS

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ABSTRACT
In this study, we aimed to evaluate the importance of possible immunologic and viral etiologies in the patients with sudden sensorineural hearing loss. Forty patients (Group 1) referred to Dicle University, Department of Otorhinolaryngology between January 2010 and October 2011 for sudden sensorineural hearing loss were included to this prospective controlled study. Control group (Group 2) was constituted from healthy subjects. These group 1 patients were screened for common virus infections and immunologic factors in order to determine their possible relationship with idiopathic sudden sensorineural hearing loss. In this study; there was no statistically significant difference in the mean immunologic parameters between the groups except complementary factor C4. Also there was no statistically significant difference in viral serology between the groups. Therefore, we conclude that HSV, HBV, HCV, HIV, EBV and CMV are not directly involved in the etiology of sudden sensorineural hearing loss in most patients.

INTRODUCTION

Sudden sensorineural hearing loss (SSNHL) is most commonly defined as sensorineural hearing loss of 30 decibel or greater over at least three contiguous audiometric frequencies occurring within a 72-hour period [1-5]. The incidence of SSNHL has been estimated to range from five to 20 per 100,000 persons per year [6]. Although the differential for SSNHL is vast, for the majority of patients an etiologic factor is not identified. The causes of SSNHL are speculative and probably multifactorial, but various etiological theories have been proposed. Infection, vascular impairment, autoimmune disorders, trauma, inner ear anomaly, and central nervous system disease have all been implicated, but in many patients no obvious cause is found. Tests to identify possible infectious causes for SSNHL were utilized in numerous studies as part of a diagnostic algorithm [1-3,5]. In this study, we aimed to evaluate the importance of possible immunologic and viral etiologies in the patients with SSNHL.

PATIENT AND METHODS

Forty patients (32 male, 8 female) (Group 1) referred to Dicle University, Department of Otorhinolaryngology between January 2010 and October 2011 for SSNHL were included to this prospective controlled study. These forty patients diagnosed with SSNHL (Group 1) were screened for common virus infections and immunologic factors in order to determine their possible relationship with idiopathic SSNHL. Patients were included according to the following criteria: unilateral SSNHL of unknown origin, with or without tinnitus and/or vertigo, and no involvement of cranial nerves other than the eighth cranial nerve. Patients were excluded when having causes of hearing loss (noise induced, drug induced, Ménière's disease, otitis media). Control group (28 male, 12 female) (Group 2) was constituted from healthy subjects.

Immunologic serologies (anti-cardiolipin antibody (ACA), anti - double stranded DNA (Anti - dsDNA)

antibody, anti-nuclear antibody (ANA), anti-streptolysin O (ASO) antibody, C-reactive protein (CRP), rheumatoid factor (RF), complement factors (C3 and C4)) and Hepatitis B Virus (HBV) antigen and antibodies, Cytomegalovirus (CMV) antibodies, Rubella antibodies, Mumps antibodies, Ebstein Barr Virus (EBV) antibodies, Herpes Simplex Virus (HSV) antibodies were evaluated and compared. Workup included pure-tone audiometry, tympanometry, stapedial reflexes, and either brain computer tomography or magnetic resonance imaging in order to rule out acoustic neurinoma. Serological studies were performed using commercially available kits in accordance with the instructions of the manufacturer.

RESULTS

The male:female ratio was 32:8 in Group 1 and 28:12 in Group 2. The mean age was 36.4 years (between 9 and 72) in Group 1 and 36.5 years (between 6 and 81) in Group 2 as shown in Table 1. The mean hearing was 64.8 in the right and 72.5 in the left ears of the Group 1. There was no statistically significant difference in the mean age and gender between the groups.

CMV-IgM, EBV-IgM, HSV1-IgM, HSV2-IgM, Rubella-IgM, Mumps-IgM, HBV surface antigen, Anti-dsDNA, ACA-IgM, ACA-IgG, ANA were negative in all patients. Rubella-IgG was positive in one patient in both groups. EBV-IgG was positive in two patients in Group 1 and in one patient in Group 2. HSV2-IgG was positive in one patient in both groups. Anti-HBs was positive in six patients in Group 1 and in three patients in Group 2. Some serologic parameters of the two groups shown in Table 2. There was no statistically significant difference in the mean immunologic parameters between the groups except complementary factor C4.

Table 1. Demographic characteristics of groups

	Group 1	Group 2
Mean age	36.4	36.5
Gender (Male:Female)	32:8	28:12

Table 2. Some serologic parameters according to groups

Serologic parameters (units)	Normal Limit	Group 1	Group 2	p
ASO (IU/mL)	0-200	139	186	>0,05
CRP (mg/dL)	0-0,5	0,1	0,07	>0,05
RF (IU/mL)	0-15	10,7	10,9	>0,05
IgG (mg/dL)	751-1560	1165	1079	>0,05
IgM (mg/dL)	46-304	122	107	>0,05
C3 (mg/dL)	79-152	109	104	>0,05
C4 (mg/dL)	16-38	19,5	23	**<0,05**

DISCUSSION

The causes of SSNHL are speculative and probably multifactorial, but various etiological theories have been proposed. Many etiologic causes of sudden sensorineural hearing loss have been proposed, but many remain unconfirmed. The cause of SSNHL remains idiopathic in most cases, despite many attempts to relate this condition to infectious diseases or microthrombosis [3,4,7]. In some reports, SSNHL was shown to be associated with the presence of various autoantibodies and/or the dysregulation of cellular immunity [8,9].

Viral infections are theorized to cause vascular obstruction through the precipitation of hemagglutination, inflammatory capillary edema, or induction of a hypercoagulable state. Thus, viral or vascular induced cochlear ischemia could be a common pathway in the development of SSNHL [3,10]. Sensitive serologic techniques, such as polymerase chain reaction and immunoglobulin titers have been used to identify the presence of an infectious agent in patients with SSNHL. None of the studies attempted an invasive in vivo technique to sample the inner ear fluids; thus, a direct causal relationship between SSNHL and a viral etiology remains in question. The evidence for the potential role of a viral infection in the pathogenesis of SSNHL is partly based on postmortem histopathologic studies of temporal bones of patients with a history of SSNHL. Neurotropic viruses, such as HSV, CMV, and rubella are well-documented etiologic causes of congenital sensorineural hearing loss, but objective evidence of acute viral inflammation of the adult auditory system causing sudden hearing loss is lacking [11]. Proposed mechanisms of action include direct viral invasion of the cochlea or cochlear nerve, reactivation of a latent virus within the spiral ganglion, and immune-mediated mechanisms such as host mimicry once an infection becomes systemic [12].

SSNHL was also reported in association with other autoimmune diseases such as systemic lupus erythematosus, rheumatoid arthritis, and the involvement of autoimmunity in some patients with ISSNHL was later supported by the following findings. Sera of these patients contain reactive autoantibodies against different inner ear proteins [13-15]. Also, disease-related autoantibodies such as anti-DNA, antithyroid antibodies, anti-smooth muscle, anticardiolipin antibodies, and rheumatoid factor have been detected in sera of such patients.

Many trials have shown that prompt administration of corticosteroids could double the likelihood of recovery of hearing, especially when the SSNHL is strongly suspected to be autoimmune [16,17,18]. An additional possibility is that stimulation by an unidentified virus could trigger the immune system polyclonally. Such a humoral response might cross-react with various inner ear targets, some of which could be antigenic epitopes on locally damaged endothelial cells of the inner ear microcirculation. Our main finding was statistically significant difference in complementary C4 levels of the groups. Alteration in the level of complementary factor C4 may be related to SSNHL but future studies should clarify the relationship between these.

CONCLUSION

In this study; there was no statistically significant difference in viral serology between the groups. Therefore, we conclude that HSV, HBV, HCV, HIV, EBV and CMV are not directly involved in the etiology of SSNHL in most patients. Further prospective studies in larger populations and in different seasons and epidemiological settings using direct and sensitive molecular assays are required to verify the role of viral infections in SSNHL.

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CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

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STATEMENT OF HUMAN AND ANIMAL RIGHTS

All procedures performed in human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

REFERENCES

1. Cadoni G, Fetoni AR, Agostino S, et al. (2002). Autoimmunity in sudden sensorineural hearing loss, possible role of antiendothelial cell autoantibodies. *Acta Otolaryngol*, 528 (suppl), 30-33.
2. Cadoni G, Scipione S, Ippolito S, Marchese R, Paludetti G. (2005). Sudden sensorineural hearing loss, our experience in diagnosis, treatment and outcome. *J Otolaryngol*, 34, 395-400.
3. Capaccio P, Ottaviani F, Ottaviani F, et al. (2007). Genetic and acquired prothrombotic risk factors and sudden hearing loss. *Laryngoscope*, 117, 547-551.
4. Gross M, Wolf DG, Elidan J, Eliashar R. (2007). Enterovirus, cytomegalovirus and Epstein-Barr virus infection screening in idiopathic sudden sensorineural hearing loss. *Audiol Neurotol*, 12, 179-182.
5. Penido N, Ramos HVL, Barros FA, Laercio O, Cruz M, Toledo RN. (2005) Clinical, etiological and progression factors of hearing in sudden deafness. *Rev Bras Otorrinolaringol*, 71, 633-638.
6. Byl FM. (1984). Sudden hearing loss, eight years' experience and suggested prognostic table. *Laryngoscope*, 94(5), 647-661.
7. Einer H, Tengborn L, Axelsson A, Edstrom S. (1994). Sudden sensorineural hearing loss and hemostatic mechanisms. *Arch Otolaryngol Head Neck Surg*, 120, 536-40.
8. Andonopoulos AP, Naxakis S, Goumas P, Lygatsikas C. (1995). Sensorineural hearing disorders in systemic lupus erythematosus. A controlled study. *Clin Exp Rheumatol*, 13, 137-141.
9. Tyndall A, Hasler P. (1998). Important role of immune processes in sudden deafness and inner ear hearing loss [in German]. *HNO*, 46, 565-6.
10. Ruckenstein MJ, Mount RJ, Harrison RV. (1993). The MRL-lpr/lpr mouse, a potential model of autoimmune inner ear disease. *Acta Otolaryngol*, 113, 160-5.
11. Joint Committee on Infant Hearing. (2007). Year 2007 position statement, principles and guidelines for early hearing detection and intervention programs. *Pediatrics*, 20, 898-921.
12. Merchant S, Durand M, Adams J. (2008). Sudden deafness, is it viral? *ORL J Otorhinolaryngol Relat Spec*, 70, 52-62.
13. Joliat T, Seyer J, Bernstein J, et al. (1992). Antibodies against a 30 kilodalton cochlear protein and type II and IX collagens in the serum of patients with inner ear diseases. *Ann Otol Rhinol Laryngol*, 101, 1000-6.
14. Shin SO, Billings PB, Keithley EM, Harris JP. (1997). Comparison of anti-heat shock protein 70 (anti-hsp70) and anti-68-kDa inner ear protein in the sera of patients with Meniere's disease. *Laryngoscope*, 107, 222-7.
15. Suzuki M, Krug MS, Cheng KC, Yazawa Y, Bernstein J, Yoo TJ. (1997). Antibodies against inner-ear proteins in the sera of patients with inner-ear diseases. *ORL J Otorhinolaryngol Relat Spec*, 59, 10-7.
16. Hisashi K, Komune S, Taira T, Uemura T, Sadoshima S, Tsuda H. (1993). Anticardiolipin antibody-induced sudden profound sensorineural hearing loss. *Atn J Otolaryngol*, 14, 275-7.
17. Takahashi M, Sakata A, Unno T, Hokunan K, Shigyo H. (1998). Immunological abnomalities in patients with etiology unknown sensorineural hearing loss [in Japanese]. *Nippon Jibiinkoka GakkaiKaiho*, 101, 1260-5.
18. Gottschlich S, Billings PB, Keithley EM, Weisman MH, Harris JP. (1995). Assessment of serum antibodies in patients with rapid progressive sensorineural hearing loss and Meniere's disease. *Laryngoscope*, 105, l347-52.