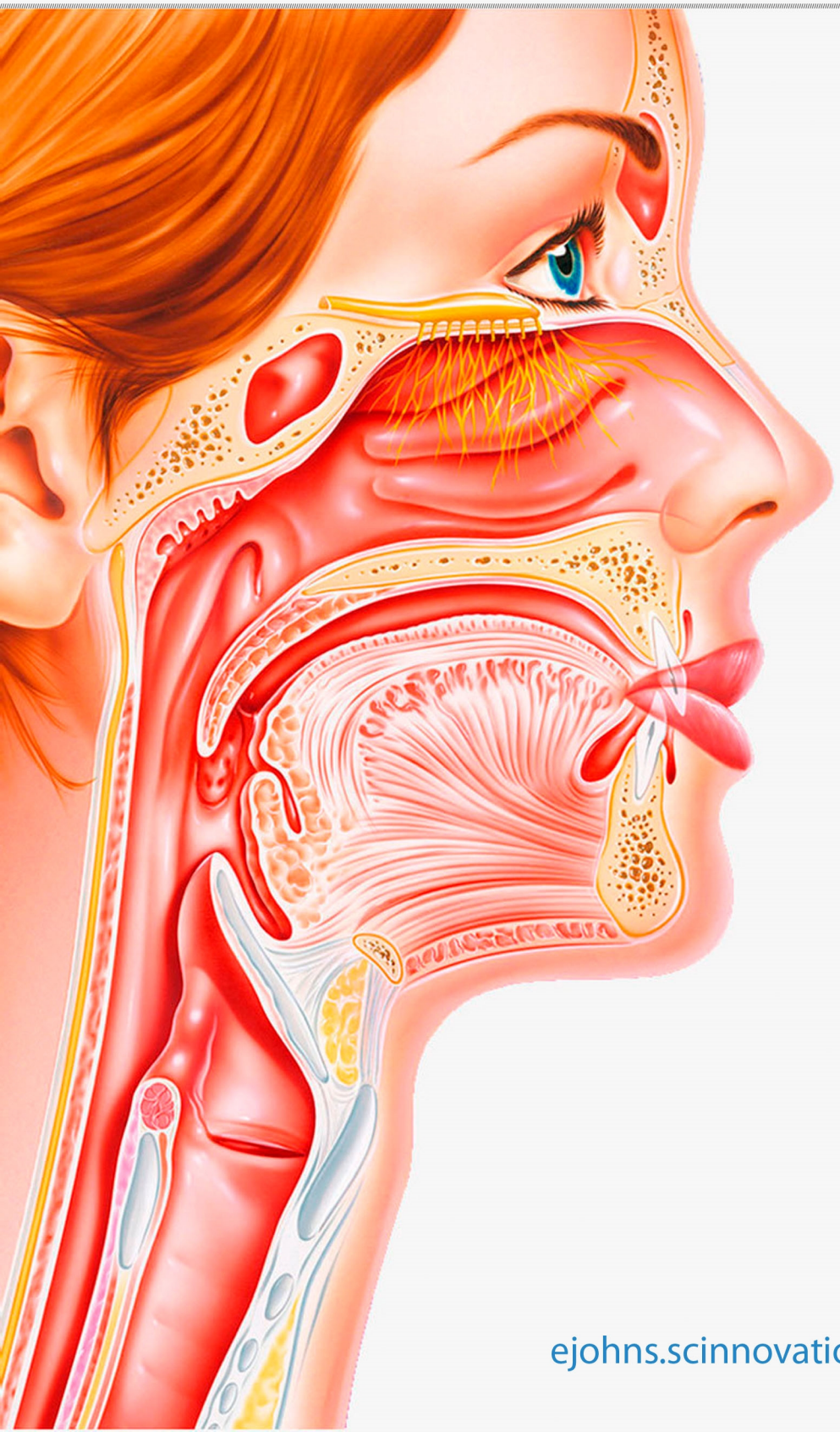
ISSN 2181-337X

EURASIAN JOURNAL OF OTORHINOLARYNGOLOGY - HEAD AND NECK SURGERY



Volume 3 • Issue 3

2024

ONLINE

ejohns.scinnovations.uz

SCIENTIFIC INNOVATIONS

https://doi.org/10.57231/j.ejohns.2024.3.3.0014

COMPARATIVE DESCRIPTION OF FREQUENCIES OF DETERMINATION OF ALLELES AND GENOTYPES OF GENE POLYMORPHISMS IN PATIENTS WITH ACUTE SENSONEURAL HEARING LOSS

Khasanov U.S.[1], Abdullaev U.P.[1]

[1] Tashkent Medical Academy

Abstract. Our data confirm the complexity of the genetic mechanism of the development of ASNHL in patients with acute sensorineural hearing loss of vascular genesis and demonstrate the need and importance of understanding the complex interaction of genes in analyzing the development and clinical stage of the pathology under study. By analyzing the distribution of genotypic variants of this polymorphism, we determined that the C-634G rs2010963 polymorphism in the VEGF-A gene is associated with the development of ASNHL of the G/G monogenotype. In group 1 of patients with vascular ASNHL, a tendency for an increase in the frequency of the minor genotype of the C-634G rs2010963 polymorphism in the VEGF-A gene (χ2=4.6; P=0.30; RR=2.15; OR=1.1; 95%CI: 2.174-6.69) was observed in comparison with the control group. In this case, the indicators of patients in group 1 were separated and compared with the control group, and the OR and RR indicators increased, and the level of reliability in the G/G genotypes increased significantly (χ2 =0.39; P=0.29; RR=2.35; OR=2.4; 95% CI: 37.929- 36.50).

Keywords: gene polymorphism, sensorineural hearing loss, audiometry.

For citation:
Khasanov U.S., Abdullaev U.P. Omparative description of frequencies of determination of alleles and genotypes of gene polymorphisms in patients with acute sensoneural hearing loss. ***Eurasian Journal of Otorhinolaryngology - Head and Neck Surgery.*** 2024;3(3):74–79. https://doi.org/10.57231/j.ejohns.2024.3.3.0014

O'TKIR SENSONEVRAL ESHITISH ZAIFLIGI BO'LGAN BEMORLARDA ALLELLAR VA GEN POLIMORFIZMLARINING GENOTIPLARINI ANIQLASH CHASTOTLARINING QIYOSIY TA'RIFI

Xasanov U.S.[1], Abdullayev U.P.[1]

[1] Toshkent tibbiyot akademiyasi

Annotatsiya. Bizning ma'lumotlarimiz qon tomir genezisning o'tkir sensorinöral eshitish qobiliyatini yo'qotgan bemorlarda O'SNEZ rivojlanishining genetik mexanizmining murakkabligini tasdiqlaydi va o'rganilayotgan patologiyaning rivojlanishi va klinik bosqichini tahlil qilishda genlarning murakkab o'zaro ta'sirini tushunish zarurati va ahamiyatini ko'rsatadi. Ushbu polimorfizmning genotipik variantlarining tarqalishini tahlil qilib, VEGF-A genidagi C-634G rs2010963 polimorfizmi G/G monogenotipining O'SNEZ rivojlanishi bilan bog'liqligini aniqladik. Qon tomir O'SNEZ bilan og'rigan bemorlarning 1-guruhida VEGF-A genida C-634G rs2010963 polimorfizmining kichik genotipining chastotasini oshirish tendentsiyasi mavjud (ch2 = 4,6; P = 0,30; RR = 2,15; OR = 1,1). 95% CI: 2.174-6.69) nazorat guruhi bilan solishtirganda kuzatildi. Bunday holda, 1-guruhdagi bemorlarning ko'rsatkichlari ajratilib, nazorat guruhi bilan taqqoslandi va OR va RR ko'rsatkichlari ortdi va G/G genotiplarida ishonchlilik darajasi sezilarli darajada oshdi (ch2 =0,39; P=0,29; RR=2,35; OR=2,4; 95% CI: 37,929-36,50).

Kalit so'zlar: gen polimorfizmi, sensonevral eshitish pasayishi, audiometriya.

Iqtiboslik uchun:
Xasanov U.S., Abdullayev U.P. O'tkir sensonevral eshitish zaifligi bo'lgan bemorlarda allellar va gen polimorfizmlarining genotiplarini aniqlash chastotlarining qiyosiy ta'rifi. ***Eurasian Journal of Otorhinolaryngology - Head and Neck Surgery.*** 2024;3(3):74–79. https://doi.org/10.57231/j.ejohns.2024.3.3.0014

INTRODUCTION

The problem of acute sensorineural hearing loss is of both medical and social importance, as it is a widespread disease that leads to disability among young people and people of working age. Current statistics show a steady increase in cases of acute sensorineural hearing loss worldwide [2]. Information on how to apply for medical care according to the frequency of acute sensorineural hearing loss It varies depending on the age of the patients and hearing 0.8% of the total number of patients with pathology does [5].

Acute sensorineural hearing loss is caused by many factors. There are about a hundred of them [1-4]. Currently, infectious diseases (influenza, infectious parotitis, typhoid fever, wounds), sound and mechanical injuries, vascular diseases (hypertension, neurocirculatory dystonia, atherosclerosis, industrial substances and a number of drugs (antibiotics - aminoglycosides, ethacrine acid, furosemide) proved the role of etiological factors such as ototoxic effect [6].

Acute sensorineural hearing loss requires urgent treatment, which is sometimes only etiological, and often empirical, polypragmatic, and carried out without sufficient scientific and theoretical foundations [10]. First, this search for pathogenetic therapy is due to the fact that it is carried out in relation to diseases with different etiological and clinical manifestations. In this regard, there is a need to more clearly and reasonably distinguish individual forms of acute sensorineural hearing loss as an independent nosological unit based on etiological, anamnestic, clinical - audiological, immuno-allergological and other characteristics. Developing a classification based on clear clinical and etiopathogenetic approaches is important in solving the problem of sensorineural hearing loss. Therefore, further investigation of etiopathogenesis and comprehensive treatment of ASNHL seems to be an area that has not yet been fully explored [7].

Studying the factors (triggers) that trigger the development of pathological processes in the sound-receiving part of the auditory analyzer, as well as concomitant diseases (predictors) that affect the frequency of ASNHL development with similar pathogenetic mechanisms, is of great importance for a more rational approach to early diagnosis, as well as ensuring the effectiveness of treatment and pnjreventive measures [8]. However, the importance and scope of research on the possibilities of early diagnosis of hearing function disorders and elimination of disorders in the auditory analyzer at the stage of socially adapted forms is associated not only with general medical aspects, but also with interest in the aspects of communicative socialization of patients with ASNHL from a general medical point of view [9]. The development of permanent hearing loss is known to lead to disability for patients and corresponding economic costs for the state.

The above allows not only to determine the nature of damage to the auditory analyzer, but also to determine the cause of certain disorders of hearing function, the mechanism of their development, as well as to develop pathogenetic therapy for acute sensorineural hearing loss. All of the above has predetermined the goals and objectives of this study.

RESULTS

A study of the frequencies of alleles and genotypes of the C-634G rs2010963 polymorphism in the VEGF-A gene (Figure 1) showed that there were differences in their distribution between groups 1-2 and the control group (Table 1).

During the study, it was possible to determine that the G allele was detected 9.3 times more frequently in group 1, 3.2 times more frequently in group 2, and 3.5 times more frequently in the control group. Compared with the C/G and G/G genotypes, the C/C genotype was detected 4.16 times more frequently in group 1, 1.84 times more frequently in group 2, and 5.53 times more frequently in the population.

The results of a comparative analysis of the frequencies of alleles and genotypes of the C-634G rs2010963 polymorphism in the VEGF-A gene in the 1st and control groups are presented in Table 2.

The frequency of the C allele of the C-634G rs2010963 polymorphism in the VEGF-A gene is statistically insignificant, being 1.19 times higher among conditionally healthy people ($\chi2$=9.3; p=0.002; RR=0.83; OR=0.31; 95%CI: 1.675-0.65), and the G allele is 2.6 times higher in patients with ASNHL in group 2 ($\chi2$=9.37; p=0.002; RR=1.19; OR=3.18; 95%CI: 2.77-6.69). The C/C genotype was detected 1.39 times more often in the population group than in patients in group 1, which was a statistically insignificant difference ($\chi2$=7.6; p=0.006; RR=0.71; OR=0.29; 95% CI: 1.79-0.69). The frequency of detection of the C/G genotype was statistically slightly higher, 1.9 times higher among patients in group 2 than in healthy controls ($\chi2$=4.69; p=0.03; RR=2.15; OR=2.71; 95%CI: 5.57-6.69). Comparative analysis of the occurrence of the G/G genotype showed an increased frequency of its detection among patients with ASNHL compared to the population group (Fig. 4), its value was 7.5% and 1.37%, respectively, and among patients in the 2

Table 1

Prevalence of alleles and genotypes of the C-634G rs2010963 polymorphism in the VEGF-A gene in groups of patients with ASNHL

№	Group	Allele frequency				Distribution frequency of genotypes					
		C		G		C\C		C\G		G\G	
		n	%	n	%	n	%	n	%	N	%
1	ASNHL with vascular genesis n=40	61	76.25	19	23.75	24	60	13	32.5	3	7.5
2	ASNHL with infection genesis n=31	56	90.32	6	9.67	25	80.64	6	19.35	0	0
3	Control group n=23	41	89,13	5	10,87	39	84,78	6	13,04	1	2,17

Table 2

Differences in the frequency of allele and genotype variants of the C-634G rs2010963 polymorphism in the VEGF-A gene in patients with ASNHL of vascular origin and in healthy controls

Alleles and genotypes	Quantity of tested alleles and genotypes				Xi2	p	RR	+ 95%CI	OR	+95%CI
	ASNHL with vascular genesis n=40		Control n=23							
	n	%	n	%						
C	61	76,25	42	91,3	9,372	0,002	0,837	1,675	0,314	0,659
G	19	23,75	4	8,69	9,372	0,002	1,195	2,773	3,187	6,694
C/C	24	60	39	84,78	7,697	0,006	0,718	1,792	0,295	0,699
C/G	13	32,5	8	17,39	4,694	0,030	2,157	5,572	2,714	6,697
G/G	3	7,5	1	2,17	2,844	0,092	5,475	18,579	5,838	45,379

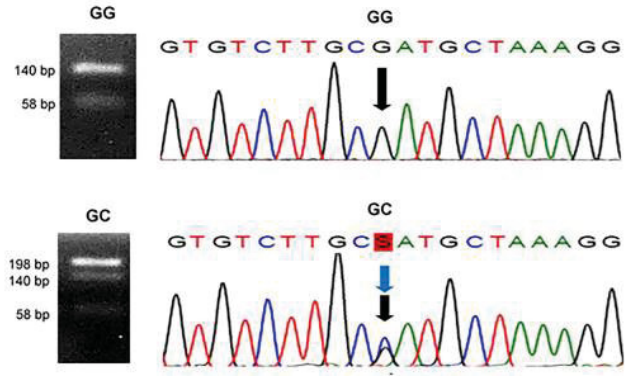


Figure 1. Allele and genotype distribution diagram of the C-634G rs2010963 polymorphism in the VEGF-A gene

groups, its occurrence was 1.39 times higher than in conditionally healthy people (χ2=1.37; p=0.09; RR=5.4; OR= 5.3; 95% CI: 18.57- 45.37).

Table 3 presents the results of a comparative analysis of the frequency of alleles and genotypes of the C-634G rs2010963 polymorphism in the VEGF-A gene in group 2 and the control group.

In group 2 patients and healthy controls,

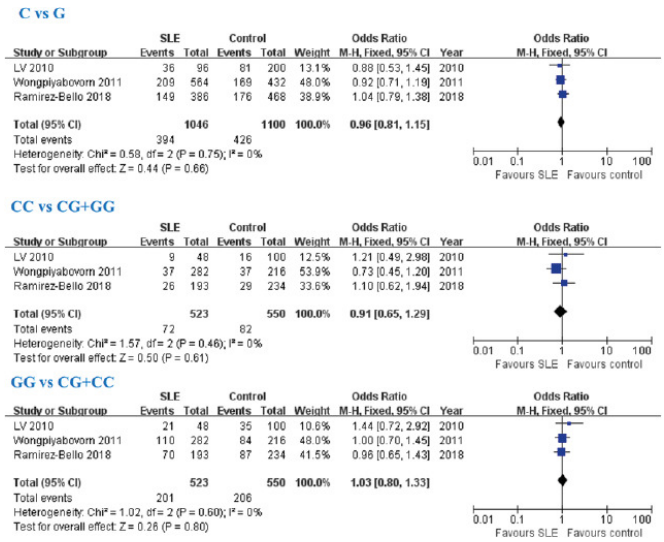


Figure 4. Comparative analysis of the incidence of G/G genotype in patients with vascular idiopathic urticaria

the C and G alleles were found at almost the same frequency. Among healthy controls, the C genotype was slightly more frequent (χ2=0.03; p=0.86; RR=0.99; OR=0.91; 95% CI: 3.891-2.52).

Table 3

Differences in the frequency of alleles and genotypic variants of the C-634G rs2010963 polymorphism in the VEGF-A gene in patients with ASNHL of infectious genesis and conditionally healthy people

Alleles and genotypes	Quantity of tested alleles and genotypes				Xi2	p	RR	+ 95%CI	OR	+95%CI
	ASNHL is of infectious genesis n=31		Control n=23							
	n	%	n	%						
C	56	90,32	42	91,3	0,031	0,860	0,992	3,891	0,912	2,528
G	6	9,68	4	8,69	0,031	0,860	1,009	1,886	1,096	3,023
C/C	25	80,65	39	84,78	0,129	0,719	0,965	4,051	0,820	2,419
C/G	6	19,35	8	17,39	0,292	0,589	1,284	5,303	1,353	4,048

Table 4

Differences in the frequency of allelic and genotypic variants of the C-634G rs2010963 polymorphism in the VEGF-A gene between patients in groups 1 and 2

Alleles and genotypes	Quantity of tested alleles and genotypes				X2	p	RR	+ 95%CI	OR	+95%CI
	Group 1 n=40		Group 2 n=31							
	n	%	n	%						
C	61	76,25	56	90,32	4,769	0,029	1,185	4,885	2,907	7,576
G	19	23,75	6	9,68	4,769	0,029	0,844	1,462	0,344	0,896
C/C	24	60	25	80,65	3,481	0,062	1,344	5,680	2,778	8,126
C/G	13	32,5	6	19,35	1,540	0,215	0,596	2,442	0,498	1,498
G/G	61	76,25	56	90,32	4,769	0,029	1,185	4,885	2,907	7,576

Compared to the control group, the frequency of the G genotype in the group of patients with ASNHL of infectious genesis was significantly, but not statistically significantly, increased by 1.08 times ($\chi2$=0.3; p=0.86; RR=1.0; OR=1.09; 95% CI: 1.88-3.02). The frequency of detection of the C/C genotype of the C-634G rs2010963 polymorphism in the VEGF-A gene in the control group was significantly higher, 1.03 times, compared to group 2 ($\chi2$=0.12; p=0.719; RR=0.96; OR=0.82; 95% CI: 4.05-2.41). The frequency of the C/G genotype among patients with ASNHL of infectious genesis was 1.28 times higher than in the control group of conditionally healthy people, i.e. 19.35 and 15.07%, respectively ($\chi2$=0.29; p=0.589; RR=1.28; OR=1.35; 95% CI: 5.303-4.04) (Table 3).

Table 4 below presents the results of a comparative analysis of the frequencies of alleles and genotypes of the C-634G rs2010963 polymorphic locus in the VEGF-A gene among patients in groups 1 and 2.

The frequency of the C allele was statistically almost 1.18 times higher in group 1 patients ($\chi2$=4.7; p=0.02; RR=4.88; OR=2.90; 95% CI: 4.88-7.57), while the G allele was detected unreliable frequently among group 2 patients ($\chi2$=4.6; p=0.02; RR=0.84; OR=0.34; 95% CI: 1.462-0.89). The frequency of detection of the C/C genotype was statistically insignificant, i.e., it was 1.34 times higher in patients in group 1 than in patients in group 2 ($\chi2$=3.4; p=0.06; RR=1.34; OR=2.77; 95% CI: 5.680-8.12). The frequency of detection of the C/G genotype was 1.7 times higher in group 1 patients and amounted to 19.35% and 32.5% ($\chi2$=1.54; p=0.215; RR=0.59; OR=0.49; 95% CI: 2.44-1.49). The differences in the frequency of detection of the G/G genotype in groups 1 and 2 were statistically significant, with the value of this indicator in group 1 patients being 1.18 times higher than in group 2 patients ($\chi2$=4.7; p=0.02; RR=1.18; OR=2.9; 95% CI: 4.88-7.57).

CONCLUSION

Thus, the C-negative allele of the C-634G rs2010963 polymorphism in the VEGF-A gene is more common in group 1 patients than in healthy individuals and group 2 patients. The high frequency of this allele was observed with a predominance of the homozygous C/G variant (1.28 times). At the same time, the difference between patients in groups 1 and 2 and the control group was noted at the trend level, and the trend was at the level of statistical significance. These data allow us to conclude that the G/G genotype of the C-634G rs2010963 polymorphism in the VEGF-A gene has a predisposing effect on the development and clinical course of the vascular type of ASNHL. This polymorphism is located in the promoter region of the gene and is a functional polymorphism. The presence of the C allele in group 1 patients is associated with increased expression of the VEGF-A gene in the presence of the G/G genotype, which leads to the development and progression of a more severe form of vascular ASNHL.

CONFLICT OF INTERESTS

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

SOURCES OF FUNDING

The authors state that there is no external funding for the study.

AVAILABILITY OF DATA AND MATERIALS

All data generated or analysed during this study are included in this published article.

AUTHORS' CONTRIBUTIONS

All authors contributed to the design and interpretation of the study and to further drafts. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

CONSENT FOR PUBLICATION

Not applicable.

PUBLISHER'S NOTE

Journal of *"Eurasian Journal of Otorhinolaryngology - Head and Neck Surgery"* remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Article received on 20.09.2024
Accepted for publication on 25.09.2024

КОНФЛИКТ ИНТЕРЕСОВ

Авторы заявляют, что данная работа, её тема, предмет и содержание не затрагивают конкурирующих интересов.

ИСТОЧНИКИ ФИНАНСИРОВАНИЯ

Авторы заявляют об отсутствии финансирования при проведении исследования.

ДОСТУПНОСТЬ ДАННЫХ И МАТЕРИАЛОВ

Все данные, полученные или проанализированные в ходе этого исследования, включены в настоящую опубликованную статью.

ВКЛАД ОТДЕЛЬНЫХ АВТОРОВ

Все авторы внесли свой вклад в подготовку исследования и толкование его результатов, а также в подготовку последующих редакций. Все авторы прочитали и одобрили итоговый вариант рукописи.

ЭТИЧЕСКОЕ ОДОБРЕНИЕ И СОГЛАСИЕ НА УЧАСТИЕ

Были соблюдены все применимые международные, национальные и/или институциональные руководящие принципы по уходу за животными и их использованию.

СОГЛАСИЕ НА ПУБЛИКАЦИЮ

Не применимо.

ПРИМЕЧАНИЕ ИЗДАТЕЛЯ

Журнал *"Евразийский журнал оториноларингологии - хирургии головы и шеи"* сохраняет нейтралитет в отношении юрисдикционных претензий по опубликованным картам и указаниям институциональной принадлежности.

Статья получена 20.09.2024 г.
Принята к публикации 25.09.2024 г.

ЛИТЕРАТУРА / REFERENCES

1. Cadoni G. et al. A case-control study on proinflammatory genetic Polymorphisms on sudden sensorineural hearing loss //The Laryngoscope. – 2015. – Т. 125. – №. 1. – С. E28-E32.
2. Cao Z. et al. Genetic polymorphisms and susceptibility to sudden sensorineural hearing loss: a systematic review // Audiology and Neurotology. – 2019. – Т. 24. – №. 1. – С. 8-19.
3. Chien C. Y. et al. Heat shock protein 70 gene polymorphisms in sudden sensorineural hearing loss //Audiology and Neurotology. – 2012. – Т. 17. – №. 6. – С. 381-385.
4. Corazzi V. et al. Genetic polymorphisms in sudden sensorineural hearing loss: an update //Ear, Nose & Throat Journal. – 2021. – Т. 100. – №. 3_suppl. – С. 337S-342S.
5. Hiramatsu M. et al. Polymorphisms in genes involved in inflammatory pathways in patients with sudden sensorineural hearing loss //Journal of Neurogenetics. – 2012. – Т. 26. – №. 3-4. – С. 387-396.
6. Kasztelewicz B. et al. Cytokine gene polymorphism associations with congenital cytomegalovirus infection and sensorineural hearing loss //European Journal of Clinical Microbiology & Infectious Diseases. – 2017. – Т. 36. – №. 10. – С. 1811-1818.
7. Kitoh R. et al. SOD1 gene polymorphisms in sudden sensorineural hearing loss //Acta Oto-Laryngologica. – 2016. – Т. 136. – №. 5. – С. 465-469.
8. Teranishi M. et al. Polymorphisms in genes involved in oxidative stress response in patients with sudden sensorineural hearing loss and Meniere's disease in a Japanese population //DNA and cell biology. – 2012. – Т. 31. – №. 10. – С. 1555-1562.
9. Teranishi M. et al. Polymorphisms in genes involved in the free-radical process in patients with sudden sensorineural hearing loss and Meniere's disease //Free radical research. – 2013. – Т. 47. – №. 6-7. – С. 498-506.
10. Uchida Y. et al. Endothelin-1 gene polymorphism in sudden sensorineural hearing loss //The Laryngoscope. – 2013. – Т. 123. – №. 11. – С. E59-E65.