Short Communication

Usage of Ginkgo in Treatment of Deafness

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Abstract

Background: Sudden deafness is an unexplained, abrupt loss of hearing that occurs either all at once or over a few days. Within the preparation of determination and treatment, it can be isolated into low-frequency, high-frequency slipped sort, flat PTA sort, and deafness sort. **Objectives:** This work explores the efficacy of Ginkgo biloba extract combined with hormones in treatment of sudden deafness and its action and changing of PTA hearing enhancement in feeling the fullness of the ear and vertigo and tinnitus. **Materials and Methods:** In this work, 56 patients with sudden deafness who were treated in The General Hospital of Al-Musayyib from August 2019 to August 2022 were selected. These patients were randomly divided into a hormone group (treatment with prednisone acetate, n =27) and a combination group (treatment with Ginkgo- combined with prednisone acetate, n =29). After the two groups of patients were treated in different ways, their efficacy, symptom improvement, and changes in (pure tone audiometry) PTA were compared. **Results:** The total effective rates (TERs) of the hormone group and the combination group were 76.32% and 95.73%, respectively (P <0:05). PTA improvements of the patients in the combination group were higher than those in the hormone group after 5 d, 7 d, and 14 d of treatment (P <0:05). The high PTA improvement values of patients in the combination group at 5 d, 7 d, and 14 d after treatment were greatly higher than those in the hormone group (P <0:05). There was no visible difference in the incidence of adverse reactions between the two groups of patients after treatment (P >0:05). **Conclusion:** the combined application of Ginkgo biloba extract and hormones could effectively improve the abnormal hearing indexes of patients with sudden deafness and effectively relieve the imbalance and hearing.

Keyword: Sudden deafness, Ginkgo biloba, PTA

Introduction

Sudden deafness, moreover known as idiopathic deafness, alludes to the sudden onset of unexplained sensorineural hearing misfortune inside 72 hours [1,2]. Within the prepare of determination and treatment, it can be isolated into low-frequency and, high-frequency slipped sort, flat PTA sort, and add up to deafness sort. Different sorts of patients have different hearing misfortune and convalescence conditions [2,3]. Among them the recovery rate of patients with minor prolapse after treatment can reach 75% and the results are good. This type of hearing loss responds well to treatment and patients often experience a significant improvement in their hearing ability. With appropriate intervention and treatment these patients have a good chance of regaining most of their hearing functions. This positive result is encouraging for both patients and healthcare providers as it demonstrates the importance of current treatment for this type of hearing loss. On

the other hand, the recovery rate of patients with hearing loss is below 20% resulting in poor outcomes and a high risk of recurrence of the disease. All deafness poses a serious problem in terms of treatment and management because in these cases there is little opportunity to restore hearing. This can lead to slow recovery and poor communication in patients with hearing loss. Additionally, the high risk of relapse in these cases further complicates the treatment plan and highlights the need for a more comprehensive strategy for patients with severe hearing loss [4]. At display, the inquire about on the etiology and pathogenesis of sudden deafness has not however come to a clear conclusion, and it is by and large accepted that it contains a certain relationship with the blood supply clutter of the inward ear and the membranous maze [5].

Considers have found that sudden deafness can be caused by viral or bacterial infections, or by certain deterrents within the human circulatory system [6,7]. In expansion, it may be caused by resistant framework issues, a few remote pathogens attack the body, causing the bodies adjust to be disturbed and coming about within the event of sudden deafness [7, 8]. Some patients may experience symptoms such as cold before sudden deafness when the virus enters the inner ear, causing infection and inflammation, which can lead to hearing loss [9,10]. Things like high stress, mood swings, daily activities and lack of sleep can trigger sudden deafness. The development of the disease is fast, in general the effectiveness of the treatment is low, and the effectiveness depends to a large extent on the development time, so it is recommended to diagnose and treat in 1 week from onset [11]. Medicines are often used to treat severe deafness, including glucocorticoids (methyl-prednisolone or dexamethasone, etc.), Ginkgo biloba extracts, neuroleptics, and antioxidants, as well as those that reduce fibrinogen (reducing fibrinogen enhanced circulation in the ear in) [12]. Glucocorticoids are more appropriate for patients with different sorts of sudden deafness, applying anti-inflammatory and antitumor effects, whereas Ginkgo biloba extraction is appropriate for moving forward blood circulation within the inward ear and diminishing blood component density [13]. Researcher have found that Ginkgo biloba extract has free radical rummaging effects, controlling effects on the circulatory framework, and progressing hemodynamics and tissue security. Hence, it plays a key part within the treatment of sudden deafness [11]. In more expansion, hyperbaric oxygen can be utilized as a protect treatment for patients who have no self-evident effect on usual treatment [14]. However, long-term use of glucocorticoids will create changes in sugar and fat levels in the body, causing problems such as hyperglycemia and hyperlipidemia. Hence it is important to strictly follow the doctor's treatment instructions [15]. Moreover, patients with fundamental maladies such as diabetes and hypertension require cyclic checking and select a sensible and secure medication procedure take in consideration medical ethics and Autonomy following doctor's orders/recommendations [16]. For the time being, a huge number of thinks about have found that both glucocorticoids and Ginkgo biloba extricates have self-evident healing effects on sudden deafness, but few considers have combined the two drugs, and the security and efficacy of the combined utilize are still hazy. A few thinks that suggest a correlation between immune status and the incidence of sudden deafness [17]. However, if it is possible to predict the effectiveness of hormones associated with Ginkgo biloba extract in the treatment of patients with sudden hearing loss and to determine the relationship between the

two can be decided by identifying the level of PTA enhancement in patients' recording. In this manner, this work chosen patients with sudden occurrence.

Materials and Methods

Investigated Objects and Their Gathering design. 56 patients with sudden deafness (sudden deafness of 72 hours only), un-explained sensorineural hearing misfortune, and hearing misfortune in at slightest two adjoining frequencies ≥20 dBHL) in at least two consecutive visits) to Al-musayyib General hospital from 2019 to 2022 as the inquire about objects. Among them, there were 27 male patients and 29 female patients, matured 20 to 85 years old a long time ancient, with an average age of Average age is: 34.97 years old. ± 13.71

Patients were randomized into who take a hormone only (treated with prednisone acetic acid derivation, n =27) and a combination gather (treated with Ginkgo- Damole combined with prednisone acetic acid derivation, n =29). The PTA test was done to Patients included had to fulfill the criteria to participate:

1. The introductory visit time was 1 to 14 days after the onset of the disease;
2. The age was 18 to 80 years;
3. The patients with Optimal blood pressure, liver and kidney work, blood sugar, blood lipids, and typical blood schedule; and,
4. Patients who were willing to effectively participate with treatment.

By excluding patients who did not meet the criteria the researchers were able to reduce bias and ensure that their findings were based on a representative sample. This following was required to be omitted.

(1) It is a heartbreaking situation for those who are unable to receive the care they desperately need as they are left to suffer the consequences of an unhealthy inability to endure hormone treatment. (2) Pregnant or breast- nourishing ladies or unfavorably susceptible to treatment drugs; (3) Cognitive disability and incapable to total the hearing test; (4) unfavorably susceptible rhinitis and immune system maladies; and (5) Hepatitis B and hepatitis C infection carriers and those with a history of safe maladies. Investigate Strategies. Research methods. The included patients were divided into the hormone group and the combination group. Patients in the hormone group were treated with prednisone acetate. After morning, the patient should take 60 mg of prednisone acetate Pharmaceutical, 5 mg/tablet) orally once a day. After 3 days of administration, the dose of the drug will be reduced, 30 mg / time and prednisone acetate to 1 time / day. After 4th days of organization, it ought to diminish the drug dose, with prednisone acetic acid derivation 30 mg/time and 1 time/day. Patients in the Ginkgo-composite were treated with prednisone acetate. 60 mg 5 mg/tablet orally, once a day after waking up in the morning. In combination therapy with prednisone acetate, patients should take prednisone acetate 60 mg 5 mg/tablet orally, once a day after waking up in the morning. After 3 days, the dose should be adjusted to 30 mg once a day. Both groups were treated continuously with for 7 days as a treatment and the effect of the treatment. The two bunches were treated ceaselessly for 14 days as a course of treatment, and the hearing PTA effect was watched.

Assessment Guidelines. Side effects made strides:

Evaluation criteria Symptoms improved: After the two groups of patients were treated differently, the symptoms of the syndrome (ear fullness, tinnitus, and dizziness) disappeared. The presence of the three symptoms was scored as 0 (no symptoms), 2 points (mild ear fullness, tinnitus, and tinnitus), 4 points (moderate ear fullness, tinnitus, and ringing), and 6 points (severe ear fullness, ringing, and ringing), in

addition. It can calculate the degree of improvement of the patient's symptoms. The calculation method was:

I = Score A1 - Score A2

I showed signs of improvement in the equation above; Score A1 refers to the syndrome score before treatment; and Score A2 indicates the post-treatment syndrome score. Treatments were rated as safe, effective and free of side effects.

Recovery: tinnitus and dizziness disappeared completely and hearing returned to normal; **Visible:** tinnitus and dizziness disappeared and hearing increased by more than 30 dB; Effective: tinnitus and dizziness are reduced and hearing is increased by 15-30 dB; and ineffective: tinnitus and dizziness remained unchanged and hearing increased by less or more than 10 dB.

Changes in PTA markers and other parameters represent the function improvement should be monitored and recorded before treatment and 3 days, 5 days, 7 days and 10 days and 14 days after treatment.

Statistical analysis

Data processing in this work was performed using SPSS 25.0. Measurement data were expressed as the mean ± standard deviation (x ± s), the comparison within the group before and after treatment was performed by the Paired t -test, and the comparison between the two groups was performed by the independent t -test. The enumeration data were expressed as percentage (%), and the pairwise comparison was made by variance analysis. To evaluate the correlation of PTA with the sudden deafness and its impact on the recovery of prognosis and the correlation was expressed by OR value (95% CI). The difference was statistically significant at P <0:05.

Ethical Approval

The agreements of all subjects' intended in this study obtained before taking the study specimens. Furthermore, the study design was approved by the research Ethical committee at College of Health and Medical Techniques, Al-Mustaqbal University.

Results

Basic Data of Patients

All patients included were divided into two groups and then treated with hormones (prednisone acetate) and Ginkgo-composite with prednisone acetate.

In order to analyze the curative effect of the two groups of patients after treatment in different ways, the basic information such as age and gender of the patients were first compared, and the results are shown in Table 1.

Table 1: Basic data of Patients

Item	Type	Proportion (%)	
		Hormone group (n=27)	Combination group (n= 29)
Gender	Males	11 (19.64%)	13(23.21%)
	Females	16 (28.57%)	15(26.78%)
Age (years olds)		33.68±0.98	35.08±12.24
Disease course (h)		8.09±2.55	8.21±1.08

It can be seen that the proportion of female patients in the hormone group and the combination group was 28.57% and 26.78%, respectively, and there was no visible difference (P >0:05). The mean age and disease course of patients between the hormone group and the combination group showed no obvious difference (P >0:05). In addition, the proportions of patients with different degrees of deafness, different tinnitus conditions, and symptoms in the two groups were compared, and the results are shown in Figure 2, 3 and 4.

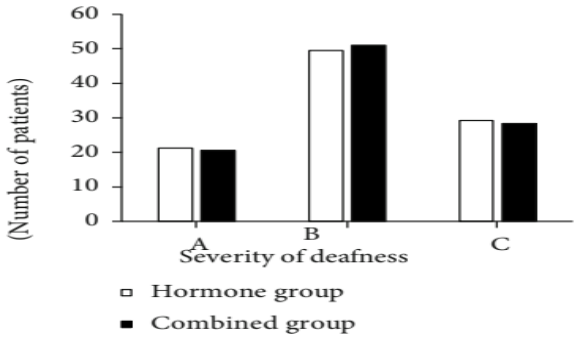

Figure 2: The degree of deafness of the two groups of patients, where (A)–(C) represented moderate deafness, severe deafness, and total deafness, respectively.

The proportions of patients with moderate deafness, severe deafness, and total deafness in the hormone group were 21.14%, 50.06%, and 29.76%, respectively; while those in the combination group were 20.42%, 51.15%, and 28.93%, respectively.

The proportions of patients with low- key tinnitus, high-profile tinnitus, and no tinnitus in the hormone group were 27.85%, 48.02%, and 24.65%, respectively; while those in the combination group were 28.06%, 49.08%, and 22.86%, respectively.

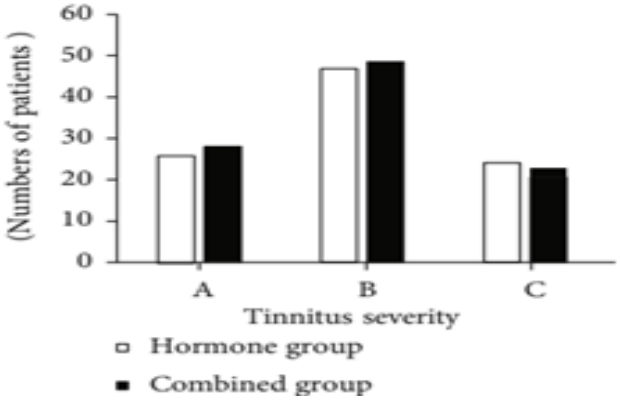

Figure 3: showed the patient's tinnitus status, where (A)–(C) represented low-key tinnitus, high-key tinnitus, and no tinnitus, respectively

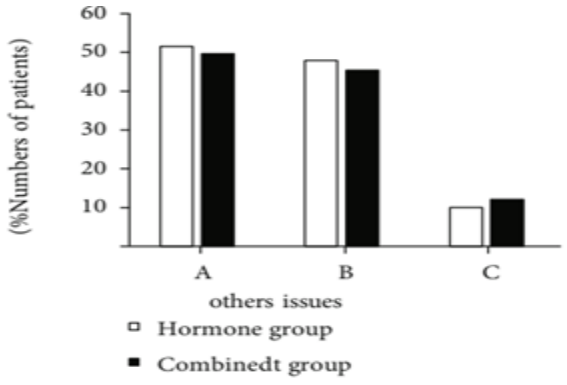

Figure 4: represented other symptoms of the patient, where (A)–(C) represented ear fullness, facial discomfort, and dizziness, respectively.

The proportion of patients with ear fullness symptoms in the two groups were 52.13% and 49.27%, respectively; the proportions of patients with facial discomfort symptoms were 49.45% and 47.32%, respectively; and the proportions of patients with vertigo symptoms were 9.94% and 11.96%, respectively. The proportion of patients with different degrees of deafness, tinnitus, and accompanying symptoms showed no visible difference between two groups (P >0:05).

Patient Efficacy and Symptom Improvement.

The improvement of ear fullness, tinnitus, and dizziness was evaluated in the two groups of patients after treatment in different ways.

The curative effect of patients was judged by four grades as cured, markedly effective, effective, and ineffective, and TER was calculated. The results are shown in Figure 5. In the hormone group, the patients post therapeutics effect as cured, markedly effective, effective, and ineffective were 6 cases, 8 cases, 2 cases, and 4 cases, respectively. In the combination group, 12, 13, 9, and 2 patients were cured, markedly effective, effective, and ineffective, respectively.

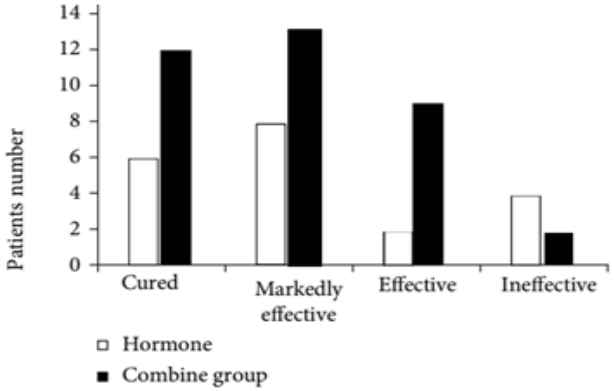

Figure 5: Curative effect and symptom improvement. Note: (a) showed the comparison of the two groups of patients whose curative effects were, respectively, cured, markedly effective, effective, and ineffective.

The number of cured and markedly effective patients was significantly higher in the combination group. The TER of the hormone group and the combination group were shown in

figure 6; 85.18% and 93.1%, respectively, showing statistically great difference (P <0:05).

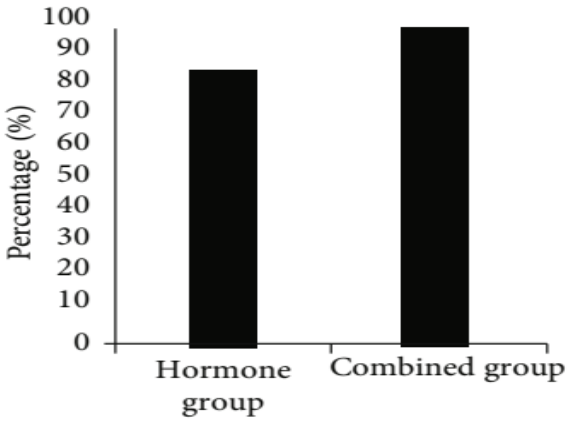

Figure 6 : showed the TER.

The improvement degrees of ear fullness, tinnitus, and dizziness in the hormone group patients were 1.6, 2.05, and 2.20, respectively; while those in the combination group were 2.63, 2.85, and 2.99, respectively, showing great difference statistically (P <0:05).

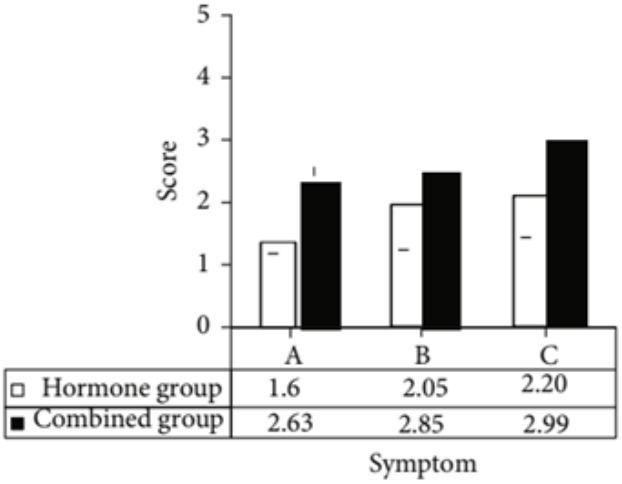

Figure 7: showed the degree of improvement of the patient's symptoms, where (A)–(C) indicated PTA improvement, less tinnitus, and dizziness, respectively; ∗ indicated P <0:05 compared with the hormone group.

Changes in PTA Indexes of Patients.

The two groups of patients were treated in different ways, and the changes of hearing indexes were monitored and recorded before treatment and after 3 d, 5 d, 7 d, 10 d and 14 d after treatment. The differences between the two groups at different times were compared; the results are shown in Figure 7. Figure 7(a) showed the changes of PTA. With the prolongation of treatment time, the hearing indexes content of the two groups of patients gradually increased , the combination group shows the improvements more obviously.

The Incidence of Adverse Reactions.

Figure 8; reveales the occurrence of adverse reactions (nausea, dizziness, skin allergy, and other adverse reactions) in the hormone group and the combination group patients after prednisone acetate and Ginkgo-composite combined with prednisone acetate treatment, respectively. The proportions of patients with nausea, dizziness, skin allergy, and other adverse reactions in the hormone group were 8.21%, 11.37%, 5.34%, and 6.01%, respectively; while those in the combination group were 8.33%, 10.66%, 5.15% and 6.24%, respectively (P >0:05).

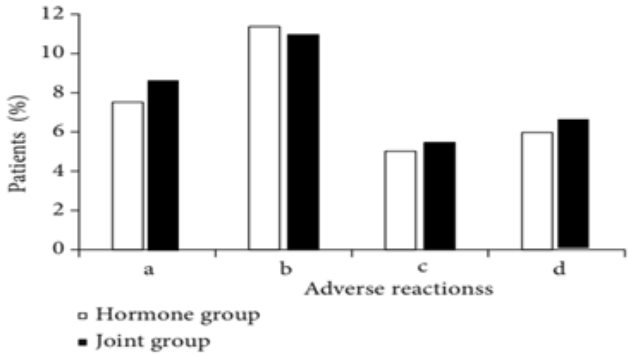

Figure 8: The incidence of adverse reactions. Note: (a)–(d) represented nausea, dizziness, skin allergy, and other adverse reactions, respectively.

Discussion

Sudden deafness is a sudden onset of sensorineural hearing loss manifested as unilateral hearing loss, which can be accompanied by tinnitus, ear blockage, dizziness,

nausea, and vomiting. It usually occurs suddenly within 72 hours, and the hearing loss of two adjacent frequencies can be found to be greater than or equal to 20 dBHL during pure tone audiometry [18]. The causes of sudden deafness are more complicated and may be related to factors such as inner ear blood supply disorder and viral infection [19]. At present, the widely recognized virus infection theory, circu- latory disorder theory, autoimmunity theory, and membrane labyrinth rupture theory are the main ones. The disease is more common in people with high blood pressure, arterio- sclerosis, hypothyroidism, and low blood pressure [20]. According to the frequency and degree of hearing loss, it can be divided into: high-frequency descending type, low- frequency descending type, flat descending type, and total deafness type (including profound deafness). Low- frequency descending type: hearing loss at frequencies below 1,000 Hz (inclusive), at least 250 Hz and 500 Hz hearing loss ≥20 dBHL; high-frequency descending type: hearing loss at frequencies above 2,000 Hz (inclusive), at least 4,000 Hz and 8,000 Hz hearing loss ≥20 dBHL; flat descending type: hearing loss at all frequencies, 250-8,000 Hz average hearing threshold ≤80 dBHL; and totally deafness type: hearing loss at all frequencies, with an average hearing threshold of 250-8,000 Hz ≥81 dBHL [21]. Different types have different treatment options. Sudden deafness should be treated with glucocorticoid drugs and neurotrophic drugs in accordance with the doctor's order. Common drugs include prednisone and methylcobalamin. Treatment options include microcirculation-improving drugs (such as Ginkgo biloba extract) combined with glucocorticoids; ion channel blockers (such as lidocaine) are better for reducing high- profile tinnitus; and neurotrophic drugs (such as methylco- balamin). The research of Singh et al. [20] showed that if the drug treatment was not effective, hyperbaric oxygen therapy and stellate ganglion block therapy can also be given. With appropriate treatment, the patient's hearing can be gradually restored. Currently, Ginkgo biloba extract is the most commonly used drug for the treatment of sudden deafness clinically. Ginkgo biloba extract is made from Ginkgo biloba leaves and extracted with appropriate solvents. The main compo- nent is Ginkgo biloba flavonoid glycosides. Its main function is that of ginkgo flavone glycosides, and the main functions include: (1) scavenging of free radicals: Ginkgo biloba extract removes excess free radicals in the body and inhibits lipid peroxidation in cell membranes; thereby, protecting cell membranes and preventing a series of damage to the cochlea caused by free radicals. (2) Adjustment to the circulatory system: arterial relaxation is produced by stimulating the release of catecholamines and inhibiting degradation, stimu- lating the production of prostacyclin and endothelial relaxa- tion factor, and jointly maintaining the tension of arterial and venous blood vessels. (3) Hemodynamic improvement effect: the onset of sudden deafness is generally considered to be related to thrombosis, especially the blood vessels of the cochlea are slender peripheral blood vessels. Research by Suzuki et al. [21] found that Ginkgo biloba extract can reduce the viscosity of whole blood, increase the plasticity of red blood cells and white blood cells, and improve the blood circulation of the cochlea. (4) Tissue protection: Ginkgo biloba extract has a protective effect on body tissues, which can increase the supply of oxygen and glucose to ischemic tissues (including the cochlea). In this work, patients with sudden deafness were selected as the research objects, and their therapeutic effects were investigated after

prednisone acetate and Ginkgo-Damole combined with prednisone acetate, respectively. The results showed that with the prolongation of treatment time, the blood rheology indexes of fibrinogen content, HBV, and LBV in the two groups were gradually decreased, and the content of the combination group decreased more obviously. The fibrinogen content, whole blood HBV, and LBV of patients in the combined group were significantly lower than those in the hormone group at 5 d, 7 d, and 10 d after treatment, and were significantly lower than those before treat- ment (P <0:05). This result is similar to the research result of Övet et al. [22], which may be due to the flavonoid glyco- sides in Ginkgo biloba extract exerting the effect of scaveng- ing free radicals and protecting brain tissue. Ginkgolide can balance lipid peroxidation, increase the tolerance of cells to hypoxia, change blood rheology, and increase the plasticity of whole blood. After different treatments, the peripheral blood CD3+, CD4+, CD4+/CD8+ in the combined group were significantly higher than those in the hormone group, and the differences were statistically significant (P <0:05). In addition, the peripheral blood CD8+ in the combined group was significantly lower than that in the hormone group, and the difference was statistically significant (P <0:05). Such results are similar to the research results of Suzuki et al. [23]. It indicates that T cell subsets may have a certain correlation with the prognosis and efficacy of patients with sudden deafness. Patients with sudden deaf- ness may have an imbalance of peripheral blood T cell sub- sets, and the combined treatment of Ginkgo biloba extract and hormones has a certain improvement effect on the imbalance of PBTCSs. No great difference was found in nau- sea, dizziness, skin allergy, and other incidence of adverse reactions between the hormone group and the combination group after different treatments (P >0:05). It indicates that the treatment method of this study has certain safety for sudden deafness treatment.

Conclusion

In this work, patients with sudden deafness were included, two methods of prednisone acetate and Ginkgo-Damole combined with prednisone acetate were used to intervene, and the comprehensive efficacy of the two groups of patients was compared. The results showed that the combined appli- cation of Ginkgo biloba extract and hormones can effectively improve the abnormal hemorheological indexes of patients with sudden deafness and effectively relieve the imbalance of PBTCSs, showing high safety. However, the sample size included in this work was small and the sources were con- centrated, so it may have a certain impact on the reliabilityof this work, Ginkgo biloba extract combined with hormones had a good therapeutic effect on sudden deafness, but the mechanism of its effect was still unclear. Therefore, the above aspects needed to be improved and optimized in the follow-up research, so as to make the research more perfect.

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