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EFFECT OF PLATELET RICH PLASMA AND STEROID INJECTION ON TINNITIS

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Abstract

Objectives: Sensorineural hearing loss (SNHL) is a widespread auditory disorder caused by damage to the inner ear or auditory nerve pathways. Traditional treatments primarily manage symptoms rather than restore function. Platelet-Rich Plasma (PRP), a regenerative therapy, has shown potential in otologic applications. This study aimed to compare the efficacy and safety of intratympanic PRP injections versus steroid (dexamethasone) injections in patients with chronic tinnitus associated with SNHL. Methodology: This prospective, comparative clinical trial included 40 patients with subjective, non-pulsatile tinnitus lasting over three months. Participants were randomly assigned to two groups: Group A received intratympanic PRP injections, and Group B received intratympanic steroid injections. Treatments were administered weekly for three sessions. Tinnitus severity was assessed using the Tinnitus Handicap Inventory (THI) and Visual Analog Scale (VAS) for loudness and annoyance at baseline, 2 weeks, 1 month, and 3 months post-treatment. Audiometric evaluations monitored hearing thresholds. Data were analyzed using paired t-tests and ANOVA; $p < 0.05$ was considered statistically significant. Results: Both groups showed significant improvements in THI and VAS scores. However, the PRP group exhibited more substantial and sustained reductions, with significant differences appearing as early as two weeks post-treatment. By three months, PRP patients had over 50% improvement in VAS scores. No adverse effects or hearing deterioration were reported in either group. Conclusion:: Intratympanic PRP injections were more effective and longer-lasting than steroid therapy in reducing tinnitus symptoms and were found to be safe. PRP may offer a promising treatment option for chronic tinnitus.

INTRODUCTION

Sensorineural hearing loss (SNHL) is a prevalent type of hearing impairment characterized by damage to the inner ear (cochlea) or the auditory nerve pathways leading to the brain [1]. The standard treatment options for SNHL focus primarily on managing symptoms rather than restoring hearing.

These include hearing aids, cochlear implants, and, in some cases, corticosteroids or other medications to reduce inflammation or address autoimmune-related hearing loss [2]. Patients with severe-to-profound SNHL may have difficulty locating the source of sounds and understanding speech, especially in noisy environments. The healthcare burden associated with SNHL is considerable. In the United States, approximately 4,000 infants are born with hearing impairment each year, underscoring the importance of early detection and intervention [3]. Estimates put the prevalence of SNHL in Egypt at 14%. This indicates that there are around 13 million SNHL sufferers in Egypt. Children are more prone to sensorineural hearing loss (SNHL) compared to adults, with an estimated 22.4% of children under the age of 4 affected by this condition [4]. Platelet-rich plasma (PRP) is a regenerative therapy that leverages the patient's own blood plasma, enriched with a high concentration of platelets and growth factors, to facilitate tissue healing and regeneration. This technique has been applied across multiple medical fields, such as orthopedics, dermatology, and otorhinolaryngology (ORL). The use of PRP dates back to the 1970s, initially in maxillofacial surgery [5]. Sensory neural hearing loss refers to deafness secondary to conditions affecting the inner ear, internal acoustic canal, cerebellopontine angle or vestibulocochlear nerve. It is the most common cause of deafness in adults accounting for almost 90% of cases [6]. Cisplatin-induced hearing loss is generally progressive, bilateral, symmetrical, irreversible and sensorineural in character. Hearing loss first starts at high frequencies and then gets into lower frequencies over time [7]. In addition to their role in hemostasis, platelets also play a significant role in the repair of tissues by releasing growth factors from α-granules in tissue damage [8].

The underlying etiology of sensory neuronal hearing loss is multifaceted, encompassing a range of factors such as genetic predisposition, noise-induced trauma, ototoxic medications, and age-related degeneration [9]. Within the auditory system, this regenerative potential offers the possibility of restoring damaged sensory neurons and enhancing auditory function [10].

METHODOLOGY

This study was conducted as a prospective, compar tive clinical trial to evaluate the effects of Platelet Rich Plasma (PRP) and intratympanic steroid injections on patients suffering from tinnitus. Ethical approval was obtained from the institutional review board prior to initiation, and written informed consent was collected from all participants.

Patients diagnosed with subjective, non-pulsatile tinnitus of at least three months' duration were included in the study. Exclusion criteria included patients with active middle ear infections, previous ear surgery, or systemic conditions that could influence hearing, such as uncontrolled diabetes or autoimmune disorders. Participants were randomly assigned into two groups: Group A received intratympanic PRP injections, while Group B received intratympanic steroid injections using dexamethasone.

PRP was prepared by collecting autologous blood from each patient and processing it through a standard centrifugation protocol to isolate the platelet-rich layer. Both PRP and steroid solutions were injected into the middle ear under local anesthesia using aseptic technique, once weekly for a total of three sessions. Patients were monitored for any immediate adverse effects following each injection.

The severity of tinnitus was assessed using the Tinnitus Handicap Inventory (THI) and Visual Analog Scale (VAS) for loudness and annoyance at baseline, and at regular follow-up intervals—namely, 2 weeks, 1 month, and 3 months post-treatment. Audiometric evaluations were also conducted to monitor hearing thresholds and rule out any deterioration in auditory function. Data were analyzed using appropriate statistical methods. Paired t-tests and ANOVA were applied to assess within-group and between-group differences over time. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 40 patients were enrolled in the study, with 20 patients in each group. Group A received intratympanic Platelet Rich Plasma (PRP) injections, and Group B received intratympanic steroid (dexamethasone) injections. All participants

completed the full course of treatment and follow-up evaluations over three months.

At baseline, there was no significant difference in Tinnitus Handicap Inventory (THI) or Visual Analog Scale (VAS) scores between the two groups. Over the follow-up period, both groups showed improvement in tinnitus symptoms; however, Group A (PRP) demonstrated a greater and more sustained reduction in both THI and VAS scores compared to Group B (steroids).

Table 1: Mean THI Scores over Time

Time Point	Group A (PRP)	Group B (Steroid)	p-value
Baseline	58.3 ± 6.4	57.9 ± 5.9	0.84
2 Weeks	45.1 ± 5.8	50.6 ± 6.1	0.03*
1 Month	35.4 ± 6.2	43.7 ± 5.6	0.01*
3 Months	28.9 ± 5.7	40.2 ± 6.4	0.001*

*Significant difference ($p < 0.05$)

Patients in the PRP group showed a more rapid decline in THI scores, with significant differences observed as early as two weeks post-treatment. This trend continued at one and three months, indicating sustained benefit.

Table 2: Mean VAS Scores for Loudness and Annoyance

Time Point	Group A (PRP) Loudness	Group B (Steroid) Loudness	Group A (PRP) Annoyance	Group B (Steroid) Annoyance
Baseline	7.6 ± 1.1	7.4 ± 1.2	7.8 ± 1.0	7.5 ± 1.1
2 Weeks	5.3 ± 1.2	6.4 ± 1.1	5.5 ± 1.1	6.6 ± 1.2
1 Month	4.2 ± 1.3	5.7 ± 1.3	4.1 ± 1.2	5.8 ± 1.3
3 Months	3.5 ± 1.1	5.2 ± 1.2	3.2 ± 1.0	5.4 ± 1.1

Across all follow-up intervals, the PRP group demonstrated significantly greater reductions in both loudness and annoyance VAS scores compared to the steroid group. By the three-month follow-up, mean VAS scores in the PRP group had decreased by more than 50% from baseline.

No adverse effects or complications were reported in either group during or after treatment. Audiometric assessments revealed no significant changes in hearing thresholds in any participant, confirming the safety of both interventions. In conclusion, both intratympanic PRP and steroid injections were effective in reducing tinnitus symptoms, but PRP showed superior and longer-lasting improvement in both subjective and functional outcome measures.

DISCUSSION

A total of 40 patients were enrolled in the study, with 20 patients allocated to each group. Group received intratympanic Platelet Rich Plasma (PRP) injections, while Group B received intratympanic steroid (dexamethasone) injections. All participants successfully completed the full treatment protocol and follow-up evaluations over a period of three months. These findings are in line with earlier research from 2025, which reported that PRP is a promising treatment for sensorineural hearing loss (SNHL), demonstrating significant auditory improvement with a favorable safety profile. However, it emphasized the need for larger-scale studies to confirm these outcomes and to establish standardized treatment protocols [11]. At baseline, there was no statistically significant difference between the two groups in terms of Tinnitus Handicap Inventory (THI) or Visual Analog Scale (VAS) scores. Both groups showed improvement in tinnitus symptoms over the follow-up period. However, Group A (PRP) exhibited a more substantial and sustained reduction in both THI and VAS scores when compared to Group B (steroids). This contrasts with earlier findings from a 2023 study, which indicated that PRP did not significantly impact hearing loss caused by cisplatin ototoxicity in rats [12]. The discrepancy may be attributed to

differences in study models, populations, and underlying pathophysiology. Patients in the PRP group experienced a more rapid decrease in THI scores, with significant differences emerging as early as two weeks after the first injection. This trend continued at one and three month's post-treatment, indicating a sustained therapeutic benefit. These findings are supported by a 2023 study that suggested PRP may be effective in managing sensorineural hearing loss, highlighting its potential efficacy and safety, though further research was recommended to understand the underlying mechanisms [13]. Throughout all follow-up intervals, the PRP group demonstrated significantly greater reductions in both loudness and annoyance, as measured by the VAS, when compared to the steroid group. By the three-month follow-up, the average VAS scores in the PRP group had decreased by more than 50% from baseline. This outcome aligns with research published in 2024, which described PRP as a promising modality for managing SNHL, possibly promoting the regeneration of damaged auditory cells and nerve fibers beyond the capacity of traditional treatments [14]. No adverse effects or complications were reported in either treatment group during or after the intervention period. Audiometric evaluations confirmed no significant changes in hearing thresholds in any participant, supporting the safety of both PRP and steroid treatments. These results corroborate previous findings from 2024, which noted that PRP is a safe and effective treatment option for idiopathic sudden sensorineural hearing loss (ISSNHL), with minimal cost and no systemic side effects, unlike systemic steroids [15]. In conclusion, while both intratympanic PRP and steroid injections were effective in alleviating tinnitus symptoms, PRP demonstrated superior and longer-lasting improvements in both subjective experiences and functional outcomes.

CONCLUSION

This study demonstrated that both intratympanic PRP and steroid injections were effective in reducing tinnitus symptoms. However, PRP showed significantly greater and more sustained improvements in both THI and VAS scores over the three-month follow-up period. No adverse effects were observed in either group, confirming the safety of both interventions. These findings suggest that PRP may serve as a superior therapeutic option for patients with chronic tinnitus.

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