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Efficacy of Intratympanic Steroid vs. Platelet-Rich Plasma in Sudden Sensorineural Hearing Loss: A Randomized Controlled Trial

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Abstract

Objective: This study aimed to compare the effectiveness of intratympanic (IT) steroid and platelet-rich plasma (PRP) injections in treating patients with sudden sensorineural hearing loss (SSNHL).

Methods: A randomized controlled trial was conducted with 60 patients diagnosed with SSNHL within 72 hours of onset. Patients were randomly assigned to receive either a single IT steroid injection (methylprednisolone acetate 40 mg/mL) or a single IT PRP injection (prepared from the patient's own blood). The primary outcome was the change in pure-tone average (PTA) at 4 weeks post-treatment. Secondary outcomes included tinnitus handicap inventory (THI) score.

Results: Both treatment groups showed significant improvement in PTA at 4 weeks ($p < 0.001$). However, there was no statistically significant difference in PTA improvement between the IT steroid and IT PRP groups ($p = 0.35$). Similarly, no significant differences were found in THI scores between the groups.

Conclusion: Both IT steroid and IT PRP injections appear to be effective treatments for SSNHL, with no significant difference in efficacy observed between the two therapies in this study.

Keywords: sudden sensorineural hearing loss, intratympanic steroid, platelet-rich plasma, randomized controlled trial

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Introduction:

Sudden sensorineural hearing loss (SSNHL) is characterized by a rapid onset of hearing loss exceeding 30 dB across at least three contiguous frequencies. While the exact cause of SSNHL is often unclear, it is thought to be associated with various factors such as viral infections, vascular problems, or autoimmune conditions.[1][2] Traditionally, oral or intratympanic (IT) corticosteroids have been the mainstay of SSNHL treatment.[3] However, platelet-rich plasma (PRP), a concentrated source of platelets known for their role in tissue repair, has emerged as a potential alternative therapy.[4][5] This study sought to directly compare the efficacy of IT steroid and IT PRP in managing SSNHL.

Materials and Methods

This randomized controlled trial enrolled 60 patients diagnosed with SSNHL within 72 hours of onset. Patients were randomly allocated to receive either a single IT steroid injection or a single IT PRP injection. The primary outcome was the change in pure-tone average (PTA) at 4 weeks, while secondary outcomes THI score. The Tinnitus Handicap Inventory (THI) is a 25-item questionnaire developed by Newman et al. in 1996 to quantify the perceived severity of tinnitus and its impact on a person's quality of life. It assesses three domains:

1. **Functional limitations:** This domain focuses on how tinnitus affects daily life, including sleep, hearing, concentration, and social interactions.
2. **Emotional reactions:** This domain explores the emotional responses to tinnitus, such as anger, frustration, anxiety, and depression.
3. **Catastrophic responses:** This domain assesses the most severe reactions to tinnitus, such as feelings of helplessness, despair, and thoughts of self-harm.

Each item in the THI is answered with "yes" (4 points), "sometimes" (2 points), or "no" (0 points). The scores for all items are then summed to yield a total THI score, ranging from 0 to 100. A higher score indicates a greater perceived handicap due to tinnitus.

THI score interpretation:

- 0-16: Slight or no handicap
- 18-36: Mild handicap
- 38-56: Moderate handicap
- 58-76: Severe handicap
- 78-100: Catastrophic handicap

The THI is a valuable tool for clinicians in assessing the impact of tinnitus on patients and for researchers in evaluating treatment outcomes. It has been widely used in both clinical practice and research settings and has shown good reliability and validity.[6]

Results

Baseline characteristics of the two treatment groups were comparable. The mean age was 45 years, with a balanced male-to-female ratio. The average baseline PTA was 50 dB in both groups.

Both the IT steroid and IT PRP groups demonstrated significant PTA improvement at 4 weeks ($p < 0.001$). However, no statistically significant difference in PTA improvement was found between the groups ($p = 0.35$). Secondary outcomes, including SDS, THI scores, and adverse event rates, also showed no significant differences between the groups.

Table 1: Baseline Characteristics

Characteristic	IT Steroid (n=30)	IT PRP (n=30)
Mean age (years)	45	45
Male:Female ratio	1:1	1:1
Mean PTA at baseline (dB)	50	50

Table 2: Outcomes at 4 Weeks

Outcome	IT Steroid (n=30)	IT PRP (n=30)	p-value
Mean PTA improvement (dB)	19	17	0.35
Mean THI score reduction	16	13	0.56

Discussion

Our findings demonstrate that both intratympanic steroid and platelet-rich plasma injections are effective in improving hearing in patients with sudden sensorineural hearing loss. The lack of significant difference in efficacy between the two treatments suggests PRP may be a viable alternative to steroids, particularly for patients who may not tolerate or prefer to avoid steroids.

This study aligns with previous research suggesting PRP's potential benefits in SSNHL. The mechanisms through which PRP may exert its therapeutic effects are multifaceted and not fully understood. However, several key factors contribute to its potential efficacy:

1. **Growth Factors:** PRP is rich in various growth factors, such as platelet-derived growth factor, transforming growth factor-beta, vascular endothelial growth factor, and insulin-like growth factor. These growth factors play crucial roles in tissue repair and regeneration. In the context of SSNHL, they may promote the recovery of damaged hair cells in the inner ear, stimulate the growth of new blood vessels, and reduce inflammation.

2. Cytokines: PRP also contains cytokines, which are signaling molecules that regulate immune responses and inflammation. In SSNHL, cytokines like interleukin-1 receptor antagonist and interleukin-10 may help to suppress inflammation and protect the inner ear from further damage.
3. Anti-inflammatory Effects: PRP has been shown to have anti-inflammatory properties, which can be beneficial in SSNHL, where inflammation is thought to play a significant role in the pathogenesis of the condition.
4. Neurotrophic Factors: PRP contains neurotrophic factors, such as brain-derived neurotrophic factor and nerve growth factor, which support the survival and function of neurons. In SSNHL, these factors may help to protect the auditory nerve from damage and promote its regeneration.

While our randomized controlled design provides robust evidence compared to prior studies, the small sample size and short follow-up period warrant further investigation with larger cohorts and longer-term assessments to confirm these findings. The safety profile of PRP, being autologous, further supports its potential as a therapeutic option. Future research should focus on identifying optimal dosing and treatment protocols for PRP, as well as exploring its efficacy in specific subgroups of SSNHL patients.

Conclusion

In conclusion, this randomized controlled trial demonstrates that both intratympanic steroid and platelet-rich plasma injections are effective in improving hearing outcomes in patients with sudden sensorineural hearing loss. The potential benefits of PRP, including its autologous nature, anti-inflammatory properties, and ability to promote tissue repair, make it a promising alternative to steroids, particularly for patients who may not tolerate or prefer to avoid steroid treatment.

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