

## A Comparative Study of Intratympanic Platelet-Rich Plasma versus Intratympanic Dexamethasone in the Management of Idiopathic Sudden Sensorineural Hearing Loss (ISSNHL)

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### Abstract

**Background:** Sudden sensorineural hearing loss (SSNHL) is an otological emergency characterized by rapid onset hearing impairment and is commonly treated with corticosteroids. Platelet-rich plasma (PRP), an autologous concentrate rich in growth factors, has recently emerged as a potential alternative therapy.

**Objective:** To compare the efficacy of intratympanic steroid (dexamethasone) and PRP therapy in patients with idiopathic SSNHL.

**Materials and Methods:** This prospective observational study was conducted in a tertiary care hospital over one and a half years (November 2022–May 2023). A total of 25 patients with SSNHL were included and divided into two groups: intratympanic steroid group (n=15) and PRP group (n=10). Pure tone audiometry (PTA) was performed before and after five consecutive daily intratympanic injections (0.5 ml). PRP was prepared from autologous blood by centrifugation. Hearing improvement was assessed by change in PTA thresholds. Statistical analysis was performed using SPSS 20, with  $p < 0.05$  considered significant.

**Results:** Both groups showed significant improvement in hearing thresholds after treatment ( $p < 0.0001$ ). The steroid group demonstrated a higher mean hearing gain ( $28.67 \pm 15.06$  dB) compared to the PRP group ( $24.40 \pm 9.65$  dB). The difference in mean hearing gain between the groups was statistically significant ( $p = 0.03$ ), favouring intratympanic steroid therapy.

**Conclusion:** Both intratympanic dexamethasone and PRP are effective in improving hearing in SSNHL. However, steroids demonstrate superior hearing recovery compared to PRP. PRP may serve as an alternative or adjunct therapy, but further large-scale randomized controlled trials are required.

**Keywords:** Sudden Sensorineural Hearing Loss, Intratympanic Steroid, Dexamethasone, Platelet-Rich Plasma, Pure Tone Audiometry, Hearing Recovery.

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### Introduction

According to the latest estimates from the World Health Organization, around 360 million people, or about 5.3% of the global population, experience disabling hearing loss. Research has consistently indicated that hearing loss negatively impacts children's academic performance, behaviour, cognitive growth and overall quality of life. It leads to diminished physical functioning and challenges in social interactions. Consequently, the overall

quality of life suffers. The most prevalent type of hearing loss globally is sensorineural hearing loss (SNHL). SNHL is an adverse condition that can result from damage to the pathway responsible for transmitting sound signals from the inner ear's hair cells of the auditory nerve. Treating SNHL has proven to be difficult. Over at least three contiguous audiometric frequencies with an onset of less than 3 days [1]. In the middle of the 1990s,

it was reported that patients with Menier's disease and autoimmune inner ear illnesses could benefit from intra tympanic steroid injections. Illness and abrupt sensorineural hearing loss. Oral corticosteroids are the most often used treatment for SSNHL [2].

Long-term use of systemic steroids can cause fluid and electrolyte abnormalities, hypertension, hyperglycemia, increased susceptibility to infection, osteoporosis, myopathy, behavioral abnormalities, cataracts, growth arrest, fat redistribution, striae, and ecchymosis, even though the cochrane review did not identify any specific side effects of the steroids used in SSNHL. There has been little evidence of systemic absorption of intratympanic steroids, therefore there is little chance of systemic adverse effects. Research has indicated that intratympanic steroid injection increases cochlear perilymph concentrations by approximately 100 times.

Platelet Rich Plasma is an autologous concentration of human platelet. It is Non-nucleated cytoplasmic bodies with irregular shape derived from fragmentation of megakaryocyte precursors .It has Glycoproteins on their cell membranes [3, 4] and it is also Natural reservoir for growth factors including platelet-derived growth factor (PDGF), epidermal growth factor (EGF), transforming growth factor-beta (TGF-B1), Vascular endothelial growth factor (VEGF), basic fibroblast growth factor (FGF), hepatocyte growth factor (HGF), and insulin like growth factor (IGF1). [5-9]

To evaluate the effect of Intratympanic PRP & steroid (Dexa) in case of ISSNHL .To compare the hearing outcome between two groups.

**Materials and Methods**

**Study Design:** This was a prospective observational study

**Study Setting and Timeline:** The study was conducted in a tertiary care hospital and medical college over a period of approximately one and a half years.

**Study Period:** The study was carried out from November 2022 to May 2023.

**Study Population:** The study population consisted of patients attending the ENT outpatient department (OPD) of the hospital.

**Sample Size:** A total of 25 patients were included in the study.

Group A: Steroid group (N = 15)

Group B: PRP (Platelet-Rich Plasma) group (N = 10)

**Procedure Steps**

- PTA performed to confirm the Dx
- 0.5 ml intra tympanic PRP/ steroid administered into round window niche
- Procedure continued for 5 consecutive days over a week
- PTA performed at the end of last injection

**Process of PRP Extraction**

- 10 ml blood collected and carefully aspirated it into vacutainer
- Mixed it gently by inverting the tube
- Centrifuged at 3000 to 3500 rpm for 5 minutes
- Remove 1-1.5 ml PPP (platelet poor plasma) (upper part)
- Remaining PRP being collected approximately 2ml

**Statistical Analysis:** The current study's data was entered into a computer, properly validated, coded, and decoded, then combined and analyzed using SPSS 20 software for Windows. Descriptive statistics and appropriate univariate and bivariate analysis were performed. If the hypothesis is deemed necessary, other statistical tests, such as the Student's t-test for continuous data and the Fishers Exact Test or  $\chi^2$  test for categorical data, will also be used. Additionally, measurements will be made of sensitivity, specificity, positive predictive value, and negative predictive value. Mean±standard deviation is used to express all means, and percentages (%) are used to express proportions. At the 0.05 level, the critical value for the results' significance will be taken into consideration.

**Result**

**Table 1: Age Distribution among Two Groups**

Age (years)	Group	Intratympanic Steroid (DEXA) (n=15)	PRP (n=10)	Chi-Square Value	P Value
≤30		2 (13.3%)	2 (20.0%)	3.1746	0.529 (NS)
31-40		6 (40.0%)	1 (10.0%)		
41-50		4 (26.7%)	3 (30.0%)		
51-60		2 (13.3%)	2 (20.0%)		
>60		1 (6.7%)	2 (20.0%)		

**Table 2: Sex Distribution among Two Groups**

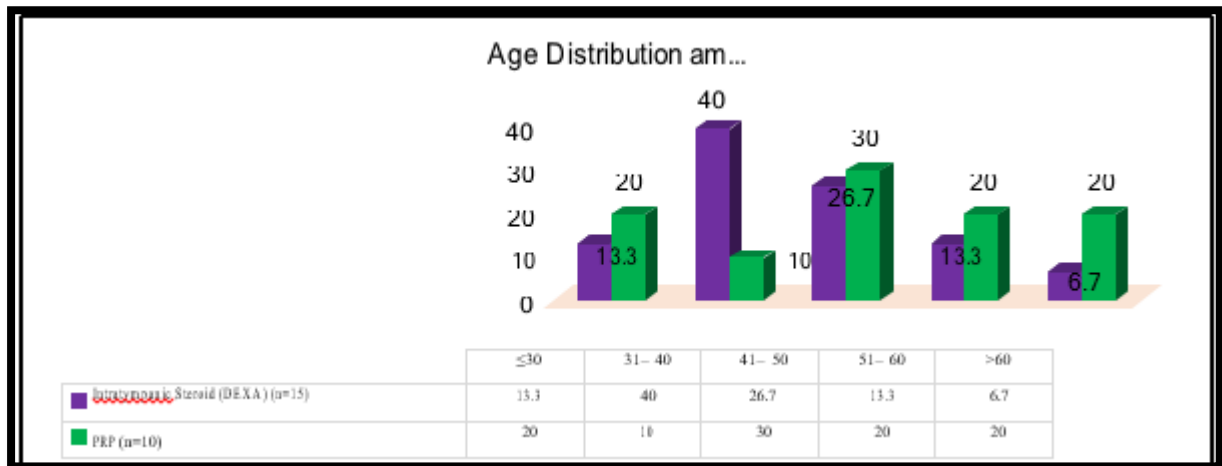
Sex	Intratympanic Steroid (DEXA) (n=15)	PRP (n=10)	Chi-Square Value	P Value
Male	8 (53.3%)	7 (70.0%)	0.69444	0.404 (NS)
Female	7 (46.7%)	3 (30.0%)		

**Table 3: Within-Group Comparison of Hearing Thresholds in Two Groups (Paired t-test)**

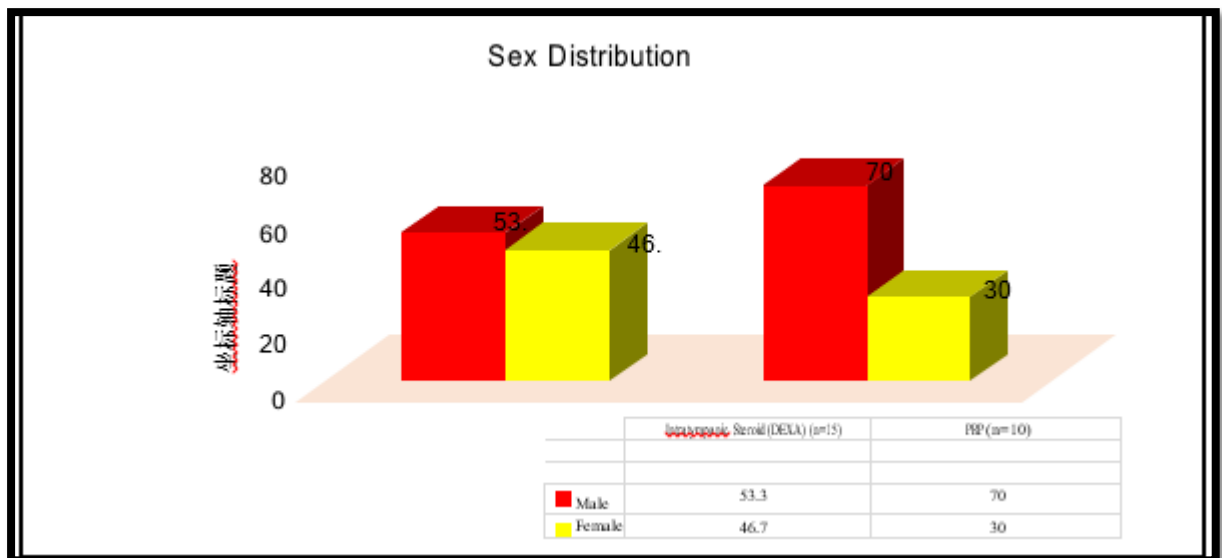
Parameter	Group A: Intratympanic Steroid (DEXA) (n = 15)	Group B: PRP (n = 10)	Mean Difference (dB)	t value
Pre-Treatment PTA (dB)	69.67 ± 10.43	66.40 ± 8.32	28.67	7.12
Post-Treatment PTA (dB)	41.00 ± 14.04	42.00 ± 11.83	24.4	6.03
P Value	<0.0001 (S)	<0.0001 (S)		

**Table 4: Comparison of Mean Hearing Gain between Two Groups (Independent t-test)**

Group	Mean Hearing Gain (dB)	SD	Mean Difference	t value	P Value
Intratympanic Steroid (DEXA) (n = 15)	28.67	±15.06	4.27 dB	1.79	0.03 (S)
PRP (n = 10)	24.4	±9.65	4.27 dB	1.79	0.03 (S)



**Figure 1: Age Distribution among Two Groups**



**Figure 2: Sex Distribution among Two Groups**

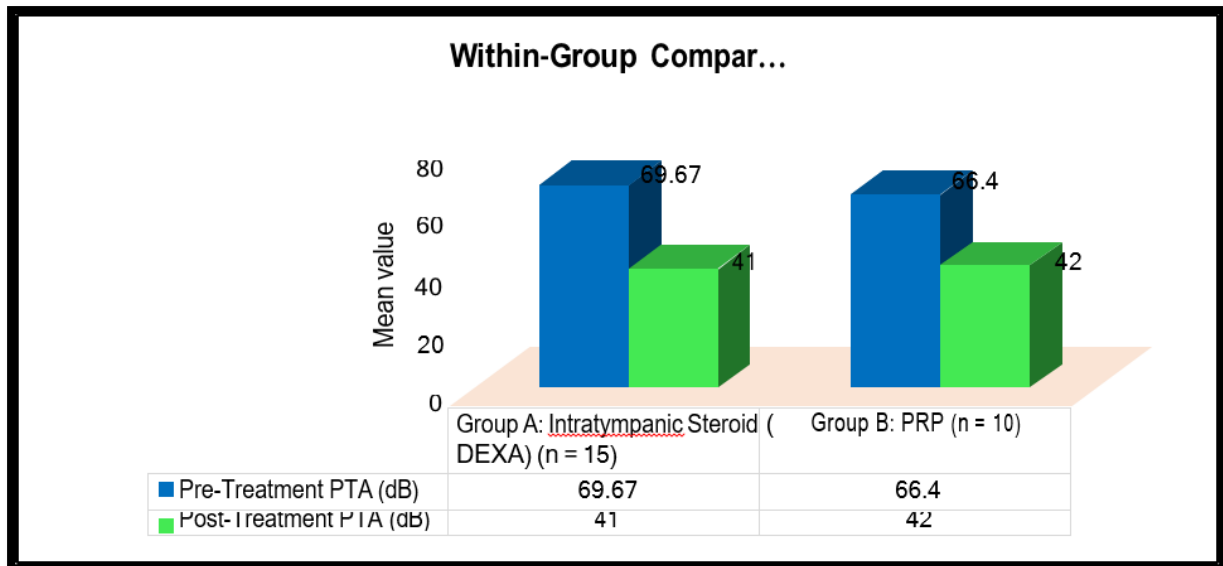


Figure 3: Within-Group Comparison of Hearing Thresholds in Two Groups (Paired t-test)

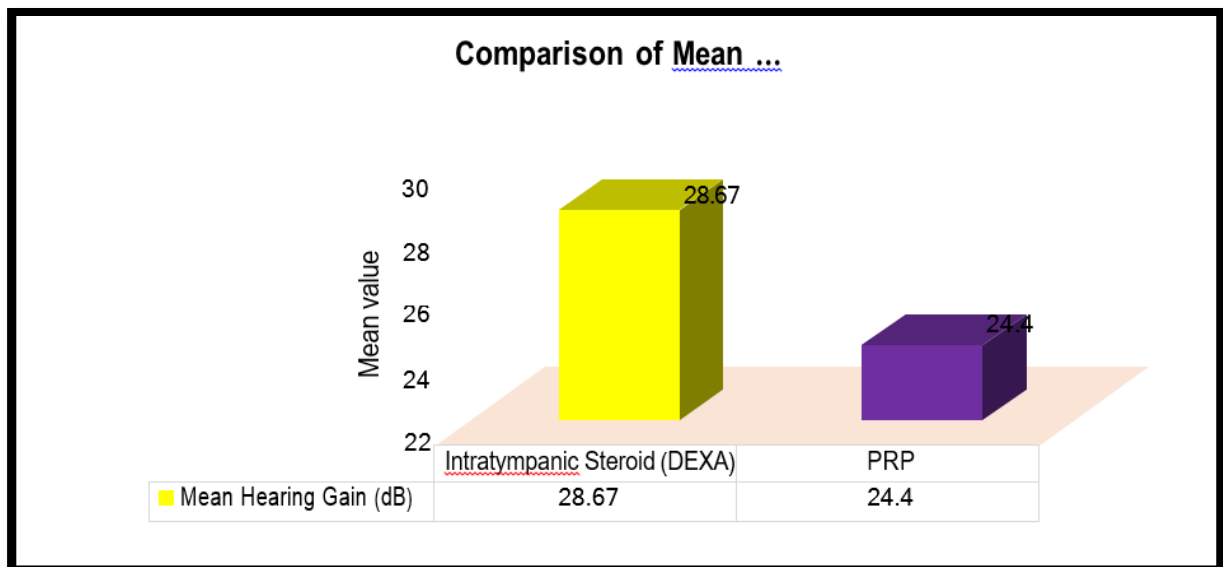


Figure 4: Comparison of Mean Hearing Gain between Two Groups (Independent t-test)

The age distribution of patients in the intratympanic steroid (DEXA) and PRP groups showed that the majority of patients belonged to the 31–40 years age group, accounting for 40.0% in the steroid group and 10.0% in the PRP group. Patients aged 41–50 years constituted 26.7% of the steroid group and 30.0% of the PRP group.

Younger patients aged ≤30 years were equally represented in both groups, while patients aged >60 years were slightly more common in the PRP group. Statistical analysis using the chi-square test revealed no significant difference in age distribution between the two groups ( $\chi^2 = 3.17460$ ,  $p = 0.529$ ), indicating that both groups were comparable with respect to age. Analysis of sex distribution revealed a male predominance in both treatment groups, with males constituting 53.3% of the intratympanic steroid group and 70.0% of the

PRP group. Females accounted for 46.7% and 30.0% of patients in the steroid and PRP groups, respectively. The difference in sex distribution between the two groups was not statistically significant ( $\chi^2 = 0.69444$ ,  $p = 0.404$ ), indicating that the groups were comparable with respect to sex distribution.

Within-group comparison of hearing thresholds demonstrated a statistically highly significant improvement in hearing following treatment in both groups. In the intratympanic steroid group, the mean pre-treatment pure tone average (PTA) of  $69.67 \pm 10.43$  dB improved to  $41.00 \pm 14.04$  dB post-treatment, with a mean hearing gain of 28.67 dB, which was statistically significant ( $p < 0.0001$ ). Similarly, in the PRP group, the mean pre-treatment PTA of  $66.40 \pm 8.32$  dB improved to  $42.00 \pm 11.83$  dB, with a mean hearing gain of

24.40 dB, and this improvement was also statistically significant ( $p < 0.0001$ ). Comparison of mean hearing gain between the two groups showed that patients treated with intratympanic steroid therapy achieved a higher mean hearing improvement ( $28.67 \pm 15.06$  dB) compared to those treated with PRP ( $24.40 \pm 9.65$  dB). The mean difference in hearing gain between the two groups was 4.27 dB. Statistical analysis using an independent t-test demonstrated that this difference was statistically significant ( $t = 1.79$ ,  $p = 0.03$ ).

### Discussion

Sudden sensorineural hearing loss (SSNHL) is an otological emergency requiring prompt intervention to improve hearing outcomes. In the present study, both intratympanic steroid (DEXA) and platelet-rich plasma (PRP) therapies demonstrated significant improvement in hearing thresholds, with intratympanic steroid therapy showing comparatively greater hearing gain.

The baseline demographic profile of the two groups showed no statistically significant difference, indicating comparability. The majority of patients were in the 31–40 years age group, with a slight male predominance in both groups. Similar demographic patterns have been reported by Bird PA et al. (2007), who observed comparable baseline characteristics in SSNHL treatment cohorts [10].

In the present study, both treatment modalities showed statistically significant improvement in PTA within groups ( $p < 0.0001$ ). Intratympanic steroid therapy improved mean PTA from  $69.67 \pm 10.43$  dB to  $41.00 \pm 14.04$  dB, while PRP improved PTA from  $66.40 \pm 8.32$  dB to  $42.00 \pm 11.83$  dB.

Campbell NA (2008) described the role of corticosteroids in reducing cochlear inflammation and immune-mediated damage, which supports the observed improvement in the steroid group [11].

PRP also demonstrated significant improvement in hearing thresholds in the present study. Midwood KS et al. (2004) highlighted the role of extracellular matrix modulation in tissue repair, which provides a biological basis for PRP-mediated regeneration [12]. Bielecki TM et al. (2007) reported that platelet-derived growth factors exhibit regenerative and antimicrobial properties, contributing to tissue healing [13]. Similarly, Ikumi A et al. (2017) demonstrated enhanced peripheral nerve regeneration following PRP application in experimental models, supporting its potential role in auditory nerve recovery [14]. Küçük L et al. (2011) also reported improved nerve regeneration with PRP in animal studies, further supporting its biological plausibility [15].

Fijnheer R et al. (1990) studied platelet activation during preparation of platelet concentrates and demonstrated increased biological activity of platelet-rich preparations, which may contribute to therapeutic effects in tissue healing [16]. Dohan Ehrenfest DM et al. (2010) described the structural and cellular composition of platelet-rich fibrin, emphasizing sustained release of growth factors that enhance regeneration [17]. Marx RE (2004) also demonstrated the clinical regenerative potential of platelet-rich plasma in maxillofacial applications, supporting its broader therapeutic utility [18].

### Conclusion

Both intratympanic steroid and platelet-rich plasma therapies are effective in improving hearing thresholds in patients with sudden sensorineural hearing loss. However, intratympanic steroid (Dexa) therapy resulted in significantly greater hearing gain compared to PRP therapy. While PRP demonstrated promising results and may serve as an alternative or adjunct treatment, intratympanic steroids remain the more effective therapeutic option. Larger randomized controlled trials with longer follow-up are recommended to further define the role of PRP in the management of sudden sensorineural hearing loss.

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