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RESEARCH ARTICLE

"A PROSPECTIVE STUDY ON APPLICATION OF ENDOSCOPIC INTRATYMPANIC INSTILLATION OF PRP V/S STEROID INJECTION IN SUDDEN SENSORINEURAL HEARING LOSS"

Shivam Narang[1], Neha Basu[2] and Akshita Agnihotry[3]

1. Junior Consultant, Otorhinolaryngology and Head & Neck Surgery, Jain ENT Hospital, Jaipur, Rajasthan.
2. Junior Resident, Otorhinolaryngology and Head & Neck Surgery, Calcutta National Medical College, Kolkata.
3. MBBS Student, RUHS CMS Jaipur, Rajasthan.

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Abstract

Background and Aim: Sudden Sensorineural Hearing Loss (SSNHL) is characterized by a sudden decline in auditory function. While traditional treatments like corticosteroids focus on facilitating hearing recovery, emerging therapies, such as intratympanic platelet-rich plasma (PRP), have demonstrated potential in improving treatment outcomes.This study aimed to evaluate and compare the effectiveness of intratympanic PRP injections and intratympanic steroid therapy in the treatment of SSNHL.

Methodology: After receiving approval from the IEC, 100 patients diagnosed with SSNHL were randomly assigned to two groups: Group A (PRP) and Group B (steroids). Pre- and post-treatment pure tone audiometry (PTA) assessments were performed on all patients, and the results were analyzed to assess the effectiveness of the treatments.

Results: Both groups demonstrated a statistically significant reduction in PTA values after treatment ($p < 0.05$). Pre-operatively, Group B had higher PTA values [44.165 (36.900–57.325) Hz] compared to Group A [40.0 (33.3225–48.3) Hz]. Post-treatment, PTA values improved to [30.0 (25.0–40.0) Hz] in Group A and [38.665 (28.3–45.4) Hz] in Group B. While intra-group improvements were significant, inter-group differences post-treatment were not statistically significant ($p > 0.05$).

Conclusion: Intratympanic PRP and steroid therapies are both effective in improving hearing in patients with SSNHL. However, intratympanic steroids remain the preferred first-line treatment. PRP may serve as a secondary option in cases where steroids fail to deliver satisfactory results.

Introduction:-

SSNHL is a pathological condition caused by impairment along the auditory signal pathway, extending from the hair cells within the inner ear to the auditory nerve [1]. Common signs include a sensation of fullness or blockage in the ear, tinnitus, dizziness, and hearing loss. Existing medical treatments, including antioxidant vitamins and coenzyme Q10, focus more on alleviating symptoms than offering a cure.

Corresponding Author:- Shivam Narang
Address:- Junior Consultant, Otorhinolaryngology and Head & Neck Surgery, Jain ENT Hospital, Jaipur, Rajasthan.

SSNHLis defined as a hearing reduction of at least 30 dB across three consecutive frequencies within a 72-hour period [2]. Its annual incidence is estimated to be 5–30 per 100,000 individuals [3-6], with 99% of cases being unilateral [7].

Trans-tympanic steroids (TTS), administered through injection into the middle ear, have gained popularity as an alternative treatment modality in contemporary clinical practice. Animal studies have demonstrated that TTS administration results in significantly higher drug concentrations in the perilymph compared to intravenous or oral steroid administration. Dexamethasone is the preferred steroid for TTS due to its anti-inflammatory properties and its ability to achieve elevated concentrations within the cochlea when delivered intratympanically.

Autologous platelet-rich plasma also refereed as PRP consists of a concentrated form of human platelets in a small volume of plasma that contains biologically active factors essential for hemostasis and the formation of new connective tissue and revascularization. It also exhibits bactericidal properties due to the presence of white blood cells. Autologous PRP is derived from plasma with a platelet concentration higher than the reference range (150,000–440,000/µl). A typical blood clot consists of approximately 95% red blood cells, 5% platelets, and less than 1% white blood cells, along with fibrin strands. In comparison, a PRP clot is composed of 95% platelets, 4% red blood cells, and 1% white blood cells [8]. Platelets release numerous growth factors, many of which are recognized for promoting nerve regeneration through the bioactive elements found in their dense and alpha granules [9].

Aim Of Study:-

The aim of the study wasto evaluate and compare the effectiveness of intratympanic PRP injections and intratympanic steroid therapy in the treatment of SSNHL.

Materials & Methodology:-

Study Area:

Present study was conducted inJain ENT Hospital (JEH), Jaipur.

Study Duration:

12 months

Study Population:

A total of 100 patients were selected and randomly assigned to 2study groups depending upon the treatment done:

- GROUP A: PRP Group (N=50)
- GROUP B:Steroid Group (N=50)

Inclusion Criteria:

- Patients presenting with SNHL with Intact TM
- Idiopathic cause
- Presenting within 72 hours
- Unilateral SNHL

Exclusion Criteria:

- Age < 10 year

Procedure Steps –

Preoperative pure tone audiometry (PTA) was performed to confirm the clinical diagnosis of SSNHL. The patient was positioned supine on the operating table (OT), and local anesthesia was achieved using 10% lidocaine (lox) spray. A 0.4 mL intratympanic injection of platelet-rich plasma (PRP) was administered into the round window niche [Figure 1] using a 0-degree endoscope. The same procedure was repeated for the steroid group. Injections were administered weekly for six consecutive weeks, and PTA was performed following the sixth injection for comparative analysis.

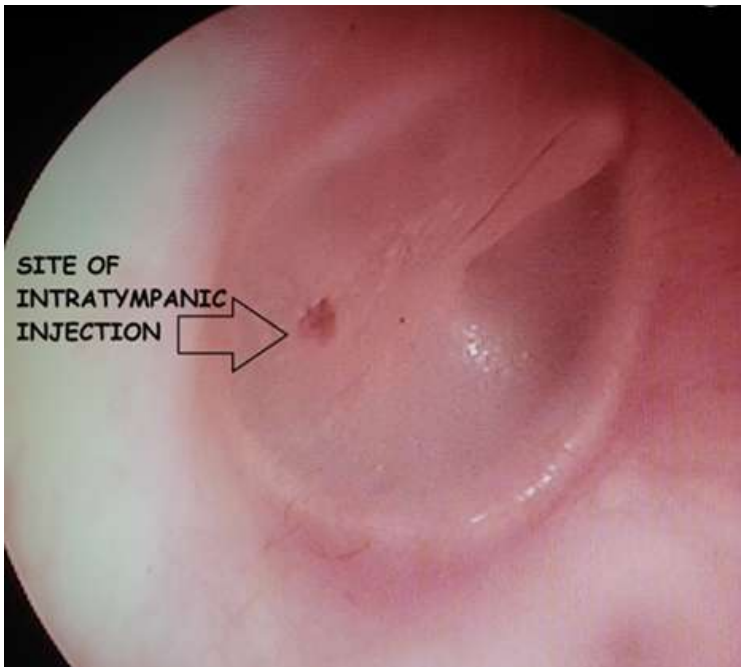

Figure 1:- Site of Intratympanic Injection.

Statistical Analysis:

Raw data from the study was organized in Microsoft Excel and analyzed using SPSS (Version 21.0). Descriptive statistics summarized participant demographics and clinical characteristics. Categorical variables, such as gender and treatment group, were compared using the Chi-square test. Changes in continuous variables, such as pure tone audiometry (PTA) values, were analyzed pre- and post-treatment. A p-value of less than 0.05 was considered statistically significant.

Results:-

In this study, 100 patients were analyzed. The age and gender distribution between Groups A and B showed statistically insignificant difference. ($p>0.05$) Most patients in both groups were aged between 31-60 years, with Group A having a higher percentage in the 51-60 age range (44%) and Group B having more patients in the 41-50 age range (28%). [Table 1) Both groups had almost same proportions of males and females, with a slightly higher percentage of females in Group A (56%) and males in Group B (52%). [Table 2]

Table 1:- Shows the Age based distribution of participants among study groups.

Age group (in years)	Grp A Frequency (%)	Grp B Frequency (%)	Chi square value	df	P value (Chi-square test)
11-20	1 (2%)	0 (0%)	7.990	5	0.157
21-30	1 (2%)	3 (6%)			
31-40	13 (26%)	15 (30%)			
41-50	6 (12%)	14 (28%)			
51-60	22 (44%)	13 (26%)			
61-70	7 (14%)	5 (10%)			
Total	50 (100%	50 (100%)			

Table 2:- Displays the gender-based distribution of participants among study groups.

Gender	Grp A No of patients (%)	Grp B No of patients (%)	Chi square value	df	P value (Chi-square test)
Male	22 (44%)	26 (52%)	.641	1	.274
Female	28 (56%)	24 (48%)			
Total	50 (100%)	50 (100%)			

Table 3:- Presents the inter-group and intra-group correlation of PTA frequency at pre- &post-operative visits between Group A and Group B.

PTA	Grp A		Grp B		Z value	P value (Inter-group;Mann-Whitney U test)
	Median	Inter-quartile range	Median	Inter-quartile range		
Pre- operative	40.0	33.3225-48.3	44.165	36.900-57.325	-2.132	0.33*
Post operative	30.0	25.0-40.0	38.665	28.3-45.4	-1.446	0.148
Z value	-5.417		-4.630			
P value(Intragroup; Wilcoxon-sign rank test)	0.001(Significant)		0.001(Significant)			

Pre-operatively, inter-group comparison showed that, the PTA frequency for group B patients was significantly more [44.165 (36.900-57.325) Hz] as compared to that of group A patients [40.0 (33.3225- 48.3) Hz]. However, post-operatively, the difference in the PTA values of Group A & Group B patients was statistically insignificant [30.0 (25.0-40.0) Hz vs 38.665 (28.3-45.4)] ($p > 0.05$). Furthermore, a statistically significant reduction in PTA frequency values was observed in both the study groups after the procedure ($p < 0.05$). [Table 3]

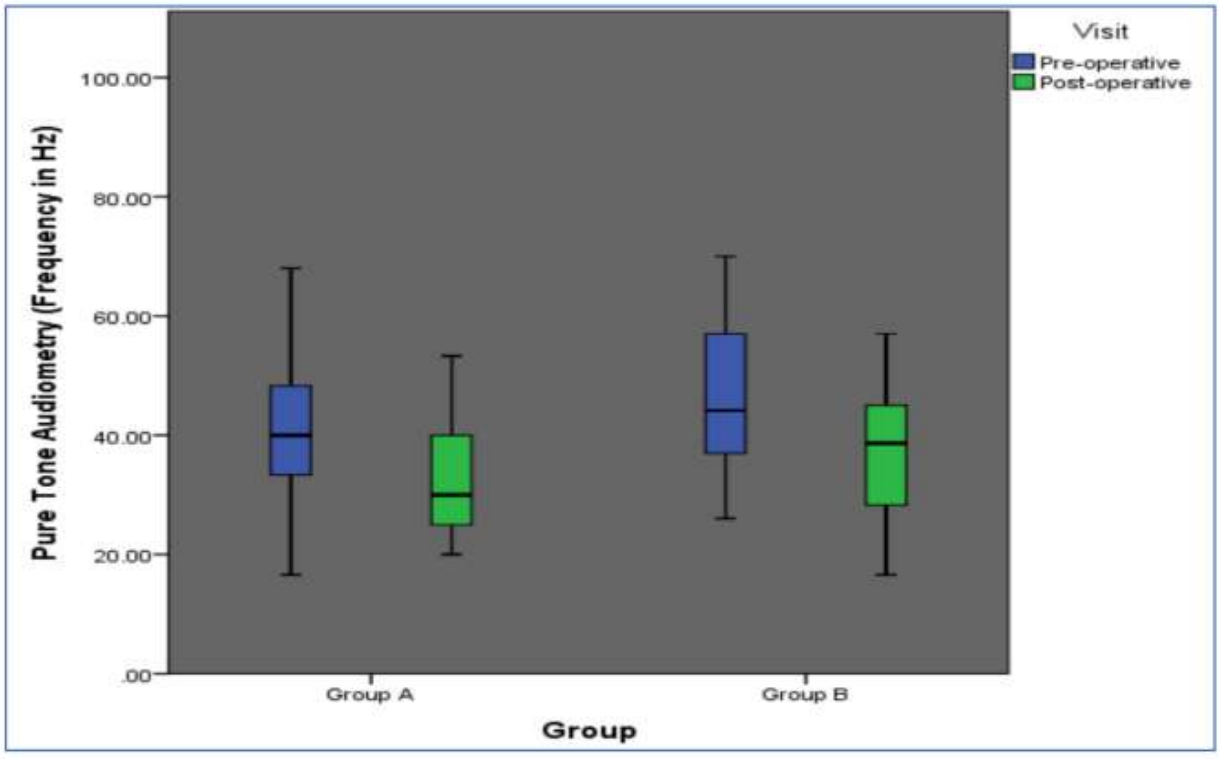

Figure 2:- PTA frequency at pre-operative and post-operative visits.

Discussion:-

SSNHL is characterized by a sudden and considerable loss of hearing, usually occurring within a 72-hour period.For many years, the primary treatment for this condition has been systemic corticosteroids. Corticosteroids, such as prednisone or methylprednisolone, have demonstrated clear benefits in reversing SSNHL by reducing inflammation and enhancing cochlear blood flow. Dexamethasone is commonly used for intratympanic injections due to its potent anti-inflammatory properties. Furthermore, intratympanic PRP injections have gained attention as a potential treatment for SSNHL. PRP, derived from the patient's own blood, is rich in platelets, growth factors, and cytokines, all of which are crucial for supporting tissue repair and regeneration.

The current study aimed to evaluate whether intratympanic PRP could serve as a viable treatment for SSNHL. The first notable publication providing convincing evidence of corticosteroid efficacy was by Wilson et al. [10], who, in

1980, conducted a randomized clinical trial demonstrating that patients receiving oral corticosteroids experienced a significantly higher recovery rate compared to those receiving a placebo. A subsequent placebo-controlled trial by Cinamon [11], although underpowered, randomized 41 SSNHL patients into four treatment groups, finding that 60% patients in corticosteroid-treatment group, compared to 54% of the placebo group, showed improvement—though the difference was not statistically significant.

A Cochrane Collaboration review [12] of corticosteroid treatments for SSNHL concluded that there was no strong evidence supporting corticosteroid efficacy. In a study by Nosrati et al. [13], the outcomes of oral prednisolone versus placebo were compared in 93 SSNHL patients, revealing no significant differences in treatment outcomes. The study by Rauch et al. [14] did not evaluate the effectiveness of intratympanic treatment in patients who didn't respond to oral treatment, nor did it investigate the impact of combining oral and intratympanic corticosteroid treatments.

Battaglia et al. [15] conducted a three-arm study comparing oral, intratympanic, and combined therapies for SSNHL. They found that combined therapy was more effective than either oral or intratympanic treatment alone; however, the small size of the samplelimited the ability to draw conclusive results from the study.

Table 4:- Comparison of various studies.

YEAR	AUTHOR	CONCLUSION
2012	FerriE et al [16]	The study concluded that IST is a reliable and effective approach for treating sudden sensorineural hearing loss in cases where conventional therapies fail to yield results.
2019	Tyagi BPS et al [17]	The study concluded that Intratympanic injection of PRP notably improves the function of hair cells in the inner ear, resulting in better hearing outcomes.
2021	Tyagi B et al [18]	The study concluded that Significant improvements in hearing were observed in patients with moderate to severe SSNHL following PRP treatment.
2022	Stephy Maria Tom et al [19]	The study concluded that a single injection of PRP resulted in greater hearing improvement compared to dexamethasone.
2023	Ruchika et al [20]	The study concluded that Significant improvement in hearing status was observed in patients with acute mild-to-severe SSNHL following intratympanic PRP injection, with no complications reported.

Conclusion:-

In our preference, Intratympanic Steroids are still preferred choice over PRP. PRP can be used as a secondary aid when steroids doesnot work.

Declarations

Author's Contribution:

Dr. Shivam Narang served as the principal investigator, overseeing the planning and execution of the project. Dr. Neha Basu contributed to the manuscript writing, while Dr. Akshita Agnihotry assisted in performing the procedure, collecting data, and conducting statistical analyses.

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None.

Conflicts of interest

None.

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