Acta Scientific Otolaryngology (ISSN: 2582-5550)

Volume 5 Issue 3 March 2023

Perspective

Platelet Rich Plasma in SNHL

Brajpal Tyagi* and Manika Feotia

Department of ENT, Harsh ENT Hospital, India

***Corresponding Author:** Brajpal Tyagi, Department of ENT, Harsh ENT Hospital, India.

Received: January 26, 2023

Published: February 15, 2023

In India, deafness is the most common disability accounting of more than 6.3 million sufferers. It has been estimated that four in every 1000 children suffer from severe to profound hearing loss. Around 100,000 babies are in-born with this disability. The estimated childhood onset deafness was found to be 2-4% [1,2].

What is SNHL

Sensorineural hearing loss: Sensorineural hearing loss (SNHL) is a type of hearing loss in which the root cause lies in the inner ear or sensory organ or the vestibulocochlear (cranial nerve VIII). It consists of damage to cochlea and auditory nerve. It is the most common type of hearing loss in adults approximating to 90 % of hearing loss. Whenever there is damage to the pathway for sound impulses from the hair cells of the inner ear to the auditory nerve or brain it will result into SNHL, which is a heterogenous disorder. Apart from the congenital causes of SNHL due to genetic dysfunction ototoxic drugs, and noise exposure accounts for the same.

Figure 1: Human ear - Organ of Corti | Britannica.

What is PRP

Platelet rich plasma, also called autologous conditioned plasma, is the form of blood plasma, derived from whole blood, that has been enriched with platelets and growth factors [4].

Mechanism of action of PRP

Alpha granules and the dense granules contribute to the mechanism of action of platelet rich plasma. Alpha granules refers to the cluster of 7 growth factors which include; platelet-derived Growth factors (PDG Faa, PDG Fbb and PDG Fab), transforming growth factor beta (isoforms TGFβ1 and 2); epithelial growth factor (EGF), and vascular endothelial growth factor (VEGF). Cell proliferation, cellular migration, differentiation angiogenesis and chemotaxis are the processes modulated by alpha granules. Dense granules basically contain bioactive agents (serotonin, histamine, dopamine, calcium and adenosine) which enhance the membrane permeability and modulate the inflammatory processes. Pre-packaged growth factors are released from these degranulated organelles. Due to short half-lives of these degranulated organelles, PRP need to be activated at or just before the application. This higher concentration of platelets followed by greater release of growth factors post initiation stimulates the cell proliferation and differentiation leading to the tissue regeneration [4,5].

PRP in SNHL

Use of PRP in SNHL and tinnitus has been very promising and is showing up with effective results in terms of improvement in hearing in both children and adults with both congenital and acquired hearing loss. In our studies we also observed clinical improvement in tinnitus. Intratympanic instillation of PRP works in regenerating the inner hair cells thus improving the SNHL.

Prepration of PRP

PRP is prepared from Patients blood drawn at the time of Intratympanic instillation. A30cc venous blood draw will yield 3-5cc of PRP depending on the baseline platelet count of an individual, the device used and the technique employed. The blood drawn is added with an anticoagulant such as citrate dextrose A to prevent platelet activation prior to its use. Blood drawn is put through two stages of centrifugation to separate PRP from platelet poor plasma and red blood cells. PRP is prepared by a process known as differential centrifugation. In differential centrifugation acceleration force is adjusted to sediment certain cellular constituents based on different specific gravity.

How we collect sample for PRP

STEP 1

- 18 No. Needle
- 12 ml blood required for 1 ml PRP
- Rotate and keep for 10 minutes
- Centrifuge at 1500 RPM for 5 minutes In Cold PRP Machine At –10 Degree Cent**.**

STEP 2

- Sample separation from RBC (after 15 minutes with Pipette)
- Then centrifuge at 3000 RPM for 10 minutes
- Then separate Plasma and Platelets
- Take bottom sediments (RICH PLASMA) with Pipette
- Then take the PRP with 18 No. Needle in Syringe (Sample ready to Inject)
- Inject Intra Tympanic with 18 No. LP Needle in Adults and 22 No. Needle in Child.

Note- The PRP sample prepared needs to be stored and maintained in cold chain till infused.

Site of intratympanic instillation of PRP

BPST point is the point of intersection of origin of chorda tympani from facial nerve in facial canal and insertion of posterior malleolar fold to annulus of tympanic membrane. BPST point lies 2 mm anterior to this point of intersection. It's the surface anatomy of round window niche. Through this point we can directly reached to round window [6-11].

Figure 2: (A) BPST point. (B) Endoscopic landmark of BPST point.

Methods of PRP preparation

PRP method

- Blood is drawn in acid citrate dextrose (ACD) tubes by venipuncture.
- Blood is centrifuged using a soft spin. Blood is not chilled in any step.
- Supernatant plasma containing platelets is transferred into another sterile tube.
- Tube is centrifuged at a higher speed (high spin) to obtain platelet concentrate.
- The lower $1/3^{rd}$ is PRP and upper $2/3^{rd}$ is platelet poor plasma (PPP). At the bottom of the tube platelet pellets are formed.
- Remove the PPP and suspend the platelet pellets in a minimum quantity of plasma (2-4 ml) by gently shaking the tube.

Buffy coat method

- Whole blood should be stored at 20°C to 24°C before centrifugation which is then centrifuged at high speed.
- Three layers are formed because of its density: The bottom layer consisting of RBCs, the middle layer consisting of platelets and WBCs and the top PPP layer.
- Remove the supernatant plasma from the top of the container and transfer the buffy coat layer to another sterile tube.
- Centrifuge at lower speed to separate WBCs or use leukocyte filtration filter.

Factors affecting PRP yield

Various factors influence the yield of PRP such as draw of blood, speed, and time, temperature of centrifugation and use of anticoagulants.

Dose and time interval

0.5 ml PRP is injected intratympanic in round window niche. Pre and post Pure tone audiograms are obtained before the intrtympanic injection and 15 days after the intratympanic instillation of PRP. After injection patient is kept on 5 days of treatment which includes antibiotics, antihistamines, and analgesics.

Side Effects

No side effects have been noted.

Contraindications

Patients are ruled out of any coagulopathy, Diabetes mellitus, Cancer, Haemodynamic instability, Systemic disorder, sepsis, low platelet count.

Summary

Intratympanic injection of platelet rich plasma is improving outcome in sensorineural hearing loss.Platelets play an important role in healing and enhancing the cell growth through the growth factors and bioactive substances present in them. This healing property of platelets have been utilized in SNHL. Platelet rich plasma (PRP) instillation therapy not only addresses the underlying cause but is also cost effective. Result varies from patient to patient as it is a derivative of platelet of his/her own blood.

Take home message !!

- PRP is a new cost effective modality for the treatment of SNHL.
- Which can be tried in cases where conventional treatment modalities such as hearing aids, cochlear implants, intratympanic injection of steroids are either not feasible or have failed.

Bibliography

1. Varshney S. "Deafness in India". *Indian Journal of Otology* 22.2 (2016): 73-76.
2. Davey S., *et al*. "Impact of indian public health standards for rural health care facilities on national programme for control of deafness in India: The results of a cohort study". *Journal of Family Medicine and Primary Care* 7.4 (2018): 780-786.
3. Tyagi BBPS and Rout M. "Platelet rich plasma (PRP): a revolutionary treatment of sensorineural hearing loss". *Acta Scientific Otolaryngology* 1.4 (2019): 2-5.
4. Dohan Ehrenfest DM., *et al*. "Classification of platelet concentrates (Platelet-Rich Plasma-PRP, Platelet-Rich Fibrin-PRF) for topical and infiltrative use in orthopedic and sports medicine: current consensus, clinical implications and perspectives". *Muscles Ligaments Tendons Journal* 4.1 (2014): 3-9.
5. Bear ZW and Mikulec AA. "Intratympanic steroid therapy for treatment of idiopathic sudden sensorineural hearing loss". *Missouri Medicine* 111 (2014): 352-356.
6. Fradis M., *et al*. "Treatment of Meniere's disease by intratympanic injection with lidocaine". *Archives of Otolaryngology* 111.8 (1985): 491-493.
7. Gouveris H., *et al*. "Intratympanic dexamethasone with hyaluronic acid in the treatment of idiopathic sudden sensorineural hearing loss after failure of intravenous steroid and vasoactive therapy". *European Archives of Otorhinolaryngology* 262.2 (2005): 131-134.
8. Hobson CE., *et al*. "Primary treatment of idiopathic sudden sensorineural hearing loss with intratympanic dexamethasone". *Current Opinion in Otolaryngology and Head and Neck Surgery* 24.5 (2016): 407-412.

9. Ng JH., *et al*. "Intratympanic steroids as a salvage treatment for sudden sensorineural hearing loss? A meta-analysis". *European Archives of Otorhinolaryngology* 272.10 (2015): 2777-2782.

10. Scott-Brown's Otorhinolaryngology, Head and Neck Surgery, 7th edn, Table 238e.6, Intra tympanic Dexamethasone for ISSNHL.