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Role of Platelet-Rich Plasma (PRP) in Type I Tympanoplasty

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ABSTRACT:

Comparison of platelet rich plasma's (PRP) effectiveness in tympanoplasty. Tympanoplasty research comparing the two methods. 50 patients with moderate to large central perforations underwent type I Tympanoplasty under LA via the post-auricular route. Those in the control group had surgery without PRP. Tympanoplasty was added to the study group with PRP by injecting PRP-soaked gel foam into the middle ear, over the graft, and into the bone canal, as well as wetting the temporal fascia with PRP graft. Audiometry was performed both before and after the operation. comparing the outcome, the majority of the patients were in the 25–30 age range. In the control group, the graft uptake success rate was 84%; in the PRP group, it was 97%. [1] Improvements in hearing were 40% in the control group and 82.0% in the PRP group. According to this study, adding PRP to type I tympanoplasty procedures increases the likelihood that the graft would accept the tissue and mend early, leading to an improvement in hearing.

Keywords: Tympanoplasty, PRP, SNHL deafness, Tympanic membrane perforation, C.S.O.M., post aural myringoplasty, Discharging ear.

INTRODUCTION:

Different studies show varying success rates for graft uptake, hearing improvement, secondary or recurrent perforation, or adhesion formation after tympanoplasty. We are constantly looking for new methods to provide better outcomes.

In numerous trials, platelet-rich plasma has been used to enhance the surgical results in tympanoplasty [2] and hearing improvement in sensorineural hearing loss [3]. Since platelet rich plasma is simple to obtain, adding it to the middle ear cavity may also enhance sensorineural hearing loss in addition to promoting quicker healing and greater success with tympanoplasty.

In the era of regenerative medicine, we talk about using platelet-rich plasma, stem cell therapy, or cloning to regenerate or accelerate the growth of body tissue or organs [4,5]. It is simplest to obtain and use platelet rich plasma in the human body. Since it is nearly autologous, there are no noticeable negative effects. The liquid component of whole blood known as plasma is mostly made up of water and proteins. Red blood cells, white blood cells, and platelets can circulate in the body thanks to plasma. In addition to their traditional role in blood clotting, platelets, often referred to as thrombocytes, release a number of growth factors

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at the site of injury that aid in healing and repair. Since we now understand that the body has an innate capacity for mending, if we intensify the growth factors or healing factors, unquestionably the repair will be much better. A method for using platelet-rich plasma to condense and deliver growth factors at the site of injury was developed by the scientist. A quantity of autologous blood plasma that has been enhanced with growth factors and platelets is known as platelet rich plasma.

Based on the number of leukocytes and fibrin, there are four types of platelet rich plasma (PRP). PRPs that are (1) leukocyte rich, (2) leukocyte decreased, (3) leukocyte platelet rich, and (4) pure platelet rich.

Growth factor is released as a result of the combination of thrombin and calcium chloride. Growth factor release is necessary for the possibility for regeneration.

Growth factors and cytokines in platelets help to direct and improve tissue repair.

The bioactive molecules released by platelet granules are important in cell differentiation, proliferation, and optimization of the tissue environment, which in turn promotes the healing process. They also have anabolic and pro-inflammatory responses. Serotonin, dopamine, adenosine, and calcium are bioactive substances that promote cell permeability and control healing. The main cytokines and growth factors released are:

- Platelet-derived growth factor.
- Transforming growth factor beta.
- Fibroblast growth factor.
- Insulin-like growth factor 1.
- Insulin-like growth factor 2.
- Vascular endothelial growth factor.
- Epidermal growth factor.
- Interleukin 8.
- Keratinocyte growth factor.
- Connective tissue growth factor.

Growth factors are released when calcium chloride and thrombin are added. Growth factor is gradually released as a result of the calcium chloride addition [6].

The utilisation of activated platelet rich plasma in the middle ear cavity and on either side of the temporal fascia graft is examined in this study. Ratio of graft acceptance, improvement in

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bone and air conduction, and prevalence of secondary perforation in myringoplasty using standard method.

MATERIAL AND METHOD:

It was a randomized controlled study of 50 patients divided in two groups 25 each having a mod-large, central perfo- ration with no clinical sign of cholesteatoma or ossicular necrosis.

Inclusion Criteria

- Mod-Large central perforation.
- No active disease of nose and throat.

Exclusion Criteria

- Sign of cholesteatoma or ossicular necrosis.
- Anaemia.
- Chronic liver or kidney disease.
- Haemodynamic instability.
- Diabetes.
- Fluctuating hypertension.

Inlay Transcanal Myringoplasty was performed under local anesthesia. Temporal fascia graft was harvested, dried and made wet by platelet rich plasma during placement.

Preparation of Autologus Platelet Rich Plasma

9.0 ml of blood were taken from the antecubital vein using a 16/18-number scalp vein placed in a special tube with 1 ml of anticoagulant. Blood was immediately centrifuged at an automated centrifuge for 15 minutes at 1500 rpm. This produced two layers: an upper, yellowish layer and a lower, dark crimson layer. A sterile pipette was used to transfer supernatant plasma to another sterile tube for hard spinning. A second centrifugation was carried out at 3000 rpm for 15 minutes, and the upper supernatant plasma was gently sucked with a pipette after 1 ml of fluid and a pallet were left at the bottom.

Now, carefully combine the pallet in the fluid that will be used during surgery using a different sterile pipette.

0.1 cc of calcium gluconate was added right before usage to trigger the release of growth factor. Just enough of this PRP was infused into the gel foam before the procedure. On either side of the dry temporal fascia graft, two drops of PRP were applied. After raising the 360° tympanomaetal flap, the graft was positioned medial to the handle of the malleus. The

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anterior portion was carefully repositioned to avoid anterior blunting. PRP wet gel foam is applied over the graft, pushing the graft to remove any blood or air pockets that may have formed between the graft and bone. A thin ribbon pack was inserted into the external auditory canal's cartilaginous section. On alternate days, the pack was inspected and gently suctioned. On the seventh day, the ribbon pack was removed, and the gel foam's state was assessed. In addition to analgesic antihistamines, vitamin C and vitamin D supplements, the patient received oral antibiotics for 10 days and an injectable antibiotic for two days [7,8]. Always stay away from ototoxic medications [9].

RESULTS:

Fifty patients full filling the inclusion criteria were the subject of study and underwent type I tympanoplasty from 1st march 21 to 21st aug with having usually large central perforation. The age of patients was from 15 to 60 years most of the patients were in the age group of 25–30 years. In our study number of males were more. Male female ratio was 2:1. Mean duration of symptoms was 1yr varying from 6 years to 7 years Left side sickness was

Table 1 Age and sex distribution

Number of patients age	PRP cases				Control				Total	
	Male (n)		Female (n)		Male (n)		Female (n)			
	No.	%	No.	%	NO.	%	No.	%	No.	%
16–24	2	4.9	1	2.8	1	2.4	1	2.4	5	10.0
24–32	12	48.7	2	7.3	8	31.7	6	24.3	28	56.0
32–40	4	14.6	1	4.9	2	9.7	3	9.9	10	20.0
40–50	3	9.7	0	2.0	2	7.3	2	9.6	12	14.0
Total patients	21	82.8	4	17.0	13	51.1	12	48.5	50	100

Table 2 Comparison of graft take up rate

	Group					
	PRP cases		Controls		Total	
	Count	%	Count	%	Count	%
Graft status						
Failure	4	14.6	1	4.9	5	10
Success	21	85.3	24	95.1	45	90.0
Total	25	100	25	100	82	100

predominant 1.3:1. The primary symptom, followed by repeated discharge and hearing impairment, was dry perforation and rejection in medical fitness during recruiting (Tables 1, 2).

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The same surgical procedure was performed on all of the patients, and platelet-rich plasma was administered to 41 of them at random. for the control group. With platelet rich plasma, the success rate at six months was 97.0% as opposed to 82% without.

DISCUSSION:

Results range from 56 to 100% but are improved with better surgical tools, sterilisation, intelligence, and antibiotics. When compared to 25% without PRP, the success rate of the PRP enhance gelfoam has been employed at 66% [10] when alvaroetal. has seen PRP have a 100% success rate [11]. The success rate in our study significantly increased from 82% to (97.0%). The finest feature of platelet rich plasma (PRP) is that it reduces the likelihood of subsequent infection and speeds up the healing process [12]. One of the most frequent side effects seen when hearing regresses after initially improving is adhesion development, which PRP is known to avoid by control of optimal cell growth. “Closing the perforation of the tympanic membrane eliminates the anatomical defect, prevents recurrence of inflammatory process in the middle ear, and prevents development of sensorineural hearing loss or other complications [13]. The graft rejection or migration could be due to central to peripheral growth pattern. Any substance which promotes fast and effective growth could avoid migration hence PRP may enhance success rate by preventing migration and rejection of graft [11].

PRP may restore permeability of round window mem- brane and by virtue of growth factor may take care of early sensorineural hearing loss. Adding calcium makes it get like to stay in position hence helps to keep the graft in position during placement and in post operative period. Various studies have shown encouraging results in clinical as well as in experimental studies.

Hearing improvement ([10 dB) was observed in con- trol group in (46.3%) and in PRP group in (78.0%)”.

CONCLUSION:

Because Platelet Rich Plasma is autologous in origin, it is simple to obtain and has almost no negative effects. In our investigation, no complications or adverse effects were seen, but the results were noticeably better after adding PRP; therefore, in the future, substituting PRP for local antibiotics or adhesive may show to be a more advantageous option with superior surgical results.

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