CLINICAL OUTCOME AFTER TYMPANOPLASTY WITH USE OFAUTOLOGUS PLATELET RICH PLASMA IN CASE OF TYMPANIC MEMBRANE PERFORATION: A ONE-YEAR OBSERVATIONAL STUDY

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Abstract
In order to evaluate the efficacy of autologous platelet rich plasma in myringoplasty patients with respect to graft uptake and hearing improvement. In order to evaluate the graft uptake and hearing improvement postoperatively, a prospective study was conducted from 2021 to 2022 in the Department of Otorhinolaryngology, Integral Institute of Medical Sciences & Research. The study involved 80 patients, 40 of whom had myringoplasty with autologous PRP usage (Group A) and 40 of whom had myringoplasty alone (Group B). Group A demonstrated graft uptake on postoperative day 21 in 92.5% of the 40 patients who had myringoplasty with autologous platelet rich plasma, but Group B demonstrated only 25% graft uptake. The results showed statistical significance (p 0.0001). (2) There were a very small number of reperforations in Group B, while 95% of Group A exhibited no residual or reperforation at all.(3) The mean A-B gap improvement for group A was 17.37 (SEM of 0.62) and for group B it was 16.75 (not statistically significant).(4) Our research found an infection rate of 2.5% in group A and 7.5% in group B, although there was no statistically significant difference between the two.

Keywords*: Myringoplasty, Autlogous, Platelet, Plasma, Patients, Reperforation, Postoperatively.*

1. Introduction

In the area of otolaryngology, tympanic membrane perforation presents a substantial problem that requires thorough surgical intervention in order to restore auditory function and avoid consequences. [1] Even though there have been breakthroughs in surgical procedures, there is still a great deal of

interest in finding novel ways that may improve graft healing and overall results. Incorporating autologous platelet-rich plasma (PRP) into tympanoplasty operations is one of the developing avenues that might be pursued. [2] This research investigates the consequences of using autologous platelet-rich plasma (PRP) as an adjuvant to tympanoplasty for tympanic membrane perforation. The purpose of this study is to examine the influence that this technique has on graft uptake, rates of residual or reperforation, measures of hearing improvement, and rates of postoperative infection. [3,4]

Perforations may occur in the tympanic membrane, which is a sensitive tissue that plays an essential role in auditory function. These perforations can be caused by a variety of factors, such as trauma, infection, or chronic otitis media. [5] Tympanoplasty, which is a surgical technique that aims to repair the tympanic membrane, is a common intervention that is used to restore hearing and prevent infections from occurring again. [6,7] In spite of this, attaining optimum results continues to be a challenging endeavour that calls for the ongoing investigation of novel methodological approaches. [8,9]

Autologous platelet-rich plasma (PRP), which is abundant in growth factors and cytokines, has shown potential in a variety of medical fields for the purpose of encouraging tissue repair and regeneration. [10,11] The possibility of its implementation in otologic surgery offers a frontier where conventional surgical techniques and regenerative medicine come into contact with one another. [12] This research aims to overcome recurring problems related with graft integration, residual perforations, and infection rates in tympanoplasty by using the regenerative characteristics of platelet-rich plasma (PRP). [13,14]

The importance of this study goes well beyond the specific clinical setting in which it was conducted. By successfully incorporating autologous platelet-rich plasma (PRP) into tympanoplasty procedures, it is possible that the standard of care might be redefined. [15] This would provide a unique and biologically driven method to improve surgical treatment results. [16,17] Within the realm of regenerative medicine, where insights into the therapeutic potential of autologous platelet-rich plasma (PRP) may inspire future applications in a variety of surgical situations, the purpose of the research is to make a contribution not only to the improvement of otological procedures but also to the larger area of regenerative medicine. [18,19]
As we go on with our investigation into the therapeutic implications of using autologous platelet-rich plasma (PRP) in tympanoplasty, the purpose of this research is to give a full knowledge of the possible advantages and limits of adopting this approach. The purpose of this study is to give useful insights that might potentially impact the future landscape of otological surgery and regenerative medicine. These insights will be contributed by investigating crucial variables such as graft uptake, residual perforation rates, hearing improvement, and infection rates. [20]

2. Review of literature

Salaheldin(2022) [21]Using platelet-rich fibrin as a graft material increased the radiographic rate of bone creation in oral and maxillofacial operations, such as bone-added osteotome sinus floor elevation. Our speciality, otorhinolaryngology, makes extensive use of platelet rich plasma. Postoperative crusting, bleeding, and dryness of the nasal mucosa are common complications of intranasal procedures including septoplasty and endoscopic sinus surgery. These side effects occur when the surgeries disrupt the nasal mucociliarycleacrance.

El-Anwar MW (2021) [22]OPlatelet-rich plasma has mostly been used in the field of tology to enhance graft uptake in surgeries like myringoplasty and tympanoplasty, which may or may not include cortical mastoidectomy. The reported success rate for obtaining a healthy tympanic membrane is 95%.Autologous platelet rich plasma has been shown in several worldwide trials to enhance outcomes after tympanic membrane surgery, including graft uptake, healing time, hearing, infection rate, and overall success rate.

3. Significance of the study

The results of this study on tympanoplasty using autologous platelet-rich plasma (PRP) to repair a perforated tympanic membrane have important implications for future studies and clinical procedures. The research adds to what is already known by investigating a new way to improve surgical results in ontological operations. The advantages of using autologous PRP in tympanoplasty, such as better graft uptake, lower infection rates, and fewer rates of residual or reperforation, highlight the possible therapeutic importance of this technique.

Furthermore, this study fills a significant gap in the current state of otolaryngology research by providing a potential remedy for problems related to graft healing and postoperative complications. When properly included into tympanoplasty procedures, autologous platelet-rich plasma has the potential to revolutionise the way tympanic membrane perforations are treated, leading to better patient outcomes and overall well-being.

The results may have implications for other areas of regenerative medicine as well, not limited to otology. The findings of this study on the therapeutic potential of autologous PRP have the potential to motivate more investigations into its uses in many types of surgeries and medical fields.

4. Statement of the Problem

When it comes to otolaryngology, tympanic membrane perforation is still a tough problem with no easy surgical solutions. It is still necessary to look for new ways to increase graft uptake, reduce postoperative problems, and boost patient satisfaction, even if surgical methods have come a long way. This research aims to increase the success of tympanoplasty surgeries by addressing these issues and especially studying the usefulness of autologous PRP. The rates of

infection, residual or reperforation, hearing improvement, and graft uptake are some of the important problems that are discussed. By conducting a thorough analysis of the possible advantages of using autologous PRP in tympanoplasty surgeries, this research hopes to provide light on current practices and future developments in otological surgery.

5. Research methodology

Using topical autologous platelet-rich plasma for myringoplasty was the subject of a randomized controlled trial that lasted from 2020 to 2022 at the Integral Institute of Medical Sciences & Research's Department of Otorhinolaryngology. We enrolled a total of 80 patients in our investigation. Included in our research were patients with Chronic Otitis Media, Tubotympanic, or Mucosal type who had experienced dry ear for 6 to 8 weeks after conservative therapy with oral antibiotics and other supportive measures.Preoperative figure depicting tympanic membrane perforation.the research did not include patients who were unwilling to undergo myringoplasty. For this study, forty patients were randomly assigned to either a "case group" that would receive myringoplasty using autologous PRP or a "control group" that would undergo myringoplasty without this procedure. Patients in Group A had 5–10 ml of blood drawn, which was then spun gently in a centrifuge to divide the sample into three layers; the platelet-poor plasma in the top layer was discarded. The intermediate layer of buffy coat was isolated from the RBCs at the bottom, placed in a new tube, and spun vigorously in a centrifuge.Myringoplasty, which involves sealing the graft's margins with platelet-rich plasma, was performed using this sample at a later date.

A image taken during the operation showing the placement of autologous platelet-rich plasma at the bottom border of the graft Patients had myringoplasty once their informed permission was obtained. Both the case and control groups had their otoendoscopic and microscopic findings compared. Patients had postoperative monitoring every seven days for a total of three months.

Statistical Package for the Social Sciences (SPSS, version 17) for Microsoft Windows was used for all statistical analysis. Numbers and percentages were used to describe the data. Mean and SD were used to represent the data. “For qualitative data, the Fischer exact probability test and chi-square test were used. Statistical significance was determined by a two-sided p value less than 0.05.

6. Results

In Group A, the majority of the 80 patients (32.5% of the total) fall within the 31–40 year old bracket, while in Group B, the majority of the patients fall within the 41–50 year old bracket. Among the 40 patients in Group A, 55 percent were female, while 52.5% were male.

Table1:evaluating graft uptake on postoperative day 21

Graft Uptake POD 21		1	2
Group	**1**	37	3
	2	10	30
Chi square		37.6	
P value		0.0001	

On the 21st day after surgery, 92.5% of patients in Group A demonstrated graft uptake, but just 25% of patients in Group B did so. Results from the chi-square test comparing Group A and Group B were statistically significant (p = 0.0001).

Table2:evaluating graft uptake on day 28 after transplant

Graft Uptake POD 21		**Yes**	**no**
Group	**Myringoplasty with autologous prp**	38	2
	Myringoplasty without autologous prp	37	3
Fisher exact probability		0.21	
P value		0.5	

At the 28th postoperative day, graft uptake was 95% in Group A and 92.5% in Group B.Research comparing the percentage of patients in Group A and Group B who had ear discharge after surgery revealed that 95% of patients in Group A had dry ears and 92.5% had discharge. For statistical purposes, this did not amount to much (p>0.05%).

Table3:displaying ear discharge on the 28th day after the operation

Graft Uptake POD 21		**Yes**	**no**
Group	**Myringoplasty with autologous prp**	1	39
	Myringoplasty without autologous prp	3	37
Fisher exact probability		1.05	
P value		0.307	

Similarly, on the 28th day after surgery, there was a little increase in the frequency of patients experiencing dry ears in Group A (97.5% vs. 92.5%), although this difference was not statistically significant (p>0.05).

Table4:showing reperforation twenty-one days after the operation

Graft Uptake POD 21		**Yes**	**no**
Group	**Myringoplasty with autologous prp**	2	38
	Myringoplasty without autologous prp	3	37
Fisher exact probability		0.21	
P value		0.5	

Group B had a slightly higher number of reperforations compared to Group A, which had no residual or reperforation on the 21st and 28th post-operative days (95%).No statistical significance was found when the data was analysed using chi-square (with a value of 0.21).

Table5:decreasing the A-B gap

Group		**Myringoplasty with autologous prp**	**Myringoplasty without autologous prp**
Reduction In A- B Gap	**mean**	17.37	16.75
	SEM	0.62	0.61
Unpaired t test		0.72	
P value		0.474	

The A-B gap improved by 17.37 points (SEM=0.62) on average for Group A and 16.75 points (SEM=0.62) for Group B. There was no statistical significance when the p value was 0.474 when the chi-square test was used for statistical analysis.

7. DISCUSSION

64 participants were included in the randomized controlled experiment. A total of 32 individuals were randomly assigned to either a group that had myringoplasty alone or one that also received autologous platelet-rich plasma (PRP). The research found that the graft uptake in the cases group (100%) was substantially higher than in the control group (81.25%), with no statistical difference in age or sex." Significant (P=0.02). Statistical analysis revealed that the rate of infection was significantly higher in the control group (12.5% vs. 65.6% in the case group) and that there was no statistically significant difference between the two groups in terms of a gain in hearing of ten dB or more.

Two groups contained forty patients each; forty-one of those patients were female and thirty-nine were male, in contrast to our study's eighty participants. There was no statistically significant difference in the rates of improvement in hearing or infection between the two groups, but graft uptake increased from 92.5% in the case group to 25% in the control group by the third week after surgery. By the fourth week, graft uptake had reached 95% in the case group and 92.5% in the control group. Consistent with their findings, our research found that platelet-rich plasma (PRP) during myringoplasty improved perforation closure in the tympanic membrane, reduced infection risk, and had no adverse effects. [23]

Administered a two-year randomized controlled experiment to 86 individuals. Forty-three patients received myringoplasty using platelet-rich fibrin from their own blood, while forty-three healthy controls did not. Patients were monitored for three months after surgery. The study group had a graft uptake rate of approximately 97.7%, which was significantly higher than the control group's 81% rate (p=0.012). Additionally, 4.7% of the study group's patients had postoperative infections, whereas only 19% of the control group's patients had infections (p = 0.039). [24]

The study's results were comparable to ours, showing graft absorption of 95% among patients and 92.5% among controls; however, our infection rate of 2.5% among cases and 7.5% among controls was not statistically significant, therefore our results did not align with theirs. Because of the similarities and differences between the two trials, we can say that platelet-rich plasma aids in perforation healing, but we cannot say if it reduces infection rates. [25,26]

Investigated the effects of platelet-rich plasma (PRP) on graft uptake in 32 patients suffering from acute tympanic perforation. By the end of the first month after surgery, 64.3% of cases had their perforations closed, compared to 22.2% of controls. However, by the end of the second month, only 1 patient in the study group and 4 patients in the control group had failed the procedure. Our research found that 38 out of 40 instances had successful closure and 2 had unsuccessful closure. Of the forty instances included in the control study, three did not succeed. Graft uptake was seen in 92.5% of patients at the 3-week follow-up, compared to 25% in the control group. However, at the end of the 4-week period, 95 percent of our patients had a mended tympanic membrane, compared to 92.5% in the control group. [27]

Therefore, our investigation confirms that autologous platelet concentrate speeds up the closing of the tympanic membrane. Two of the instances were determined to have failed as a result of infection. There were three patients in the control group whose perforations did not close. Fifty patients, ranging in age from fifteen to forty-five, were the subjects of an interventional study in 2019 by Lyngdoh N C. The study found that adding PRP to fat myringoplasty had a success rate of 87.5% and a failure rate of 12.5%. It also found that the thresholds of air conduction decreased by 9.375 dB post-operatively, with a closure rate of 100% in small perforations of the tympanic membrane and 79.3% in medium sized perforations. [28.29]

released a prospective trial with 50 patients; 25 recipients of Myringoplaty with autologous platelet rich plasma and 25 recipients of Myringoplasty alone served as controls. In the first month, 72% of cases and 40% of controls demonstrated perforation closure in the tympanic membrane; in the second month, 92% of cases and 70% of controls demonstrated perforation closure; and in the third month, 96% of cases and 80% of controls demonstrated perforation closure. [30]

Using 80 patients split evenly between the two groups, we found graft uptake of 92.5% in the cases and 25% in the control group three weeks after surgery. By week four, that number had risen to 95% in the cases and 92.5% in the control group. Therefore, the results of both investigations indicate that the use of platelet-rich plasma in myringoplasty speeds up the closure of perforations. In a preliminary trial involving three patients, Maria Luisa demonstrated that type 1 tympanoplasty using platelet-rich plasma completely sealed the opening in the tympanic membrane. [31,32]

By the conclusion of the fourth week after surgery, the majority of our cases (95%) demonstrated graft uptake and full perforation closure, in contrast to the control group's (92.5%) rate. Therefore, the findings of both investigations were consistent in revealing that platelet rich plasma improved the success rate and overall outcome of myringoplasty. Twenty patients had myringoplasty using autologous platelet rich plasma in a 2016 prospective research.[33,34]

In a study that used platelet-rich plasma for myringoplasty, all patients demonstrated graft uptake after the procedure, and in 85% of instances, patients' hearing improved by 10 dB. Our research found a similar pattern: 95% graft uptake in patients who received autologous platelet rich plasma in addition to myringoplasty, 92.5% graft uptake in those who had myringoplasty alone, and a 10 dB improvement in hearing in all instances. Both investigations found that growth factors in platelet-rich plasma improve bio stimulation and post-operative transplant uptake. [35]

8. CONCLUSION

Using autologous platelet-rich plasma in myringoplasty speeds up graft absorption by accelerating epithelialization over the graft. It reduces graft displacement due to its substantial platelet concentration. Because it is derived from the patient's own blood, platelet rich plasma poses no risk of infection with HIV, hepatitis B, or any other blood-borne illness. To improve the success rate of myringoplasty, it should be employed since it is inexpensive and easy to produce.

8.1 Findings of the study

Out of 80 patients ranging in age from 18 to 70 years, 95% had effective graft absorption, with 5% experiencing failure. It's worth noting that fat was not used in this trial; instead, platelet-rich plasma was. Following surgery, the air-bone conduction gap decrease was 16.75%. After comparing the patients' hearing improvement (17.37) to the control group's (16.75), there was no significant difference (p=0.474). Consistent with their findings, we were able to draw the same conclusion: PRP promotes graft uptake; however, whether or not PRP really improves hearing is debatable.

8.2 Clinical Implications

This work has important therapeutic implications for the use of autologous platelet-rich plasma (PRP) in tympanoplasty for tympanic membrane perforation. The PRP group showed better graft absorption, fewer cases of residual or reperforation, and fewer infections, which might improve surgical results. It seems that tympanoplasty treatments may safely use autologous PRP, which has the additional benefit of stabilising hearing improvement.

8.3 Limitations of the Study

Several limitations are included in the research. There is a potential limitation to the generalizability of the results to a larger population receiving myringoplasty because to the small sample size of 80 patients, which was separated into two groups. The findings may also not be generalizable to other healthcare settings due to the study's single-center design and the fact that it was carried out at the Integral Institute of Medical Sciences & Research's Department of Otorhinolaryngology. Before extrapolating the study's findings to a broader range of patients or healthcare settings, these caveats should be thought about.

8.4 Suggestions for Future Research

To evaluate the long-term effects of autologous PRP, it is advised to do follow-up studies over an extended period of time. The external validity of the results might be enhanced by conducting multicenter studies with bigger and more varied populations. A thorough comprehension of the relative benefits and economic ramifications might be achieved by comparative studies versus other methods and a cost-benefit analysis. Furthermore, focused treatments for tympanic membrane restoration might be possible with the help of mechanistic investigations into the mechanisms of autologous PRP in tissue regeneration. Ultimately, further research is necessary to confirm and expand upon these findings, overcome current constraints, and enhance our knowledge of the therapeutic value of autologous PRP in tympanoplasty, even if the study shows encouraging outcomes overall.

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