



ORIGINAL RESEARCH PAPER

Otorhinolaryngology

A STUDY ON EFFICACY OF AUTOLOGOUS PLATELET-RICH PLASMA ON GRAFT UPTAKE IN MYRINGOPLASTY

KEY WORDS:

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ABSTRACT

Aim: This study aims to analyze the use of autologous platelet-rich plasma (PRP) to improve graft uptake and benefit hearing after myringoplasty. **Objectives:** The objective is to compare pre- and post-operative graft uptake and audiological benefit following myringoplasty with and without PRP. **Materials and Methods:** A total of 70 patients diagnosed with chronic suppurative otitis media Tubo tympanic type was divided into groups of 35 each. Patients in group one underwent myringoplasty with PRP while in second group underwent myringoplasty without PRP. Pre- and post-operative graft status and pure tone audiometry were performed for all the patients, and the outcomes were compared. **Results:** Of 35 patients in each group; four in the study group and eight in the control group had residual perforation. Graft uptake in the case group was 88.57% and graft uptake in the control group was 77.1%. The result was better in cases that underwent myringoplasty with PRP. Of 35 patients in case group, audiological improvement (>10 dB) was seen in 31 patients (88.57%), whereas in the control group of 35 patients, 27 (77.1%) had audiological benefits. **Conclusion:** This study shows there is a definite benefit of using PRP in myringoplasty. As the PRP can be easily prepared, PRP myringoplasty can be routinely performed.

INTRODUCTION

Chronic otitis media (COM) is one of the major otological problems causing hearing loss in developing countries. It is defined as the "persistent inflammation of the middle ear cleft". Apart from the medical measures, myringoplasty remains the mainstay of surgical treatment for COM for the repair of tympanic membrane perforations. Myringoplasty aims at the reconstruction of the tympanic membrane using a graft material. The success rate of myringoplasty has ranged from 70 and 80%. There are multiple factors responsible for the failure of the procedure like upper airway infection, type of the procedure, grafts, and trapped epithelial cell. For repairing the tympanic membrane, there is a pursuit for new biomaterials or biological tissues which are cost effective and safe, which tends to have better outcome.

Autologous serum and autologous platelet-rich plasma have been used along with graft to have better successful outcomes. Platelet-rich plasma (PRP) contains 95% platelets, 4% RBCs, and 1% WBC. Some of the other factors from PRP are platelet-derived growth factor, TGF- β 1, vascular endothelial growth factor, insulin-like growth factor, interleukin, etc. These factors play an important role in chemotaxis, mitogenesis, metabolism, differentiation, etc. Being an autologous product, PRP is safer as there is no chance of disease transmission and it does not have a mutagenic effect. The preparation and extraction of PRP is easy and quick. Hence, this study was planned to find out the efficacy of platelet-rich plasma on graft uptake in patients undergoing myringoplasty.

MATERIALS AND METHODS

Our study was a randomized controlled trial with 70 patients (divided into two groups of 35 each) who were having TM perforation caused by chronic suppurative otitis media or CSOM, of the Tubo tympanic type, for whom myringoplasty was performed. All the patients underwent a meticulous history taking and thorough clinical examination as well as routine laboratory testing and pure tone audiometry.

Inclusion Criteria

The patients included had a TM perforation (small, medium, large, or subtotal) and apparent absence of discharge and healthy middle ear mucosa for at least 2 months prior to surgery.

Exclusion Criteria

Patients presenting with sensorineural hearing loss, active ear discharge, cholesteatoma, immunocompromised status, or suspected ossicular pathology were excluded from the study.

Patients were divided into two groups, with 35 patients in each group. The case group consisted of patients undergoing myringoplasty with the use of autologous PRP, while the control group consisted of patients undergoing myringoplasty without the use of autologous PRP.

Myringoplasty was performed using an underlay technique under general anesthesia. A postauricular approach was used for access, and a temporalis fascia graft was used to repair the TM defect.

All the patients in this study were assessed with respect to postoperative graft uptake and improvement in hearing at 3 months' postoperatively. The audiological benefit was assessed as improvement in hearing >10 dB.

Preparation of Autologous Platelet-rich Plasma and Application

Using a 16 or 18 G syringe, 5 ml of blood was withdrawn from a peripheral vein of the patient after induction of anesthesia. Centrifugation was then carried out immediately, at 3200 rpm for a total of 12 min. This caused the blood to be divided into three layers. The top layer consisted of platelet-poor plasma, the middle layer contained about 1.5 ml of PRP as well as a buffy coat of white blood cells, and the bottom layer consisted of red blood cells (RBCs). The layer of PRP was easily extractable at the time of use.

Once the graft was placed over the TM remnant, this extracted PRP was then placed into the external auditory canal (EAC) over the lateral aspect of the newly grafted TM. Large fragments of gel foam were then placed in support of the PRP. Thereafter, a medicated ear wick was kept over the gel foam.

RESULT

In the case group, out of 17 patients who had medium central perforation, graft uptake was 100%. Out of eight patients in the case group who had large central perforation, graft uptake was 75%. Out of seven patients in the case group who had small central perforation, graft uptake was 85.71%. In the control group, out of 16 patients who had medium central perforation, graft uptake was 87.5%. Out of eight patients in the control group who had large central perforation, graft uptake was 62.5%. Out of eight patients in the control group who had small central perforation, graft uptake was 87.5%.

Out of 35 patients in the case group, audiological improvement (>10 dB) was seen in 31 patients (88.57%), whereas in the control group of 35 patients, 27 (77.1%) had

audiological benefit. Audiological benefit (improvement > 10 dB) was better in cases who underwent myringoplasty with PRP, but it was statistically not significant with $P = 0.205$

DISCUSSION

PRP is a concentration of plasma protein with a higher amount of platelets which is derived from whole blood, centrifuged to avoid RBCs.[6] Growth factors are present in higher concentration than in whole blood; and hence, PRP has been used to enhance the healing response across quite a few specialties, and it is also being used in traumatic injuries. Several different growth factors and cytokines are present which enhance healing of soft tissue and joints. It hastens epidermal, endothelial and epithelial regeneration, encourages angiogenesis, augments synthesis of collagen as well as healing of soft tissues, decreases scarring of the dermis, and promotes hemostatic response to injury. WBCs present in a high concentration in PRP makes it bactericidal. PRP does not have any side effects and can be harvested through a simple method without using any additives. PRP provides protection to the operated site, and it will keep the graft in position and avert sagging of the posterior wall of the ear canal and prevents complications associated with an EAC pack.

Different constituents have been used in the past to treat TM perforations. These include epidermal growth factor, hyaluronan, heparin, fibroblast growth factor, and transforming growth factor. [202122] The autologous PRP is simple and easy to prepare with no reported side effects.

In our study, we analyzed functional results in patients suffering from CSOM, who underwent myringoplasty with and without PRP. We discuss the graft take up rate, clinical improvement, and audiological benefit in 70 patients who presented to our institution.

CONCLUSION

This study shows there is a definite benefit by using PRP in myringoplasty. As the PRP can be easily prepared, PRP myringoplasty can be routinely performed. PRP is a platelet concentrate with enriched growth factors. It helps in the TM closure following myringoplasty. It prevents displacement of the graft from the site. It has no noticeable side effects.

The present study concludes that the usage of platelet-rich plasma in the conventional myringoplasty technique has improved the success rate of graft uptake and reduced graft migration. It has been shown to accelerate the closure of tympanic membranes. The addition of PRP has also revealed greater audiological outcome in terms of air-bone gap closure, in the pure-tone audiogram. Platelet-rich plasma, an autologous serum which is rich in proteins and growth factors, helps and promotes healing with no noticeable side effects in our study. Moreover, the addition of PRP has not altered the cost of the procedure significantly. Though various literature signifies the usage and effectiveness of PRP.

REFERENCES

1. Sankaranarayanan G, Prithviraj V, Kumar V. A study on efficacy of autologous platelet-rich plasma in myringoplasty. *Otolaryngol Online J*. 2013;3(3):1-15.
2. Pacifici L, Casella F, Maggiore C. Platelet rich plasma (PRP): Potentialities and techniques of extraction *Minerva Stomatol*. 2002;51:341-50
3. Shiomi Y, Shiomi Y. Surgical outcomes of myringoplasty using platelet-rich plasma and evaluation of the outcome-associated factors *Auris Nasus Larynx* 2019. pii:S0385-8146(19)30116-6.
4. Taneja MK. Role of platelet rich plasma in tympanoplasty *Indian J Otolaryngol Head Neck Surg*. 2020;13:1-4.
5. El-Anwar MW, El-Ahl MA, Zidan AA, Yacoub MA. Topical use of autologous platelet rich plasma in myringoplasty *Auris Nasus Larynx*. 2015;42:365-8
6. Rick G, Craig J, Mark C. Platelet-rich plasma: Properties and clinical applications *J Lanc Gen Hosp*. 2007;2:73-8
7. Erkilet E, Koyuncu M, Atmaca S, Yarim M. Platelet-rich plasma improves healing of tympanic membrane perforations: Experimental study *J Laryngol Otol*. 2009;123:482-7