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The Efficacy of Platelet-Rich Plasma on Graft Uptake and Audiometric Outcomes in the Repair of Tympanic Membrane Perforation

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Abstract:

Background: Tympanic membrane perforation is a common otological condition frequently seen with various causes including trauma and infections. Chronic perforation may lead to hearing loss, recurrent otorrhea due to middle ear infection and so reduced quality of life making surgical repair necessary. Myringoplasty remains the standard treatment; however, graft failure, reperforation and postoperative discharge may still occur. Therefore, there is still a need to search for methods to enhance tympanic membrane healing after myringoplasty. Platelet-rich plasma (PRP) is an autologous blood-derived product rich in platelets and growth factors such as platelet-derived growth factor, transforming growth factor-β, vascular endothelial growth factor and epidermal growth factor. These factors promote tissue healing, hemostasis, epithelial regeneration and reduced scarring. Recent studies suggest that using platelet-rich plasma as an adjunct to myringoplasty may improve graft uptake, enhance tympanic membrane healing, reduce postoperative infection and improve hearing outcomes compared with conventional myringoplasty alone. Therefore, platelet-rich plasma represents a promising, safe and effective adjunctive therapy in the repair of tympanic membrane perforation.

Keywords: Tympanic membrane perforation; Platelet-rich plasma; Myringoplasty; Tympanoplasty; Graft uptake; Chronic otitis media; Hearing improvement.

Introduction:

Trauma, Eustachian tube dysfunction, or infections like acute otitis media (AOM) and chronic suppurative otitis media (CSOM) can all result in tympanic membrane (TM) perforation. The perforation is considered chronic if it persists for longer than three months. CSOM is one of the most significant causes of chronic TM perforation, which can impair quality of life and result in severe hearing loss (1).

Perforations that are traumatic or acute typically heal on their own. Cholesteatoma formation, hearing loss, and recurrent ear drainage are all possible outcomes of chronic perforation. In order to stop more infection of the exposed middle ear mucosa and damage to middle ear structures, which could cause hearing loss to worsen, the TM must be repaired (2).

TM perforations have been attempted to be repaired using a variety of methods. The traditional course of treatment, known as myringoplasty, involves surgically repairing only the TM with a graft. Because of their internal structure and ease of harvesting, perichondrial and fascial grafts have been used extensively (3).

Myringoplasty has a wide range of surgical success rates, from 64 to 96%. In an investigation into traditional underlay myringoplasty conducted by **Mururgendrappa et al.**, **(4),** It was discovered to be 76%. The best possible contact between the freshly inserted graft and the remaining TM is essential for surgical success, and medialization or lateralization of the graft may result in failure.

Any material that promotes quick healing will also lessen the likelihood of graft migration, which will raise the rate of graft absorption. In otology, fibroblast growth factor and hyaluronic acid have been utilized to aid in the repair of TM perforations. One such substance that has recently been used to treat TM perforations is platelet-rich plasma (PRP), which has also been shown to aid in healing (4).

A tiny amount of autologous blood with a platelet concentration higher than normal and different growth factors is known as platelet-rich plasma. Platelet-derived growth factors (PDGF), transforming growth factor-β (TGF-β), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF) are a few of these growth factors. These are known to aid in hemostasis, speeding up the healing of wounds, and reducing the formation of scar tissue (5).

The use of platelet-rich plasma in ENT has recently raised concerns. It is an emerging technique that has been successfully applied in several medical domains (6).

One of the most popular treatments for persistent TM perforations is still myringoplasty. However, reperforation and postoperative otorrhea increase the risk of surgical failure. Because PRP promotes healing and reduces scarring, using it in conjunction with myringoplasty can increase success rates (1).

- **The Role of Platelet-Rich Plasma in Enhancing Myringoplasty Outcomes**

Platelet-rich plasma is one such adjunct that has been sought for in an effort to improve the success rate following myringoplasty. It is a product made from autologous blood by centrifugation; it has a high concentration of platelets and numerous growth factors, including platelet-derived growth factor, VEGF, EGF, and TGF, among others. Combining PRP with myringoplasty increases the surgical success rate since PRP has immunological properties that promote quick wound healing with fewer scars and infections **(7)**.

In a double blinded study by **Saeedi et al., (8)** The outcomes of type 1 tympanoplasty using PRP-enriched gelfoam vs surgery using gelfoam alone were compared in patients with persistent TM perforation. In the group that had tympanoplasty using PRP-enriched gelfoam, full healing of the TM was observed in 66.67% of cases at the 3-month follow-up, which was statistically significant. During the follow-up period, three patients in the control group experienced ear discharge, compared to none in the intervention group.

A randomized control trial was performed by **El-Anwar et al., (7)**. on 64 individuals who had TM perforations. Patients who received tympanoplasty with PRP had a 100% success rate, while patients who got tympanoplasty alone had an 81.25% success rate. Four patients in the control group developed otorrhea that needed medical attention, but no postoperative problems were observed in this investigation.

In a study done by **Yadav et al., (5)** Patients with persistent otitis media were divided into two groups: group 1 underwent PRP-assisted myringoplasty, while group 2 underwent PRP-free myringoplasty. Group 2's graft uptake rate was statistically significant at 85%, while Group 1's was 95%. In this study, group 1's mean gain in hearing threshold was 18.62 dB, while group 2's was 13.15 dB, both of which were statistically significant.

In a study done by **Prashanth et al., (1)** revealed that 85.3% of patients who received tympanoplasty alone and 97.1% of patients who received tympanoplasty with PRP achieved full recovery. At three weeks of follow-up, four patients in the myringoplasty group and one patient in the myringoplasty with PRP group experienced otorrhea. While the air-bone gap difference was 10.76 ± 2.36 in the case group and 8.29 ± 2.14 in the control group, the mean PTA difference was 11 ± 2.28 in the case group and 8.35 ± 2.05 in the control group.

At three months after surgery, the PRP group's success rate (graft taking) was 100%, compared to the Classic group's 83.3%. The PRP group showed considerably higher hearing gains (14 dB) than the Classic group (7.5 dB). These findings show that the PRP group had better audiometric results than the Classic group.

PRP's essential ability to promote healing and its adherence, which reduces graft displacement, account for a higher graft uptake rate when used in conjunction with myringoplasty. The immunological characteristic of PRP can account for the decline in the postoperative infection rate (1).

PRP use with myringoplasty can result in better hearing gain because it reduces scar tissue and speeds up healing, according to **Yadav et al., (5)** who stated that PRP has a number of growth factors that encourage healing and lessen scarring and **Prashanth et al., (1)** who stated that using PRP in conjunction with myringoplasty promotes quick wound healing while lowering infection and scarring. A superior hearing gain in the PRP group would result from a more elastic grafted tympanic membrane with improved vibratory and sound conductivity characteristics due to fewer scars.

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