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NARRATIVE REVIEW

Platelet-Rich Fibrin in the Closure of Tympanic Membrane Perforations: A Narrative Review

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Abstract: Tympanic membrane perforation, caused by trauma, iatrogenic factors, or infection, affects 1-4% of the global population and may lead to permanent hearing loss. Conservative management shows variable failure rates, while conventional surgical approaches like myringoplasty and tympanoplasty are invasive, time-consuming, expensive, and associated with complications. Platelet-Rich Fibrin (PRF) emerges as a promising autologous biomaterial alternative. This narrative review comprehensively evaluates PRF's clinical efficacy, mechanisms of action, safety profile, and limitations in managing tympanic membrane perforations. A systematic search was conducted across Google Scholar, PubMed, and ScienceDirect databases using relevant keywords. Inclusion criteria encompassed original research articles including clinical trials, cohorts, and case series discussing PRF application in tympanic membrane closure. Reviews, meta-analyses, editorials, and single case reports were excluded. Results demonstrate PRF achieves 92% success rates with an average 8-day healing time, surpassing conventional treatments. PRF functions as a biological scaffold providing growth factors for tissue regeneration. Safety profile is favorable with mild complications including granulation (7.69%) and otomycosis (1.6-19.23%). However, success rates decrease to approximately 80.76% in large perforations, emphasizing proper patient selection. PRF represents an effective and safe adjuvant therapy for tympanic membrane perforation management with minimal adverse effects.

Keywords: Platelet-Rich Fibrin (PRF), Tympanic Membrane Perforation, Myringoplasty, Tympanoplasty, Autologous Biomaterials

INTRODUCTION

Perforation of the tympanic membrane is a tear or hole that occurs in the

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tympanic membrane of the ear due to trauma, iatrogenic causes, and ear infections. This can develop into ear infection, otorrhea, and conductive hearing loss[1], therefore proper management of tympanic membrane perforation is necessary [2].

Treatment of tympanic membrane perforation uses surgical techniques, such as myringoplasty, tympanoplasty, and temporal fascia graft [3]. Surgical management has a high cure rate, but research reports indicate a potential for failure, especially in large perforations [4]. Therefore, other therapeutic modalities are needed to address large perforations, improve healing and closure rates, and minimize complications.

A new development and modality for treating tympanic membrane perforations is the use of Platelet-Rich Fibrin (PRF). Platelet-Rich Fibrin (PRF) is an autologous biomaterial obtained from an individual's blood, containing platelets, leukocytes, cytokines, and a three-dimensional fibrin matrix. PRF components have significant benefits in cell proliferation and regeneration, making PRF a potential candidate for healing tympanic membrane perforations, either as an adjuvant or conservatively [5,6].

This narrative review focuses on the use of PRF in closing tympanic membrane perforations by summarizing scientific evidence related to its mechanism, application techniques, clinical results, and benefits and limitations. With this, it is hoped that researchers and health workers will have an overview of the role of PRF in closing tympanic membrane perforations.

METHOD

This study employed a narrative review design to critically examine and synthesize evidence on the use of Platelet-Rich Fibrin (PRF) in the closure of tympanic membrane perforations. To improve the scientific rigor and address the balance between evidence types, this review prioritized primary research articles as the main data sources, while secondary sources were used only to support theoretical background and biological mechanisms.

The primary sources included original clinical studies such as randomized controlled trials, cohort studies, case–control studies, and prospective or retrospective observational studies that reported empirical data on PRF application in tympanic membrane perforation closure. These studies constituted the majority of the included literature and provided direct evidence regarding closure success rates, healing duration, hearing improvement, and complications.

Secondary sources, including narrative reviews and mechanistic studies, were used in a limited manner to explain the biological properties of PRF, growth factor release, and regenerative mechanisms. These sources were not used as the main basis for clinical outcome conclusions, thereby ensuring that the review’s findings

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were primarily driven by empirical human data.

The inclusion criteria comprised original research articles involving human subjects (adults and children) that evaluated PRF in tympanic membrane perforation closure and reported measurable clinical outcomes. Exclusion criteria included systematic reviews, meta-analyses, editorials, expert opinions, single case reports without comparative or outcome data, animal studies, and in vitro studies. Articles without full-text availability or not written in English or Indonesian were also excluded.

A comprehensive literature search was conducted using PubMed, ScienceDirect, and Google Scholar databases with keywords such as “tympanic membrane perforation,” “platelet-rich fibrin,” “PRF,” and “healing.” Articles were screened sequentially by title, abstract, and full text. Methodological quality and relevance were assessed, and only studies meeting the predefined criteria were included in the final analysis. To ensure transparency and quality in narrative synthesis, the preparation of this review followed the Scale for the Assessment of Narrative Review Articles (SANRA) guidelines. An independent internal assessment based on SANRA was performed prior to manuscript finalization.

RESULTS

From the initial search results, 137 articles were obtained. After screening based on titles and abstracts, 77 articles were eliminated because they were irrelevant, leaving 60 articles.

Next, the full texts were assessed, and 32 articles were excluded because they did not meet the established inclusion and exclusion criteria, leaving 28 articles.

In the final selection stage, 14 studies were found to meet the criteria and were included in the analysis. These studies consisted of 1 randomized clinical trial (RCT), 1 case-control study, 4 literature reviews, 2 cross-sectional studies, 3 prospective observational studies, 1 additional prospective observational study, and 2 experimental studies.

Most of the studies involved patients with presbycusis in the elderly age group, with publication years ranging from 2015 to 2025. The characteristics of the included studies are summarized in Table 1.

Tabel 1. Study Selection Used for Discussion of Post-Traumatic Tympanic Membrane Perforation

Author	Year	Study Design	Population	Countr y	Clinical Findings Related to Post-Traumatic Tinnitus

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Remenschneider, et al	2021	Cross-sectional	23 participants	United States	This article describes an effective tympanic membrane (TM) repair technique that can be performed in a clinic setting, without the need for an operating room. Using an endoscopic approach, local anesthesia, and a two-layer graft from the submucosa of pig's small intestine, this procedure was well tolerated by patients.
Liu, et al	2023	Literature review	-	China	The mechanism of Platelet-Rich Fibrin (PRF) in alveolar bone regeneration. PRF, as an autologous blood product, is rich in growth factors and cytokines that accelerate bone regeneration.
Ali, et al	2025	prospective obsevational study	63 participants	Bangladesh	This study concluded that PRF holds significant potential as a minimally invasive, safe, and effective treatment option for traumatic TM perforation. The high healing success rate, rapid pain reduction, and improved patient satisfaction suggest that PRF could be a primary choice in otologic practice.
Al-arman, et al	2024	RCT	156 participants	Mesir	The application of PRF in fascia grafting during tympanoplasty promotes tympanic membrane healing and improves graft success rates for large perforations, similar to the use of cartilage, but with the advantage of a shorter surgical time. Moreover, PRF is safe, inexpensive, easy to prepare, and does not require additional cartilage grafts.
Rajendran Dinesh Kumar	2017	prospective obsevational study	25 participants	India	The effectiveness of TCA technique and PRF Plug Myringoplasty in healing tympanic membrane (TM) perforations due to trauma. This study involved 25 patients with central perforations less than 4 mm in size.
Mohanty, et al	2024	prospective obsevational study	52 participants	India	Autologous platelet-rich fibrin (PRF) for repairing small perforations of the eardrum. PRF, being derived from the patient's own blood, is safe and does not cause immunogenic reactions.
Saini, et al	2024	Eksperimental study	80 participants	India	Platelet-rich fibrin (PRF) in tympanoplasty surgery for chronic otitis media (COM). The results showed that the group receiving PRF had better graft survival rates and faster healing times compared to the group that did not receive PRF.
Dispenza, et al	2018	Case-control	72 participants	italia	Tympanoplasty is a common surgical procedure to reconstruct the eardrum but has variable failure rates. This study analyzed factors contributing to surgical

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					failure in 72 patients undergoing tympanoplasty. The overall recurrence rate found was 19.4%.
Serafini, et al	2020	Study in Vitro	10 participants	italia	Liquid fibrinogen produced by this centrifugation method contains a high platelet concentration, approximately 1.5 times higher than whole blood. Meanwhile, the counts of other cells such as lymphocytes, neutrophils, and monocytes significantly decreased.
Pokharel , et al	2024	Cross-sectional	384 participants	Nepal	This study aimed to describe the clinical profile of traumatic tympanic membrane perforation in the pediatric population. Results showed that the most common cause was physical assault (28.39% of cases).
Pavlovic, et al	2021	Literature review	-	Serbia	The main components of PRF, namely platelets, leukocytes, and fibrin matrix, work together to promote wound healing and tissue regeneration. Leukocytes play an important role in soft tissue and bone regeneration by releasing factors critical for intercellular communication.
Tiple, et al	2023	Retrospective observational	47 participants	Rumania	Graft success rate: The PRF group had a significantly higher graft success rate (95.0%) after 12 months compared to the non-PRF group (70.4%). This difference was statistically significant ($p<0.05$).
Principi, et al	2017	Literature review	-	Italia	This review concluded that effective preventive methods for uncomplicated AOM, such as influenza vaccination and vitamin D supplementation, show much lower effectiveness in preventing AOM episodes with TM perforation. These results support the idea that AOM with TM perforation may be a distinct entity.

DISCUSSION

Platelet-rich fibrin (PRF) is an autologous biomaterial obtained from an individual's blood, consisting of a mixture of platelets, leukocytes, cytokines, and a three-dimensional fibrin matrix. PRF consists of cells, growth factors, and a three-dimensional fibrin matrix that functions as a natural scaffold. The cellular components of PRF are primarily platelets (±97%) and leukocytes (>50%) that play an important role in hemostasis, immune response, and wound healing stimulation.[5]. In addition, PRF is rich in growth factors such as TGF-β1 (Transforming Growth Factor-β1), PDGF (Platelet-Derived Growth Factor), VEGF (Vascular Endothelial Growth Factor), EGF (Epidermal Growth Factor), IGF (Insulin Growth Factor), IL-1β (Interleukin-1β), IL-6 (Interleukin-6), TNF-a (Tumor Necrosis Factor), IL-4 (Interleukin-6) [6].

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Transforming Growth Factor-β (TGF-β) is a multifunctional cytokine in the large TGF-β family, with TGF-β1 as the most dominant isoform. TGF-β1released by platelets plays a role in fibroblast chemotaxis, stimulation of extracellular matrix production, prevention of collagen degradation, and supports angiogenesis, immune activation, and osteoblast differentiation. Platelet-Derived Growth Factor (PDGF), one of the early growth factors at the site of injury, facilitates the migration, proliferation, and viability of mesenchymal cells, while enhancing angiogenesis and TGF-β secretion TGF-β by macrophages. Insulin-like Growth Factor-1 (IGF-1) functions to stimulate mesenchymal cell differentiation, provides anti-apoptotic signals, and supports osteoblast activation and bone formation. Vascular Endothelial Growth Factor (VEGF), which is released by platelets and macrophages, is a major regulator of angiogenesis, with its expression influenced by other factors such as IGF-1, IL-1β, PDGF, and EGF. Epidermal Growth Factor (EGF) accelerates epithelialization, angiogenesis, and cytokine secretion by epithelial and mesenchymal cells.

Interleukin-1β (IL-1β) initiates inflammation through regulation of leukocyte and endothelial adhesion, enhances chemotaxis of phagocytes and lymphocytes, and together with TNF-α activates osteoclasts and inhibits osteogenesis. Interleukin-6 (IL-6) supports proliferation, migration, differentiation of immune cells, and antibody production, serving as an important mediator in inflammation and tissue remodeling. Tumor Necrosis Factor-α (TNF-α) regulates inflammatory response, epithelial healing differentiation, and expression of other proinflammatory cytokines. Interleukin-4 (IL-4) directs Th2 differentiation, promotes M2 macrophage activation, and plays a role in controlling pathological inflammation and fibrosis.

Platelet-Rich Fibrin (PRF) is the second generation of platelet concentrates following Platelet-Rich Plasma (PRP). PRF was developed to overcome the limitations of PRP in terms of stability and duration of growth factor release. Platelet-Rich Plasma (PRP) is a platelet concentrate obtained from blood plasma with the addition of anticoagulants and activators to prevent premature coagulation. This preparation is liquid in form and generally requires additional materials to be applied in gel or membrane form. The growth factor release profile of PRP shows a rapid increase in the early phase but decreases significantly within a short time, making it more suitable when immediate healing stimulation is required.

In contrast, Platelet-Rich Fibrin (PRF) was developed as the second generation of platelet concentrates that is completely autologous and does not require anticoagulants. The natural coagulation process produces a three-dimensional fibrin

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matrix that entraps platelets and leukocytes, thereby forming a biological scaffold that supports cell migration, proliferation, and differentiation. PRF demonstrates a slower but sustained growth factor release for up to 7-10 days, with a higher total accumulation compared to PRP. These characteristics make PRF superior in supporting long-term tissue regeneration while maintaining biomaterial stability at the application site.

Platelet-Rich Fibrin (PRF) Classification

Platelet Rich Fibrin (PRF) is classified into several types based on modifications of centrifugation protocols and application methods, namely Leukocyte-Platelet Rich Fibrin (L-PRF), Advanced Platelet Rich Fibrin (A-PRF), Advanced Platelet Rich Fibrin Plus (A-PRF+), and Injectable Platelet Rich Fibrin (i-PRF). Each type has distinct characteristics that influence cellular content, growth factor release, and clinical application.

L-PRF is the first form of platelet rich fibrin developed to maximize the roles of platelets and leukocytes in healing wounds. Its building procedure uses standard centrifugal speeds that create a dense fibrin mass rich in platelets (about 97%) and contains more than half a total blood leukocyte. The fibrin matrix that is formed serves as a natural backup of growth factors, such as PDGF, TGF-1, and VEGF, which is released gradually to support tissue regeneration, although its release duration is relatively shorter than the newer variant.

A-PRF is the development of L-PRF by applying the concept of low-speed centrifugation, which is a lower velocity of spin and a shorter time of centrifugation. This technique enables more leukocytes, especially neutrophils, to be contained in the fibrin and distributed matrix evenly, not just at the bottom of the tube. This increased cellular content contributes to the release of a more stable and prolonged growth factor, thus supporting the angiogenesis process and the formation of new tissue more optimally.

A-PRF+ is further modification of A-PRF using the speed and time of the lower centrifuges. This approach increases the number of leukocytes and platelets trapped in fibrin tissue, so growth factor levels such as TGF-β1, PDGF, VEGF, EGF, and IGF that are released become higher and last up to about ten days. These formulations provide the largest bioactive effect of any other PRF, either to accelerate cell migration or stimulate collagen synthesis during the healing process.

I-PRF is a liquid version of PRF produced with a very low centrifugal (about 700 RPM for three minutes) without the added anticoagulation. It should be used in a short time, usually less than fifteen minutes, before coagulation. The liquid form enables I-PRF to be applied by injection or mixed with bone grafts to increase stability and make placement easier. Although more flexible, I-PRF continues to maintain a superior release of gradual growth factors

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and higher leukocyte content than conventional platelets [5].

Mechanism Of Platelet-Rich Fibrin (PRF) In Tympanic Membrane Perforation

Platelet-Rich Fibrin (PRF) works through three main mechanisms. First, PRF acts as a biological scaffold. When the patient's blood is processed, PRF forms a strong three-dimensional fibrin matrix. This matrix provides an ideal framework for epithelial and fibroblast cells to migrate and adhere [7]. By placing the PRF membrane directly over the tympanic membrane perforation, the matrix effectively bridges the gap, allowing new cells to grow and close the damaged area in an orderly manner.

Second, PRF functions as a long-term source of growth factors. The dense fibrin matrix in PRF traps high concentrations of essential growth factors such as TGF-β1, PDGF, and VEGF[8].Unlike other platelet concentrates, the dense PRF matrix ensures that these factors are released gradually and continuously [6]. This distributed release provides constant cellular stimulation, which is crucial for proliferation, differentiation, and tissue regeneration throughout the healing phases. The presence of leukocytes in the PRF matrix also contributes to the release of these growth factors, immune regulation, and anti-infective activity [6,8].

Lastly, PRF provides physical protection and modulation of inflammation. As an absorbable membrane, PRF protects the perforation site from unwanted epithelial cell migration from the outer ear layer into the middle ear, which could interfere with healing [9]. This mechanical and inflammatory protection helps maintain graft integrity and creates a conducive environment for healing [8]. The combination of PRF's roles as a biological scaffold, a long-term growth factor reservoir, and a protective agent makes it a highly effective tool for increasing graft success rates and accelerating tympanic membrane perforation healing[9].

According to research conducted by Ming Liu, Yeng Liu, and Feng Luo (2023), Platelet-Rich Fibrin (PRF) supports alveolar bone regeneration through the periodic release of growth factors, including PDGF, TGF-β1, VEGF, and IGF-1, which induce stem cell differentiation into osteoblasts and accelerate bone matrix formation. The VEGF content in PRF stimulates angiogenesis, thereby optimizing blood and nutrient supply to the defect area. Meanwhile, PRF's three-dimensional fibrin structure serves as a natural scaffold that retains cells and biological mediators at the wound site, while leukocytes help regulate the inflammatory response. This synergy creates a favorable healing environment and effectively accelerates bone regeneration[10].

In tympanic membrane perforation, PRF plays a role through complementary biological and mechanical mechanisms. The platelets, leukocytes, cytokines, and growth factors it contains stimulate epithelial cell

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proliferation and migration, promote angiogenesis, and accelerate new tissue formation. The three-dimensional fibrin matrix of PRF acts as a natural scaffold that retains biological mediators at the wound site, protects the graft, and reduces the risk of immune reactions, thereby significantly improving closure success and hearing restoration[8].

Indications For The Use Of Platelet-Rich Fibrin (PRF) In Tympanic Membrane Perforation

This procedure can be considered in patients who present with conductive hearing loss associated with chronic tympanic membrane perforation that has not undergone spontaneous healing. The perforation should have persisted for more than three months, be small to moderate in size involving less than 50% of the total tympanic membrane area, be in a dry condition, and be free from signs of active infection in the middle ear or external auditory canal[11].

In addition to meeting morphological and clinical criteria, patients are also expected to demonstrate adequate motivation to undergo the reconstruction procedure and have good tolerance for ear canal manipulation while awake, considering that the procedure is performed under local anesthesia without deep sedation[12].

This approach is particularly beneficial for patients who are unsuitable for or not recommended to undergo general anesthesia, including individuals with comorbidities that increase anesthetic risk or those for whom continuing anticoagulant or antiplatelet therapy is medically safer. Thus, this procedure provides a minimally invasive, cost-effective, and relatively safe alternative for patient groups with limitations to conventional surgical techniques requiring general anesthesia[3].

Platelet-Rich Fibrin (PRF) Application Technique

The use of Platelet-Rich Fibrin (PRF) for improvement of the Tympanic Membrane Perforation (PMT) is based on preparation and application as a biological material that facilitates healing. The use process begins from preparation of materials to its placement in the location of perforation. At the PRF materials preparation stage, the process begins with taking a small amount of the patient's blood. About 10 ml of blood was withdrawn from the patient. It was then quickly disentrifugation using a special machine[9]. The centrifugal process is carried out without adding anticoagulant, allowing for a dense fibrin clot. The result of the centrifuzation is the division of the blood into three layers: the red cell's lower section (RBC), the upper part of a celled plasma, and the central layer of a PRF clot.

The Platelet Rich Fibrin clot is extracted and separated from the surrounding layer of blood cells. Once the

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Platelet Rich Fibrin clot is obtained, it can be modified and applied depending on the size and type of perforation. For small perforations, the Platelet Rich Fibrin clot is cut and shaped like a barbell or dumbbell. This portion of the Platelet Rich Fibrin is placed with some parts on the medial side and others on the lateral side of the perforation, followed by placing thin sheets of Platelet Rich Fibrin on top. This technique allows the Platelet Rich Fibrin to act as a single material to close the defect.

In cases of greater perforation or when more extensive surgical procedures such as tympanoplasty are required, Platelet Rich Fibrin is used as a supportive or adjuvant material. Platelet Rich Fibrin is applied topically as an adjunctive layer on the main graft, which often uses temporal fascia. After the main graft is positioned, Platelet Rich Fibrin is placed at the edges of the perforation with the aim of enhancing graft survival and accelerating the healing process[7]. Furthermore, the Platelet Rich Fibrin clot can be converted into a thin membrane and combined with a cartilage transplant to improve the rate of successful graft integration and survival[8].

Platelet-Rich Fibrin (PRF) Effectiveness In Tympanic Membrane Perforation

PRF has been shown to accelerate the healing of tympanic membrane perforations, with a mean closure time of approximately 8 days and a success rate of 92% by day 10. This is significantly faster than spontaneous healing, which typically requires 25–90 days. Moreover, PRF provides meaningful improvement in hearing, with an average air–bone gap closure of 12.1 dB. This success is attributed to the ability of PRF to serve as a biological scaffold that gradually releases growth factors, stimulates epithelialization and angiogenesis, and creates an optimal environment for healing [11].

Advantages And Disadvantages Of Platelet-Rich Fibrin (PRF)

PRF has the advantage of a shorter surgical duration and avoids morbidity at the donor site and has a lower complication rate in the PRF group [12]. The main difference between conventional tympanoplasty and PRF is the additional application of PRF to the edges of the perforation after the temporalis fascia graft is placed. PRF acts as a biological layer that stabilizes the graft, stimulates angiogenesis, accelerates epithelialization, and increases healing success without requiring additional donor incisions [7].

Apart from having many advantages, of course PRF is not free from shortcomings. PRF has the disadvantage of not always achieving complete closure of the tympanic membrane perforation, with a success rate of 80.76% and in some cases the perforation remains. Mild complications such as granulation (7.69%) and otomycosis (19.23%) may occur, so studies with larger populations and long-term follow-up are

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needed to evaluate its effectiveness in larger perforations[9]. The side effect rate of PRF procedures to close tympanic membrane perforations is very low, only 1 in 63 patients or 1.6% of patients experience otomycosis. These results prove that PRF is a safe, biocompatible, and effective method for accelerating healing [13].

Recent clinical evidence consistently demonstrates the effectiveness of Platelet-Rich Fibrin (PRF) in tympanic membrane regeneration. A systematic review and meta-analysis reported that PRF significantly improves anatomical closure rates and shortens healing duration compared to conservative management or conventional graft materials, indicating its strong regenerative capacity.[14] Randomized controlled evidence further confirms that PRF-augmented tympanoplasty achieves graft success rates comparable to cartilage tympanoplasty while offering shorter operative time and reduced surgical morbidity.[15] In cases of acute traumatic tympanic membrane perforation, PRF application has been shown to result in faster closure and superior healing outcomes compared to conservative treatment alone.[16] Prospective and observational studies also support PRF as a reliable regenerative biomaterial that enhances graft integration, epithelial regeneration, and overall surgical success through sustained release of growth factors.[17] Moreover, recent pediatric data demonstrate high anatomical success rates of myringoplasty using PRF membranes, suggesting that PRF is effective across different age groups and clinical settings.[18] Collectively, these findings support PRF as a minimally invasive, biologically active, and clinically effective option for tympanic membrane repair with a favorable safety profile.[19,20]

CONCLUSION

Based on the narrative study carried out, it can be concluded that Platelet-Rich Fibrin (PRF) is a promising biomaterial innovation in the treatment of tympanic membrane perforation. PRF works through complex biological mechanisms, including by releasing various important growth factors such as Transforming Growth Factor-β (TGF-β), Platelet-Derived Growth Factor (PDGF), Vascular Endothelial Growth Factor (VEGF), Epidermal Growth Factor (EGF), as well as other cytokines that play a role in stimulating cell proliferation and differentiation. In addition, naturally occurring three-dimensional fibrin structures function as biological scaffolds, facilitating the adhesion, migration, and proliferation of epithelial cells and fibroblasts. This dual role not only supports the processes of angiogenesis, epithelialization, and tissue regeneration, but also keeps the biological environment stable and conducive to healing of tympanic membrane perforations.

The results of the various studies reviewed show that the use of PRF in closing tympanic membrane perforations is able to speed up the healing process, with an

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average duration of closure that is shorter compared to spontaneous healing or conventional procedures. PRF has also been proven to improve functional outcomes in the form of improved hearing thresholds, and has demonstrated a closure success rate of up to 92%. Another advantage of this method is that it is minimally invasive, does not require additional tissue donors, and can be performed under local anesthesia, thereby reducing the risk of systemic complications that often occur in surgical procedures under general anesthesia.

However, even though the effectiveness of PRF is relatively high, several studies still report limitations in the form of inconsistent closure success in all cases, with a success rate of around 80.76% in some studies. In addition, there are reports of mild complications such as otomycosis and granulation, although the incidence is relatively low and can be treated with supportive therapy. This shows that although PRF is a safe and biocompatible method, caution is still needed in its application, especially in patients with certain predisposing conditions.

By considering the existing advantages and limitations, PRF can be seen as an effective alternative or adjuvant to conventional reconstructive procedures in treating tympanic membrane perforation. In the future, studies with more robust designs, larger sample sizes, and long-term follow-up periods are needed to strengthen the scientific evidence regarding the effectiveness and safety of PRF. In addition, further research is also important to explore the combination of PRF with other techniques or biomaterials that have the potential to increase closure success and expand the scope of clinical indications for various types of tympanic membrane perforation.

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REFERENCES

1. Pokharel A, Bhandari C, Sharma B. Traumatic Tympanic Membrane Perforation in Children: A Descriptive Cross-sectional

E-ISSN :2722-0877

Study. J Nepal Med Assoc. 2024;62(275):463-67.
2. Principi N, Marchisio P, Rosazza C, Sciarrabba CS, Esposito S. Acute otitis media with spontaneous tympanic membrane perforation. Eur J Clin Microbiol Infect Dis. 2017;36(1):11-18.
3. Remenschneider A, Polanik MD, Kozin ED. In office repair of tympanic membrane perforations. Oper Tech Otolaryngol Head Neck Surg. 2021;32(2):116-20.
4. Dispenza F, Battaglia AM, Salvago P, Martines F. Determinants of failure in the reconstruction of the tympanic membrane: A case-control study. Iran J Otorhinolaryngol. 2018;30(6):341-46.
5. Fujioka-Kobayashi M, Miron RJ. Biological Components of Platelet Rich Fibrin: Growth Factor Release and Cellular Activity. In: Platelet Rich Fibrin in Regenerative Dentistry: Biological Background and Clinical Indications. 2017. p. 15-32.
6. Pavlovic V, Ciric M, Jovanovic V, Stojanovic P. Platelet-rich fibrin: Basics of biological actions and protocol modifications. Open Life Sci. 2021:446-54.
7. Saini S, Khan SR, Kumar MB, Singh K, Pandey P. The Impact of Topical Application of Platelet-Rich Fibrin on Graft Survival in Surgeries for Chronic Otitis Media. Cureus. 2024;16(1):1-6.
8. Tiple C, Chirila M, Vesa SC, Stamate MC. Plasma-Rich Fibrin—Regenerative Material in Tympanic Membrane Surgery. Medicina (Kaunas). 2023;59(7):1-9.
9. Mohanty R, Harkut R, Mhashal S, Kadao Y. Advancement in Tympanic Membrane Repair: Exploring the Potential of Platelet Rich Fibrin. Indian J Otolaryngol Head Neck Surg. 2024;76(4):2962-67.
10. Liu M, Liu Y, Luo F. The role and mechanism of platelet-rich fibrin in alveolar bone regeneration. Biomed Pharmacother. 2023;168:115795.
11. Kumar RD. Application of Platelet Rich Fibrin Matrix to Repair Traumatic Tympanic Membrane Perforations: A Pilot Study. Indian J Otolaryngol Head Neck Surg. 2019;71(Suppl 2):1126-34.
12. Al-Arman AM, Moneir W, Amer HE, Ebada HA. Platelet rich fibrin augmented tympanoplasty versus cartilage tympanoplasty: a randomized clinical trial. Eur Arch Otorhinolaryngol. 2024;281(11):5739-46.
13. Ali MH, Talukder A, Ali H, Hossain MGS. Evaluation of therapeutic potential of platelet rich fibrin (PRF) in the healing process of traumatic tympanic membrane (TM) perforation. Int J Otolaryngol Res. 2025;7(1):17-22.
14. Serafini G, Lopreiato M, Lollobrigida M, Lamazza L, Mazzucchi G, Fortunato L, et al. Platelet rich fibrin (Prf) and its related products: Biomolecular characterization of the liquid fibrinogen. J Clin Med. 2020;9(4):1099.
15. Huang J, Teh B, Zhou C, Shi Y, Shen Y. Tympanic membrane regeneration using

E-ISSN :2722-0877

platelet-rich fibrin: a systematic review and meta-analysis. Eur Arch Otorhinolaryngol. 2022;279(1):557-565.
16. Ahmed A, Mohamed S, El-Shimi O, Belal M. Use of platelet rich fibrin in acute traumatic tympanic membrane perforation compared with conservative treatment. Benha Med J. 2020;1(1):1-8.
17. Tiple C, Chirila M, Vesa SC, Stamate MC. Plasma-rich fibrin—regenerative material in tympanic membrane surgery. Medicina (Kaunas). 2023;59(7):1292.
18. Kupica L, Kolesova O, Tomina K, Seglina G. Anatomical success of myringoplasty using platelet-rich fibrin membrane in pediatric patients: a prospective study. Int J Pediatr Otorhinolaryngol. 2025;195:112425.
19. Al-Arman AM, Moneir W, Amer HE, Ebada HA. Platelet rich fibrin augmented tympanoplasty versus cartilage tympanoplasty: a randomized clinical trial. Eur Arch Otorhinolaryngol. 2024;281(11):5739-5746.
20. Huang J, Teh B, Zhou C, Shi Y, Shen Y. Tympanic membrane regeneration using platelet-rich fibrin: a systematic review and meta-analysis. Eur Arch Otorhinolaryngol. 2022;279:557-565.