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THE USE OF FIBRIN, PLATELET, AND LEUKOCYTE-RICH MEMBRANE (L-PRF) IN AESTHETIC DERMATOLOGY: A NARRATIVE REVIEW

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ABSTRACT

Introduction: The dermatological style has been developed using smaller and less dangerous techniques, driven by dissatisfaction with the status quo. Highlighted among the advances of L-PRF, which is an autologous procedure that causes cell regulation and collagen synthesis, without any pain and rejection. Even with the benefits, however, there are still problems in standardizing processes and obtaining demonstration of late effects. **Objective:** This study investigates the use of L-PRF (Leukocyte-Platelet Rich Fibrin) in aesthetic dermatology, highlighting its relevance in tissue regeneration and biostimulation, with the aim of evaluating its applications and efficacy in the treatment of various dermatological conditions. **Methodology:** A narrative review of the literature was carried out, with the selection of articles published between 2013 and 2024, prioritizing clinical and experimental studies that address the use of L-PRF in aesthetic dermatology. **Key results:** L-PRF has demonstrated significant benefits in facial rejuvenation, scar treatment, and accelerated tissue regeneration. In addition, studies indicate an improvement in the appearance of the skin, with positive effects in terms of elasticity, firmness and reduction of fine lines. **Conclusion:** L-PRF is an effective and safe therapy with great potential in aesthetic dermatology, although there are gaps in the standardization of protocols and in the variability of results. More in-depth studies are needed to validate its effectiveness and establish clear guidelines for application.

Keywords: L-PRF. Aesthetic Dermatology. Tissue regeneration. Biostimulation.

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INTRODUCTION

Aesthetic dermatology is an area of medicine that has experienced significant advances over the past few years, driven by the constant search for effective and non-invasive treatments that meet the growing demand for rejuvenation and aesthetic improvement. With the advancement of technology and scientific techniques, new approaches have been developed to treat a variety of dermatological conditions, from signs of aging to scars and skin lesions. Contemporary dermatological aesthetics is no longer limited to complex surgical interventions, but increasingly integrates minimally invasive technologies that allow natural results to be obtained, with rapid recovery and low risk of complications (Gadelha *et al,* 2024).

Within this context, regenerative and biostimulatory treatments have gained prominence, especially due to their ability to stimulate cell regeneration and collagen production, fundamental factors for skin rejuvenation. These treatments not only promote aesthetic improvement, but also act to restore skin function, being effective in conditions such as sagging, uneven texture, and loss of facial volume. Regenerative therapies differ from traditional methods by their more natural approach, focusing on stimulating the body's own biological processes, reducing dependence on exogenous substances and, consequently, the risk of adverse reactions (Nascimento, Dantas, and Guimarães, 2024).

Among the emerging technologies in the field of aesthetic dermatology, L-PRF (Leukocyte-Platelet Rich Fibrin) stands out as an innovative and promising option. L-PRF is a form of platelet-rich plasma derived from the patient's own blood, which gives it a high degree of biocompatibility and safety. The L-PRF collection procedure is simple and minimally invasive, consisting of extracting a blood sample from the patient, which is then processed to separate platelets and leukocytes, creating a fibrinous gel. This gel is then applied to the skin to promote cell regeneration, increase collagen production, and improve skin texture and firmness. As it is an autologous treatment, L-PRF does not involve risks of allergic reactions or rejection, which makes it an attractive alternative for patients looking for a natural approach and without the use of external substances (Garcia *et al,* 2024).

Despite the benefits already observed in the use of L-PRF in aesthetic dermatology, there are still challenges that need to be addressed, such as the standardization of application protocols, the evaluation of efficacy in different skin types, and the possible limitations regarding the duration of the results. In addition, it is important to understand the exact mechanisms by which L-PRF promotes its regenerative effects and how these results

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hold up over time, as the literature still has some gaps in data on long-term efficacy and possible side effects.

The relevance of this review is justified by the need to consolidate existing information on the application of L-PRF in aesthetic dermatology, providing a critical analysis of the benefits and challenges of this treatment. A comprehensive review can contribute to the improvement of clinical practice by clarifying the best ways to use this technology and minimizing the associated risks, as well as guiding future research and the improvement of application techniques.

The objective of this study is to review the scientific literature on the use of L-PRF in aesthetic dermatology, highlighting the proven benefits, the limitations observed, the most common clinical indications, and future perspectives. From this analysis, it is intended to provide an updated and critical view of the impact of this technology in the field of dermatological aesthetics, with emphasis on its efficacy, safety and applicability.

METHODOLOGY

The present narrative review aims to gather and analyze the data available in the scientific literature on the use of the membrane rich in fibrin, platelets and leukocytes (L-PRF) in aesthetic dermatology. To achieve this goal, a systematic search was carried out in the main scientific databases, including PubMed, Scopus, Web of Science, Google Scholar and SciELO, covering the period from 2013 to 2024. This period was chosen due to the relevance of the most recent publications on L-PRF techniques and applications, reflecting advances and innovations in clinical practice.

Studies addressing the use of L-PRF in dermatological aesthetic treatments, such as facial rejuvenation, scar treatment, alopecia, and other dermatological conditions, were included. The articles selected for analysis were randomized controlled trials (RCTs), cohort studies, case studies, and systematic and narrative reviews related to the use of L-PRF in aesthetic dermatology. On the other hand, studies that did not specifically address the use of L-PRF in aesthetic dermatology, such as those that focus on non-dermatological areas, such as orthopedics, as well as articles with incomplete results or inadequate methodological quality, were excluded. Studies involving experimental or animal models were also disregarded, since the focus of the review is clinical application in humans.

The selection of articles was conducted in two stages. Initially, a search was made for the terms "L-PRF", "aesthetic dermatology", "platelet-rich membrane", "facial

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rejuvenation", "scars" and "alopecia treatment" in the aforementioned databases. From the titles and abstracts, the articles that met the inclusion criteria were selected. Then, the articles were read completely to extract the pertinent information, including details about the methodology used, the results obtained, the efficacy of the treatment, the side effects reported, and the authors' conclusions.

The analysis of the selected studies was carried out qualitatively, with the objective of identifying the main trends and clinical applications of L-PRF in aesthetic dermatology. A critical synthesis of the results was made, considering the methodological quality of the studies, the consistency of the findings, and the implications for clinical practice. In particular, the application techniques, the clinical benefits observed, the proposed mechanisms of action, and the challenges faced in the use of L-PRF were highlighted, in addition to identifying gaps in the literature and suggesting directions for future research on the subject. Considering that this is a narrative review, there was no involvement of humans or animals, and the analysis was based exclusively on studies already published. It was not necessary to obtain specific ethical approval for this work.

RESULTS

The L-PRF

L-PRF (Leukocyte-Platelet Rich Fibrin) is an advanced form of autologous plasma derived from the patient's own blood. It is distinguished from other types of plasma, such as PRP (Platelet Rich Plasma), by the absence of anticoagulants or additives during the preparation process, which results in a more biocompatible product. L-PRF is characterized by a high concentration of platelets, leukocytes, and fibrin, which are essential components for tissue regeneration and healing. The technique of obtaining L-PRF not only offers a highly effective product, but also minimizes the risks associated with the use of external substances, ensuring greater patient safety (Nacopoulos and Vesala, 2020).

The composition of L-PRF is composed of three main components: platelets, leukocytes, and fibrin. Platelets are key blood cells in the healing process, as they release a variety of growth factors, such as Platelet-Derived Growth Factor (PDGF), which stimulate cells to proliferate and differentiate, accelerating the regeneration of damaged tissues. These growth factors act directly on fibroblasts, the cells responsible for collagen production, and other cells involved in the repair process. In addition, platelets promote the

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formation of new blood vessels, a process called angiogenesis, which is essential for oxygenation and proper nutrition of regenerating tissues (Monteiro *et al*., 2013).

Leukocytes, also present in L-PRF, play a crucial role in controlling inflammation and defending against infection. They are responsible for immune mediators that help create a favorable environment for tissue repair, promoting a controlled inflammatory response and the removal of pathogens or damaged cells. In this way, leukocytes not only participate in the body's protection against infections, but also help in the regeneration process, collaborating with the healing of wounds and skin damage (Junior *et al.*, 2020).

Fibrin, the third essential component of L-PRF, is a protein that forms a three-dimensional matrix at the site of injury. This matrix serves as a structural support for cells, facilitating cell migration and the deposition of new collagen fibers. It creates a suitable microenvironment for tissue regeneration, promoting cell adhesion and providing a stable platform for repairing damage. In addition, fibrin contributes to the formation of a network that retains the growth factors released by platelets, ensuring that these factors act gradually and sustainably over time (De Perder *et al.,* 2020).

The process of obtaining L-PRF begins with the collection of a blood sample from the patient, which is then subjected to a low-speed centrifugation. Unlike the methods used for PRP, which require anticoagulants to prevent early clotting, L-PRF is prepared without the addition of external substances, allowing natural clotting to occur. This process results in the separation of the different blood fractions, with the L-PRF staying in the middle layer between the plasma and the red blood cells. After centrifugation, the platelet- and leukocytes-rich fibrinous gel is extracted and can be used directly in areas of therapeutic interest, such as topical application on the skin or introduction into invasive procedures (Hassan, Quinlan, and Ganem, 2020).

The mechanism of action of L-PRF is centered on the gradual release of growth factors present in platelets. These factors act as signaling signals that activate local cells, stimulating tissue regeneration and collagen production. Neocollagenesis, or the formation of new collagen, is an essential response to skin aging, sagging, and scarring, and is critical for restoring skin firmness and elasticity.

In addition, the cell regeneration promoted by L-PRF accelerates the healing process in various dermatological conditions, such as the treatment of wounds, burns and traumatic injuries. The presence of leukocytes also contributes to a controlled inflammatory environment, preventing infections and favoring tissue regeneration effectively. In this way,

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L-PRF acts as a potent biostimulator, not only improving the aesthetic appearance, but also promoting a functional restoration of the skin, with significant therapeutic potential (Gadelha *et al,* 2024).

L-PRF has shown great potential in the various areas of dermatology, especially in the treatment of soft tissue regeneration and facial rejuvenation. When used in healing processes, such as after surgical procedures or in skin lesions, L-PRF significantly accelerates the tissue regeneration process, optimizing cell repair. Its effectiveness is attributed to the gradual release of growth factors and the promotion of neocollagenesis, which result in healthier skin with a lower incidence of scarring. In addition, the presence of leukocytes in the composition of L-PRF helps reduce inflammation, which contributes to a faster healing process and a lower risk of infection. Soft tissue regeneration is facilitated by the fibrin matrix present in L-PRF, which serves as a structural support for cells during the repair process (Hassan, Quinlan, and Ganem, 2020).

GENERAL APPLICATIONS OF L-PRF IN DERMATOLOGY

In terms of skin biostimulation, L-PRF plays a crucial role in improving the texture and elasticity of the dermis. This is because it promotes the production of collagen and elastin, proteins that are fundamental for the structure and firmness of the skin. (Silva, Cezaretti and Silva, 2021). The stimulation of collagen production results in an increase in the thickness of the dermis and, consequently, in the reduction of skin flaccidity. Elastin, in turn, is responsible for the elasticity of the skin, giving it the ability to return to its original shape after distensions, which is especially important in treatments aimed at facial firmness. In rejuvenation treatments, L-PRF acts effectively in restoring the vitality of the skin, providing not only an improvement in texture but also a visible reduction in signs of aging (Gadelha *et al,* 2024).

L-PRF has especially excelled in the field of facial rejuvenation. In this context, its application aims to reduce wrinkles and expression lines, one of the main signs of skin aging. The regeneration of the deeper layers of the skin, stimulated by the growth factors present in L-PRF platelets, allows collagen fibers to reorganize and regenerate, restoring the dermal structure that decreases over time. The result of this process is visibly younger skin, with less depth in expression lines and a firmer and rejuvenated appearance (De Perder *et al.,* 2020).

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The depth of wrinkles, often associated with collagen loss and the degradation of elastin fibers, can be significantly reduced with the use of L-PRF. This treatment stimulates a regenerative response in the deeper layers of the skin, promoting the formation of new collagen and improving skin elasticity. In addition, by improving the integrity of the skin and stimulating the production of new dermal cells, L-PRF provides a natural filling effect, without the need for external substances, as occurs in some aesthetic treatments. This natural filler contributes to smoothing wrinkles and facial sagging, providing remarkable rejuvenation in a non-invasive way (Lins and Brandão, 2021).

L-PRF, by acting on facial rejuvenation, not only reduces wrinkles and expression lines, but also contributes to the improvement of overall skin quality. In addition to collagen stimulation, the skin becomes more hydrated, even, and healthier-looking, as the growth factors present in L-PRF stimulate cell regeneration and repair damage caused by aging. The application of L-PRF to specific areas of the face, such as around the eyes, mouth and forehead, has shown promising results, with the reduction of fine lines and an increase in facial firmness, providing a natural and long-lasting lifting effect. This treatment, due to its ability to regenerate and restore the dermal structure gradually and without invasive interventions, has been consolidated as an effective rejuvenation technique, with visible and sustainable results over time (Ferreira, Suguihara, and Muknicka, 2023).

Therefore, L-PRF is not limited to treating only injuries or scars, but also stands out as an innovative tool in the fight against aging, providing facial rejuvenation with natural and effective results. The positive impact on the texture, elasticity, and overall appearance of the skin makes L-PRF one of the most promising and sought-after treatments in aesthetic dermatology today.

L-PRF IN AESTHETIC DERMATOLOGY

L-PRF has established itself as an effective tool in minimally invasive dermatological procedures, being widely used both in rejuvenation treatments and in therapies for conditions such as alopecia. Regarding alopecia, the application of L-PRF on the scalp has been shown to be particularly advantageous, promoting an increase in hair density and a significant improvement in hair quality. The presence of platelets and leukocytes in L-PRF stimulates the activation of growth factors, which are essential for the regeneration and strengthening of hair follicles (Bento and Cavenassi, 2022).

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These factors promote greater cell proliferation in the scalp, improving local blood circulation and, consequently, favoring the growth of new hair. This procedure has been particularly effective for cases of androgenetic alopecia, a condition that affects both men and women, providing a natural and safe alternative for the treatment of this condition (Campos and De Souza, 2021).

In addition to its application in the treatment of alopecia, L-PRF has been shown to be effective in facial aesthetic procedures, such as filling wrinkles and expression lines. L-PRF acts as a biostimulator, promoting skin regeneration and collagen production, which results in firmer skin, with increased volume and a more uniform texture. This ability to regenerate has also been observed in facial rejuvenation treatments, where L-PRF is applied to areas of the face to improve the overall appearance of the skin, making it look younger and more lush (De Perder *et al.,* 2020).

Compared to other techniques, such as PRP (Platelet Rich Plasma), L-PRF stands out for its higher concentration of leukocytes and fibrin, two essential components for more robust and effective cell regeneration. While PRP can generate temporary results due to its lower structure and concentration, L-PRF provides longer-lasting and more consistent effects. The denser structure of L-PRF allows for a more continuous release of growth factors, which contributes to a more prolonged and efficient regeneration of the skin and hair follicles, making it a more advantageous therapeutic option in the long term (Hassan, Quinlan, and Ganem, 2020).

The clinical results observed after using L-PRF have been largely positive, with patients reporting significant improvements in skin texture, tone evenness, and overall appearance, especially in rejuvenation treatments. The quality of the skin, including its firmness and elasticity, was visibly improved, and the volume of the treated areas also showed a noticeable increase. These benefits have been observed in a wide range of skin types, making L-PRF an attractive option for a wide spectrum of patients seeking effective and safe aesthetic treatments. In addition, the application of L-PRF has been shown to be especially effective in patients with more flaccid or aged skin, promoting a significant improvement in facial contour and skin texture, without the risks associated with external substances (Garcia *et al,* 2024).

L-PRF also has other substantial advantages, especially when compared to treatments that use exogenous substances, such as hyaluronic acid-based fillers or other synthetic products. One of the biggest advantages of L-PRF is the fact that it is an

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autologous treatment, that is, derived from the patient's own blood. This eliminates the risk of allergic reactions or rejection, which can occur with the use of foreign products on the body. Additionally, the absence of chemical additives in L-PRF means that the risks of adverse reactions, such as inflammation or infection, are significantly reduced, which makes L-PRF a safer alternative with a lower likelihood of undesirable side effects. In economic terms, L-PRF also presents itself as a more affordable option, considering that the costs of exogenous substances and continuous treatments are many times higher. Thus, in addition to being a safer therapy, L-PRF also offers a more financially viable solution for many patients (Dantas, 2021).

LIMITATIONS AND CHALLENGES

One of the main limitations of L-PRF concerns the scarcity of long-term studies evaluating the efficacy and safety of treatment in different clinical settings. Although many early studies have shown positive results, most of them have a relatively short follow-up, which makes it difficult to analyze the long-term effects of L-PRF. The lack of data on the durability of results and the possibility of late adverse effects still represent an important gap in the scientific literature. For L-PRF to be considered a reference therapy in aesthetic and regenerative dermatology, it is essential that more robust studies with prolonged follow-up periods are carried out, in order to provide more conclusive evidence on its efficacy and safety over time (Ferreira, Suguihara, and Muknicka, 2023).

Another important challenge is the need for standardization in the protocols for the application of the L-PRF. Although the technique for obtaining L-PRF is relatively simple, there are variations in preparation methods and application techniques among different clinics and practitioners. These differences can result in significant variations in the outcomes observed among patients. For example, the amount of platelets, leukocytes, and fibrin present in L-PRF can vary depending on the centrifugation technique used, which can influence the effectiveness of the treatment (Hassan, Quinlan, and Ganem, 2020).

In addition, the application of L-PRF can be performed in different ways, such as intradermal injections or through more advanced methods, such as the use of microneedling, which can also generate different results. The standardization of these protocols, both in the collection and preparation of L-PRF and in its application, is essential to ensure that treatments are effective and consistent in various clinical contexts (Lins and Brandão, 2021).

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DISCUSSION

The analysis of the studies demonstrated that L-PRF stands out as a potent tool in tissue regeneration, especially in stimulating collagen and elastin production. These two elements are fundamental for facial rejuvenation and scar treatment. L-PRF promotes a significant increase in the thickness of the dermis, contributing to the reduction of skin sagging, and improves skin elasticity, which is crucial for facial rejuvenation procedures. These findings corroborate the concept that biological stimulation through autologous treatments has great therapeutic potential, promoting natural and progressive results, with a lower risk of complications.

Another relevant aspect is the contribution of leukocytes in modulating inflammation, essential for efficient and uncomplicated healing. The presence of these cells, combined with the release of growth factors by platelets, aids in cell regeneration and accelerates the healing process, especially evidenced in the treatment of wounds and scars. The reviewed literature highlights that L-PRF not only favors regeneration, but also creates a favorable environment for healing, minimizing the risk of infection, one of the main complications in aesthetic procedures.

The studies analyzed agree on the efficacy of L-PRF in facial rejuvenation treatments and healing of skin lesions. In addition, its applicability in cases of alopecia, especially in individuals with androgenetic baldness, has been widely highlighted. However, despite the promising results, the literature also points to significant challenges. The standardization of application protocols and the evaluation of their efficacy on different skin types are still issues that have not been completely resolved. Although positive effects were observed in a range of patients, the variability of the results suggests that more studies are needed to establish clear guidelines on best practices for different dermatological conditions.

Another critical point addressed in the research is the durability of the results obtained with L-PRF. While a temporary increase in skin firmness and texture has been evidenced, the duration of long-term benefits remains an area of debate. Many studies point out that the effects can be transient, requiring multiple sessions to maintain the results. Therefore, it is essential that new clinical trials investigate the duration of therapeutic effects over time, considering aspects such as the maintenance of collagen production and skin regeneration after the end of the initial treatment.

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Regarding safety, L-PRF, being an autologous product, has significant advantages, such as the absence of risk of allergic reactions or rejection, which makes it an attractive alternative compared to treatments based on exogenous substances. However, despite its relative safety, the application technique requires specific skills, and the literature does not completely rule out the possibility of adverse effects, such as bruising and temporary inflammation at the application site. These adverse events are usually mild and self-limiting, but indicate the need for adequate training of the professionals who perform the procedure.

CONCLUSION

The use of L-PRF in aesthetic dermatology presents itself as a promising therapy, demonstrating significant benefits in facial rejuvenation, scar treatment, and acceleration of tissue regeneration. The application of this technique has been shown to be safe, effective, and with a minimal adverse effect profile, mainly because it is autologous. However, the variability in the results and the lack of standardization of the protocols indicate the need for further clinical studies, especially multicenter and long-term ones, to validate their efficacy in different dermatological conditions and establish clear guidelines for use. The combination of L-PRF with other therapeutic approaches and the personalization of treatments also show promise for improving outcomes.

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