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REVIEW ARTICLE

Platelet rich fibrin and its use in dentistry

Fibrina rica en plaquetas y su uso en odontología

Monserrath Susana Ballesteros-Díaz[1] ✉, **Pamela Lissette Hidalgo-Tobar**[1], **Fernando Marcelo Armijos-Briones**[1]

[1]Regional Autonomous University of the Andes (UNIANDES). Ecuador.

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ABSTRACT

Introduction: Platelet-rich fibrin (PRF) is considered a regenerative material that possesses a large amount of growth factors, leukocytes, platelets and cytokines that are required in healing processes. In dentistry, it is a growing trend due to its versatility, especially in oral and maxillofacial surgery, oral implantology and periodontics.
Methods: The methodology used was PRISMA Preferred Reporting Items for Systematic reviews and Meta-Analysis Protocols, where the search criteria were met according to Cochrane standards for systematic reviews. In addition, the Perish or Perish tool was used for data extraction, in order to carry out this search for articles related to the object of study.
Development: platelet-rich fibrin is obtained by centrifugation of the patient's own blood without artificial biochemical modification. Among its main properties are the stimulation of osteoblast differentiation and proliferation, stimulation of angiogenesis and mitogenic effect. It has a wide use in the field of dentistry. In periodontics and oral implantology it has multiple applications, to treat gingival recessions, in maxillary sinus floor elevation, increases the effect of coagulation/tissue regeneration at the surgical site by means of a natural clot that accelerates the healing of soft and hard tissues.
Conclusions: It is concluded that the benefits of FRP in the recovery of patients, therefore, the feasibility of its use in different procedures, whether they are periodontics, endodontics, surgery or easy harmonization, is evidenced.

Keywords: Platelet-Rich Fibrin; Periodontics; Endodontics.

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RESUMEN

Introducción: la fibrina rica en plaquetas (FRP) se considera un material regenerativo que posee una gran cantidad de factores de crecimiento, leucocitos, plaquetas y citoquinas que se requieren en los procesos de curación. En odontología, se presenta como una tendencia en auge por su versatilidad, sobre todo en cirugía bucomaxilofacial, implantología oral y en periodoncia.
Métodos: se utilizó como metodología la denominada PRISMA Preferred Reporting Items for Systematic reviews and Meta-Analysis Protocols, donde se cumplieron los criterios de búsqueda de acuerdo a los estándares Cochrane para revisiones sistemáticas. Además, para la extracción de datos se utilizó la herramienta Perish or Perish, con la finalidad de realizar esta búsqueda de artículos relacionados al objeto de estudio.
Desarrollo: la fibrina rica en plaquetas se obtiene mediante la centrifugación de sangre del propio paciente sin modificación bioquímica artificial. Dentro de sus principales propiedades se puede encontrar el estímulo a la diferenciación y la proliferación de los osteoblastos, estimulación de la angiogénesis y efecto mitógeno. Tiene un amplio uso en el campo de la odontología. En la periodoncia y la implantología oral tiene múltiples aplicaciones, para tratar las recesiones gingivales, en la elevación del piso del seno maxilar, aumenta el efecto de la coagulación/regeneración tisular en el sitio quirúrgico mediante un coágulo natural que acelera la curación de los tejidos blandos y duros.
Conclusiones: se concluye que los beneficios de las FRP en la recuperación de los pacientes, por lo cual, se evidencia la viabilidad de su uso en los diferentes procedimientos, sean estos de periodoncia, endodoncia, cirugía o armonización fácil.

Palabras clave: Fibrina Rica en Plaquetas; Periodoncia; Endodoncia.

INTRODUCTION

Platelet-rich fibrin (PRF) is considered a regenerative material that possesses a large amount of growth factors, leukocytes, platelets and cytokines that are required in healing processes.[1,2] In turn, it is considered a platelet concentrate, which is assumed to be an active plasma fibrin molecule, which supports in wound or laceration healing.[3,4,5]

In dentistry, it is a growing trend due to its versatility, especially in oral maxillofacial surgery, oral implantology and periodontics.[1,2] In addition, it is considered a truly viable practice due to its rapid application and regeneration, affordable costs for the patient and the lower probability of infection, allergic reactions or rejection.[6]

In 1974 the potential of using platelet-rich fibrin was introduced and described in 2001 and 2006 by Choukroun, since the growth factors, generated from platelets, bind to the outer surface of the cell membrane of the tissue by transmembrane receptors, where it supports healing as a biological effect and bone regeneration.[7]

Likewise, different studies coincide with the previous criterion, adding that it provides less recovery time, promotes better healing and quality in the tissue in recovery.[8] Also, its efficacy has been demonstrated in the recovery of periodontal tissues of patients who have undergone surgery, which have contributed to alveolar regeneration and closures of the maxillary sinus, fistulas, defects or anomalies, among others.[9]

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Another of the most outstanding uses is in endodontics, where the advances in research on engineering, tissue regeneration and the characterization of stem cells in various oral tissues are integrated, where the injured structures are recovered.[10] Likewise, it is necessary to consider various aspects that intervene in this field, such as migration, proliferation, differentiation and apoptosis of the cells of the dental pulp; where the growth factors can collaborate with the modulation of cellular behavior.[11]

On the other hand, what happens after dentoalveolar surgery is the presence of inflammatory processes, pain and edema.[12] In turn, in hard tissues there is a dizzying and dramatic bone wasting around the missing teeth,[13] also hemorrhages, infection or alveolitis. Therefore, different techniques have been introduced to minimize these risks; thus, platelet-rich fibrin helps in the healing process.

Finally, it has a use in facial harmonization, where fibrin, having a firmer and denser texture, allows the realization of facial fillers and provides volume to the quality of the skin. Therefore, facial harmonization is given by being a protein in the form of threads or filaments and that provides support to the tissues, which contributes to their regeneration.[14]

Platelet-rich fibrin has direct benefits in tissue regeneration due to its biological effect, since it generates cells capable of promoting angiogenesis and osteogenesis, as well as collagen synthesis. Therefore, the aim of this review was to establish the feasibility of the use of platelet-rich fibrin in dentistry.

METHODS

The PRISMA methodology (Preferred Reporting Items for Systematic reviews and Meta-Analysis Protocols) was used for systematic research and theoretical review according to Cochrane standards.[15]

In this context, a systematic search was made of the most relevant contributions in the indexed literature on the variable under study in databases such as: Latindex, Scielo and Scopus; between the years 2016 and 2021.

The inclusion criteria included research in Spanish, English or Portuguese that was carried out in recent years on platelet-rich fibrin and its use in dentistry; studies that address the process of obtaining, benefits, uses and application in periodontics, endodontics, surgery and easy harmonization. It should be noted that the descriptors or keywords used in the search engine were: platelet-rich fibrin, fibrin in periodontics, fibrin in endodontics, fibrin in surgery, fibrin in easy harmonization, fibrin in dentistry, platelet-rich fibrin, use in perio, use in endo, use in surgery, use in facial harmonization.

While, the exclusion criteria focus on those researches that have been performed in years prior to 2016, without statistical support or methodology to support their primary objective.

Subsequently, the Perish or Perish tool was used for data extraction, in order to search for articles related to the object of study.

Within the analysis of the articles found, a comparative matrix of each and every one of the selected research studies was prepared, with the following fields: author, year, study design, population, intervention and conclusions.

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DEVELOPMENT

A total of 134 articles were reviewed, 220 studies were excluded based on the title, four based on the information found in the abstract and introduction, and three after reading the entire text. Finally, 12 studies were included. Thus, Figure 1 shows the results obtained in this purification process, using the PRISMA methodology.

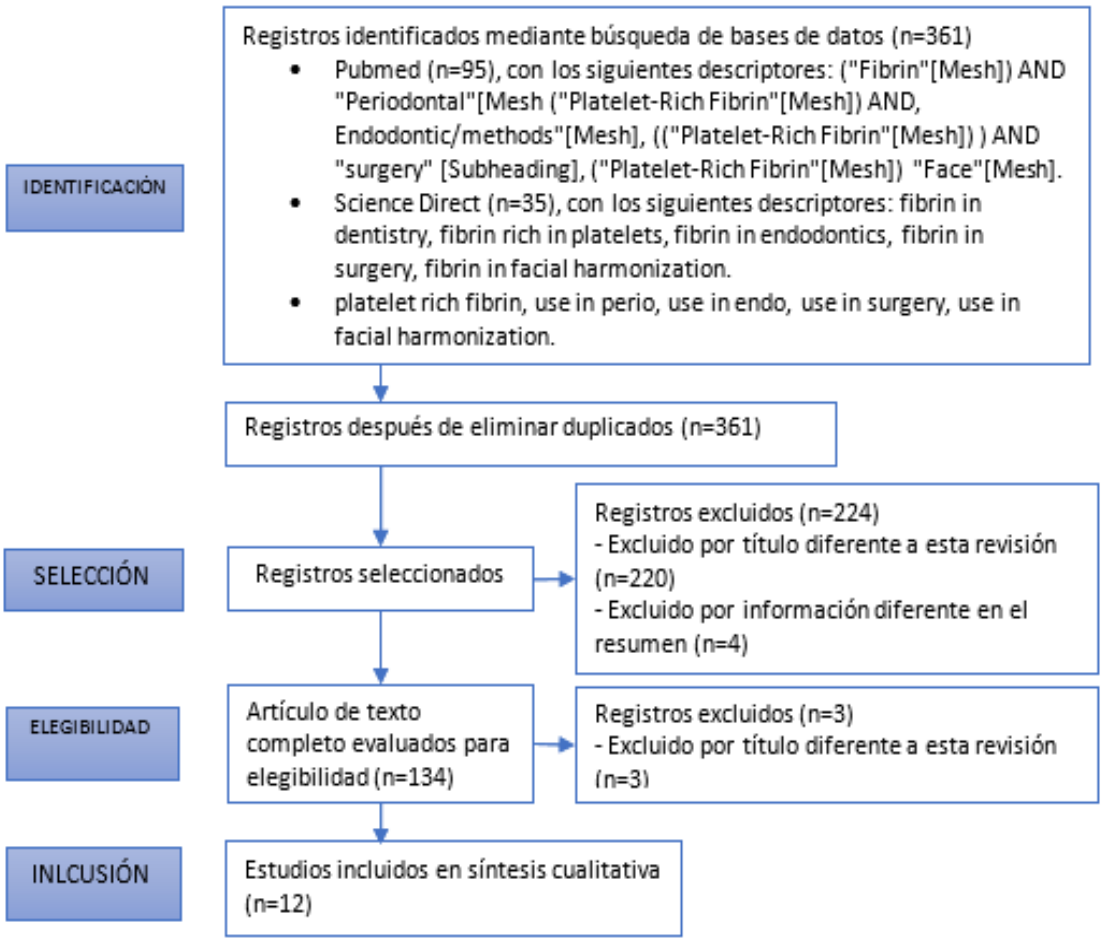

Fig. 1 PRISMA research methodology. Adapted from Cochrane.[15]

The main results of this review can be consulted in Table 1, where the author(s), the study design used in these investigations, the population, the intervention and the conclusions obtained from each one of them are discussed.

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Table 1. Main theoretical contributions of the study variable.

Author and Year	Study Design	Population	Intervention	Conclusions
Mazor et al. (2009)	Case series	20 patients with 25 lateral sinus elevations sinus lifts, with immediate placement of implants.	Coagulum of FRP coagulum as the only filling material and FRP membrane	The final bone gain was always very significant very significant between seven and 13 mm. FRP and its systematic use during a sinus lift seems to be a relevant a relevant option, in particular for the protection of the for Schneider's membrane protection. Schneider's membrane.
Gassling et al. (2013) Study. membrane.	Comparative study	six patients with 12 lateral sinus lateral sinus elevations, with the placement of dental implants, five months later.	- Autologous bone and Bio-Oss® with FRP membrane. - Autologous bone and Bio-Oss® with BioGide®	It was demonstrated that the coverage of the lateral window of the sinus with FRP membrane (experimental group) and Bio-Gide® membrane (control group) resulted in a similar amount of vital bone formation and residual bone
Tajima et al. (2013)	Case series	Six patients with nine lateral sinus lateral sinus lifts, with immediate immediate implant of implants.	- FRP as the only grafting material.	The average residual bone height between the sinus floor and the alveolar crest was 4.28 ± 1.00 mm before surgery and 11.8 ± 1.67 mm

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				surgery and 11.8 ± 1.67 mm after. - Sinus elevation with simultaneous implant placement using FRP as the sole filler material filler material can promote natural bone regeneration
Tovar (2011)	Experimental research	Experimental research 40 patients	Evaluates the healing and regeneration regeneration, once FRP is applied, and the relationship the relationship with the risk of presentation and the presence of ONJ induced by Bisphosphonate.	It points out that the use of FRP provides an alternative for bone healing and. regeneration.
Lobatón et al. (2015) It was found that the soft tissues in contact with the FRP showed better healing of the wounds at 24 hours, 7, 15 and 45 days. in contact with the FRP showed improvements	Clinical study	five patients	Both third molars were extracted. third molars, then FRP was applied on one side (study side). FRP was applied on one side (study side) and on the and on the opposite side no biomaterial was applied (control side). biomaterial was applied on the opposite side (control side). wound healing was evaluated after 24 hours, at 7, 15 and 45 days.	It was possible to demonstrate that the soft tissues in contact with the in contact with the FRP showed improvements in terms of pain, color, consistency; with respect to the control wounds. From the clinical point of view, no differences were observed differences were not observed in the reduction of postoperative edema in the intervened patients. postoperative edema in the intervened patients, therefore the application of the PRF for this parameter was not conclusive.

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				for this parameter was not conclusive.
Garcia (2016)	Case series intervened	In 11 areas of study of 10 patients.	Minimally traumatic exodontia and preservation of alveolar ridge were performed with platelet-rich fibrin (PRF) in teeth that were not teeth that could not be rehabilitated.	The use of platelet-rich fibrin as an alternative for the preservation of the alveolar ridge for the purpose of early implantation. .
Atamari et al. (2017)	Quasi-experimental, longitudinal	18 patients	two exodontia were performed and fibrin was placed in one alveolar and the other alveolus without fibrin as a control sector, both sockets were sutured.	The platelet-rich fibrin does benefit clinical closure of the alveolar mucosa post postexodontia, decreasing symptoms and post-surgical complications and accelerated healing at five and 14 days, in contrast to the control days, as opposed to the control sector where the presence of post-surgical symptomatology and slow symptoms and slow clinical closure.
Guzman G.F. (2017)	Study Comparative	30 patients	Two platelet-rich fibrin meshes were placed in the alveolus the lower left third molar to compare it with the alveolus compared with the alveolus of the lower right third molar, where no platelet lower right third molar alveolus,	The study showed that the healing of soft tissue and bone tissue in the alveolus of the lower left third molar was and bone tissue healing improved with the use of PRF, stating that the use of PRF, thus affirming its effectiveness.

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			where no biological no substance or biological material was added	
Quispe (2018) Although platelet-rich fibrin obtained a lower horizontal and vertical loss obtained a lower horizontal and vertical loss Although platelet-rich fibrin resulted in less horizontal and vertical ridge loss on clinical and tomographic evaluation, the difference was not was not significant between the two groups. Only at two months of evaluation was a better preservation of better preservation of ridge height.	Clinical study	32 alveoli	Counting with 16 alveoli for the placement of platelet-rich fibrin (experimental group) and 16 alveoli for the placement of the platelet-rich fibrin (experimental group) and 16 alveoli that were group) and 16 alveoli that did not receive any biomaterial placed any biomaterial (control group). For the clinical evaluation, acrylic guides were used to to evaluate horizontal and vertical ridge loss at the and vertical ridge loss at 2, 4 and six months. CT scans were taken preoperatively and at six months to evaluate bone width and height.	Although platelet-rich fibrin resulted in less horizontal and vertical ridge loss on clinical and tomographic evaluation, the difference was not significant between the two groups. Only at two months of evaluation was a better preservation of ridge height.
Ochoa AI (2018)	Qualitative and descriptive study	Clinical case	Technique used analytical and synthetic, assisted by observation	Concluding that the surgery was successful by the application of postoperative platelet aggregate post-exodontic platelet, it is efficient in the regeneration of

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				tissues in a short time, where there are no postoperative discomfort such as inflammation and pain for the patient, as would be the case of a natural regeneration.
Sharma et. al. (2017)	Non-randomized clinical study	Oral surgery of 100 people	PRF was placed in all extraction sites of molars with established localized osteitis	There was a significant reduction in associated pain
Marenzi, et al. (2015) osteitis	Non-randomized clinical study	Multiple extractions to 26 people	PRF was placed in all extraction sites of molars with established localized	There were no reported cases of bleeding, infection, alveolar osteitis and any complications.

In this review different uses of platelet-rich fibrin were found, in the first instance, bone gain or vital bone formation, during the placement of dental implants for lateral maxillary sinus elevations, where it allows the protection of the Schneider membrane.

Thus, it is evident that FRP becomes an ideal filling material for the bone to regenerate naturally and heal each of the tissues.[16,17,18] These criteria are supported by several authors who investigated bone formation, who reported an increase of 50.29% in the generation of bone in the patients evaluated. [19, 20]

One aspect to highlight is that FRP lead to an important level of improvement when used in soft tissues, for example, the extraction of dental pieces, since among the benefits registered were: decrease in pain levels, color, consistency and control in the wounds. Other authors also assumed that the symptomatology in extraction processes was minimized in patients, obtaining positive results regarding the use of FRP.[21,22,23]

Other authors agree, stating that the healing in exodontia processes in the alveoli is remarkable, as it was proved that there were no post-surgical symptoms; as well as, a null complication in cases of osteitis. At the same time, according to other studies, 33,33 % have significant improvements in oral surgeries when there are processes of extractions and manifest alveolitis.[23,24,25]

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CONCLUSIONS

Platelet-rich fibrin (PRF) in the area of dentistry is considered versatile and useful to support the processes of healing, extraction of dental pieces and generation of bone mass. It should be noted that the studies analyzed confirm the benefits of PRFs in the recovery of patients, which shows the need for their use in different procedures, whether they are periodontics, endodontics, surgery or facial harmonization.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' Contribution

All authors participated in conceptualization, formal analysis, project management, writing - original draft, writing - revision, editing and approval of the final manuscript.

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