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THE USE OF THE RICH FIBRIN IN PLATELETS AND LEUKOCYTES AS ALTERNATIVE TREATMENT FOR LIFTING THE MAXILLARY SINUS- A LITERATURE REVIEW

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ABSTRACT

Introduction: Currently, the management of higher excellence for the replacement of missing elements in invalid oral patients areosseointegrated implants, but for this, it is necessary enough bone quantity. In many cases, there is a marked resorption, which in the case of the maxilla requires bone grafting, especially in the maxillary sinus lift; Autogenously and xenogeny grafts have been used, as well as their alternative, in this case L-PRF.
Objective: This study aims to clarify the need for breast lift using L-PRF; and its applications in the clinical routine of the dental surgeon.
Methodology: A bibliographic search was carried out in the databases PUBMED, SCIELO, Europe PMC and BVS, which collected papers that were published from 2004 to 2017. 30 articles met the criteria for inclusion in laboratory studies, case reports and systematic reviews As well as of literatures, that were developed in the human species; In which they had made the allocation of the platelet material.
Results: A careful study and tabulation of the respective articles led to the result that the breast lift maneuver through the atraumatic technique with allocation of the platelet material offers a superior postoperative period, when it is not done by means of this technique Measure.
Conclusion: It is concluded that the placement of a graft on the peri-implant region is indispensable, together with the adaptation of the platelet material, in order to allow rapid formation of bone, tissue and other structures, like a postoperative period Satisfactory for the patient.

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INTRODUCTION

Nowadays, the management seen with greater excellence for the replacement of elements lost in oral invalid patients areosseointegrated implants.

The population has been increasing, more and more, the life expectancy and because they did not have a preventive education from the beginning of the life, as for the care with the oral cavity, they present a rapid loss of dental elements, thus making necessary the use of measures rehabilitation that allow a stability of the occlusion, returning the harmony of the

face, aesthetic, phonetic and masticatory function (Albuquerque *et al*., 2014). Formerly the only rehabilitation measures were the prostheses, be they total or partial, even fixed that is a more modern handling; these prostheses, in turn, it was the best alternative for the patients for many years, even because they were cheaper when compared to the implants and provided all the external characteristics that the patient might have needed (Agrawal *et al*., 2014). The human being has always been very careful and vain with physical appearance, even because facial symmetry and aesthetics have always been points of frequent discussions about the environment or social environment in which the individual is inserted, besides the economic, climatic or historical factors, which also influence the behavior of society (Batista *et al*., 2011). Severe alveolar bone loss after surgical therapy is one of the main complications that occurred in some regions, which in turn may still suffer from the pneumatization of the maxillary sinus, causing a lack of success during the rehabilitative treatment with the implants (Camargo *et al*., 2010). In this way, it is necessary to use techniques that allow the gain of bone structure, since it is of the utmost importance to understand that the breast lift can only be performed if there is a minimum presence from 5 to 7 mm of bone remnant, Consecutively in the same session the installation of the implants being performed, since this remnant is to allow a primary instability of the implant (Canniazzaro *et al*., 2013).

If there is a region with a bone remnant smaller than 5mm, it is necessary to perform two surgical times, one for the implant installation and the other for the graft, starting with the graft installation to allow the formation of Bone structure, tissue repair and a rapid osseointegration process; because one of the peri-implant disadvantages is the low vascularization, in this way the region around the implant has a very reduced vascularity, in a second surgical time the implant is installed in the operated area (Canullo *et al*., 2009). The maxillary sinus lift maneuver, developed by Tatum in 1976, is a management that is frequently indicated in patients who have a quantity of bone that is insufficient to perform the rehabilitation treatment in the posterior region. In the last decades some changes have been made in these surgical procedures (Correia *et al*., 2012). There are numerous techniques to perform this breast lift, but in general, it consists initially of a wear of the anterior bone wall, exposing the maxillary sinus membrane which is known as Schinaider's membrane; the sinus must be elevated to provide a space that is capable of housing the graft into which it will be inserted (Couto, 2016). Based on the foregoing, this literature review aims to clarify the need for breast lift using L-PRF, as well as its applications in the clinical routine of the dental surgeon.

METHODOLOGY

A bibliographic search was carried out in the databases PUBMED (www.pubmed.gov), SCIELO (www.scielo.org), Europe PMC (www.europepmc.org) BVS (www.bvsalud.org), which was collected Works that were published from 2004 to 2017. It was included laboratory studies, case reports and systematic reviews as well as literature that were developed in the human species, and, therefore, articles that did not deal with the rehabilitation of maxillary sinus removal were excluded, even if they did not use of L-PRF. Through the bibliographic research, 30 articles were selected, which were extracted 15 articles from PUBMED (www.pubmed.gov), 06 SCIELO (www.scielo.org), 05 Europe PMC (www.europepmc.org) and 04 BVS (www .bvsalud.org) as previously reported (FIG.1 and GRAF.1). The following titles of specific medical subjects and keywords were used: (Dental Implant [MeSH Terms]), Antiplatelet ([MeSH Terms]), Maxillary Sinus [MeSH Terms]).

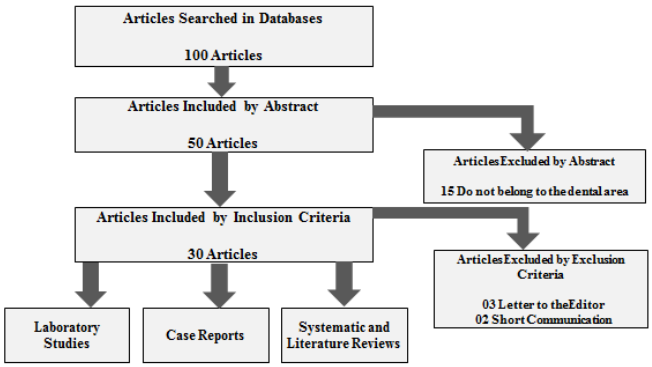
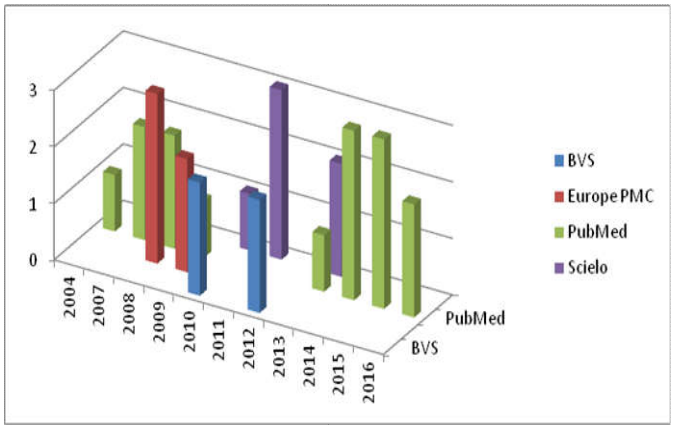


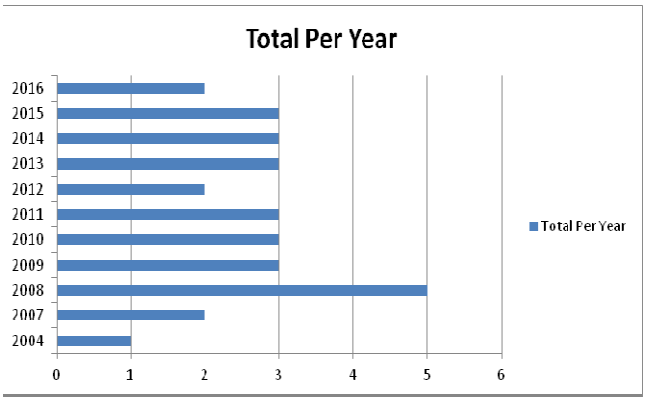
Figure 1. Flowchart of the criterion of inclusion of articles

RESULTS

Through the review, all the papers presented the approach of the breast lift maneuver either by traumatic or atraumatic form with L-PRF allocation. The researchers performed the placement of platelets in most cases, because it was a management that provided a high success rate, still a rapid bone neoformation and in turn a low rate of rejection of the organism with the platelet material (TABLE.1 and GRAPH 2).



Graph1 - Cumulative Graph



Graph 2. Number of articles in relation to years of publication

Table 1 - Results presented by the authors' approaches

Author / Year	Published Article	Type of study
Couto MH., 2016	Faculdade de Ciências da Saúde	Laboratory Studies
Ponte ME., 2016	Faculdade de Odontologia da Pontifícia	Systematic review
Galafassiet al., 2015	Arch Health Invest	Case report
Pavelskiet al., 2015	Rev. Odontologia (ATO),	Literature review
Pinto et al., 2015	Journal of Biodentistry and Biomaterials	Literature review
Albuquerque et al., 2014	RFO UPF	Case Report
Agrawal, M.; Agrawal, V., 2014	National Journal of Medical and Dental Research	Literature review
Paiva et al., 2014	Revista de Odontologia da UNESP	Laboratory Studies
Tunali et al., 2013	British Journal of Oral and Maxillofacial Surgery	Laboratory Studies
Canniazaroet al., 2013	Journal.oralImplantology	Laboratory Studies
Mendonça-Caridadet al., 2013	InternationalJournal oral MaxilofacialImplants	Case Report
Mazonetoet al., 2012	1ª Ed. São Paulo: Napoleão	Literature review
Correia et al., 2012	Revista Portuguesa de Estomatologia, Medicina Dentária e Cirurgia Maxilofacial	Case Report
Machado; Marzola, 2011	Rev.Odont. ATO	Literature review
Faveraniet al., 2011	Salusvita	Literature review
Batista et al., 2011	Revista Portuguesa Estomatolologia Medicina Dentária e Cirurgia Maxilofacial	Laboratory Studies
Camargo; Geraldo., 2010	Faculdade de Odontologia da Universidade de São Paulo	Laboratory Studies
Ehrenfestet al., 2010	Jornal Periodontology	Laboratory Studies
Ferraz et al., 2010	Revista ABO	Case Report
Canullo; Claudi , 2009	Clinic Implant Dental Relate Reseach	Laboratory Studies
Raja, 2009	Journal Oral MaxillofacialSurgery	Laboratory Studies
Davidet al., 2009	Trends in Biotechnology	Laboratory Studies
Marzola; 2008	Ed. Big Forms	Literature review
Pjeturssonet al., 2008	JournalClinicalPeriodontology	Systematic review
Saniet al., 2008	Journal Oral MaxillofacialSurgery	Case Report
Italiano et al., 2008	Blood Journal Hematology	Laboratory Studies
Plachocovan et al., 2008	Clinical Oral Implants Reseach	Systematic review
Schnabel et al., 2007	Journal of OrthopaedicReseach	Laboratory Studies
Hesham et al., 2007	Journal of Periodontology	Laboratory Studies
Crottiet al., 2004	Biomaterials	Laboratory Studies

DISCUSSION

Innumerable advances in genetic engineering, dentistry surgeries were able to advance about 10 years of study because with the advent of platelet material of "Rich Fibrin in Platelets and Leukocytes" commonly known as (L-PRF) Is a biomaterial derived from blood and rich in growth factors capable of transforming adult stem cells into cells specific for bone formation or gingiva (FIG. 3).And still presenting as a fibrin matrix, in which cytokines and platelets, growth factors and some cells become trapped, functioning as a reabsorbable membrane, being considered basically as a concentrate of growth factors, in addition to other growth promoting agents. Wound healing and, in this case, as a tissue regenerator, as a material rich in platelets and growth factors, contributing to the osteoconduction process, which will stimulate the patient's own cells to generate a regenerative response (FIG. 4) (Crotti, 2014).

The old Plasma materials required an added coagulant use over their composition where it would aid in the release of growth factors on the inner surface of the platelet material.This elimination process would be available in a relatively long time, about 14 hours; Thereafter there was a drastic fall in the respective factors (FIG. 2). It is worth noting that L-PRF allowed a higher biological compatibility than the other materials, since it releases itself when in contact with the organism, a greater release of growth factors and with a much longer period, about two weeks, precisely in the Most important moment of the healing process (David *et al*., 2009). There are several ways of using this material either by membranes, which can be sutured over the region where the surgical procedure was performed, allowing for an increase of the gingival tissue, favoring the tissue biotype and obtaining the ability to change the profile gingival (FIG. 6) It can also be used in the form of "plugs", in that it concerns it being able to be associated with a bone in which it appears particulate or filled by the alveolus after exodontic maneuvers of dental elements; However, its main function is to allow a volume gain (FIG.5) (Ehrenfest *et al*., 2010). The posterior region of the maxilla is a well selected area for the maxillary sinus elevation, when it is necessary to install an implant in a single session, many cases are necessary to perform placement of a graft over the region to implant.

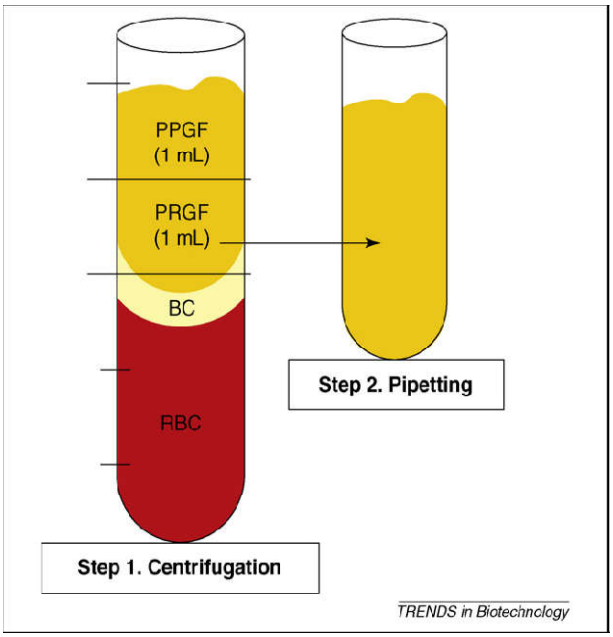


Figure 2. Commonly described protocol for Anitua PRGF. Step 1: Blood citrate (in 5 ml tubes) is gently centrifuged (8 min at 460 g) and separated into three layers: RBC base, buffy coating (BC) and acellular plasma. Acellular plasma exhibits empirically defined plasma layers that are poor in growth factor (PPGF) and plasma-rich growth factors (PRGF). Step 2: The PPGF layer (1 ml) is discarded, and the PRGF, just above the BC, is collected by careful pipetting. PRGF of all tube samples are collected in a tube and calcium chloride is added for coagulation. Source: DAVID, M et al., 2009, p. 162.

The use of this biomaterial contributes to the increase of the bone tissue, favoring the installation of the implant, since the lack of adequate thickness and proximity of the maxillary sinus are the frequently encountered situations to be made the measurement of allocation of the respective graft (Pereira *et al*., 2017). At first, devitalized or lyophilized bone is placed on the lacuna formed with the sinus elevation. It is noteworthy that there is no difference in success between implant placement late or immediate with maxillary sinus elevation, even if this procedure is divided into two surgical steps the response will be the same, in the case the success of the treatment in question, however it is important to know that the due procedures must be obeyed and consequently their respective indications (Ferraz *et al*., 2010).

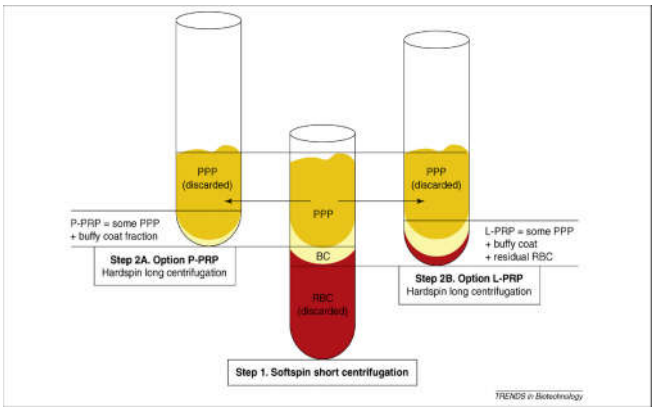


Figure 3. Classical manual platelet-rich plasma (PRP) protocol using a two-step centrifugation procedure. Step 1: Whole blood is collected with anticoagulants and briefly centrifuged with low forces (softspin). Three layers are obtained: red blood cells (RBCs), 'buffy coat' (BC) layer and platelet poor plasma (PPP). BC is typically of whitish colour and contains the major proportion of the platelets and leucocytes. Step 2A: For production of pure PRP (P-PRP), PPP and superficial BC are transferred toanother tube. After hardspin centrifugation (at high centrifugal force), most of the PPP layer is discarded. The final P-PRP concentrate consists of an undetermined fraction of BC (containing a large number of platelets) suspended in some fibrin-rich plasma. Most leucocytes are not collected. Step 2B: For production of leucocyte-rich PRP (L-PRP), PPP, the entire BC layer and some residual RBCs are transferred to another tube. After hardspin centrifugation, the PPP is discarded. The final L-PRP consists of the entire BC, which contains most of the platelets and leucocytes, and residual RBCs suspended in some fibrin-rich plasma. Therefore, the final product greatly depends on the means of BC collection. The transfer step is often performed with a syringe or pipette, with only eyeballing as measuring tool. Because the manual PRP process is not clearly defined, this protocol might randomly lead to P-PRP or L-PRP..Source: DAVID, M et al., 2009, p. 159.

The success of rehabilitation treatment is more related to the environment that the individual is inserted than to the professional, even because many cultures do not make use of the therapeutic implant. However, in the regions that dispose of and are allowed to perform these rehabilitation measures success is more related to the use of osseointegratable implants, and taking as reference several surgical principles until the final installation of the prosthesis implanto retida or implanto supported (Galafassi *et al*., 2015). The use of L-PRF is indicated primarily as a support during bone and gingival graft surgeries. However, the main driver of this technique is to have a shorter healing time for the patient and an acceleration of the bone and tissue repair, avoiding healing and regeneration, which is nothing more than a tissue repair process where there is no loss Function or exchange of coating epithelium (Hesham *et al*., 2007). Consider also important characteristics such as the conscience of the dental surgeon, aspects of the micro-structure that the zirconia implant presents and essential factors to promote an optimal osseointegration of the operated area, as there are factors that

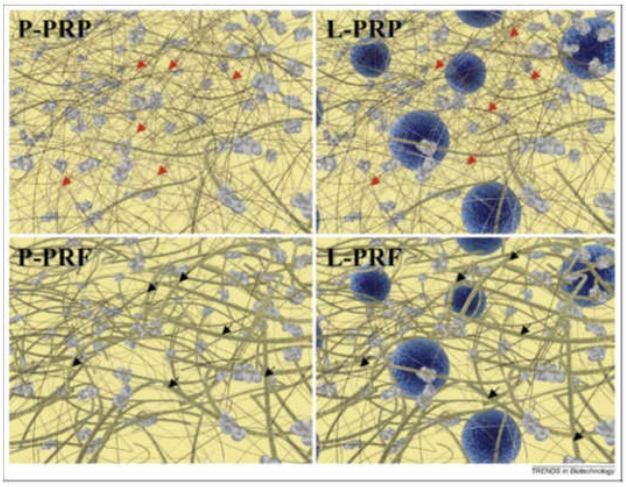


Figure 4. Schematic illustration of the matrix and cell architecture of the four categories of platelet concentrates. Two key parameters are important: leucocyte content (blue circles) and density of fibrin (yellow/light-brown fibres). Platelet aggregates (light-grey shapes) are always assembled on the fibrin fibres. In typical P-PRP and L-PRP preparations (top panels), the fibrin network is immature and consists mainly of fibrillae with a small diameter (red arrows) due to simple fibre polymerization. This fibrin network supports platelet application during surgery but dissolves quickly like a fibrin glue. In P-PRF and L-PRF preparations (bottom panels), fibrin fibres are thick (black arrows) due to multiple fibre assembly and constitute a resistant matrix that can be considered as a fibrin biomaterial.Source: DAVID, M et al., 2009, p. 165.

are capable of altering the bone repair, such as relative ischemia, use of topical products and elevation of local temperature (ItalianoJr *et al*., 2008). The maxillary sinuses consist of pneumatized cavities delimited by a thin pyramidal-shaped membrane, most of them reinforced by intra-sinus septa and covered by ciliated pseudostratified epithelium, known as the Schneider's membrane, which is attached to the underlying bone, formed by the Union of four processes, like: frontal, zygomatic, horizontal palatine and the short alveolar process (Marzola, 2008). The technique of lifting the maxillary sinus, also called sinus lift, is a technique used to rehabilitate edentulous areas in the posterior region of the maxilla in situations of bone resorption, in addition to being a predictable surgical procedure that allows the implantation of implants, since it is necessary to use materials or grafts in the space between the alveolar ridge and the new position of the sinus membrane (Machado *et al*., 2011).

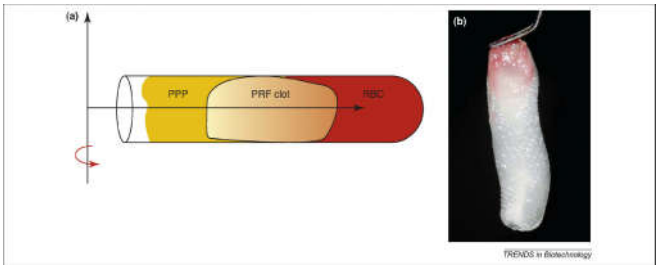


Figure 5. Choukroun's platelet-rich fibrin (PRF) method. (a) Blood is softly centrifuged immediately after collection without anticoagulants, and coagulation starts quickly. Blood is separated into three components with the formation of a strong fibrin clot in the middle of the tube. This clot acts as a plug that traps most light blood components, such as platelets and leucocytes, as well as circulating molecules, such as growth factors and fibronectin. This method leads to the natural production of a dense leucocyte-rich PRF (L-PRF) clot. (b) After compression of the L-PRF clot, it can be used easily as a membrane (actual length shown: 3 to 4 cm) Source: DAVID, M et al., 2009, p. 163.

The osseointegration of the implants placed in the maxilla associated with the maxillary sinus lift takes into consideration the height of the bone remnant, the size of the window of access to the maxillary sinus and the selection of the

Figure 6. Platelet material after centrifugation and removed from the test tube, to be allocated in a surgical shop of the maxillary sinus. Source: Pereira, ALC et al., 2017, p. 13175

biomaterial that will be used in that procedure.Bone height is one of the fundamental conditions for a maxillary sinus survey to be performed: the first situation is when the remaining alveolar bone of the posterior maxilla is between 1 and 4 mm, in these cases the most appropriate is to perform a breast lift Traumatic, await healing of the graft and then implant installation (lack of primary stability necessary for the osseointegration process); The second when the bone quantity is between 5 and 7 mm, indicating the installation of the implant associated with maxillary sinus removal (bone quantity that ensures primary stability); The third when the height of the bone remnant is equal to 8 mm, which allows the use of osteotomes for the lifting of the atraumatic maxillary sinus (Mendonça-Caridad *et al*., 2013). Rehabilitation of the maxilla more specifically of the posterior region is a procedure that requires a sufficient amount of bone remnant, it is still necessary that the quality of this tissue is good. We must be carefull to avoid complications involving the maxillary sinus, since there are innumerable cases that when patients are rehabilitated in the posterior maxilla there is a very great proximity of the alveolar bone crest with the sinus floor, of this fear being a difficulty For implant installation it is necessary to seek measures that facilitate the success of the case in question (Pavelski *et al*., 2015). Previous studies have shown that there are two types of implantation techniques: the late and the immediate, but the immediate technique is defended when there is a bone remnant greater than 5 mm, a decrease in morbidity and a reduction in time of the proposed treatment. However, in cases that present a remnant less than 5 mm, with a high risk of an infectious process in the bone tissue grafted on the exposed region (Paiva, 2014; Pinto, 2011; Pjetursson, 2008; Plachocovan *et al*., 2008).

In the regions that it has and legally allows the accomplishment of implant rehabilitation measures, the success is more related to the use of osseointegratable implants, taking as a reference several surgical principles until the final installation of the prosthesis implanto retida or implanto supported. it should be take into main important characteristics features such as the ethical principles of the dental surgeon, aspects of the micro-structure of the zirconia implant and essential factors to promote optimal osseointegration of the operated area, as there are factors that are capable of altering the bone repair, such as relative ischemia, use of topically applied products and elevation of local temperature (Ponte, 2016). Rehabilitation of the posterior maxilla requires the presence of two factors considered essential for the success of the procedure, such as the amount of remnant and the quality of the tissue.During the procedure some care should be taken to avoid complications involving the maxillary sinus, considering the proximity of the alveolar bone crest with the sinus floor, when the subject is the rehabilitation in the posterior region of the maxilla, and measures are necessary to facilitate the success of the maxillary sinus case (Raja, 2009). Breast lift by means of the atraumatic technique in conjunction with the placement of the platelet material may be better for the patient, since it offers innumerable benefits, such as: acceleration in the process of formation of bone matrix, formation of new vessels and a great biocompatibility of the organism of the individual with the same (Sani *et al*., 2008). Posterior regions of the maxilla in most cases present a quantity bone (maxillary sinus pneumatization and remodeling of edentulous alveolar crest) and insufficient quality when it comes to implant-supported prosthetic rehabilitation. In this case, the use of L-PRF (platelet-rich plasma and leukocytes) has as one of the functions the maintenance of the sinus membrane raised, contributing to the success of the case (Schnabel *et al*., 2007; Tunali *et al*., 2013).

Conclusion

It can be concluded from this study that

The posterior region of the maxilla is a well selected area for maxillary sinus elevation, and when it is necessary to install an implant, grafting may be necessary with the use of platelet material. It was clarified through this literature review that the breast lift maneuver with the use of Platelet-Rich and Fibrin-rich Leukocytes (L-PRF) offers a superior post-surgical response to the individual because the tissue repair process is optimized, due to the release of innumerable growth factors on the inflammatory region, under close biological compatibility without rejections with acceleration of the cicatricial process.

Conflict of Interests

The authors declare they do not have any conflict of interests.

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