Is Platelet Concentrate Advantageous for the Surgical Treatment of Periodontal Diseases? A Systematic Review and Meta-Analysis

Massimo Del Fabbro,* Monica Bortolin,* Silvio Taschieri,* and Roberto Weinstein*

Background: The aim of the present review is to systematically evaluate the effects of autogenous platelet concentrates on clinical outcomes of the surgical treatment of periodontal diseases.

Methods: MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Trials were searched using a combination of specific search terms. Furthermore, a hand search of relevant journals and bibliographies of reviews was performed. Only randomized clinical trials were included. For periodontal intrabony defects, the primary outcome variable was the clinical attachment level. For gingival recession, outcome variables were root coverage and keratinized tissue increase. Data were adjusted for baseline values. The methodologic quality of the included studies was assessed. The results of studies in which the only difference between test and control groups was the adjunct of platelet concentrates were aggregated using a meta-analysis. For intrabony defects, the influences of guided tissue regeneration (GTR) and study type (split-mouth versus parallel studies) were also evaluated.

Results: The initial search yielded 424 studies. Of the 29 eligible studies, 24 studies were included. There were 16 studies on the treatment of periodontal intrabony defects, all of which used platelet-rich plasma (PRP); six studies on gingival recession treatment; and two studies on the treatment of furcation defects. A significant positive effect of the adjunct of PRP was found for intrabony defects. Such an effect was magnified in studies in which GTR was not used, whereas in studies using GTR, the use of PRP had no adjunctive effect. No effect of the study type was found. No significant effect of platelet concentrates was found for gingival recession treatment in which only studies with a follow-up ≤6 months displayed positive results. No significant benefit of PRP could be demonstrated for furcation treatment.

Conclusions: PRP may exert a positive adjunctive effect when used in combination with graft materials, but not with GTR, for the treatment of intrabony defects. No significant benefit of platelet concentrates was found for the treatment of gingival recession. J Periodontol 2011;82:1100-1111.

KEY WORDS
Gingival recession; meta-analysis; periodontal disease; platelet-rich plasma; randomized controlled trial.

* Department of Health Technologies, Scientific Institute for Care and Clinical Research (IRCCS) Galeazzi Orthopedic Institute, University of Milan, Milan, Italy.

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healing and regeneration. Platelets also play a role in the host defense mechanism at the wound site by delivering signaling peptides that attract macrophage cells. In addition, platelet concentrates may contain small amounts of leukocytes that synthesize interleukins involved in the non-specific immune reaction. The antimicrobial activity of platelet concentrates against several bacterial species involved in oral infections was also reported.

In recent years, there has been a growing interest in the use of platelet concentrates for the treatment of many intraoral clinical conditions, including periodontal defects. However, there has been no agreement about the advantages derived from the adjunct of platelet concentrates to periodontal surgical procedures as suggested by some reviews. The first systematic review that evaluated the effect of platelet-rich plasma (PRP) on clinical applications in dentistry reported beneficial effects of PRP in the treatment of periodontal defects, whereas a subsequent, but not systematic, review reported divergent results that ranged from the significant enhancement of graft healing to a null effect in the treatment of intraosseous and furcation defects. Another systematic review based on randomized trials concluded that PRP improved the outcome of gingival recession treatment but not the clinical attachment level (CAL) in chronic periodontitis.

A recent systematic review that evaluated the effect of a PRP adjunct in the treatment of periodontal intraosseous defects underlined the limits and the heterogeneity of available data and cautiously concluded that the specific selection of bioactive agents and procedures combined with PRP may be important.

A further issue is that different techniques were adopted to obtain platelet concentrates. Several commercial methods are available in the market for the preparation of different types of platelet concentrates such as PRP, plasma rich in growth factors (PRGF), and platelet-rich fibrin (PRF), and each one has specific features and effects. Taken together, the available clinical evidence can be confusing for the practitioner.

The aim of the present evidence-based systematic review is to determine whether the use of autologous platelet concentrates may affect the outcome of regenerative procedures for the treatment of periodontal defects and gingival recession.

**MATERIALS AND METHODS**

**Literature Search**

A search was performed in electronic databases (i.e., MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Trials) using the following search terms alone and in combination by means of Boolean operators: “platelet-rich plasma,” “autologous platelet concentrate,” “plasma-rich growth factors,” and “platelet-rich fibrin.” The search was limited to clinical trials involving human subjects. No language or time restriction was applied. The last electronic search was performed during September 2010.


Reference lists of the reviews and of identified randomized trials were also checked for possible additional studies. Finally, the manufacturing companies producing devices for concentrating platelets were contacted to identify ongoing or unpublished studies pertinent to this review.

**Inclusion and Exclusion Criteria**

All randomized clinical trials (RCTs) assessing the efficacy of platelet concentrates for healing and regeneration of hard and soft tissues in patients undergoing surgical procedures for the treatment of periodontal defects and gingival recession were included. All other types of study designs, like case series, case reports, retrospective studies, technical studies, animal studies, and reviews, were excluded. Studies investigating the effect of platelet concentrates in surgical procedures involving implant therapy, like the maxillary sinus augmentation procedure, were also excluded as were articles reporting on any other oral surgical intervention like tooth extraction, inlay and onlay grafts for the treatment of jawbone defects, treatment of odontogenic cysts, and periapical surgery. No limitation was placed regarding the number of patients treated. Studies were only included if a test group using platelet concentrates was compared to a control group in which platelet concentrates were not used.

**Data Extraction**

The titles and abstracts of retrieved articles were screened independently by two reviewers (MDF and MB), and publications meeting the inclusion criteria were identified. When the title and abstract of an article did not provide sufficient information to make a decision, the full text was obtained and examined.
Publications that did not meet the inclusion criteria were excluded. In case of a disagreement, a third reviewer (ST) was consulted, and a joint decision was achieved after discussion. The full text of all included studies was obtained. Characteristics of the included studies were examined by the reviewers, and relevant data were extracted. Studies were grouped according to the type of surgical intervention performed.

**Primary Outcome Variables**
For studies evaluating the treatment of periodontal intrabony defects, the change in CAL between baseline and the final follow-up was considered. For each study, the CAL change was adjusted for the initial clinical condition in terms of defect severity by dividing by the CAL value at baseline. This ratio was expressed in percentages and used for the meta-analysis. The effects of surgical techniques (in particular the use of guided tissue regeneration [GTR]) and study design (i.e., parallel group versus split-mouth studies) on clinical outcomes were also evaluated. For studies evaluating gingival recession treatment, the percentage of root coverage and the keratinized tissue increase at the end of each study were considered for the meta-analysis. For studies evaluating the effect of platelet concentrates on other types of periodontal surgical procedures, such as furcation defect treatment, the outcome variables reported in each study were examined before establishing the primary outcome variable to be used for the meta-analysis.

**Secondary Outcome Variables**
Any other clinical variable reported in the included studies was considered, such as the defect width, number of walls, changes in probing depths and gingival recession, and radiographic changes between baseline and the final follow-up. Patient-based variables such as esthetics, postoperative discomfort (i.e., pain, swelling, infection, and abscess), any type of complication, and adverse events, when reported, were also considered.

**Assessment of Risk of Bias**
The risk of bias of included studies was evaluated independently and in duplicate by two reviewers (MDF and MB) as part of the data extraction process. Criteria for assessing the risk of bias of RCTs in the present review were adapted from the guidelines reported in the *Cochrane Handbook*. Included trials were assessed considering the following criteria: sequence generation (the randomization method), concealed allocation of treatment, blinding of evaluators for outcome assessment, completeness of outcome data, comparability of control and treatment groups at entry, clear definitions of exclusion/inclusion criteria, and other sources of bias (clear definition of success criteria, calibration of assessors, and sample size calculation). All criteria were judged as adequate (yes), unclear, or non-adequate (no). The authors of identified RCTs were contacted for clarification or to provide missing information whenever possible.

To summarize the validity of studies, they were grouped into the following categories: 1) a low risk of bias if none of the quality criteria were judged as inadequate and no more than two of them were judged as unclear; 2) moderate risk of bias if one to three criteria were judged as inadequate; and 3) a high risk of bias if four or more criteria were judged as inadequate. In case of discrepancy between the two reviewers, an agreement was obtained by discussion. Otherwise, a third reviewer (ST) was consulted until a consensus was achieved by discussion.

**Data Synthesis**
For each trial, the mean difference in the primary outcome variable, along with 95% confidence intervals (CIs), was calculated to estimate the effect of interventions. Clinical heterogeneity was assessed by examining the types of participants, interventions, and outcomes in each study. A meta-analysis was attempted only if studies of similar comparisons (the only difference between test and control groups was the adjunctive use of platelet concentrates in the former) that reported the same outcome measures were found. The primary outcome variables from each study were combined for continuous data using a random-effects model. In the case of a continuous variable, like CAL and keratinized tissue, the mean difference was adjusted for the baseline value. The analysis was performed using software, and the results were graphically presented by means of Forest plots. Funnel plots were also used to assess the publication bias. The risk of bias was synthesized by means of a graph. The patient was considered the unit of analysis.

**RESULTS**
The initial electronic search provided 424 studies. Figure 1 is a flowchart that summarizes the article selection process. After screening the titles and abstracts, 29 studies investigating the effects of platelet concentrates in periodontal procedures were identified. No further study was identified by the hand-searching of journals and other search methods. After review of the full texts, five articles were excluded because platelet concentrate was used in all study groups. Twenty-four RCTs fulfilled all inclusion criteria and were included in the present analysis. Finally, only 14 articles could be submitted to meta-analysis (10 for periodontal defects and four for gingival recession). Most of the RCTs had a split-mouth design. The included articles were published...
in a period ranging from 2002 to 2009. They described different surgical procedures (i.e., the treatment of periodontal intrabony defects, furcation defects, and gingival recession) performed in a total of 628 patients.

**Treatment of Periodontal Intrabony Defects**

Sixteen articles\(^2\) reported the treatment of periodontal intrabony defects (Table 1). Overall, 602 defects (307 test and 295 control defects) were treated in 446 patients. In all studies, PRP was used. No study evaluated the effect of PRP alone versus open-flap debridement alone. Various bone substitutes were used as grafting materials: anorganic bovine bone, β-tricalcium phosphate, demineralized freeze-dried bovine bone, bioactive glass, and hydroxyapatite. In one study,\(^4\) enamel matrix derivative was also used. Eight studies\(^\) performed additional GTR using various kinds of membranes: porcine-derived collagen membranes, polylactic acid membranes, synthetic bioabsorbable membranes, and expanded polytetrafluoroethylene membranes. Follow-up periods ranged from 6 to 12 months. Healing was assessed through the measurement of different clinical parameters and, in some studies, through radiographic evaluation. Four studies\(^3\) reported a positive effect of platelet concentrates. Six studies were excluded from the meta-analysis because either PRP was not the only adjunctive treatment in the test group,\(^2,31\) the platelet concentrate was compared to a bone substitute,\(^35\) the mean values for CAL change were not provided,\(^37,43\) or the baseline CAL was not reported.\(^44\) From the meta-analysis of the 10 remaining studies,\(^30,32,33,36,38-42\) a significantly greater CAL gain was observed in the cases in which PRP was used compared to control sites (mean adjusted percentage difference: 5.50%; 95% CI: 1.32% to 9.67%; \(P = 0.01\)) as shown in Figure 2. In terms of millimeters, the mean weighted CAL-gain difference was 0.50 mm (95% CI: 0.12 to 0.88 mm). The Funnel plot did not show asymmetry, indicating an absence of publication bias (Fig. 3).

**PRP and GTR.** A further meta-analysis was performed by separately considering the studies that used GTR in both test and control groups and those in which membranes were not used at all. In the four studies\(^34,36,38,41\) that used GTR, the effect of PRP was negligible (mean adjusted percentage difference: 0.56%; 95% CI: –2.92% to 4.04%; \(P = 0.75\)) as shown in Figure 4. Conversely, in the six studies\(^30,32,33,39,40,42\) in which GTR was not used, PRP demonstrated a significant positive effect on periodontal intrabony defects treatment (mean adjusted percentage difference: 9.70%; 95% CI: 3.16% to 16.24%; \(P = 0.004\)) as shown in Figure 5. In terms of millimeters, the mean weighted CAL-gain difference in favor of the PRP group was 0.04 mm (95% CI: –0.33 to 0.41 mm) and 0.84 mm (95% CI: 0.27 to 1.42 mm) for studies using and not using GTR, respectively.

**Effect of experimental design.** No significant effect of the experimental design was found. In the seven parallel group studies,\(^32,36,38-42\) the mean adjusted percentage difference in CAL change between test and control groups was 4.46% (95% CI: –0.19% to 9.10%), which corresponded to a mean weighted difference of 0.39 mm (95% CI: –0.01 to 0.79 mm).
and in the three split-mouth studies, it was 9.16% (95% CI: -2.40% to 20.72%), which corresponded to a mean weighted difference of 0.80 mm (95% CI: 0.10 to 1.50 mm).

### Treatment of Gingival Recession

Six studies reported the treatment of gingival recession (Table 2). Overall, 217 defects (106 test and 111 control defects) were treated in 136 patients. Different surgical procedures were performed to obtain root coverage (coronally advanced flap, modified coronally advanced flap, and coronally positioned tunnel). In some cases, grafting materials (connective tissue grafts harvested from the palate or acellular dermal matrix allograft) were added. In two studies, a collagen sponge was used as a carrier for platelet concentrates. Follow-up periods ranged from 6 weeks to 12 months. Various clinical parameters were evaluated to assess healing. Only one study reported significant differences, in terms of clinical parameters, in favor of the platelet-concentrate group. This study had the shortest follow-up among included studies (6 weeks). In this study, the authors also presented a histologic evaluation of the connective tissue donor-site showing more inflammatory cells and less collagen in control samples. In the studies by Cheung and Griffin and Yen et al., the pain level was assessed through a visual analog scale (VAS) at 1 week and at 1 and 3 weeks after surgery, respectively. No differences were found at 1 week, whereas a significant reduction of pain was observed at 3 weeks in the test group.

### Root coverage

Two studies were excluded from the meta-analysis because mean values for root

### Table 1. Randomized Trials Reporting Treatment of Periodontal Intrabony Defects

<table>
<thead>
<tr>
<th>Authors, Publication Year</th>
<th>Patients (n)</th>
<th>Number of Units (patients)</th>
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<th>Membrane</th>
<th>Follow-up (Months)</th>
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<td>18 18 18</td>
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<td>No</td>
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Test = platelet-concentrate group; PC = platelet concentrate; ABB = anorganic bovine bone; ND = not determined; HA = hydroxyapatite; β-TCP = β-tricalcium phosphate; BG = bioactive glass; DFDBA = demineralized freeze-dried bone allograft; EMD = enamel matrix derivative.

* Split-mouth study.
† Polylactic acid membrane, Atrisorb®, Atrix Laboratories, Fort Collins, CO.
‡ Porcine-derived collagen membrane, Bio-Gide, Geistlich Pharma AG, Wolhusen, Switzerland.
§ Synthetic bioabsorbable membrane, Resolut XT, W.L. Gore & Associates, Flagstaff, AZ.
¶ Non-bioabsorbable e-PTFE (expanded polytetrafluoroethylene) membrane, W.L. Gore & Associates.

Table 1. Randomized Trials Reporting Treatment of Periodontal Intrabony Defects

and in the three split-mouth studies, it was 9.16% (95% CI: -2.40% to 20.72%), which corresponded to a mean weighted difference of 0.80 mm (95% CI: 0.10 to 1.50 mm).

### Treatment of Gingival Recession

Six studies reported the treatment of gingival recession (Table 2). Overall, 217 defects (106 test and 111 control defects) were treated in 136 patients. Different surgical procedures were performed to obtain root coverage (coronally advanced flap, modified coronally advanced flap, and coronally positioned tunnel). In some cases, grafting materials (connective tissue grafts harvested from the palate or acellular dermal matrix allograft) were added. In two studies, a collagen sponge was used as a carrier for platelet concentrates. Follow-up periods ranged from 6 weeks to 12 months. Various clinical parameters were evaluated to assess healing. Only one study reported significant differences, in terms of clinical parameters, in favor of the platelet-concentrate group. This study had the shortest follow-up among included studies (6 weeks). In this study, the authors also presented a histologic evaluation of the connective tissue donor-site showing more inflammatory cells and less collagen in control samples. In the studies by Cheung and Griffin and Yen et al., the pain level was assessed through a visual analog scale (VAS) at 1 week and at 1 and 3 weeks after surgery, respectively. No differences were found at 1 week, whereas a significant reduction of pain was observed at 3 weeks in the test group.

### Root coverage

Two studies were excluded from the meta-analysis because mean values for root
coverage were not available. From the meta-analysis of the remaining four studies, no significant effect of platelet concentrates was observed (mean weighted percentage difference: \(-4.22\%\); 95% CI: \(-14.30\%\) to \(5.86\%\); \(P = 0.41\)) as shown in Figure 6.

**Keratinized tissue.** The meta-analysis performed on four studies for keratinized tissue increase showed no significant effect of platelet concentrates (mean weighted difference: \(0.18\) mm; 95% CI: \(-0.19\) to \(0.54\) mm; \(P = 0.34\)) as shown in Figure 7.

**Treatment of Furcation Defects**

Two split-mouth studies reported a favorable effect of PRP in the treatment of Class II furcation defects in 20 patients, even when no complete closure of the defect was observed after 6 months. The study by Lekovic et al. also reported a positive effect of the experimental group against the control group in 26 patients 6 months after surgery. However, because PRP was used in combination with anorganic bovine bone and GTR, it was not possible to determine the contribution of each factor to the positive outcome observed in the study.

**Assessment of Risk of Bias**

Of the randomized trials dealing with the treatment of intrabony defects, six trials were classified as having a low risk of bias, and 10 trials were classified as having a moderate risk of bias. All RCTs dealing with gingival recession were classified as having a moderate risk of bias. One of the RCTs dealing with furcation defect was judged as having a low risk of bias, and another RCT was judged as having a moderate risk of bias. Figure 8 summarizes the results of risk of bias for each item assessed.

**DISCUSSION**

The present systematic review aimed to assess the value of platelet concentrates in enhancing hard-and soft-tissue healing in periodontal regenerative surgical procedures based on randomized trials. Although the quality of the studies was considered generally good, the results of the present literature analysis demonstrated a substantial heterogeneity among different studies with regard to experimental designs, study aims, surgical techniques, outcome assessment variables, patient populations, follow-up...
durations, and types and methods of preparation of the platelet concentrate. Grouping of the included studies according to the type of periodontal defect treated allowed us to reduce variability among studies, so as to attempt a meta-analysis.

**Periodontal Intrabony Defects**

When evaluating the effect of platelet concentrates in the surgical treatment of periodontal intrabony defects and using CAL as the primary outcome variable, an overall positive effect was detected (Fig. 2). Despite the slightly different study-selection criteria, the present meta-analysis substantially confirmed the outcomes of another systematic review that found evidence for a beneficial effect of PRP in the treatment of periodontal defects. This confirmation indicated that, independent of the clinical approach, the use of platelet concentrates may improve the CAL in these procedures.

**PRP and GTR.** An additional analysis showed that, when platelet concentrates are used in combination with GTR, no adjunctive effect can be detected after 12 months (Fig. 4). Among the studies using GTR only, the one with the shortest follow-up (6 months) reported a significant positive adjunctive effect of PRP. This suggested that the proven efficacy of GTR in regenerative periodontal procedures could mask the effect of the platelet concentrate. This was even more evident when prolonging the follow-up to 12 months. Conversely, in those studies in which GTR was not used, PRP showed a marked positive effect on the CAL (Fig. 5). It is possible that the dense fibrin network that is formed after platelet activation may act as a barrier and prevent infiltration of epithelial tissue into the defect. Because of the high cost of the membranes used for GTR, and the competence required for performing this technique, the adoption of autologous platelet concentrates instead of barrier membranes would allow a reduction of the overall treatment cost and a simplification of the procedure. Furthermore, as reported by some authors, it is possible to flatten the platelet concentrate after activation and obtain autologous platelet-rich membranes, which can be placed over the defect, similar to conventional membranes.

**PRP and other reconstructive materials.** The true effect of platelet concentrates on periodontal regeneration could not be evaluated in the present review because no study compared open-flap debridement alone versus open-flap debridement plus platelet concentrates for the treatment of intrabony defects. In all studies except one, a periodontal reconstructive technique (grafting or GTR or a combination of both) was used in control and test groups, with PRP used as
an adjunctive agent in the test group. The combined use of a regenerative technique like GTR, whose efficacy is well known, and PRP can mask the true regenerative effect of the latter. The type of biologic agent used in combination with platelet concentrates could also have an influence on the action of the growth factors contained within the preparation, as suggested by a recent systematic review. Other possible confounding factors could be the number of defect walls and the width of the defect. These factors were not statistically evaluated in the present review because they were not systematically reported, and such an investigation would have implied a considerable fragmentation of data and reduced the power of the analysis.

Another systematic review reported that the use of PRP in association with graft biomaterials for the treatment of periodontal defects led to a statistically significant improvement of defect-associated clinical parameters. However, when the additional effect of PRP over the graft was evaluated, contrasting results emerged.

Excluded studies. Some studies were excluded from the present meta-analysis evaluating the specific effect of PRP in the treatment of intraosseous defects even if they were judged of a good quality level. In two studies, a test group consisting of the treatment of intrabony defects with anorganic bovine bone, GTR, and platelet concentrates was compared to a control group consisting of the treatment with GTR alone or open flap debridement alone. These studies showed better outcomes for the test group, suggesting that a combination of multiple agents like anorganic bovine bone, GTR, and platelet concentrates was effective in treating intrabony defects. However, similar to what was reported by a previous review, no conclusion about the contribution of platelet concentrates could be drawn because the role played by each agent in the regenerative process could not be distinguished.

In another study, platelet concentrates were used as alternative graft material compared to bioactive glass, both in association with GTR. No differences in terms of clinical parameters were found between the two groups after 6 months, which suggested that platelet concentrates may be as effective as bioactive...
glass and may be used as graft material for treating intrabony defects.

**Study design.** No significant differences in outcomes were found between studies adopting a split-mouth protocol and those studies with a parallel-group design. This suggested that both study designs were equally effective in assessing the influence of PRP on the outcomes of the surgical procedures. Funnel plots were performed for all comparisons, and no publication bias was detected.

**Gingival Recession**

Platelet concentrates showed no significant effect on the improvement of root coverage and keratinized tissue when used as an adjunctive treatment for gingival recession. This result was in contrast with a recent review that reported accelerated wound healing and enhancement of root coverage procedures. However, in the latter review, studies of low-evidence level such as case reports were also considered. This might have influenced the reliability of the conclusions, even though the authors correctly recognized the inadequate available clinical evidence. In the present meta-analysis, the only study that showed a positive effect of platelet concentrates in the treatment of gingival recessions was the one with the shortest follow-up (4 months). Of the two excluded studies, one study reported no effect of PRP after 12 months of follow-up, whereas the other study found a positive effect after 6 weeks, which was also validated by histologic analysis. Unfortunately, no mean values and SDs for root coverage were available for these studies. Their inclusion would have increased the power of the meta-analysis, but it is unknown if and how its outcome would have been modified. Because of the short half-life of platelet-derived growth factors, platelet concentrates are supposed to have an effect on the very early stages of bone and soft tissue healing. This trigger effect could induce an acceleration of the healing process, which implies an increase of the tissue regeneration in the first weeks after surgery. Such an effect probably tends to disappear over the long term. Therefore, it can be speculated that studies with shorter follow-up time are more likely to produce positive outcomes than those with a longer follow-up duration. This was another reason for the exclusion of the study by Yen et al. (which had only a 6-week follow-up) from the meta-analysis.

In one study, the treatment with platelet concentrates embedded in a collagen sponge was compared to the treatment with connective tissue graft. No differences in clinical parameters were seen between the two groups after 8 months of healing; moreover, the treatment with platelet concentrates resulted in a better esthetic appearance, suggesting that it may
be an alternative to a connective tissue graft and reduce the patient’s discomfort.

**Furcation Defects**
The two selected studies reported a significantly better outcome in the group using PRP versus the control group. However, because of differences between the experimental treatment groups, no meta-analysis was performed. Therefore, no consistent evidence was present regarding the effect of PRP in the treatment of furcation defects. This result was in line with the findings of Trombelli and Farina.19

**Methods for Preparation of Platelet Concentrates**
Different protocols were used for platelet-concentrate production. Some of the included studies did not provide a detailed description of the protocol for platelet-concentrate production (e.g., the use of a cell separator, centrifugation steps, the amount of blood collected preoperatively, the baseline platelet concentration in the collected blood, the amount of platelet concentrate obtained, the final platelet concentration, the type of blood anticoagulant, and the use of a platelet activator). Any of these variables might have played a role in the platelet viability and activity. Furthermore, different platelet concentrates may have different biologic properties. For example, the technology for obtaining PRGF produces a leukocyte-free preparation with the aim of reducing the content of proinflammatory cytokines.

**Further Effects of Platelet Concentrates**
Some studies on various oral surgical procedures highlighted the advantages of platelet concentrates on the very early stages of soft tissue healing and suggested that they might reduce postoperative inflammation and pain, with positive effects on the quality of life. However, these effects were not properly assessed across the studies included in the present review. Only two studies evaluated pain levels after surgery and reported a beneficial effect of platelet concentrates in controlling postoperative symptoms.

**Indications for Future Research**
Some aspects emerged from this review that deserved further investigation. The effect of platelet concentrates other than PRP (e.g., PRGF and PRF) on periodontal intrabony-defect treatment has not been investigated. Evidence is lacking concerning the effect of platelet concentrates on common postoperative symptoms like pain and swelling that might be relevant for patients’ quality of life and preferences regarding the use of such adjunctive agents. Further randomized studies are needed to investigate if the adjunctive use of platelet concentrates may have benefits for the treatment of furcation defects. Future studies should report with greater detail the protocol used for the preparation of platelet concentrates as well as the baseline and final platelet concentration for each patient. Clinical evidence regarding the true effect of platelet concentrates over open-flap debridement alone, without other confounding factors like reconstructive techniques, is needed. Because of the methodologic limitations of the existing studies, there is a need for further well-designed studies to provide more insight in the precise role of platelet concentrates for periodontal tissue regeneration.

**CONCLUSION**
The evidence available in the literature for beneficial effects of platelet concentrates in periodontal surgical procedures has been increasing in the recent years. Platelet-rich plasma may be advantageously used as an adjunct to grafting procedures, but not in combination with GTR, for the treatment of intrabony defects, whereas no significant benefit of platelet concentrates was found for gingival recession.

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**REFERENCES**


