Comparative Investigation of Anti-inflammatory Effect of Platelet-Rich Fibrin After Mandibular Wisdom Tooth Surgery: A randomized controlled study

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Research Article

Keywords: Anti-inflammatory effect, edema, serum markers, PRF, wisdom tooth

Poster Date: June 14th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1711895/v1

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Abstract

Objectives

This study evaluated the anti-inflammatory effect of platelet-rich fibrin (PRF) applied to the extraction socket after impacted mandibular third molar surgery with subjective and objective parameters.

Materials and Methods

A total of 48 patients who had fully impacted wisdom teeth in bilateral and similar positions were included in the study. The control group was formed with the standard extraction of the lower third molars, and the PRF group was formed with local PRF application in addition to standard impacted tooth surgery (n = 96). The anti-inflammatory activity of PRF on postoperative 2nd and 7th days was evaluated subjectively by clinical parameters and objectively by biochemical parameters.

Results

Postoperative 2nd and 7th-day follow-up data of pain, edema, and trismus in the PRF group were found to be statistically significantly lower. Erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were found to be statistically significantly lower in the PRF group than in the postoperative 2nd day follow-up period (p < 0.001). There was no statistically significant difference in interleukin 6 (IL-6) and tumor necrosis factor-alpha (TNF-α) parameters when the PRF group and the control group were compared in both follow-up periods (p > 0.05).

Conclusions

PRF has a positive effect in controlling complications associated with mandibular impacted third molar extraction, as confirmed by measurement of serum ESR, CRP, and IL-6 values.

Clinical Relevance

The use of PRF in the extraction socket after impacted third molar surgery can be used as a routine procedure, but this recommendation should be supported by comprehensive studies with high patient numbers.

Introduction

The most frequently performed surgical procedure in oral and maxillofacial surgery is the extraction of the impacted third molars [1]. Minimizing local complications after impacted lower third molar tooth extraction has always been the subject of innovative research [2–5]. Recently, autogenous blood concentrations have attracted attention due to their high tissue healing and regenerative effects in medicine and dentistry [6]. Platelet-rich fibrin (PRF) is an immune and platelet concentrate that collects all the constituents of a blood sample beneficial for healing and immunity on a single fibrin membrane [7].
PRF has many application areas in the branch of dentistry because it has easy clinical usage and it does not require any biochemical treatment [7–8]. Various studies have shown that it contributes to wound healing with its transforming growth factor – β (TGF-β) and platelet-derived growth factor (PDGF) content [8, 9]. Although the use of PRF after the mandibular third molar (MTM) surgery is recommended in the literature for benefits such as reducing postoperative swelling and pain, accelerating new bone formation, and soft tissue regeneration, studies on the effect on the severity of inflammation based on objective data have not been fully clarified.

Serum biomarkers are substances that change quantitatively in the serum during the development of inflammation. Although the increase in the level of these reactants during inflammation is non-specific for diagnostic purposes, it is decisive in monitoring the process and in the follow-up of treatment [10]. The erythrocyte sedimentation rate (ESR) measurement and C-reactive protein (CRP) level, which are among the acute phase reactants, are widely used to show the presence of inflammation [11, 12]. Additionally, cytokines such as interleukin 6 (IL-6) and tumor necrosis factor-alpha (TNF-α) play a crucial role in the acute phase response, as they are necessary for initiating the inflammatory response [13].

In line with this information, this study evaluated the anti-inflammatory activity of PRF, which is placed locally in the extraction socket after the bilateral impacted MTM surgery, on the postoperative 2nd and 7th days. Subjective data were obtained by evaluating clinical parameters such as pain, edema, and trismus, and objective data were obtained by analyzing ESR, CRP, IL-6, and TNF-α serum values. According to our knowledge, this is the first study to explain the anti-inflammatory activity level of PRF by supporting it with objective parameters as well as clinical data.

**Materials And Methods**

This study was approved by Trakya University Clinical Research Ethics Committee with the number 06/09 and was conducted on patients who applied to Trakya University Faculty of Dentistry, Department of Oral and Maxillofacial Surgery between 08.11.2019 and 27.02.2020. All patients included in the study were informed about the purpose and method of the study, and an informed consent form was used to obtain their permission to participate. In the power analysis performed using the G*power 3.1 program, VAS values in the control and PRF groups were found to be between 8% and 25% (alpha error probability=0.05), and a result of the sample size analysis performed with a power value of 0.8, the total number of samples required to be taken was determined to be 48.

The study was completed by extracting a total number of 96 teeth from 48 patients who met all the criteria. Patients between 18 and 50 years old, did not have any systemic disease that could affect the healing process, had asymptomatic teeth and did not smoke with impacted bilateral MTM in a symmetrical location (Vertical and mesioangular position according to Winter classification, and class II, position B and C position according to Pell & Gregory classification) (Fig 1) were included in this study. Pregnancy, having a chronic disease, having a local infection in the impacted tooth area, and smoking were exclusion criteria for this study.
The control group was formed by standard extraction of impacted teeth, and the PRF group was formed with local PRF application to the extraction socket in addition to standard impacted tooth surgery (Fig 2). The group the tooth will be included in was determined by the closed envelope method just before the surgery on the first operation day. After 3 weeks, the other impacted tooth of the same patient was extracted with the appropriate surgical procedure and included in the relevant group. During the study, 6 patients were excluded because they did not come to the second appointment and 4 patients were excluded because the procedure time exceeded 30 min due to root fracture during surgery. In all, 48 patients were included in the study.

**Operations**

All surgical procedures were performed by the same surgeon, with the same flap design and the same surgical technique. 2 ml of a local anesthetic solution containing 40 mg/ml articaine HCl and 0.006 mg/ml epinephrine HCl was used for *N. alveolaris inferior* and *N. buccalis* blockage. The mucoperiosteal flap was removed by making a horizontal incision starting from the retromolar region, through horizontally in the buccal, circular around the neck of the mandibular second molar, and continuing vertically at the mesial half of the mandibular second molar tooth. Alveolotomy and/or division of teeth and/or roots were performed with sterile tungsten carbide burs with an electric controlled motor rotating at 20,000 rpm under 0.9% saline irrigation during operation. Roots were removed from the alveoli with the help of a bein elevator placed on the buccal and/or mesial parts of the teeth. After tooth extraction, the bone, soft tissue residues, and debris in the area were removed, and the socket was irrigated with 0.9% saline. In the control group, primary suturing was performed after bleeding control without any application to the extraction socket, while in the PRF group, PRF was applied to the socket just before suturing (Fig 3). All patients were prescribed antibiotics (amoxicillin-clavulanic acid, 1gr, 2x1) (Augmentin-BID, GlaxoSmithKline, London, England), analgesic (Acetaminophen, 500 mg, 3x1) (Parol, Atabay, Istanbul, Turkey) and mouthwash (120-mg %0.12 chlorhexidine gluconate and 150 mg %0.15 benzydamine hydrochloride, 200 ml, 3x1) (Kloroben, Drogsan, Ankara, Turkey) after the surgical procedure.

**PRF Preparation**

Blood sampling was performed through the peripheral antecubital vein by selecting a suitable granule for the patient's vascular structure with a closed vacuum system. PRFs were prepared according to the method of Choukron *et al.* [7]. 10 ml blood samples were inserted in a centrifuge device (Intra-Lock International Inc., Boca Raton, USA), under 2700 rpm for 12 min using high speed. The platelet-rich fibrin layer remaining between the acellular plasma and red blood cells in the tube was separated with the help of scissors or a scalpel.

**Obtaining edema, pain, and serum marker data**

A visual analog scale (VAS) of 100 mm was given to the patients to determine the severity of pain on the operation day and the 2nd and 7th postoperative days, with 0 indicating no pain and 100 indicating the
worst pain they had ever experienced. In order to evaluate the severity of edema, the tragus - buccal commissure and lateral canthus - gonion distances of the patients were measured using a flexible ruler before the operation and on the 2nd and 7th days postoperatively, and the results were recorded. To evaluate the trismus level, the interincisal distance of the patients was measured with a flexible ruler before the operation and on the 2nd and 7th days postoperatively in both groups. The progression of swelling and trismus was measured in millimeters and evaluated by comparing it with the value obtained at baseline [14].

For objective data, ESR values were measured using the Vision ESR analyzer (YHLO Biotech Co., Shenzhen, China), and CRP values were measured using the BN II nephelometric analyzer (Siemens Healthcare Diagnostics, Marburg, Germany). IL-6 levels (pg/ml) were determined using the Human IL-6 Elisa Kit (Elabscience Biotechnology Co., Wuhan, China), and TNF-α levels (pg/ml) were determined using the Human TNF-α Elisa Kit (Elabscience Biotechnology Co., was measured using Wuhan, China).

**Statistical Evaluation**

Data were analyzed with the IBM SPSS® V23 (IBM Company, Chicago, IL, United States) package program. Mann–Whitney U test was used to compare non-normally distributed data according to paired groups, and an independent two-sample t-test was used to compare normally distributed data. The significance level was taken as p<0.05.

**Results**

Forty-eight patients, 31 female and 17 male, with an age range of 19 to 41 (mean age 24.5 ± 4.5 years), underwent impacted MTM tooth extraction surgery (n = 96). There was no statistically significant difference between the PRF group and control group according to the positions of the impacted teeth and operation durations (p < 0.05). VAS values in the postoperative 2nd and 7th day follow-up periods in the PRF group were significantly lower than in the control group (p < 0.001, p = 0.002, respectively) (Table 1). Edema levels were significantly lower in the PRF group in LC-G measurements in the postoperative 2nd and 7th day follow-up periods (p < 0.001, p = 0.026, respectively) (Table 2). T-AC measurements in the postoperative 2nd-day follow-up also showed significantly lower results in the PRF group (p = 0.021) but in the 7th-day follow-up the difference was not significant (p = 0.179) (Table 2). Trismus assessments showed interincisal distance was significantly higher in the PRF group in the postoperative 2nd and 7th day follow-up periods compared to the control group (p < 0.001, p < 0.001, respectively) and that PRF had a positive effect in terms of trismus (Table 3). Both the increases in serum ESR and CRP values were significantly less in the PRF group on the postoperative 2nd day (p = 0.009, p < 0.001, respectively), while the increase in the 7th-day levels was not significant in both markers (p = 0.158, p = 0.345, respectively) (Table 4). There was no statistically significant difference in IL-6 and TNF-α levels between the two groups in the 2nd and 7th-day comparisons (p = 0.419, p = 0.087, p = 0.438, p = 0.574, respectively) (Table 5).
Table 1

<table>
<thead>
<tr>
<th></th>
<th>PRF</th>
<th>Control</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PrO</td>
<td>0,0 ± 0,0</td>
<td>0,0 ± 0,0</td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>0,0 (0,0–0,0)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0,0 (0,0–0,0)&lt;sup&gt;a&lt;/sup&gt;</td>
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<tr>
<td>PO 2nd day</td>
<td>2,88 ± 0,79</td>
<td>4,83 ± 1</td>
<td>&lt; 0,001</td>
</tr>
<tr>
<td></td>
<td>3 (1–5)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5 (2–7)&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>PO 7th day</td>
<td>0,31 ± 0,59</td>
<td>0,71 ± 0,71</td>
<td>0,002</td>
</tr>
<tr>
<td></td>
<td>0 (0–2)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1 (0–2)&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

PrO: Preoperative, PO: Postoperative, PRF: platelet-rich fibrin, mean ± s. deviation, median, range, different letters in a row indicates significance p < 0.05

Table 2

<table>
<thead>
<tr>
<th></th>
<th>LC-G</th>
<th>T-MC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRF</td>
<td>Control</td>
</tr>
<tr>
<td>PrO</td>
<td>11,05 ± 1,01</td>
<td>11 ± 0,98</td>
</tr>
<tr>
<td></td>
<td>11 (8,8–13,2)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>11 (8,8–13)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>PO 2nd day</td>
<td>11,34 ± 1,04</td>
<td>12,19 ± 1,03</td>
</tr>
<tr>
<td></td>
<td>11,4 (9–13,6)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>12 (10–14,8)&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>PO 7th day</td>
<td>11,12 ± 1,03</td>
<td>11,52 ± 0,96</td>
</tr>
<tr>
<td></td>
<td>11 (9–13,4)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>11,4 (9–13,8)&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

PrO: Preoperative, PO: Postoperative, mean ± s. deviation, median, range, different letters in a row indicates significance p < 0.05 for each variable.

LC-G: Lateral Cantus-Gonion
T-BC: Tragus-Buccal Comissura
Table 3
Distribution of trismus levels of the groups according to the follow-up periods (in millimeters)

<table>
<thead>
<tr>
<th></th>
<th>PRF</th>
<th>Control</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PrO</td>
<td>4,73 ± 0,62</td>
<td>4,76 ± 0,63</td>
<td>0,777</td>
</tr>
<tr>
<td></td>
<td>4,65 (3,8 – 6,2)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4,8 (3,8 – 6,3)&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>PO 2nd day</td>
<td>4,09 ± 0,64</td>
<td>3,61 ± 0,69</td>
<td>&lt;0,001</td>
</tr>
<tr>
<td></td>
<td>4,2 (2,2–5,8)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3,6 (1,8 – 5)&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>PO 7th day</td>
<td>4,4 ± 0,58</td>
<td>3,86 ± 0,62</td>
<td>&lt;0,001</td>
</tr>
<tr>
<td></td>
<td>4,4 (3,6 – 5,8)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>3,8 (2,2–5)&lt;sup&gt;e&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

PrO: Preoperative, PO: Postoperative, different letters in a row indicates significance p < 0.05, mean ± s. deviation, median, range

Table 4
Distribution of ESR and CRP values of the groups according to the follow-up periods

<table>
<thead>
<tr>
<th></th>
<th>ESR</th>
<th>CRP</th>
<th>p</th>
<th></th>
<th>ESR</th>
<th>CRP</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRF</td>
<td>Control</td>
<td></td>
<td>PRF</td>
<td>Control</td>
<td>p</td>
<td></td>
</tr>
<tr>
<td>PrO</td>
<td>6,31 ± 5,87</td>
<td>6,63 ± 6,1</td>
<td>0,652</td>
<td>0,35 ± 0,25</td>
<td>0,39 ± 0,21</td>
<td>0,301</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 (2–27)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4,5 (2–35)&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>0,31 (0,31 – 2)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0,31 (0,31 – 1,29)&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO 2nd day</td>
<td>8,71 ± 6,54</td>
<td>12,02 ± 7,36</td>
<td>0,009</td>
<td>0,53 ± 0,45</td>
<td>1,52 ± 1,76</td>
<td>&lt;0,001</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 (2–28)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>11 (2–34)&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td>0,31 (0,31 – 2,34)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1,02 (0,31 – 9,44)&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO 7th day</td>
<td>7,96 ± 7,09</td>
<td>9,4 ± 6,29</td>
<td>0,158</td>
<td>0,35 ± 0,13</td>
<td>0,41 ± 0,31</td>
<td>0,345</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 (2–33)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>9,5 (2–24)&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td>0,31 (0,31 – 1,11)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0,31 (0,31 – 2,29)&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PrO: Preoperative, PO: Postoperative, mean ± s. deviation, median, different letters in a row indicates significance p < 0.05 for each variable. ESR: mm/h, CRP: mg/l
Table 5
Distribution of IL-6 and TNF-α values of the groups according to the follow-up periods

<table>
<thead>
<tr>
<th></th>
<th>PRF</th>
<th>Control</th>
<th>p</th>
<th>PRF</th>
<th>Control</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PrO</td>
<td>10.04 ± 20.09</td>
<td>9.67 ± 19.28</td>
<td>0.702</td>
<td>9.78 ± 6.34</td>
<td>6.57 ± 3.37</td>
<td>0.094</td>
</tr>
<tr>
<td></td>
<td>6.71 (0.95–131.08)</td>
<td>6.47 (0.17–123.81)</td>
<td></td>
<td>8.9 (3.01–30.23)</td>
<td>5.46 (3.01–13.31)</td>
<td></td>
</tr>
<tr>
<td>PO</td>
<td>12.23 ± 28.37</td>
<td>12.27 ± 20.55</td>
<td>0.419</td>
<td>6.13 ± 3.09</td>
<td>7.73 ± 6.65</td>
<td>0.438</td>
</tr>
<tr>
<td>2nd day</td>
<td>7.11 (0.95–187.7)</td>
<td>7.43 (1.26–135.97)</td>
<td></td>
<td>5.22 (3.01–12.33)</td>
<td>5.71 (3.25–32.19)</td>
<td></td>
</tr>
<tr>
<td>PO</td>
<td>10.99 ± 25.45</td>
<td>5.52 ± 3.6</td>
<td>0.087</td>
<td>6.81 ± 2.35</td>
<td>8.42 ± 5.1</td>
<td>0.574</td>
</tr>
<tr>
<td>7th day</td>
<td>6.15 (1.57–163.58)</td>
<td>4.25 (1.26–15.73)</td>
<td></td>
<td>6.81 (3.25–10.86)</td>
<td>7.18 (3.01–23.86)</td>
<td></td>
</tr>
</tbody>
</table>

PrO: Preoperative, PO: Postoperative, mean ± s. deviation, median, range, IL-6: pg/ml, TNF-α: pg/ml

Discussion

PRF was first described by Choukroun et al. [7] as an agent that increases wound healing and tissue regeneration. Platelets, growth factors, leukocytes, stem cells, and cytokines in their content support wound healing, angiogenesis, tissue remodeling, bone formation, host defense, and reepithelialization [15–17]. Additionally, PRF has several uses in oral and maxillofacial surgery, as it is used in many branches of medicine and dentistry since it is obtained from the patient's blood sample, does not show an allergic or immune response, does not cause cross-reactions, is low in cost and has a short preparation time [18].

The effects of PRF to accelerate wound healing in the area of tissue damage have also popularized clinical studies on impacted tooth extraction. Kim et al. [19] reported that there was no significant difference in reducing the severity of edema and pain when they compared treatment methods with and without PRF application after the bilateral impacted MTM tooth extraction surgery in the same session. In a similar study, Ozgul et al. [20] evaluated the effectiveness of PRF application on the severity of pain and edema after the bilateral MTM extraction and reported that edema in the area where PRF was not applied was higher on the postoperative third day. Jeyaraj et al. [21] also reported that the severity of pain and trismus, as well as edema, were significantly lower in the group that underwent PRF in the postoperative 3rd day follow-up period after the bilateral impacted MTM surgery. Kumar et al. [22] stated that the edema and pain levels were significantly lower on the PRF applied side after the impacted MTM surgery and PRF increases postoperative comfort. In the current systematic review studies, although there is a general acceptance of the severity of pain and edema was low in the PRF group, the severity of trismus is controversial [23–24]. In our study, the results of VAS and edema measurement results were significantly
lower in the postoperative 2nd and 7th day follow-up periods on the PRF applied side. The high level of pain in the early postoperative period, especially on the 2nd-day follow-up, is consistent with previous studies [20–22]. The results of our study on trismus, which gave conflicting results in the literature, again yielded results in favor of the PRF group, and the interincisal distance measurements were significantly higher than those in the control group in the postoperative 2nd and 7th day follow-up periods.

The clinical evaluation of inflammatory responses to pain, edema, and trismus assessment after the impacted MTM surgery is valuable but subjective. Making these measurements depends on many factors, including the patient's cooperation, the investigator's measurement method, and the appliances required for the measurement, and these factors may affect the results obtained. Therefore, this study aimed to determine the acute phase response of inflammation by obtaining objective results based on numerical data, besides clinical edema measurements. For this purpose, initially, serum CRP and ESR, which are the most frequently used parameters in determining the acute phase response [25], were measured. In practice, CRP level varies according to the amount and severity of tissue damage, the type of inflammatory stimulus, and the prognosis of the disease. In healthy individuals, its plasma level is low and rises rapidly on the 2nd day with an acute inflammatory response [26–27]. Alternatively, the ESR value is a nonspecific laboratory test that helps to show the presence of infection and inflammation. Although the increase in the CRP level is faster than the ESR level, the serum levels of both reach their peak on the first or second day [28].

In a study evaluating the serum markers and the level of inflammation after surgeries involving osteotomy in the oral cavity, Freitas et al. [29] reported that there was no significant difference in CRP levels at the 48th and 72nd hours after the impacted tooth extraction with and without the application of 830 nm diode laser. Kiran and Rajendra [30] reported that CRP levels in jaw fractures treated with rigid fixation increased immediately after the operation and on the 1st postoperative day, but decreased to the normal level on the 7th postoperative day. Bridgen et al. [31] reported that measuring serum CRP and ESR levels is the most effective method for evaluating inflammation after tissue trauma. ESR and CRP data obtained as a result of our study are compatible with the results of Kiran and Rajendra [30]. The low ESR and CRP values in the PRF group during the 2nd day follow-up period, when the edema level is highest, may be explained by the high anti-inflammatory activity of locally applied PRF. The fact that these values were observed at the highest level on the 2nd postoperative day in both groups is consistent with the described highest level of edema time observed after the impacted MTM surgery in the literature. Additionally, the absence of a significant difference in these markers on the 7th day supports the idea that they are important parameters only in the early period of inflammatory response.

IL-6 and TNF-α are the main cytokines responsible for the production of acute-phase proteins that are commonly expressed following tissue injury in the inflammatory process [32–33]. For this reason, although it is widely known and evaluated in the studies of inflammation research in the medical branch, the number of studies concerning oral surgery is relatively low, and the current information is mostly on oral cancers and tumor development [34]. In one of the few studies on tissue healing, Mozzati et al. [35] formed two groups with and without the application of growth factor-rich plasma (PRGF) to the
extraction socket after bilateral impacted MTM surgery and evaluated the cytokine levels during the healing process. According to their results, the IL-6 level was found to be higher in the PRGF group than in the control group, and they explained this with its wound healing accelerating effects. Chae et al. [36] reported that mechanical compression and hypoxia caused by orthodontic force in the periodontal ligament affect proinflammatory cytokines, and IL-6 and TNF-α levels in this region increase significantly. In a serum marker evaluation study following bone tissue injuries, Karakaya et al. [37] reported that serum CRP and IL-6 levels increased significantly after the first 24 h following lower extremity fractures, the CRP level reached its highest level at the 48th hour, and the IL-6 level returned to normal within 48 h. Dağlı et al. [38] reported that in patients with multiple head trauma, the IL-6 level was highest on the first day, reached the lowest level on the 3rd day and returned to normal level on the 7th day, while there was no significant change in TNF-α level. Considering this information, the absence of a significant difference in IL-6 levels between the two groups in all follow-up periods in our study can be explained by the fact that IL-6 levels peaked in the first 24 h, and returned to normal values after 48 h. The result that the IL-6 level was high on the 2nd day follow-up period, especially in the control group, supports the view that the IL-6 value can be used to control in the response to tissue trauma after the impacted MTM surgery. TNF-α levels, on the other hand, did not show a significant difference in postoperative 2nd and 7th-day follow-ups, similar to previous local tissue trauma results.

Limitations

The limitations of the study are the lack of simultaneous surgery and evaluation, which is more suitable for split-mouth studies, and the inability to evaluate the variations that may change in the patient’s systemic parameters within 3 weeks, but simultaneous surgery is not possible for such serum marker evaluation. Considering this situation, the number of patients was kept high.

Conclusion

As a result, local application of PRF after the impacted lower third molar tooth extraction surgery has a significant positive effect in controlling clinical complications and these results were objectively supported by the measurement of serum ESR, CRP, and IL-6 values in our study. TNF-α levels, on the other hand, did not give a statistically significant difference in terms of the evaluation of clinical parameters.

Declarations

Ethics approval and consent to participate

This study was approved by Trakya University Clinical Research Ethics Committee with the number 06/09 and an informed consent was obtained from all individual participants included in the study.

Consent for publication

All authors in the study consent to the publication.
Availability of data and materials

The data of the study is available and can be present upon request.

Competing interest

The authors declare that they have no competing interests.

Funding

This study was funded by the Trakya University Scientific Research Projects Department by the number 2019/235.

Authors' contributions

Conception and design of study: Gonca Duygu, Nilay Er

Acquisition of data: Gamze Tanan Karaca, Eray Özgün

Analysis of data: Eray Özgün, Gonca Duygu

Drafting of article and/or critical revision: Nilay Er, Gamze Tanan Karaca

Final approval of manuscript: Nilay Er, Gonca Duygu, Gamze Tanan Karaca, Eray Özgün

Acknowledgements

None

References


Figures
Figure 1

Flow diagram of the study protocol
Figure 2

Panoramic radiograph of a patient with a similarly positioned, symmetrical, and bilaterally impacted lower third molar tooth
Figure 3

Placement of PRF into the third molar extraction cavity