

ORIGINAL ARTICLE

Evaluation of leukocyte-platelet rich fibrin (L-PRF) on postoperative complications following mandibular impacted third molar surgery

Alt gömülü yirmi yaş dişi cerrahisi sonrası lökosit ve trombositten zengin fibrinin (L-PRF) postoperatif komplikasyonlar üzerine etkisinin araştırılması

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SUMMARY

Aim: The aim of this study is to evaluate the outcomes of leukocyte-platelet rich fibrin (L-PRF) inserted in the extraction sockets following mandibular impacted third molar surgery.

Materials and Methods: Forty patients who required at least one surgical removal of impacted mandibular third molar were evaluated. In Group I (n=20); L-PRF obtained from withdrawing blood from the patients was inserted in the extraction sockets whereas in Group II (n=20), extraction socket was left empty. Surgical wound was primarily closed in both groups. All the patients were assessed regarding postoperative pain, edema, maximum mouth opening (trismus), alveolar osteitis, sleeping, daily activities, speaking, eating and loss of work.

Results: There was not a significant difference considering pain between the groups postoperatively ($p>0.05$). Similarly, there was not a significant difference considering facial edema ($p>0.05$) and trismus ($p>0.05$) postoperatively between the groups as well. None of the patients developed alveolar osteitis in either group. Comparison of daily activities including eating, speaking, sleeping, missed work and daily routine did not yield any significant difference ($p>0.05$).

Conclusion: Application of L-PRF in the extraction sockets of impacted mandibular third molars did not influence the early postoperative complications and daily activities after tooth removal.

Key Words: L-PRF, third molar surgery, complications.

ÖZET

Amaç: Bu çalışmanın amacı, alt gömülü yirmi yaş cerrahisi sonrası çekim soketlerine yerleştirilen lökosit ve trombositten zengin fibrinin (L-PRF) etkilerinin araştırılmasıdır.

Gereç ve Yöntem: En az bir adet alt gömülü yirmi yaş dişi çekiyecek olan kırk hasta çalışmaya dahil edildi. Grup 1'de (n=20) cerrahi çekim soketine hastadan alınan kanla elde edilen L-PRF yerleştirilirken, Grup 2'de (n=20) çekim soketi boş bırakıldı. Her iki grupta cerrahi bölge primer olarak kapatıldı. Bütün hastalar postoperatif ağrı, şişlik, maksimum ağız açıklığı, alveolit, uyku düzeni, günlük yaşam, konuşma, yemek yeme ve iş gücü kaybı açısından değerlendirildi.

Bulgular: Her iki grup arasında postoperatif ağrı açısından bir fark bulunmadı ($p>0.05$). Benzer şekilde, gruplar arası postoperatif ödem ($p>0.05$) ve trismus ($p>0.05$) açısından da bir fark tespit edilmedi. Hiçbir hastada alveolit gelişmedi. Hastanın günlük aktivitelerini içeren yemek yeme, konuşma, uyku düzeni, iş gücü kaybı ve genel günlük yaşam değerlendirildiğinde, iki grup arasında anlamlı bir fark görülmedi ($p>0.05$).

Sonuç: Alt gömülü yirmi yaş dişlerinin çekim soketine L-PRF yerleştirilmesinin erken postoperatif komplikasyonlara ve hastanın günlük aktiviteleri üzerine etkili olmadığı görüldü.

Anahtar Kelimeler: L-PRF, yirmi yaş dişi cerrahisi, komplikasyonlar.

INTRODUCTION

Platelet concentrates have been used in oral and maxillofacial practice since the beginning of 1990s. Autologous Platelet Rich Plasma (PRP), Platelet Rich Fibrin (PRF) and Platelet Concentrate (PC) have been used as a sole biological material alone or in combination with other grafting material (1-3).

Platelet Rich Fibrin (PRF) is a second platelet generation platelet concentrate which was developed and introduced by Choukron et al. (2-6). Fibrin nature of PRF provides proper structure for migration of endothelial cells and fibroblasts. Also PRF acts as a scaffold for osteoblasts and other cells during bone healing (6, 7). PRF slowly releases high concentrations of cytokines and growth factors (GFs) such as; Platelet Derived Growth Factor (PDGF), Insulin-like Growth Factor (IGF), Transforming Growth Factor (TGF). This release mostly occurs in the first post-operative 7 days and gradually decreases following 28 days (1, 4, 5, 7).

PRF contains high amounts of leukocytes. It behaves as an immune node and has ability to stimulate defense mechanisms. Although this mechanism is unclear, it is believed that platelets have functional effects in antimicrobial host defense (1, 4, 8).

Extraction of impacted mandibular third molar is a routine procedure in oral and maxillofacial surgery practice. The most common complications after third molar surgery are edema, pain, trismus and dry socket (9-12). Postoperative management of impacted mandibular third molar is still an issue. To limit postoperative complications and improve patient's comfort, surgeons try several attempts to improve wound healing with biological agents.

The purpose of this study was to investigate the effects of L-PRF on postoperative complications such as edema, trismus, dry socket as well as postoperative self-assessed parameters of pain, sleeping, eating, speaking, and activities of daily living and missed work days.

MATERIALS AND METHODS

The study was conducted at Istanbul Medipol University School of Dentistry, Department of Oral and Maxillofacial Surgery and approved by the University Ethical Board. The patients were informed regarding the study protocol and written consent was obtained. Inclusion criteria of the study were; presence of at least one impacted mandibular third molar to be extracted, lack of any systemic disease, no presence of pericoronitis or pathology associated with impacted tooth, smoking less than 10 cigarettes per day and no use of any antibiotics or anti-inflammatory drugs for at least 30 days prior to surgery. If the patient had bilateral impacted tooth, only one side was included in this study.

Patients with impacted lower third molar, which are in similar positions i.e. Class II and position B (Pell and Gregory classification) (13). Forty patients, between 18-45 years of age were randomly assigned to one of two groups: Group I and Group II. Each patient was examined using panoramic radiography to determine the position of the impacted tooth preoperatively.

In group I (n=20) 20 cc (two tubes of each 10 cc) of blood was obtained from the cephalic or basilica vein with a 19-gauge needle just before the surgery and was immediately centrifuged at 3.000 rpm for 12 minutes. L-PRF gels obtained from two tubes were compressed and then inserted into the extraction sockets in Group I and the wound was closed primarily with 4/0 silk suture. In Group II extraction socket was left empty and primarily closed similar to Group I. In the postoperative period, antibiotic (oral amoxicillin 1g, two times daily for five days) and pain killer (500 mg of acetaminophen two times daily for five days) were prescribed.

Pain was evaluated in the post-operative period using a visual analog scale (VAS) on a 10 point scale at 8 hours, 1st day, 2nd day, 3rd day, and 7th day postoperatively. Mouth opening was measured with a ruler before the surgical procedure and at 3rd and 7th days postoperatively.

The evaluation of the facial edema was performed using a horizontal and vertical guide with a flexible ruler. The facial reference points were the distances from; lateral canthus-mandibular angle, tragus-corner of mouth, tragus- soft tissue pogonion. Facial edema was determined comparing the measurements preoperatively and at 3rd and 7th days postoperatively.

Alveolar osteitis was diagnosed in the presence of unrelied pain by analgesics, denuded socket or necrotic clot remnants. Evaluation of alveolar osteitis was carried out at 3rd and 7th days postoperatively.

All the patients were given a questionnaire to assess their life activities including eating, speaking, sleeping, missed work and daily routine. Patients were asked to score these parameters on a 4-point scale (0: no change, 1: little change negatively, 2: medium change negatively, 4: gross change negatively) on the day of surgery and on 1st day, 2nd day, 3rd day and 7th day postoperatively.

For the statistical analysis, IBM SPSS Statistics 22 program (IBM SPSS, Türkiye) was used. Shapiro Wilks test was used to evaluate the normal distribution of the parameters. For the comparison of normal distributed parameters between the groups, Student-t test was used whereas, those did not show normal distribution was evaluated by Mann Whitney U test. $P \leq 0.05$ was considered significant.

RESULTS

There was not a significant difference considering pain between the groups postoperatively ($p > 0.05$). Similarly, there was not a significant difference considering facial edema ($p > 0.05$) and mouth opening ($p > 0.05$) postoperatively between the groups as well. None of the patients developed alveolar osteitis in either group. Comparison of daily activi-

ties including eating, speaking, sleeping, missed work and daily routine did not yield any significant difference ($p > 0.05$).

The results were interpreted in Table 1 and Table 2.

	Group I Mean±Sd	Group II Mean±Sd	P	
Tragus-mandibular angle	Preoperative	101.19±6.33	104.47±7.48	0.175
	3rd day	105.56±6.22	111.11±9.81	0.060
	7th day	102.81±6.31	106.16±5.93	0.116
Tragus - mouth corner	Preoperative	109.31±6.59	112.05±5.54	0.190
	3rd day	114.44±6.24	114.68±3.86	0.887
	7th day	110.56±7.04	112.0±5.21	0.505
Tragus-pogonion	Preoperative	144.56±7.46	146.74±8.77	0.440
	3rd day	148.94±7.91	150.58±8.42	0.559
	7th day	145.75±7.31	147.16±7.6	0.582
Mouth Opening (Trismus)	Preoperative	45.69±7.06	43.89±4.53	0.370
	3rd day	30.81±8.96	29.63±7.8	0.680
	7th day	39.25±9.07	38.53±7.5	0.798

Table 1: Comparison of preoperative and postoperative edema and trismus.

		Group I Mean±Sd	Group II Mean±Sd	P
Pain	8 th hours	2.25±0.86	2.16±1.12	0.900
	1 st day	1.81±0.98	1.58±1.02	0.523
	2 nd day	1.31±0.95	0.95±0.71	0.261
	3 rd day	0.81±0.83	0.89±0.74	0.710
	7 th day	0.31±0.6	0.26±0.56	0.786
Sleeping	Operation Day	1.63±1.02	1.16±1.07	0.175
	1 st day	1.31±0.95	1±1.05	0.307
	2 nd day	0.81±0.75	0.63±0.83	0.408
	3 rd day	0.38±0.72	0.21±0.42	0.651
	7 th day	0.13±0.5	0.11±0.32	0.708
Eating	Operation Day	1.63±1.02	2.53±0.61	0.684
	1 st day	1.31±0.95	2.11±0.99	0.832
	2 nd day	0.81±0.75	1.63±1.07	0.876
	3 rd day	0.38±0.72	1.16±0.83	0.847
	7 th day	0.13±0.5	0.42±0.61	0.937
Speaking	Operation Day	1.88±0.89	1.84±1.01	0.972
	1 st day	1.31±1.01	1.42±1.12	0.769
	2 nd day	0.75±0.68	0.95±1.08	0.804
	3 rd day	0.38±0.62	0.53±0.7	0.497
	7 th day	0.06±0.25	0±0	0.276
Daily routine	Operation Day	2±0.97	1.84±0.96	0.626
	1 st day	1.69±0.95	1.74±0.93	0.794
	2 nd day	0.88±0.96	0.95±0.97	0.819
	3 rd day	0.63±0.96	0.58±0.77	0.925
	7 th day	0.19±0.75	0.05±0.23	0.869
Missed work	Operation Day	1.88±1.09	1.84±1.01	0.890
	1 st day	1.31±1.14	1.63±1.07	0.392
	2 nd day	0.75±0.77	1.21±1.18	0.295
	3 rd day	0.44±0.63	0.63±0.96	0.758
	7 th day	0±0	0.11±0.46	0.359

Table 2: Comparison of self-assessed pain and daily activities postoperatively.

DISCUSSION

Healing process after surgical extractions, especially in the mandible, is a complex sequence that consists of some physiological episodes (10). Pain, edema, trismus and alveolar osteitis are the most seen complications after removal of impacted teeth (10-12).

PRF is defined as a second-generation platelet concentrate, which contains high amounts of platelets, leukocytes, cytokines and circulating stem cells. The fibrin structure and

presence of leukocytes, growth factors and cytokines permits enhanced wound healing (1-6). In our study we aimed to evaluate the effects of L-PRF application on inflammatory complications such as trismus, pain, edema besides postoperative patient comfort.

Dohan et al. (4) emphasized that inflammatory reactions are suppressed by PRF application by the behavior of PRF as an immune regulation node and by the release of anti-inflammatory cytokines. Simonpieri et al. (14) also reported that PRF reduces pain and edema in oral surgical procedures and limits minor infectious phenomena. These authors also suggested that the leukocytes and cytokines in the structure of PRF play important role in preventing infection and inflammation.

Our study was conducted on the extraction of impacted teeth having similar surgical difficulty. Our hypothesis was that application of PRF into third molar extraction sockets would reduce complications such as pain, edema and trismus thus improve postoperative patient comfort. In the literature the clinical effects of PRF on tooth extraction healing is challenging. Eshghpour et al. (15) reported that PRF application in mandibular third molar surgery might decrease alveolar osteitis incidence. They suggested the lower incidence of alveolar osteitis might be related to its hemostasis effect, sealing ability and healing properties of PRF. Hoaglin and Lines (16), in a study investigating the alveolar ostitis formation after fully erupted third molar concluded that PRF significantly influenced non-infectious healing.

Uyanik et al. (17) investigated the effects of PRF in third molar surgery, where it was used in combination with either piezosurgery or conventional rotatory osteotomy. The results showed the use of PRF with traditional surgery and piezosurgery significantly reduced pain during the postoperative period and also PRF in combination with piezosurgery significantly decreased the number of analgesics taken.

Marenzi et al. (18) investigated the effects of L-PRF on healing of simple extraction sockets. They reported that the use of PRF was useful in order to manage the postoperative pain and to promote the soft tissue healing process, reducing the early adverse effects of the inflammation.

Kumar et al. (19) also reported significantly less pain, swelling and trismus with PRF after mandibular third molar surgery in a randomized controlled study. Ozgul et al. (20) applied PRF to impacted third molar extraction sockets and reported that application of PRF did not affect postoperative pain. However, they found that edema was significantly lower in the PRF group.

The results of our study revealed no significant changes between the groups in pain, edema and mouth opening. In contrast to the literature supporting the positive effects of PRF use in the postoperative period, our study brings questionable results. Additionally, our clinical experiences in which we evaluated the effects of PRF in reducing postoperative complications following direct sinus lift operations showed similar results with this study (1). In order to use PRF routinely in oral and maxillofacial surgery procedures detailed studies on action mechanism of PRF is advisable.

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