



EFFECT OF PLATELET-RICH FIBRIN AND PIEZO SURGERY ON IMPACTED MANDIBULAR THIRD MOLAR SURGERY OUTCOMES

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ABSTRACT

Background: The aim of the study was to evaluate the effect of platelet-rich fibrin and piezo surgery on impacted mandibular third molar surgery outcomes. **Methods:** This study was performed over total sample of 20 lower 3rd molar teeth of 10 patients using split mouth technique. This study compared the surgical outcomes (pain, number of analgesics taken, swelling, trismus) after extraction of mandibular third molars using PRF and piezosurgery combined with PRF compared to standard rotating handpiece. **Results:** The use of PRF combined with piezo surgery, significantly reduced pain and number of analgesics taken. Both operations also significantly decreased trismus 24 h after the surgery. **Conclusion:** The use of PRF, and PRF combined with piezo surgery, significantly reduced pain, decreased the number of analgesics taken, and decreased trismus 24 h after the surgery. The results of this study clearly indicate that PRF is significantly better in healing dental sockets and decrease bone reduction of the socket after third molar surgical extraction in comparison to that without PRF.

INTRODUCTION

In oral surgery, impacted third molar surgery is one of the most common operations performed by oral and maxillofacial surgeons. ⁽¹⁾ Many attempts have been made to reduce postoperative outcomes following third molar surgery, including platelet-rich plasma administration ⁽²⁾, cryotherapy, preoperative and postoperative antibiotics, osteotomy using high or low speed rotary instruments, wound draining, the use of different kinds of flaps, postoperative ice packs, corticosteroids, analgesics and laser ⁽³⁾.

Piezoelectric surgery has been proposed as an alternative to rotatory drilling instruments in oral surgery involving osteotomies. Piezoelectric ultrasound osteotomy devices are very efficient when used at complex surgical sites, including soft tissues, nerves, and blood vessels due to their ability to selectively cut, which is effective on mineralized structures ⁽⁴⁾. The advantage of ultrasonic instruments is that they reduce trauma to hard tissues thanks to their highly accurate and

conservative cutting action, which means that the procedure improves healing process ⁽⁵⁾.

Platelet-rich fibrin (PRF) is a second-generation immune and platelet concentrate. PRF accrues all blood sample components supporting healing and immunity on just one fibrin membrane ⁽⁶⁾. Dr. Joseph Choukroun was the first to address the application of platelet rich fibrin in oral and maxillofacial surgery. He used autogenous whole blood to create a PRF clot with the help of a centrifuge ⁽⁷⁾. PRF has been used in bone augmentation, angiogenesis, wound healing, and periodontal healing with promising results ⁽⁸⁾. PRF concentrates and membranes used as filling material during a lateral sinus lift with immediate implantation. From a radiologic and histologic point of view at 6 months after surgery, the use of PRF as the sole filling material stabilized a high volume of natural regenerated bone in the sub-sinus cavity up to the tip of the implant ⁽⁹⁾. PRF can be used as advocated membrane insurance by possibly sealing an undetected perforation during the lateral window osteotomy procedure. ⁽¹⁰⁾ PRF is used as the sole

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grafting material, and found it to be an effective modality of regenerative treatment for periodontal intra bony defect, PRF sites exhibited a pocket reduction, and gain in clinical attachment after 3 months and 6 months with regard to clinical and radiographic parameters⁽¹¹⁾.

Lee et al. evaluated the application of PRF into a peri-implant defect in vivo. PRF was applied into the bony defect and in the control group; the peri-implant defect was left unfilled. The animals were sacrificed 8 weeks after implantation and histomorphometric analysis was done. In the animal model, peri-implant defect was successfully repaired by the application of PRF alone⁽¹²⁾. The use of autologous PRF matrix in the extracted socket has a benefit for organizing the formative cells (especially osteoblasts), formation of neovascularization and more rapid and faster apposition of bone matrix with its mineralization process⁽¹³⁾. The present study evaluated and compared the effects of PRF, PRF combined with piezoelectric surgery, and rotatory instruments on the postoperative period after surgical mandibular third molar extractions.

SUBJECTS AND METHODS

This study was Randomized split mouth clinical study, performed over total sample of 20 lower 3rd molar teeth of 10 patients using split mouth technique. This study was performed at clinics outpatient of Faculty of Dental Medicine, Boys, Cairo Al Azhar University, and Sayed Jalal University hospital. Only patients with bilaterally and vertically impacted lower third molars were included. Inclusion criteria for patient selection: The selection criteria were as the follow; Bilateral symmetrical vertically impacted 3rd molars of moderate difficulty, classified of class I, level C according to classification system of Pell and Gregory⁽¹⁴⁾.

Grouping and random allocation: Grouping and sub grouping was randomly allocated of the following: Group A: Was divided into 2 subgroups: Subgroup A1: One side was treated by traditional

surgery (surgical bur alone). Subgroup A2: The other side of same patient was treated by traditional surgery + PRF. Group B; Was divided into 2 subgroups: Subgroup B1: One side was treated by traditional surgery (surgical bur alone). Subgroup B2: The other side of same patient was treated by piezo surgery +PRF. A minimum of 21 days separates the two operations in each patient for the return of the patient to preoperative-baseline prior to commencing second operation. The selection of which technique performed first and the side of operation was done randomly. Parameters to be examined in each patient, was include pain, number of analgesics taken, trismus, and cheek swelling, these parameters was evaluated at baseline (prior to surgery) and on postoperative days 1, 2, 3, and 7. All of the examinations was undertaken at approximately the same time of day and by the same surgeon.

Preparation of PRF gel

PRF was prepared according to the technique described by Choukroun et al.⁽¹⁵⁾. Approximately 15min before surgery, a blood sample was taken without anticoagulant in 10 mL glass-coated plastic tubes that was immediately centrifuged at 3,000 rpm for 10 min (approximately 400 g).⁽¹⁶⁾.

Evaluation procedures:

- To asses pain by visual analogue scale
- To evaluate trismus post-operative
- To calculate analgesic tablets consumption.

Measurements were obtained on postoperative days 1, 2, 3, and 7. The preoperative sum of the three measurements was considered the baseline for that side. All patients were seen on each of the four postoperative days and measurements was obtained by the same individual, both preoperatively and postoperatively, on days 1, 2, 3, and 7 at approximately the same time of day (these measurements were done for each operation. Measurements: In the present study we use the following measurements: Inter-incisal distance was measured in each patient by digital caliper which has two arms, one of them touch the mesio-incisal angle of upper central

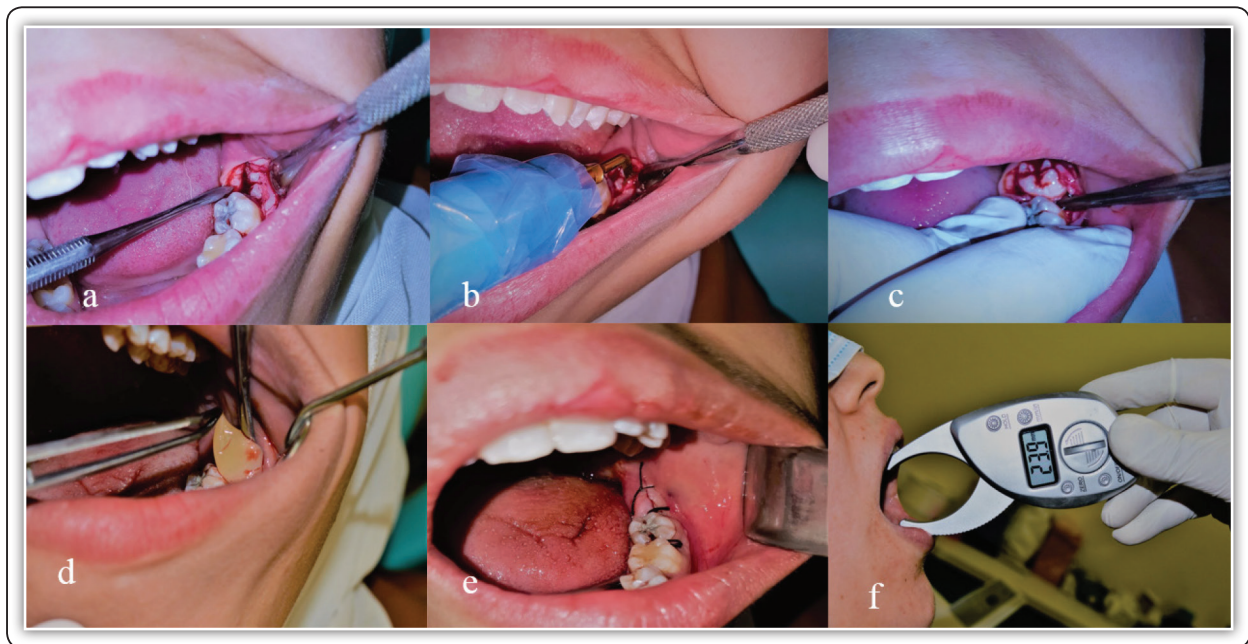


FIG (1) a: Mucoperiosteal elevation of the flap, b: Using piezo device for bone guttering, c: elevation of the impacted third molar tooth with elevator, d: PRF placement in the socket, e: Suturing of the flap after placement the PRF, and f: Mouth opening at 7th day post-operative by traditional method.

incisor and the other touch the mesio-incisal angle of lower central incisor. The line between the tragus to the corner of the mouth by tab. The line between the tragus to the pogonion was measured in each patient by tab.

RESULTS

All of the patients tolerated the medication well, with no serious complications or side effects. Wound healing was uneventful in all patients. This study compared the surgical outcomes

(pain, number of analgesics taken, swelling, trismus) after extraction of mandibular third molars using PRF and piezosurgery combined with PRF compared to standard rotating handpiece. The use of PRF, and PRF combined with piezo surgery, significantly reduced pain, in addition number of analgesics taken. Both operations also significantly decreased trismus 24 h after the surgery. As a result of this study, PRF and combination use of PRF and piezo- surgery have positive effects in reducing postoperative outcomes after impacted third molar surgery.

TABLE (1) Comparison between the different studied groups

	Traditional (GAI)	Traditional+PRF (GAI1)	Traditional (GBI)	Piezo+PRF(GBI1)	Test of sig.	p
VAS at 7 th day	74.6 ^{ac} ±35.2	25.0 ^b ±19.0	48.5 ^b ±44.2	24.5 ^c ±15.0	H=18.56*	0.001*
Anal at 7 th day	9.4 ^a ±4.8	5.6 ^{ab} ±3.0	9.5 ^a ±6.1	4.3 ^b ±2.9	H=8.436*	0.038*
Trismus						
After 1 day	25.6 ^a ±16.7	9.0 ^b ±12.5	26.2 ^a ±19.5	9.3 ^b ±11.5	H=10.88*	0.012*
2 nd postoperative day	20.9±17.8	8.7±10.5	19.1±19.5	7.6±6.9	H=5.355	0.148
3 rd postoperative day	16.2±16.3	7.0±9.4	15.6±15.5	5.3±7.6	F=1.985	0.134
7 th postoperative day	6.8±11.8	2.0±3.5	8.7±13.2	0.8±1.6	H=2.411	0.492

	Traditional (GAI)	Traditional+PRF (GAIL)	Traditional (GBI)	Piezo+PRF(GBII)	Test of sig.	p
Swelling						
1 st postoperative day	2.2±1.8	2.1±1.4	3.7±1.6	3.0±1.2	F=2.397	0.084
2 nd postoperative day	1.7 ^b ±1.7	1.4 ^b ±1.0	3.0 ^{ab} ±0.8	2.3 ^a ±1.2	F=3.478*	0.026*
3 rd postoperative day	1.2±1.3	0.8±0.6	2.0±0.9	1.4±1.0	F=2.421	0.082
7 th postoperative day	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0	F=2.421	0.082

F: F for ANOVA test, pairwise comparison bet. each 2 groups were done using Post Hoc Test

H: H for Kruskal Wallis test, pairwise comparison bet. each 2 groups were done using Post Hoc Test

Means with Common letters are not significant (i.e. Means with Different letters are significant)

*: Statistically significant at $p \leq 0.05$

TABLE (2) Mean and Standard deviation of alveolar bone reduction at two months postoperative in millimeter

	With PRF	Without PRF	t-test	p
Horizontal level reduction	2.0±0.7	3.2±0.9	3.441*	0.003*
Vertical level reduction	1.3±0.4	2.1±0.6	3.924*	0.011*
Buccal side reduction	1.3±0.3	2.5±0.5	6.322*	<0.001*
Lingual side reduction	1.5±0.8	2.0±0.4	2.384*	0.024*

*: Statistically significant at $p \leq 0.05$

DISCUSSION

This study compared the surgical outcomes (pain, number of analgesics taken, swelling, trismus) after extraction of mandibular third molars using PRF and piezosurgery combined with PRF compared to standard rotating handpiece. In the present study, the combined use of piezosurgery and PRF significantly decreased the number of analgesics taken. However, when PRF was not combined with piezosurgery, there were no statistically differences in the number of analgesics taken compared to groups that used traditional handpieces (the mean values: 9.4, 5.6, 4.3, 9.5, from group 1–4, respectively). In general, piezo- surgery decreased the number of analgesics taken, which was in accordance with Barone et al. ⁽¹⁷⁾ and Goyal et al. ⁽¹⁸⁾ In addition, the mean value of total VAS scores was so close in groups A2 and B2 (25.00, 24.45, respectively). According to this result, in impacted third molar surgery, the combined use of PRF and piezo- surgery reduced pain more than the use of PRF after traditional surgery. VAS has been proven to be

a reliable and sensitive method for recording pain after oral surgery procedures which is straightforward to apply and widely used ^(17,18, -21)

There are many authors, indicated in their studies that, using PRF is effective in reducing pain, in their studies, patients were recorded to either have no severe pain, significantly less pain or even no pain ^(22,23). Although further studies would be needed to deepen the knowledge of this biomaterial to determinate by which mechanism can it reduce pain. In the literature there are few studies which show the effect of PRF for the control of pain, swelling, and trismus following the extraction of mandibular third molars. Kim et al. ⁽²⁴⁾ reported that the use of PRF had no effect on pain following the surgical removal of impacted mandibular third molars and Singh et al. Also reported that PRF had no effect on pain following removal of mandibular third molars (no impaction), similar to that observed by Kim et al. ⁽²⁴⁾ However, in the present study, PRF significantly reduced pain. In the study by

Kim et al. all of the patients underwent bilateral removal of impacted third molars during a single appointment. In our study, a minimum of 21 days separated the two operations in each patient for the return of parameters to propanelike prior to commencing second operation. In addition, the selection of processes of which technique to use first on each patient were randomly selected.

The extent of trismus was significantly less in the groups treated with PRF (%9.03) and piezosurgery combined with PRF (%9.3), compared to the traditional handpieces used in group A1 (%25.61) and group B1 (%26.16) at the first day visits for postoperative interincisal distance, which was used for the evaluation of trismus. Various methods have been used to measure facial swelling ⁽²⁵⁾. Our method was modification of tape measuring method of Gabka and Matsamura which was described by Ustun et al. ⁽²⁵⁾ Our study indicated no significant differences on swelling among the techniques used. In the present study, we excluded the case if tooth needed sectioning during the surgery, flap design was triangular in shape in all extractions, there was no statistical difference between surgery durations, all of the examinations and extractions were done by same surgeon to optimize the homogeneity between the groups. In addition, operation side and age distributions between the groups were homogeneous.

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