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Evaluation of the effects of platelet-rich fibrin and piezosurgery on outcomes after removal of ımpacted mandibular third molars

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Abstract

We compared postoperative outcomes after the removal of 80 impacted mandibular third molars in 59 patients. In the control group, osteotomies were done with traditional burs (n = 20). The second group had traditional osteotomies and platelet-rich fibrin (PRF) placed into the socket of the extracted tooth (n = 20). The third group had piezosurgery (n = 20), and the fourth had piezosurgery and PRF placed in the extraction socket (n = 20). Baseline variables were assessed preoperatively and included pain, the number of analgesics taken, trismus, and swelling. These were also assessed on postoperative days 1, 2, 3, and 7. There was a significant reduction ($p < 0.05$) in pain on days 1, 2, and 3, and in the number of analgesics taken on days 2 and 3 in both PRF groups. However, in the piezosurgery alone group this was the case only on day 3. There was no significant difference in swelling and trismus between the control and other groups.

Keywords: Platelet rich fibrin; Piezosurgery; Impacted third molar surgery; Pain; Swelling; Trismus

Introduction

Operations to remove impacted mandibular third molars typically cause pain, swelling, and trismus in the early postoperative period,[1–3] and surgeons should develop strategies that will reduce their severity and improve healing.[4]

Piezoelectric devices, which can be used instead of conventional burs,[5–7] may be beneficial for operations at complex sites because they can preferentially cut mineralised structures.[8] Pain, swelling, and trismus after the extraction of mandibular third molars have been reported to be reduced when they have been used.[4,5,8]

Joseph Choukroun was the first to use platelet-rich fibrin (PRF) in oral and maxillofacial surgery.[9,10] He argued that sockets would heal more quickly and pain would be reduced if autogenous platelet concentrate was applied to the area. PRF, which is a second-generation immune and platelet concentrate, gathers all the components of blood that support healing and immunity on just one fibrin membrane.[11]

We compared the outcomes of operations to remove mandibular third molars using rotatory instruments and piezoelectric surgery, with and without application of PRF to the extraction sockets.

Patients and methods

We studied 59 patients aged between 18 and 31 years who had impacted third molars removed at the Near East University Faculty of Dentistry in Nicosia, Cyprus, between

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January 2014 and January 2015. A total of 21 patients (10 female, 11 male) had bilateral extractions and 38 (27 female, 11 male) had unilateral extractions. Patients aged 18 or over who had bilateral or unilateral, vertically impacted lower third molars that required extraction for prophylactic reasons, were included. None had systemic diseases or had taken opioids for a long period. They did not smoke or drink alcohol, were not pregnant, and were not allergic to penicillin or other drugs used during standard postoperative treatment. Those taking antibiotics for a current infection, those with acute pericoronitis or severe periodontal disease at the time of the operation, or whose teeth needed to be sectioned, were excluded. All required an osteotomy. Extractions were of moderate difficulty (class I, level C), and were assessed according to the classification by Pell and Gregory.[12,13]

Operations were divided into 4 main groups that each included 20 teeth and 20 patients. In the control group (10 men, 10 women), osteotomies were done with traditional burs. The second group (7 men, 13 women) had traditional osteotomies and platelet-rich fibrin (PRF) placed into the socket of the extracted tooth. The third group had piezosurgery (6 men, 14 women), and the fourth (10 men, 10 women), piezosurgery and PRF placed in the extraction socket. Patients who had bilateral impaction had the second operation a minimum of 21 days after the first to allow the variables to return to the preoperative baseline. The technique used in each case was randomly selected. Pain, the number of analgesics taken, trismus, and swelling of the cheek, were evaluated before, and after operation on days 1, 2, 3, and 7. Only the assessor was blinded when measurements were taken.

Patients were told about the operation, the expected postoperative course and possible complications, and all provided written, informed consent. The design of the study was approved by the local ethics committee (project number, NEU/2014/19–101).

Preparation of PRF gel

PRF was prepared according to the technique described by Dohan et al.[14] About 15 minutes before the operation, blood samples were taken without anticoagulant in 10 ml glass-coated plastic tubes, which were immediately centrifuged (Elektro-mag M415P, Istanbul, Turkey) at 3000 rpm (about 400 g) for 10 minutes. We discarded the platelet-poor plasma that accumulated at the top of the tubes and collected the PRF from roughly 2 mm below its contact point with the red corpuscles to include any remaining platelets.[15] A clot of PRF, which was produced in a 10 ml tube, was enough to fill the socket of each patient.

Operation

Patients had a radiological examination, including panoramic radiography, and all were treated by the same surgeon and assistant under local anaesthesia. A triangular incision was used to avoid involvement of muscle (Archer flap). Nerve blocks to the inferior alveolar, lingual, and buccal nerves contained 0.012 mg/ml adrenaline hydrochloride and 40 mg/ml articaine hydrochloride (2 ml Ultracaine® D-S Forte Ampul, Sanofi Aventis). After raising a full-thickness mucoperiosteal flap, the surgeon used an identical approach during both types of operation, changing only the instruments. Osteotomies in the control group were made with a 1.6 mm round bur mounted on a surgical high-speed hand piece (W&H Implantmed, W&H, St Albans, UK) at 40 000 rpm under abundant irrigation. All parts of the tooth were loosened with a lever and removed. In the second group, osteotomies were made with a bur, and PRF was placed in the extraction socket. In the third group, a piezoelectric device (Piezon Master Surgery®, EMS Electro Medical Systems, Nyon, Switzerland) was used with an SL 2 cutting insert. In the fourth group, piezosurgery was used and PRF was placed in the extraction socket.

In all cases, the residual cavity was cleaned with sterile physiological saline solution that contained no antibacterial agents. Wounds were closed with 3-0 silk sutures (4 stitches) that were removed after 7 days. A gauze pack was pressed against the surgical site for the patient to bite on for 30 minutes, and an icepack was applied to the surgical area for 6 hours (15 minutes on and 15 minutes off). No patients had had pharmacological treatment or antibiotics before operation. They were all told to have a soft and cold diet for 24 hours, and were prescribed amoxicillin 500 mg 3 times/day for 5 days and an antiseptic (7.5% povidone-iodine) mouthwash 3 times/day for 7 days. They were also advised to take paracetamol 500 mg as required (500 mg every 4-6 hours).

Evaluation

We assessed pain postoperatively using a visual analogue scale (VAS) (0: no pain to 100: severe pain),[16] and recorded the number of analgesic tablets taken. We assessed trismus by measuring the distance between the mesial incisal corners of the upper and lower right incisors during maximum mouth opening as described by Üstün et al,[17] and recorded swelling using the modified method by Gabka and Matsumara described by Üstün et al.[17,18] Three preoperative measurements between 5 reference points: tragus to soft tissue pogonion, lateral corner of the eye to the angle of the mandible, and tragus to the outer corner of the mouth, were repeated on postoperative days 1, 2, 3, and 7. The sum of the 3 preoperative measurements was taken as the baseline for that side, and the difference between each postoperative measurement and the baseline gave the value for facial swelling and trismus on that day.[17] Daily changes were recorded as a percentage. The operating time was considered to be the period between the first incision and termination of suturing. Patients were seen on each of the 4 postoperative days, and all measurements were assessed by the same person (not the operating surgeon), at roughly the same time of day.