

Assessment of Locally Metronidazole on Postoperative Complications after the Surgical Extraction of Impacted Mandibular Third Molars

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Abstract: Objectives: The surgical extraction of mandibular 3rd molar is a frequently executed dental operation. A multitude of studies has concentrated on variables influencing the postoperative problems associated with this procedure. The most common complications after lower third wisdom extraction are postoperative pain, edema, trismus, and alveolar osteitis. Comparison of the effects of locally applied metronidazole and the use of systemic metronidazole on postoperative complications including edema, pain, and trismus following the surgical extraction of an impacted mandibular wisdom. Materials and Methods: Fifty patients who had impacted mandibular wisdom which are indicated for surgical removal under local anesthetic were engaged in a randomized clinical trial. The patients were categorised into 2 groups: study group consisting of 25 patients who received local metronidazole application in the area right after the surgical extraction of the impacted wisdom, and the control group, comprising 25 patient who were given systemic metronidazole 1 hour before surgery. A clinical examination were conducted on the second, seventh days post-surgical removal to assess postoperative trismus, discomfort, and oedema. Results: The peak facial oedema and trismus were observed 48 hours post-surgery., and these gradually decreased by the 7th postoperatively day. On the day of operation, the pain score was maximum, after that it gradually reduced. Conclusion: The local application of metronidazole gives better postoperative outcomes in comparison to the systemic given metronidazole.

Keywords: Metronidazole; Impacted mandibular third molars; Postoperative complications.

INTRODUCTION

A tooth that remains in the jaw beyond its anticipated eruption period is referred to as an impacted tooth. When a tooth fails to emerge into its designated functional position, it is referred to as impaction.[Pechalova, P. F. *et al.*, 2017] The surgical extraction of impacted mandibular wisdoms is one of the most frequently performed procedures in oral and maxillofacial surgery clinics. Postoperative problems subsequent to the surgical extraction of IMTMs may include postoperative pain, edema, trismus, dry socket, infection, or insult to the neighboring second molars and damage of the inferior alveolar nerve and blood vessels. [Bello, S. A. *et al.*, 2011; Pasqualini, D. *et al.*, 2005] Numerous research have concentrated on the factors influencing postoperative problems associated with this procedure, including surgical protocol, the length of the procedure, and pre- and postoperative medications in an effort to lower the risk of these factors. [Üstün, Y. *et al.*, 2003; Koyuncu, B. Ö., & Çetingül, E. 2013] Metronidazole is an antibiotic and antiparasitic medication used to treat a wide variety of serious infections caused by specific anaerobic bacteria and protozoa. Metronidazole enters anaerobic microorganisms and its nitro group is reduced, forming reactive intermediates that damage microbial DNA by causing strand breaks and helix destabilization. This ultimately inhibits nucleic acid and protein synthesis, leading to cell death. The reduction of the nitro group is

catalyzed by the organism's own enzymes, such as the pyruvate-ferredoxin oxidoreductase system, making it selectively toxic to anaerobes. [Herrera, D. *et al.*, 2020] Due to its relatively dependable absorption and long half-life, metronidazole is more effective than other antibiotics in treating sensitive infections and is more effective against several bacterial species, such as streptococcus pyogenes, enterococci, and other anaerobe. [Martindale, J. & Westcoot, W. 2007] Topical metronidazole administered within the socket diminishes postoperative pain, trismus, and alveolar osteitis in comparison to those undergoing surgical extraction without its application. [Franco, T. P. M. *et al.*, 2019] Metronidazole's anti-inflammatory effects may reduce postoperative problems after surgical extraction of 3rd molar. [Pasquale, T. R., & Tan, J. S. 2005] Metronidazole could be administered as in single dose of 500 mg for prophylactic purposes. [Chusri, S. *et al.*, 2014]

MATERIALS AND METHODS

This randomized clinical experiment was done at Al-Salam Dental Specialized center in Kirkuk Governorate during the period from December 2021 to June 2022. All participants executed a consent form to engage in this trial. The study protocol was approved by the Al-Rafidain ethics committee (ID number: 126/21 in 26 june 2025), The participants in this experiment were individuals eligible for the surgical extraction of

lower wisdom teeth. Exclusions were made for individuals with systemic diseases that hinder normal tissue healing, those undergoing antibiotic therapy, patients with local pathological lesions linked to impacted tooth, smokers, pregnant and lactating women, and patients with allergies to metronidazole.

A panoramic radiograph, in conjunction with clinical examination, is utilised to evaluate the orientation, position, depth of the impacted maxillary third molars, as well as root development, morphology, and number of roots. The relation of impacted tooth with the adjacent mandibular second molar. CBCT is sometimes essential for the precise evaluation of impacted teeth and their proximity to the inferior dental canal.

Preoperative measurements were used to establish baseline data of edema for all patients which included: Three lines were measured with a measuring tape on five fixed points to obtain the direct facial measurements. The initial line extends from the angle of the mandible to the lateral canthus of the eye, while subsequent line traverses from the tragus of the ear till the corner of mouth, the last line reaches from the midpoint of the tragus to the soft tissue pogonion. The maximal oral aperture is evaluated via determining the vertical length between the maxillary and mandibular incisors. Pain severity was classified as moderate to severe when rated 6 or higher on numeric rating scales (NRS) at the time of assessment.

In the control group, one hour prior to surgery, the patient was instructed to take one metronidazole tap (500 mg). A triangular flap was reflected under local anesthesia, and elevators were employed to extract the teeth unless bone removal or tooth sectioning was necessary. In study group; 100 mg of metronidazole was dispensed and combined with 1 milliliter of normal-saline liquid. A gel-foam specimen (10×10×10 mm) is submerged in the solution intended for saturation with the antibiotic. The gel-foam was promptly inserted in the socket following the surgery, Wound closure was executed utilizing a (3/0) silk suture with simple interrupted technique. duration is assessed from the incision to the conclusion of the suturing. All cases received postoperative Ibuprofen 400 milligram tablets bi-daily and Paracetamol 500 milligram tablets tri-daily for a period of 3 days.

Facial measurements were conducted 48 hours (T1) and 7 days (T2) post-surgery to evaluate postoperative oedema and maximal mouth opening to evaluate the severity of trismus. A numerical rating scale ranged from 0 to 10 was used to assess postoperative pain (0 indicating no pain- 10 denoting the severe pain).

Statistical analysis were conducted utilising SPSS, Version 27. Descriptive statistics was calculated by using frequencies, percentages, means, standard deviations, standard errors. and t-test compares means between 2 groups.

RESULT

50 patients participate in the trial, comprising 33 females (66%) and 17 males (34%). The ages varied from 19 to 32 year. Among the 50 patients of IMTMs, 23 (46%) was on right side and 27 (54%) on left side. The average working time was 14.41 ± 2.35 minute for the control group and 15.42 ± 3.39 minute for the study group.

As per surgical complexity classification proposed by Park, 17 cases (34%) were categorised as slightly difficult, 26 cases (52%) as moderately difficult, and 7 cases (14%) as very difficult [Park, K. L. 2016].

The average recorded pain score reached its zenith on the day of operation and subsequently diminished progressively. Except for the day of surgery, there is significant differences between the two groups with less pain in (study group) over the course of seven days (Table 1).

The differences between preoperative (T0), after 48 hours(T1) and 7 days (T2) postoperatively regarding swelling and mouth opening were statistically nonsignificant as illustrated in (Table 2 and 3).

DISCUSSION

The surgical extraction of the (IMTM) invariably results in soft and hard tissue trauma, rendering total elimination of postoperative morbidity unattainable. Oral and maxillofacial surgeons consistently seek novel materials or refined surgical techniques to enhance outcomes. [Deliverska, E. G., & Petkova, M. 2016] This study assessed the impact of locally administered metronidazole in new sockets following the surgical extraction of IMTMs on prevalent postoperative symptoms, including pain, oedema, and trismus.

Regarding this study, in control group, the mean preoperative measurements was 48.58 mm,

reduced to be 37.75 mm at T1 postoperatively and then increase again to be 42.89 mm at T2. When compared with the study group, the mean of mouth opening measurements was 50.90 mm, 39.342 mm and 44.57 mm at baseline, T1 and T2 respectively. While there were no significant differences between mouth opening of control and study groups preoperatively ($P=0.089$), at T1 ($P=0.190$) and at T2 ($P=0.223$). The possible cause of this result might be that trismus is multifactorial in nature, the limitation in mouth opening varies with individuals depending on preoperative condition of IMTMs and intraoperative factors such as type of incision and difficulty of tooth removal. [Balakrishnan, G. *et al.*, 2017]

Maximum facial swelling was seen in the current study on the next day in the tow groups, after which it gradually subsided. This result is similar to Patil's results that facial edema was a result of injury from surgery to the the region of the IMTMs. [Patil, C. *et al.*, 2019] The symptoms begin gradually, peak after 24 to 48 hours, and may even last up at 7 days.

Swelling analysis in the current study were observed at T1 with a highly significant difference compared to T0 and T2 in both groups. Furthermore, no significancy regarding comparison of the degree of swelling in both groups at each period.

The pain was assessed daily by the patient throughout 7 days postoperatively using NRS to rate the intensity of pain that felt after surgical removal of IMTMs, as it is easy to be understood by the patient and does not need language translation. The data that have been gained by NRS are interpreted and documented in simple manner. [Thomas, S. H. 1945] For the control group, the mean pain records started at day of surgery score 7.36, at the second day decreased to 6.00 and reduced gradually to 4.32, 3.12, 1.76, 0.88 and 0.40 at the D3, D4, D5, D6 and D7 respectively. In constant, in the study group, the means of pain records started at day of surgery score 66.4, at the second day reduced to be 4.44 and reduced gradually to 2.68, 1.84, 1.00, 0.24 and 0.0 at the D3, D4, D5, D6 and D7 respectively. The results showed that pain was gradually decreased in a significant level at each day in both groups. In comparison of pain between both groups, this study found a significant difference ($P<0.05$) at each day except at day of surgery (T0) which shows no significant difference ($P>0.05$). This comes in agreement with Farronato who

noticed that the pain on the 1st day following surgical extraction was nearly identical in both groups, but starting on the 2nd day, the pain in the study groupe diminished more quickly than it did in the control group. [Farronato, G. *et al.*, 2013]

CONCLUSION

This study concluded that local application of the saturated gelfoam with metronidazole had no effect concerning swelling, and trismus in comparison to systemic metronidazole. However, the saturated gelfoam with metronidazole was effective in reducing postoperative pain significantly except the first day of operation.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to this study.

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