Effect of Tetracycline Dressing in Reducing Post-Operative Complications after Impacted Third Molar Surgery

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Submitted: 2019-01-12; **Accepted:** 2019-03-20; **Published Online:** 2019-04-01; **DOI**: *10.22037/rrr.v4i2.29237*

Introduction Surgical removal of mandibular impacted third molars is a routine dental procedure which is associated with the complications such as trismus, swelling, alveolar osteitis, and pain. Furthermore, tetracycline dressings are possibly useful to prevent some of these complications, although this finding requires more investigations. This study determined the effects of post-surgical placement of tetracycline impregnated gauze in dental socket to prevent the incidence of the complications related to the surgical removal of impacted third molars in patients referred to School of Dentistry, Tehran University of Medical Sciences, Tehran, Iran. **Materials and Methods**: In this split-mouth randomized clinical trial, 27 patients were enrolled. All the patients had bilateral impacted mandibular third molars. A single surgeon extracted all teeth. At the end of surgery, a gauze pack was placed on socket in one side and a tetracycline impregnated mesh in the socket of the other side. The patients were called at 3rd day after the surgery and the maximum mouth opening and pain were measured and the incidence of alveolar osteitis was recorded. The patients' pain scores were calculated at 2nd, 3rd and 7th days post-surgery by 10-scaled VAS system. The patients' pain scores and the amount of maximum mouth opening were subjected to Wilcoxon Signed Ranks test. **Results**: There was no incidence of alveolar osteitis in any of the patients. The mean pain scores of the patients after using tetracycline impregnated mesh and gauze pack were 6.07 and 6.59 on 2nd day, 3.78 and 4.07 on 3rd day, and 0.19 and 0.33 on 7th day post-operatively. No statistically significant differences were observed regarding pain scores of the patients in both groups on 2, 3 and 7 days post-operatively. The mean maximum mouth opening of the patients in tetracycline dressing and control groups were found to be 24.11mm and 21.74mm after 3rd day post-operatively which was significantly higher in the tetracycline group than control group (P=0.03). **Conclusion**: It seems that there is no need to use of tetracycline impregnated mesh in dental sockets following surgical removal of mandibular third molars.

Keywords: Third molar; Trismus; Alveolar osteitis; Tetracycline

Introduction

Surgical extraction of the impacted third molar is the most frequent minor surgical intervention in oral and maxillofacial surgery (1). Since they are the last teeth to appear in the jaw, due to lack of space, they often remain impacted (2). They need to be removed when there is not enough space for them to erupt or when they are lying in poor position (3). Surgical extraction involves hard and soft tissue trauma and induces inflammatory reaction, resulting in pain, swelling, trismus and alveolar osteitis, the common post-operative complications.

While inflammatory reaction is beneficial for healing, an aggravated response may cause patients' discomfort. The formation of prostaglandins and other inflammatory mediators derived from membrane phospholipids that are released after surgery may result in pain and trismus (4). Etiology of alveolar osteitis is arguable, although it has often been attributed to the disintegration of the blood clot in dental socket, resulting in the loss of reparative agents normally present in coagulated blood. Owing to increased fibrinolytic activity, the clots may be lost (5).

The severity of postoperative complications depends on different variables such as individuals, physiological inflammatory response, and the severity of intervention (6), which depends on expertise of the surgeon and depth of the impacted tooth.

These sequelae can cause distress and affect patient's quality of life, so many efforts have been devoted to minimize post-operative complications, particularly in the field of pharmacological agents (7). Local or systemic steroid, nonsteroidal anti-inflammatory drugs consumption, and antibiotic prophylaxis are common medication methods, due

Table 1. Post-operative changes in maximum mouth opening comparison between the two groups.

Group	Average (mm)	SD	Minimum (mm)	Maximum (mm)	*P*-value
Experimental group	24.11	6.16	14	35	0.03
Control group	21.74	5.09	12	30	

Table 2. Post-operative changes in pain scores comparison between the two groups.

Day	Group	Average (VAS)	SD	Minimum (VAS)	Maximum (VAS)	*P*-value
Second day	Experimental group	6.07	1.64	2	9	0.22
	Control group	6.59	2.08	2	10	
Third day	Experimental group	3.78	2.46	0	8	0.6
	Control group	4.07	2.85	0	8	
Seventh day	Experimental group	0.19	0.4	0	1	0.21
	Control group	0.33	0.68	0	2	

to their anti-inflammatory and analgesic properties. Antibiotic prophylaxis seems an effective method to increase postoperative oral quality of life for surgically extracted impacted third molars and oral surgeons also use it to reduce the risk of complications and promote wound healing (8). Few studies have evaluated the effect of tetracycline in third molar surgery. Based on the newest one, the use of a tetracycline-impregnated drain is a simple and effective way to reduce the incidence of alveolar osteitis and overall postoperative morbidity (9).

This is a prospective, split-mouth, and randomized controlled study which was conducted to assess the effect of tetracycline dressing on pain, trismus, and alveolar osteitis which may occur after surgical removal of impacted lower third molars.

Materials and Methods

27 patients who were referred to the department of oral and maxillofacial surgery, dental school of Tehran University of Medical Sciences, Tehran, Iran, from march 2017 to march 2018, for removal of their impacted 3rd molar were enrolled in the study. All patients, including 9 males and 18 females, had asymptomatic bilateral impacted mandibular 3rd molars, which were similar in depth and angulation. Smokers, pregnant women and patients with any drug allergy, systemic disorder, and periodontal disease were excluded from the study. The mean age of the patients was 24.5 ± 4 years, ranging from 19 to 39 years old. Informed consent was obtained from all patients. The study design was approved by the ethics committee of Tehran University of Medical Sciences (No. IR.TUMS.DENTISTRY.REC.1396.3614).

Patients were submitted to surgical procedures in two clinical sessions, with two weeks' time interval. Randomization was done by flipping a coin. The patients were blinded to the use of tetracycline dressing.

All patients were operated on by a single experienced surgeon using a standard technique and the duration of the surgery ranged from 20 to 30 minutes. Inferior alveolar, buccal and lingual nerve blocks were administered using two cartridges of 2% lidocaine hydrochloride and epinephrine (1:100000). Surrounding bone of the third molar was removed with a round bur. The crown or roots were sectioned using a fissure bur, and finally dental socket was rinsed with sterile 0.9% saline.

In both groups, incisions were sutured using 3-0 silk suture with equal number of sutures. In the experimental group, the tetracycline impregnated mesh, measuring 5 cm, was packed in the extraction socket, then flap was sutured back, but in the control group, flap was sutured back, and then a small gauze pack was applied to the site.

Post-operative instructions were given, and Ibubrofen 400 mg; 1 tablet every 6 hours for 4 days, and 0.2% chlorhexidine mouth rinse; twice daily for 5 days, were prescribed.

Patients were recalled on the 2nd, 3rd and 7th post-operative days. Pain, trismus and alveolar osteitis were used as clinical parameters for comparison between the two groups. A single examiner who was blind to the interventions, recorded pain, trismus on the 3rd day, and alveolar osteitis on the 3rd and 7th days. Dressing was removed on the 3rd post-operative day.

Pain levels were recorded on the visual analog scale (VAS). Every patient was asked to rate his/her pain from 0 (no pain) to 10 (worst pain imaginable).

Trismus was expressed as a decrease in the post-operative mouth opening and was calculated by evaluating the inter-incisal distance with a vernier scale when patients were asked to open their mouth unassistedly as wide as possible.

The incidence of alveolar osteitis was evaluated with its clinical features, including malodor, severe throbbing pain, and exposed bone.

The patient's mouth opening and pain scores were subjected to Wilcoxon Signed Ranks test. Statistical analysis was performed using SPSS software version 22.0. Data were expressed as mean ± standard deviation and P-value of less than 0.05 was considered significant.

Results

Of the 27 patients enrolled in the research, all finished the survey and no cases of alveolar osteitis, wound infection, or medication side effects were noted until the 7th post-operative day.

Inter-incisal mouth opening on the 3rd post-operative day was 24.11 mm in experimental group and 21.74 mm in control group. This difference was statistically significant (P=0.03), revealing that the experimental group was significantly more able to open their mouths than the control group (Table 1).

The mean pain score on the 2nd day post-operatively was 6.07 for the experimental group and 6.59 for the control group. On the 3rd day the score was 3.78 and 4.07 for experimental and control groups. On the 7th day the scores decreased to 0.19 and 0.33 for experimental and control groups. There were no significant differences in pain scores on the 2nd (P=0.22), 3rd (P=0.6), and 7th (P=0.21) post-operative days in tetracycline study group as compared to controls (Table 2).

Discussion

The specific aims of the study were the assessment of the effect of tetracycline dressing on pain, trismus, and alveolar osteitis, after surgical removal of impacted lower third molars. The main finding was the significantly lower rate of trismus, when a drain had been placed in the socket. This is in accordance with the results in the study by Sanchis *et al* (10). In a clinical comparative study involving 200 patients, they concluded that topical administration of intra-alveolar tetracycline did not affect the incidence of alveolar osteitis but could reduce pain and trismus to some extent. In another research, Stavropoulos et al (11) assessed the role of minocycline in third molar surgery. Minocycline is a chemically modified tetracycline analog which its antimicrobial properties are similar to Tetracycline (12). For example, it inhibits the nociceptive phase associated with inflammatory mediator synthesis (13). They applied slow-release microspheres containing 1 mg of minocycline in dental socket. The outcome was that intra-alveolar administration of minocycline reduced the incidence of late clinical recovery. They concluded that it is only indicated in cases with a high risk of complications. The other research assessing the efficacy of local administration of minocycline indicates that local deposition of slow-release microspheres containing 1 mg of minocycline reduces post-operative pain level (14), whiles, there were no significant differences in pain scores even on the 7th day (P=0.21).

Placing tetracycline impregnated mesh in extraction socket, might act like a drain which leads to the decrease in inflammatory complications. Tetracycline is a broad-spectrum antibiotic with bacteriostatic activity against gram-positive and negative bacteria, both aerobic and anaerobic. It also prevents neutrophil chemotactic activity, thereby preventing the collection of microtubules. This action then affects the leukocyte cell movement. It also inhibits the formation of protein kinase C (related to signal transmission for inflammation) and matrix metalloproteins. These features are probably the key factors to prevent the incidence of alveolar osteitis (15).

Prophylactic antibiotics administered to healthy patients without infection, with a controlled aseptic chain, may lead to serious problems for both the individual and the population. By a systematic review of 18 studies, Lodi et al (16) concluded that prophylactic antibiotics may reduce the risk of infection, pain, and alveolar osteitis, but result in an increase in mild and transient adverse reactions and their use in healthy patients is dubious. But the studies on local antibiotics show another results and we know that local administration of tetracycline for a short period is unlikely to cause antimicrobial drug resistance and is safe (17). Nevertheless, with extreme confidence in the efficiency of antibiotics, the reluctance to perform strict sterilization, irrigation of wound debris and adequate hemostasis could increase risk of postoperative infection. So more recent studies have also contraindicated antibiotic use with the exception of surgeries involving immunocompromised older patients or less skilled surgeons.

Conclusion

Placing tetracycline impregnated mesh in dental socket resulted in significant decrease in trismus, but there was no significant pain reduction over the entire follow up period. Also no case of alveolar osteitis was detected in any patients. So it can be concluded that ophthalmic tetracycline ointment is mildly effective in reducing the post-operative trismus.

Under the present experimental conditions and because the rational use of antibiotics should be encouraged, there is no advantage in using tetracycline dressing for healthy patients undergoing extraction of impacted third molar.

Conflict of Interest: 'None declared'.

References

1. Moraschini V, Hidalgo R, Porto Barboza Ed. Effect of submucosal injection of dexamethasone after third molar surgery: a meta-analysis of randomized controlled trials. Int J Oral Maxillofac Surg. 2016 Feb;45(2):232-40.
2. Lee CT, Zhang S, Leung YY, Li SK, Tsang CC, Chu CH. Patients' satisfaction and prevalence of complications on surgical extraction of third molar. Patient Prefer Adherence. 2015 Feb 10;9:257-63.
3. Conrad SM, Blakey GH, Shugars DA, Marciani RD, Phillips C, White RP Jr. Patients' perception of recovery after third molar surgery. J Oral Maxillofac Surg. 1999 Nov;57(11):1288-94; discussion 1295-6.
4. Bello SA, Adeyemo WL, Bamgbose BO, Obi EV, Adeyinka AA. Effect of age, impaction types and operative time on inflammatory tissue reactions following lower third molar surgery. Head Face Med. 2011 Apr 28;7:8.
5. Blum IR. Contemporary views on dry socket (alveolar osteitis): a clinical appraisal of standardization, aetiopathogenesis and management: a critical review. Int J Oral Maxillofac Surg. 2002 Jun;31(3):309-17.
6. Acham S, Klampfl A, Truschnegg A, Kirmeier R, Sandner-Kiesling A, Jakse N. Beneficial effect of methylprednisolone after mandibular third molar surgery: a randomized, double-blind, placebo-controlled split-mouth trial. Clin Oral Investig. 2013 Sep;17(7):1693-700.
7. Sortino F, Cicciù M. Strategies used to inhibit postoperative swelling following removal of impacted lower third molar. Dent Res J (Isfahan). 2011 Oct;8(4):162-71.
8. Salmerón-Escobar JI, del Amo-Fernández de Velasco A. Antibiotic prophylaxis in Oral and Maxillofacial Surgery. Med Oral Patol Oral Cir Bucal. 2006 May 1;11(3):E292-6.
9. Øyri H, Jonsdottir O, Jensen JL, Bjørnland T. The use of a tetracycline drain reduces alveolar osteitis: a randomized prospective trial of third molar surgery under local anesthetics and without the use of systemic antibiotics. Oral Surg Oral Med Oral Pathol Oral Radiol. 2019 Sep;128(3):205-212.
10. Sanchis JM, Sáez U, Peñarrocha M, Gay C. Tetracycline compound placement to prevent dry socket: a postoperative study of 200 impacted mandibular third molars. J Oral Maxillofac Surg. 2004 May;62(5):587-91.
11. Stavropoulos MF, Shugars DA, Phillips C, Conrad SM, Fleuchaus PT, White RP Jr. Impact of topical minocycline with third molar surgery on clinical recovery and health-related quality of life outcomes. J Oral Maxillofac Surg. 2006 Jul;64(7):1059-65.
12. Sapadin AN, Fleischmajer R. Tetracyclines: nonantibiotic properties and their clinical implications. J Am Acad Dermatol. 2006 Feb;54(2):258-65.
13. Bastos LF, Merlo LA, Rocha LT, Coelho MM. Characterization of the antinociceptive and anti-inflammatory activities of doxycycline and minocycline in different experimental models. Eur J Pharmacol. 2007 Dec 8;576(1-3):171-9.
14. Gelesko S, Long L, Faulk J, Phillips C, Dicus C, White RP Jr. Cryotherapy and topical minocycline as adjunctive measures to control pain after third molar surgery: an exploratory study. J Oral Maxillofac Surg. 2011 Nov;69(11):e324-32.
15. Akamatsu H, Nishijima S, Takahashi M, Ushijima T, Asada Y. Effects of subminimal inhibitory concentrations of erythromycin, tetracycline, clindamycin, and minocycline on the neutrophil chemotactic factor production in Propionibacterium acnes biotypes 1-5. J Dermatol. 1991 May;18(5):247-51.
16. Lodi G, Figini L, Sardella A, Carrassi A, Del Fabbro M, Furness S. Antibiotics to prevent complications following tooth extractions. Cochrane Database Syst Rev. 2012 Nov 14;11:CD003811.
17. Encarnacion M, Waxman D, Wright J, O'Hanley P. Topical tetracycline: potential for allergic reaction or bacterial resistance. Compend Contin Educ Dent. 1997;18:325-326.

Please cite this paper as: Badri A, Hasheminasab M, Jamshidian M, Ghoreyshi Y. Effect of Tetracycline Dressing In Reducing Post-Operative Complications after Impacted Third Molar Surgery. Regen Reconstr Restor 2019;4(2):46-49. Doi: 10.22037/rrr.v4i2.29237.