Journal of Current Research in Oral Surgery
2021, Volume 1, Page No: 8-12

Available online at: www.tsdp.net

ISSN: 3062-3480

Review Article

Pharmacological Approaches for the Prevention and Management of Alveolar Osteitis: A Comprehensive Review

Nikolai V. Muravev[1]*, Ekaterina Y. Diachkova[1], Elena V. Larionova[1], Svetlana V. Tarasenko[1]

[1]Department of Oral Surgery, Borovskiy Institute of Dentistry, Sechenov University, Russian Federation.

***E-mail** ✉ 163789789@mail.ru

Received: 29 May 2021; **Revised:** 28 August 2021; **Accepted:** 03 September 2021

ABSTRACT

To identify the most cutting-edge and successful therapeutic approach for alveolitis, the review conducted a retrospective study of scientific publications devoted to clinical and experimental research on the use of various medications in the treatment of patients with this nosology for the years 2000–2020. The electronic medical library eLIBRARY.RU, the PubMed medical publication database, and Google Scholar were used to select scientific literature. According to the literature, various preventive and therapeutic approaches have been proposed based on the complicated and multiple aetiology of dry socket syndrome. In addition to performing repeated surgical procedures, socket irrigating, and revision of the socket, alveolitis can be treated with a variety of therapeutic dressings that have antibacterial and local anaesthetic qualities and keep food particles and oral fluid out of the well. However, the best and most efficient preventative strategy has never been determined.

Keywords: Alveolitis, Alveolitis treatment, Iodoform, Collagen, Review

How to Cite This Article: Muravev NV, Diachkova EY, Larionova EV, Tarasenko SV. Pharmacological Approaches for the Prevention and Management of Alveolar Osteitis: A Comprehensive Review. J Curr Res Oral Surg. 2021;1:8-12. https://doi.org/10.51847/5MAV09aVIQ

Introduction

The most frequent post-extraction consequence is alveolitis [1–5]. The primary signs of alveolitis appear one to three days following surgery and include reddish gingiva surrounding the socket, exposed alveolar bone, greyish plaque on the hole walls, regional lymphadenitis, blood clot loss, halitosis, fever to sub-febrile values, and pain of variable intensity radiating to neighboring teeth, ears, temporal region, and in certain cases, to the neck, eyes, and frontal region [1, 4-8].

The research indicates that the incidence of alveolitis ranges from 1-4% and that it happens 10 times more frequently in mandibular molar extractions than in maxillary extractions [1, 3, 9]. Alveolitis incidence ranges from 1-37.5% for lower third molar extraction [1, 2, 6], from 0.5-5% for normal tooth extraction [5, 6], and up to 45% for impact tooth extraction, according to several additional research [9].

One of the most researched side effects of dental care is alveolitis, and as efforts to find the best way to avoid and cure this condition continue, so does the quantity of publications written about it [3]. The major goals of alveolitis treatment are to alleviate discomfort, inhibit bacterial growth, eradicate inflammation, and improve the patient's quality of life [7, 9]. Modern dentistry faces an essential challenge in preventing the development of alveolitis: lowering overall morbidity, reducing the length of time patients need to recover and see doctors, and lowering treatment costs [9, 10].

The literature states that several therapeutic and preventive strategies have been put forth in light of the complicated and multifaceted aetiology of dry socket syndrome [10]. Nevertheless, the best and most efficient preventative strategy has not yet been determined [4, 6, 7, 9].

To identify the most cutting-edge and successful therapeutic approach for alveolitis, the review conducted a retrospective study of scientific publications devoted to clinical and experimental research on the use of various medications in the treatment of patients with this nosology for the years 2000–2020.

Materials and Methods

A retrospective analysis of materials from sources of Russian and foreign scientific literature devoted to modern trends in the selection and appointment of pharmacological drugs for the prevention and treatment of alveolar osteitis (e-library, Pubmed, Google Academy) was performed using keywords and their combinations: alveolitis, dry socket, treatment of alveolitis, iodoform, collagen.

Results and Discussion

Alveolitis can be treated with a variety of methods and medications, including those based on eugenol, chlorhexidine, antibiotics, analgesics, enzymes, local anaesthetics, hemostatics, hormones that impregnate collagen sponges, gels, pastes, turundas, and medications based on biopolymers like chitosan and platelet-rich plasma [3, 5, 7, 9-12]. Treatment options for alveolitis include irrigating the socket, reworking the socket, undergoing a second surgical procedure, and applying a range of therapeutic dressings with occlusive, antibacterial, and local anaesthetic qualities [8].

To give the mass plasticity, Chisholm first described zinc-oxide-eugenol paste in 1873. The antimicrobial and soothing properties of eugenol are counteracted by its cytotoxic effects at high concentrations, which harm osteoblast-like and fibroblast cells and impede the healing process [13].

The most important factor in socket repair and the lack of inflammatory post-extraction problems is the stability of blood clots in the early postoperative phase [7]. Angiogenesis and the development of granulation tissue in the extraction socket are supported by the blood clot. Haemostatic ingredients in medications used to treat alveolitis help to avoid blood clot lysis and atrophy as well as any disruptions in the clot's structure. Various haemostatic sponges that include thrombin and fibrinogen are used as such medications, along with albumin, collagen, L-arginine hydrochloride, sodium chloride, sodium citrate, and riboflavin as auxiliary ingredients [14].

The use of antifibrinolytic medicines such as para hydroxybenzoic acid [15] and tranexamic acid [16] is being studied for the prevention of alveolitis. Nevertheless, the healing of the socket was not considerably impacted by these medications [17, 18].

An essential part of the pathophysiology of alveolitis is infection of the extraction socket. Accordingly, the use of systemic antibiotics including erythromycin, clindamycin, penicillin, and metronidazole is one way to stop the onset and treat alveolitis [4, 6]. However, because of the potential for the emergence of resistant bacterial strains, hypersensitivity, and disruption of the patient's microbiota, this prescription for preventative purposes is contested [6, 19, 20].

Since the inflammatory process only affects the thin, cortical bone lining the tooth socket, local drugs are sufficient for treating alveolitis, according to several experts, hence systemic antibiotics are also incorrect [4].

The most used antiseptic in dental practice is chlorhexidine [2]. Chlorhexidine's broad spectrum of action, influence on anaerobic flora, and lack of microorganism resistance make it one of the medications of choice for avoiding alveolitis development [1, 2, 9]. In contrast to the chlorhexidine solution, the gel form of chlorhexidine gel permits the medicine to work on the extraction socket for a longer time [1]. Haraji *et al*. [21] examined the impact of 0.2% chlorhexidine bioadhesive gel on lowering the incidence of alveolitis and found that it reduced incidence by 60–70%.

The effectiveness of a 0.2% chlorhexidine bioadhesive gel in preventing alveolitis was assessed by Shad *et al*. [3]. 180 patients who had their impacted lower third molars extracted were included in the study. All patients were split into two groups: the study group received a 0.2% gel based on chlorhexidine injected into their socket, while the other group received a placebo. Alveolitis consequently occurred in 7.7% of the study group's patients, compared to 17.7% of the comparator group's patients. The authors concluded that alveolitis was 2.3 times less likely to occur when the lower third molar teeth were extracted if the chlorhexidine-based gel was used [3].

According to the authors of certain research, alveolitis incidence is decreased when 0.12% chlorhexidine solution is used both before and during the intervention [6, 10].

Iodoform-based topical medications are frequently utilized in dentistry. This material is used to make medicines that are antiseptic, disinfecting, bactericidal, antifungal, antiprotozoal, and antiviral. These medications can be manufactured as solutions, powders, pastes, sponges, flagella, etc. [7, 11]. Iodine is produced when iodoform hydrolyses, combining

with the bacterial cell's proteins to form iodamine and causing them to coagulate. Formic acid, a byproduct of this reaction, irritates the patient's tissues [7].

Kostina *et al*. [7] carried out an experimental study using the most widely available medications in Russia for the prevention and local treatment of alveolitis that contained iodoform. The spectrophotometric approach was used to measure the amount of iodoform emitted from the preparations as soon as they were placed in the model solution and then every 15 minutes for the first 2 hours on the first and second days. Despite variations in iodoform content and iodine desorption into the aqueous medium, the iodoform content in all preparations was below the maximum allowable limit (2000 μg per day). Iodine desorption from turunda was much less than that from the non-woven flagellum after 15 minutes; the collagen sponge's concentration remained constant for the first day and increased gradually over the next 48 hours; it decreased from the powder after 45 minutes; and it increased gradually from the paste, reaching its maximum by the second hour after the introduction and remaining constant for 48 hours. Iodine desorption from turunda, a traditional treatment for alveolitis, was observed to happen 25.2 times faster than paste, 5.7 times faster than collagen sponge, 1.6 times faster than powder, and 3.5 times faster than viscose flagellum. According to the experiment's authors, when treating alveolitis, it is important to take into account the extent and length of iodoform release from different preparations and dosage forms [7].

"Alvogyl" (Septodont) is another medication that is frequently used to treat alveolitis. This paste is fibrous and dark. Active components in the preparation include eugenol (13.7 g/100 g), iodoform (15.8 g/100 g), and butyl paraminobenzoate (25.7 g/100 g). Additionally included in this product are olive oil, calcium carbonate, sodium lauryl sulfate, and peppermint oil [8].

Supe *et al*. [8] assessed "Alvogyl's" clinical effectiveness in the manufactured zinc-oxide-eugenol paste. The paste was created separately by combining liquid and powder. The liquid comprised 85% eugenol and 15% olive oil, while the powder was composed of 80% zinc oxide, 20% polymethyl methacrylate, and trace amounts of zinc stearate, zinc acetate, and thymol. In this study, 50 patients with alveolitis were split into two groups. Each group received "Alvogyl," an occlusive bandage saturated in zinc oxide-eugenol paste, following an antiseptic rinsing of the socket with betadine solution and sterile saline. On days 3, 5, 7, and 10, patients were retrieved, and assessments of pain syndrome and healing rate were conducted. In contrast to the other group, where this indicator was 9.06 days, the Alvogyl group experienced a faster drop in pain intensity, with an average time needed for the pain to completely go away being 6.52 days. The first group needed an average of 7.47 days to mend the hole, whereas the second group needed an average of 9 days. According to the study's authors, "Alvogyl" is an effective combination medication for treating post-extraction issues [8].

Collagen is frequently employed as such a fixing material, and while creating novel medications, particularly for the prevention and treatment of alveolar osteitis, researchers focus closely on both the active ingredient and the carrier's direct impact on the wound [22].

Material types based on collagen I have a haemostatic action, alter platelet adhesion, protect against plasma loss when closing wound surfaces, play the role of biological drainage of wounds or infected cavities, stimulate phagocytosis, and guard against the development of infections [22]. These materials are easy to insert into the hole and do not need to be removed because they can resorb food particles from the extraction socket, reduce postoperative pain syndrome, absorb the exudate that forms in the socket, and prevent it from accumulating beneath the wound covering, and promote wound healing [7, 22].

Cho *et al*. [22] assessed 2697 individuals' incidence of post-extraction problems, specifically the emergence of alveolitis, following lower third molar extraction. Type I collagen called "Ateloplug" (Bioland) is used to fill the sockets of the extracted molars. Alveolitis only appeared in 1.14% of cases, while the prevalence of postoperative complications was 4.52%. To prevent problems including alveolitis, postoperative haemorrhage, and surgical site suppuration, the study's authors suggest collagen-based drugs [22].

It is also possible to apply collagen in gel form. Iordanishivili *et al*. [11] prevented the development of alveolitis in individuals with type 2 diabetes mellitus by using the wound-healing medication "Agrakol." On the surface of the wound, this biodegradable hydrogel creates an elastic layer that is permeable to both water and air. Collagen hydrolyzate, a sodium salt of alginic acid, glycerin, sodium hypochlorite, and antiseptics (catapol, dioxidin, and poviargol) are among the ingredients in this medication. Twenty-five individuals in the control group had wounds that healed beneath a blood clot. The research medication was given to the blood clots in the main group (37 patients) in a thin layer up to 1 mm thick. The incidence of alveolitis was 29.73% in the main group and 68.0% in the control group. The scientists observed that the main group's

inflammatory process progressed less sharply [11].

Conclusion

Preventing and treating post-extraction problems, particularly alveolar osteitis, remains one of the most significant challenges in contemporary surgical dentistry, according to a review of the scientific literature. There are comparatively few techniques and tools for treating alveolitis, however, there are several pharmaceutical options and substances that can be used to address the inflammatory effects of tooth extraction. The "gold standard" for treating alveolitis patients has not yet been established, though. Therefore, more research is required to identify the best medication for alveolitis prevention and therapy.

Acknowledgments: This paper was supported by the “Russian Academic Excellence Project 5-100”.

Conflict of Interest: None

Financial Support: None

Ethics Statement: The protocol for this study was approved by the local ethics committee of Sechenov University. The trail was registered as № 10-20.

References

1. Requena-Calla S, Funes-Rumiche I. Effectiveness of intra-alveolar chlorhexidine gel in reducing dry socket following surgical extraction of lower third molar. A pilot study. J Clin Exp Dent. 2016;8(2):e160-3.
2. Halabi D, Escobar J, Alvarado C, Martinez N, Muñoz C. Chlorhexidine for prevention of alveolar osteitis: a randomized clinical trial. J Appl Oral Sci. 2018;26:e20170245.
3. Shad S, Hussain SM, Tahir MW, Rahat Geelani SR, Khan SM, Abbasi MM. Role of 0,2% bio-adhesive chlorhexidine gel in reducing incidence of alveolar osteitis. J Ayub Med Coll Abbottabad. 2018;30(4):524-8.
4. Ansari A, Joshi S, Garad A, Mhatre B, Bagade S, Jain R. A study to evaluate the efficacy of honey in the management of dry socket. Contemp Clin Dent. 2019;10(1):52-5.
5. Puidokas T, Kubilius M, Nomeika D, Januzis G, Skrodeniene E. Comparative analysis of blood clot, plasma rich in growth factors and platelet-rich fibrine resistance to bacteria-induced fibrinolysis. Microorganisms. 2019;7(9):328.
6. Kolokythas A, Olech E, Miloro M. Alveolar osteitis: a comprehensive review of concepts and controversies. Int J Dent. 2010;2010:249073. doi:10.1155/2010/249073
7. Kostina IN, Molvinskikh VS, Belokonova NA, Ognev MY. Comparative characteristics of physico-chemical properties of drugs topical application for the prevention of complications of tooth extraction. Probl Dent. 2018;14(4):64-70.
8. Supe NB, Choudhary SH, Yamyar SM, Patil KS, Choudhary AK, Kadam VD. Efficacy of alvogyl (combination of iodoform + butylparaminobenzoate) and zinc oxide eugenol for dry socket. Ann Maxillofac Surg. 2018;8(2):193-9.
9. Teshome A. The efficacy of chlorhexidine gel in the prevention of alveolar osteitis after mandibular third molar extraction: a systematic review and meta-analysis. BMC Oral Health. 2017;17(1):82.
10. Haghighat A, Najafi RB, Bazvand M, Badrian H, Khalighinejad N, Goroohi H. The effectiveness of gecb pastille in reducing complications of dry socket syndrome. Int J Dent. 2012;2012(1):587461.
11. Iordanishivili AK, Korovin NV, Lyskov NV, Serikov AA, Muzykin MI, Zhmud' MV, et al. Prophylaxis of the alveolitis at the patients suffering from the diabetes mellitus of second type. Russ Dent. 2017;10(2):25-9.
12. Abdelghany AM, Meikhail MS, El-Bana AA. Microbial activity and swelling behavior of chitosan/polyvinyl alcohol/sodium alginate semi-natural terpolymer interface containing amoxicillin for wound dressing applications. Biointerface Res Appl Chem. 2019;9(5):4368-73.
13. Alemán Navas RM, Martínez Mendoza MG. Case report: late complication of a dry socket treatment. Int J Dent. 2010;2010(1):479306.
14. Sirak SV, Sletov AA, Chitanava AD. Experience of alveolitis treatment with various antibacterial and hemostatic agents. Far Eastern Med J. 2013;2:56-8.
15. Birn H. Antifibrinolytic effect of apernyl in “dry socket”. Int J Oral Surg. 1972;1(4):190-4.
16. Anand KP, Patro S, Mohapatra A, Mishra S. The efficacy of tranexamic acid in the reduction of incidence of dry socket: an institutional double-blind study. J Clin Diagn Res. 2015;9(9):ZC25-8.
17. Solanki N, Patel Y. Drug utilization pattern and drug interaction study of antibiotics prescribed to orthopedic patients in private hospital. Arch Pharm Pract. 2019;10(4):114-7.

18. Sergeevna SM, Efimovna LE, Irina K. Pharmaceutical consultation as a basis for drug care continuity. Pharmacophore. 2020;11(4):76-82.
19. Ali GW, Abd El-Moez SI, Abdel-Fattah WI. Synthesis and characterization of nontoxic silver nano-particles with preferential bactericidal activity. Biointerface Res Appl Chem. 2019;9(6):4617-23.
20. Garipov R, Davtyan A, Diachkova E, Volkova M, Repina S, Tarasenko S. Efficiency and microbiological substantiation of the use of Er: YAG and Nd: YAG lasers in patients with inflammatory diseases of the peri-implant and periodontal tissues. Biointerface Res Appl Chem. 2021;11(3):10141-7.
21. Haraji A, Rakhshan V, Khamverdi N, Alishahi HK. Effect of intra-alveolar placement of 0,2% chlorhexidine bioadhesive gel on dry socket incidence and postsurgical pain: a double-blind split-mouth randomized controlled clinical trial. J Orofac Pain. 2013;27(3):256-62.
22. Cho H, Jung HD, Kim BJ, Kim CH, Jung YS. Complication rates in patients using absorbable collagen sponges in third molar extraction sockets: a retrospective study. J Korean Assoc Oral Maxillofac Surg. 2015;41(1):26-9.