



Current Treatment Methods for Dry Socket (Alveolar Osteitis) — Literature Review

Piotr Zdziebło¹, Anna Bieniasz², Maria Sitko³, Dominika Stolarczyk⁴, Aleksandra Bąk⁵, Katarzyna Agopsowicz⁶, Katarzyna Blicharz⁷, Martyna Biernacka⁸, Anna Zdziebło⁹, Michalina Piwowa¹⁰

¹Medical Dentistry Doctor, Medical University of Lublin, Faculty of dentistry, al. Raclawickie, 120-059 Lublin, Poland; ²Student, Jagiellonian University Medical College ul. Świętej Anny 12, 31-008 Kraków, Poland; ³Student, Jagiellonian University Medical College ul. Świętej Anny 12, 31-008 Kraków, Poland; ⁴Student, Jagiellonian University Medical College ul. Świętej Anny 12, 31-008 Kraków, Poland; ⁵Student, Jagiellonian University Medical College ul. Świętej Anny 12, 31-008 Kraków, Poland; ⁶Medical Dentistry Doctor, Medical University of Warsaw, Faculty of dentistry Żwirki i Wigury 61, 02-091 Warszawa, Poland; ⁷Student, Medical University of Silesia, Faculty of Medical Sciences in Zabrze, plac Traugutta Street 2, 41-800 Zabrze, Poland; ⁸Student, Medical University of Warsaw, ul. Żwirki i Wigury 61, 02-091 Warszawa, Poland; ⁹Student, University of Rzeszów, College of Medical Sciences, al. Rejtana 16c, 35-959 Rzeszów, Poland; ¹⁰Student, Medical University of Silesia, Faculty of Medical Sciences in Zabrze, plac Traugutta Street 2, 41-800 Zabrze, Poland.

ABSTRACT

Alveolar osteitis (AO), also known as post-extraction alveolitis, is one of the most frequently encountered complications following tooth extraction. Its etiology is multifactorial. Dry socket is common name for this complication. It may result from the failure to form a blood clot, its disintegration, or loss. The sharp pain is the main symptom of this condition. It can significantly reduce the patient's quality of life. Sometimes, in an effort to help the patient, doctors resort to systemic antibiotics. In strictly defined cases, especially in immunocompromised individuals, the preventive use of antibiotics before and after the procedure appears to be justified. However, such management during routine extractions in patients with a properly functioning immune system is considered a medical error. Experts emphasize that antibiotics are often overused and misused in dentistry. It must be acknowledged that dentists share responsibility for the rapidly growing problem of bacterial resistance to antibiotics.

In clinical practice, many treatment protocols are used for managing dry socket. There is a growing body of evidence supporting primarily local treatment of this complication. With the advancement of medicine, increasingly newer and more effective methods of managing this condition are being introduced. The most recent literature is focusing more and more on methods based on the latest scientific and technological achievements.

Key Words: Dry socket, Dry socket treatment, Alveolar osteitis, Dentistry, Inflammation, Alveolitis, Tooth extraction risks

INTRODUCTION

Alveolar osteitis (*lat. alveolitis sicca*) is an inflammatory condition of the alveolar bone, with an incidence ranging from 1% to 5% of all extractions and up to 38% in the case of third molar extractions, more frequently in women. In dry socket, the exposed bone is deprived of blood clot or healing epithelium, leading to inflammation of the nerve endings.¹ The socket appears empty or filled with grayish necrotic tissue, and sometimes with food debris. The main symptoms of post-extraction alveolitis include pain (typically between the 1st and 5th day after extraction), halitosis, and regional lymphadenopathy.

The etiology of dry socket is multifactorial. Systemic factors such as immune competence, age, sex, and nutritional status

are believed to play a role. Local factors predisposing to the occurrence of this complication include: poor oral hygiene, smoking, traumatic extraction, mechanical injury or loss of the blood clot, use of anesthetics with vasoconstrictors, and hormonal influences. The role of specific bacterial flora promoting fibrinolytic activity is also suggested.³⁻⁷ To minimise the risk of developing this complication, the following are recommended:

- General infection prophylaxis in dentistry, where maintaining proper oral hygiene and adherence to principles of asepsis and antisepsis around the procedure are of key importance. This includes the use of preoperative mouth rinses containing chlorhexidine;

Corresponding Author:

Piotr Zdziebło, Medical Dentistry Doctor, Medical University of Lublin, Faculty of dentistry, al. Raclawickie, 120-059 Lublin, Poland.
Email: piotrzdzieblo@op.pl; <https://orcid.org/0009-0000-9291-8406>

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- Atraumatic and minimally invasive tooth extractions;
- Smoking cessation or reduction during the postoperative period;
- Avoiding extractions between days 1 and 22 of the menstrual cycle in women;
- Rinsing the socket with sterile saline solution before suturing;
- Filling the post-extraction socket with PRF (Platelet-Rich Fibrin) preparation;
- Recommending the use of chlorhexidine-based rinses or gels by the patient in the postoperative period.^{8,9,10}

MATERIALS AND METHODS

The current literature was studied and collected to present commonly used treatment methods of dry socket and those methods, whose use requires further research. The purpose of this study was to review the most recent available literature on current treatment methods for dry socket. In order to create a review article a comparative analysis of articles available in Pubmed, Google Scholar and scopus databases was performed using the following keywords dry socket, dry socket treatment”, alveolar osteitis, dentistry, inflammation, alveoliti, tooth extraction risks: After reviewing the titles and abstracts, 35 articles and articles cited in them were obtained and analyzed in detail.

RESULTS

What follows is a summary of the most popular methods for treating dry socket (AO).

Chlorhexidine (CHX) is a biguanide derivative and is a popular antiseptic used in medicine and dental practices due to its antibacterial properties. Its action involves damaging the bacterial cell membrane. Chlorhexidine has strong bactericidal effects on Gram-positive bacteria, weaker effects on Gram-negative bacteria, and some viruses. Additionally, it reduces the amount of dental plaque. BlánaidDaly conducted a study where participants underwent extraction of third molars. He proved that rinsing the oral cavity with chlorhexidine (0.12% and 0.2%) before the procedure reduced the likelihood of developing dry socket. He also observed that post-procedural application of chlorhexidine gel (0.2%) significantly reduced the incidence of this complication.⁸ Although there is sufficient evidence supporting the effectiveness of using chlorhexidine in pre- and post-operative protocols, dental professionals should exercise caution when using chlorhexidine, considering the possibility of hypersensitivity to this agent.^{11,12,13}

Recent studies report the effectiveness of hyaluronic acid (HA) in treating post-extraction dry socket. Hyaluronic acid is a natural polysaccharide from the glycosaminoglycan

group. HA is a substance naturally produced by the body, which supports the healing process, reduces inflammation, and has no side effects.⁶ The positive effect of hyaluronic acid on the healing of post-extraction sockets was demonstrated in a study by Domic and others. They showed a significant reduction in post-operative pain over 7 days after the administration of HA into the socket following surgical extraction of lower third molars. In another study, Suchanek and others described the beneficial effect of 2.5% hyaluronic acid combined with octenidine dihydrochloride in sponge form. The treatment protocol involved irrigating the socket with a 2 ml 3% hydrogen peroxide solution and 2 ml of injection water. Fifty-eight patients diagnosed with AO were studied. A subjective pain intensity scale (VAS) was used for measurement. A significant improvement was observed in 96% of patients with no side effects.⁷

Alveogyl (Septodont, Inc, Wilmington, DE) is a popular antiseptic and analgesic paste used for treating dry sockets and pathological pocket inflammation. Its active ingredients include eugenol (which has analgesic properties), butampryr (an anesthetic), and iodoform (with antibacterial properties).¹⁴ A study was conducted comparing the effectiveness of preparations placed inside the socket: Alveogyl and freshly mixed zinc oxide with eugenol (ZNO) in paste form applied to a piece of gauze. After using the Alveogyl dressing, pain relief was significantly faster than with the ZNO, and accelerated healing of the socket was also observed.¹⁵

Recent reports suggest the justification of using honey in the treatment of AO. This fact should be treated more as a curiosity. Studies showed that placing honey in the dry socket during a one-week observation period had a positive effect on parameters such as: pain, healing of the wound edges, granulation tissue formation, and reduction of CRP levels.

No side effects were observed during the therapy.^{16,17}

Honey has antibacterial, anti-inflammatory properties, helps maintain appropriate moisture levels in the wound, and stimulates blood cells to produce cytokines, primarily interleukin-1, interleukin-6, and tumor necrosis factor. The antibacterial properties of honey are attributed to an enzyme called hydrogen peroxide. The physical properties of honey ensure protection of the socket through the formation of an osmotic barrier. The creation of a moist environment prevents the surrounding tissues from adhering.¹⁸

An increasingly popular treatment is local application of PRF. Platelet-rich fibrin (PRF) is an autogenous biomaterial obtained from the patient's blood. Blood is drawn and centrifuged to obtain a fibrin membrane rich in platelets, leukocytes, cytokines, and growth factors. PRF also initiates the release of platelet-derived growth factor (PDGF), transforming growth factor (TGF), and thrombospondin-1, which support cell adhesion.

The growth factors, including vascular endothelial growth factor (VEGF) found in PRF, promote angiogenesis, accelerating the healing of tissues and being utilized in AO treatment. Additionally, the physical properties of the fibrin membrane, its elasticity and flexibility make it an easy to manipulate material.^{19,20}

In recent years, the use of PRF has gained popularity among dentists and maxillofacial surgeons. It is used to accelerate wound healing after the procedure, alleviate post-operative pain, and minimize the risk of adverse effects, including dry socket.^{20,21,22}

Unlike most painkillers, the use of PRF has no side effects.²² Unfortunately, there is a lack of studies on the frequency of recurrence of dry socket after using this treatment. Clinical outcomes could improve if this method were combined with laser therapy and advanced antimicrobial agents.^{20,23}

Dental curettage was considered a controversial method.^{24,25,26,27} Dry socket results from the disintegration of the blood clot in the socket. The purpose of curettage in treating dry socket is to remove remnants of the abnormal clot from the socket. Opponents of this method referred to studies where no reduction in healing time was proven compared to other methods, difficulties in the formation of a new clot, and emphasized the pain and increased bleeding during the procedure. In a study by Mosaad Abdaljawwwadi and others, positive results were observed with curettage in all four patient groups treated with different treatment protocols.²⁴ Removal of the old clot was intended to create an anatomical, safe space for the formation of a new socket wall. After curettage, it is important to rinse the socket with saline or sodium hydroxide solution.^{23,24} Positive results were also obtained for rinsing the socket with warm saline solution and using collagen sponges.²⁸

Although dry socket is not directly caused by bacterial infection, in some cases, dentists decide to use antibiotics. *Antibiotics* can be administered both locally and systemically. However, this is not routinely recommended due to the possible post-antibiotic modification of the oral microbiome and the development of antibiotic resistance.^{23,28} Studies have shown that prophylactic antibiotic administration after the

extraction of third molars reduces the risk of developing AO by 34%. Among preoperative antibiotics, clindamycin was the most effective in the studies, while amoxicillin was most commonly used postoperatively in dental practice. Other antibiotics used include combinations of amoxicillin with clavulanic acid, azithromycin, and metronidazole.^{29,30,31}

Low Level Laser Treatment (LLLT) can be an effective alternative to conventional methods for treating and preventing dry socket syndrome. It is a minimally invasive method with no side effects. It reduces pain, accelerates the healing process, and has a preventive effects.^{32,33,34} In the study by Es-hghpour, participants were divided into three groups. In the group using a diode laser with a wavelength of 810 nm, pain relief occurred within three days. In the group treated with Alvogyl, a rapid onset of pain reduction was noted. In the group treated with a laser of 660nm wavelength, pain relief occurred more slowly but steadily, providing an advantage over Alvogyl.³² Another study showed that LLLT resulted in faster pain reduction in the VAS scale compared to the use of acetylated glucomannan.^{33,34}

The healing process was shortened during both red and infrared light laser therapy, indicating its preventive potential. Photobiomodulation performed in the first week after surgery reduced the risk of developing AO.³⁴

Ozone therapy can be used as a form of adjunctive treatment for dry socket syndrome. It has anti-inflammatory properties and accelerates tissue regeneration. Its antibacterial action reduces the risk of infection, which is important when treating wounds. In practice, ozone therapy can be applied by administering ozone gas or ozonated water directly into the socket area.

In the study by Smucler et al., it was shown that ozone water therapy shortened the treatment time by 6 days (from 9.39 to 3.37 days) and reduced the number of follow-up visits from 4.27 to 3.37.³⁵

Moreover, Ghosh et al. found that ozonated water was more effective than regular saline and povidone-iodine after surgical removal of impacted third molars.³

Table 1: Comparison of new promising methods in AO therapy

Honey ^{16,17,18}	Ozone therapy ^{3,35}	Low Level Laser Treatment ^{32,33,34}	Platlet rich fibrin (PRF) ^{19,20,23}	Hialuronic acid ^{6,7}
Natural, anti-inflammatory, antibacterial, anti-adhering properties.	Anti-inflammatory, regenerative potential, accelerating healing	Analgesic, accelerating healing, preventive	Analgesic, accelerating healing, preventive	Natural, anti-inflammatory, accelerating healing
No side effects		No side effects		No side effects

Table 2: Conventional methods in AO therapy

Dental curettage ^{24,25,26,27}	Chlorhexidine ^{11,12,13}	Alveogyl ^{14,15}	Antibiotics ^{23,28,29,30,31}
Enable to create physiological space	Antibacterial, antiviral	Analgesic, anesthetics, antibacterial	Antibacterial
Possible: increasing bleeding, emphasizing pain,	Possible: hyperintensity		Possible: Resistance for antibiotics

DISCUSSION

In the article by Maria Taberner-Vallverdú, it is emphasized that due to the variability of interventions and the type of measurement scale used, it is difficult to compare the effectiveness of different treatment methods. In the case of dry socket, both curettage and socket irrigation can be considered, as well as other therapies such as LLLT, zinc oxide with eugenol, or platelet-rich plasma, which show good results in pain remission and healing of the socket mucosa.²⁸

Standard treatment involves curettage and irrigation of the socket with saline solution.^{23,24,28} To the prepared socket, pain-relieving and anti-inflammatory medications can be applied. Alveogyl is frequently used for this purpose, as it alleviates pain, protects against infection, and soothes the sensitive tissue of the socket. Salicet patches (acemannan in hydrogel form) can also be applied. Eugenol with zinc oxide can also be administered. Of the treatments mentioned, Alveogyl seems to be the most effective.^{15,25} Dentists also secure the edges of the wound with sutures, and some opt to use antibiotics, although this is not recommended.^{23,26,28} Chlorhexidine also has good antiseptic properties, but the possibility of hypersensitivity should be taken into account.^{11,12}

According to the latest research, laser therapy appears to shorten treatment time and more effectively reduce pain than Alveogyl, Salicet, or eugenol.^{32,33}

The study on ozone therapy in AO treatment presents very promising results, indicating that ozone therapy significantly shortens the treatment process compared to standard treatment methods. Similarly promising results are shown for treatment with PRF, which supports the regeneration process and promotes vascularization.²²

Both laser therapy, the use of PRF, and ozone therapy appear to be free from side effects, while demonstrating high effectiveness^{22,28,29}.

CONCLUSION

There is no single effective method for treating AO. The treatment approach should be tailored to the patient's profile, taking into account all the advantages and disadvantages of the methods mentioned above.

DISCLOSURE

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