

Update on Management of Alveolar Osteitis (Dry Socket): A Review of The Literature

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ABSTRACT

An inflammation of the maxilla or mandible's alveolar process is known as alveolar osteitis (AO). The disease is usually self-limiting, but it can occasionally persist for up to seven days after extraction. It is characterized by dull, radiating discomfort that can affect the neck, eyes, or temple. Despite the fact that dry socket has been known about for over a century, its etiology is still not well understood, and there are many different treatment options with variable results. This review's objective is to look into upgrades for dry socket management. The three types of treatment endeavors were regenerative techniques, conventional approach, and empirical methodology. While contemporary therapeutic approaches influence angiogenesis and granulation tissue production, earlier approaches focused on controlling pain, preventing infections, and resolving inflammation. These later arsenals employ laser and ultrasonic technology to induce and disseminate tissue regeneration while using blood-based consumables like platelet-rich plasma.

Keywords: Dry socket, Alveolar osteitis, Low Level Laser Therapy

INTRODUCTION

In post-extraction sockets, the term "dry socket" describes a situation in which part or all of the bone inside the socket, or around the occlusal perimeter of the socket, is visible in the days that follow the extraction. This is because the bone is not covered by a layer of

vital, persistent, healing epithelium, or by an initial and persistent blood clot. Alveolar osteitis or fibrinolytic osteitis are other names for it. The majority of the time, this issue appears two to three days following tooth extraction [3]. Patients may have frequent acute pain as a result of their inability to stop food particles or their tongue from mechanically stimulating the exposed bone, which is extremely uncomfortable to the touch. Roughly 1% to 5% of all extractions and up to 38% of mandibular third molar extractions result in dry socket lesion [1,2]. It happens frequently in patients who are well and those who have medical problems, although it rarely happens in children.

The genesis of dry socket has been linked to a number of factors, including trauma from forced tooth extraction, excessive use of vasoconstrictors during local anesthetics, infection, forceful mouth washing that removes blood clots from the socket, usage of contraceptives, and heavy smoking [4]. An other potential mechanism is an increase in local fibrinolysis at the wound site [5]. Dry socket is more common in patients with diabetes or other immunocompromised diseases. Additionally, it was discovered that ischemia, which results in a weak or decreased blood supply, causes the frequency of alveolar osteitis to rise with infiltration anesthesia [6]. Birn's 1973 research shown that the presence of tissue activators activates plasminogen to plasmin and increases

fibrinolytic activity in dry sockets [7]. In a typical post-extraction socket, fibrinogen and thrombin combine to produce a fibrin clot. The epithelium migrates over this. Before osteoproliferation begins, the clot breaks down because of fibroblast activity and fibrinolysis caused by plasmin. New blood vessels sprout into the clot during granulation tissue formation [8]. When inflammation occurs, plasminogen in the blood is either directly or indirectly activated, which releases kinases. There are two types of activators for the plasminogen pathway: direct (physiologic) and indirect (non-physiologic). Following trauma, direct activators are released into the alveolar bone cells. Bacteria release indirect activators [9, 10]. This study aims to do a brief overview of the dry socket management updates.

MATERIALS & METHODS

From January 2000 to December 2023, a comprehensive search of the PubMed, Science Direct, Scopus, and Medline literature databases was carried out. Dry socket, or alveolar osteitis, or post-extraction complication, or alveolar osteitis management, or treatment of dry socket, or treatment of alveolar osteitis, or treatment of pain following tooth extraction, or management of tooth-socket healing were among the sets of keywords included in the search. Clinical trials conducted on healthy patients with appropriate controls that were conducted in English and directly related to the local treatment of alveolar osteitis or dry socket were the only studies that met the inclusion criteria. We carefully reviewed articles on managing pain after tooth extraction, managing pain after the extraction, and managing tooth-socket healing. We only approved studies that addressed dry socket conditions. The chosen publications were perused and analyzed with an emphasis on treatment methodology, materials, drugs, and technologies utilized, as well as the active ingredient utilized, the recommended dry socket healing mechanism, and the treatment result attained.

TREATMENT METHODS

The therapies used in this review are part of the "empirical approach" to treating dry socket and include vitamin C, aloe vera, honey, and turmeric [11]. In this sense, the term "remedy" refers to a drug that either temporarily reduces symptoms of an illness or injury, or in rare cases, can completely heal it. Dry socket remedies have been used for ages to manage wound healing and are now frequently prescribed in both allopathic and alternative medicine. Aloe vera, honey, and turmeric are natural remedies that are used as dietary supplements. The honeybee, *Apis mellifera*, gathers and processes nectar to create honey. It is a syrup that is high in carbohydrates and is made from the nectars and secretions of flowers and other plants [12]. Since ancient times, honey has been utilized in folk medicine. More recently, medical researchers have recognized the benefits of honey for treating both acute and chronic wounds [13]. A perennial plant native to South East Asia and India, turmeric has been shown to provide therapeutic benefits for wound infection [14]. Shrubby and xerophytic, aloe vera is a green plant that grows mostly in arid regions of Africa, Asia, Europe, and America. Antioxidant vitamins A (beta-carotene), C, and E are present in this essential nutrient [15]. Calcium, copper, magnesium, potassium, and zinc are found in aloe vera and are necessary for the correct operation of several enzyme systems in several metabolic pathways [16]. Aloe vera, honey, and turmeric all have analgesic, anti-inflammatory, antioxidant, and antibacterial properties. They also help the body fight infection by promoting immunomodulation. Strong antioxidant vitamin C gel is inserted into the socket and stimulates collagen synthesis to aid in tissue healing [11, 17]. Compared to other pharmacological therapies, the remedies' strengths are that they are non-toxic and do not cause recognized allergies. Furthermore, the treatments we reviewed are essentially food supplements that are available over-the-counter and have a good success rate in supporting dry socket. To guarantee safety,

quality control, and professional licensing requirements, however, the clinical use of treatments in dry socket will necessitate the relevant clinical and scientific investigations. Medication and medicines are recommended for local treatment in conventional treatment for dry socket. The process starts with irrigation and the formation of a new blood clot, then gently curettages the slough in the socket. Only physiological saline solution or other irrigant solutions, such as hydrogen peroxide and chlorhexidine, may be used as the irrigation solution [18]. The next step is to insert a dressing into the socket, which may contain antibiotic dressings like chlortetracycline, rifampicin, Clin-Damycin, and metronidazole gel, or medications like alvogyl, zinc oxide eugenol, oil of clove/eugenol, antihomotoxic, colloidal silver, and SaliCept [19, 20]. Because curettage and wound debridement are the cornerstones of managing poorly healing wounds, and because the formation of a new clot stimulates the wound healing mechanism by reiterating the clotting, inflammatory, and proliferative phases, this therapeutic approach is regarded as "conventional." It is debatable and has both advantages and disadvantages when new therapeutic dressings are inserted into the socket after the wound healing cascades have been "re-freshened." This review demonstrates that the most widely used dry socket dressings over time have been alvogyl, zinc oxide eugenol, eugenol, and Neocone. Alvogyl is an alveolar hemostatic and analgesic paste made of Penghawar fibers that has a fibrous consistency and good adhesion [21]. It is a self-eliminating, one-step procedure that doesn't need sutures or extra attention [22]. When intra-socket dressings are inserted tightly, other studies have shown damage to the granulation tissue within the healing dry socket. Additionally, high doses of these materials may have cytotoxic effects on stem cells, inhibiting active angiogenesis during the proliferative phase [23, 24].

The main objective of dry socket treatment is thought to be pain management. Direct

application of topical anesthetic gel to the dry, exposed bone appears to provide quick, efficient relief; however, unlike eugenol and GECB, it has no further antibacterial or cellular healing properties. Eugenol, the active ingredient in zinc oxide eugenol (ZOE), possesses stronger analgesic, sedative, and anodyne effects than alvogyl. It also possesses antimicrobial qualities. Eugenol on its own is an allyl chain-substituted guaiacol, a chemical molecule that belongs to the allylbenzene class. It is a colorless, aromatic essential oil that is derived from cinnamon, nutmeg, and clove oil. Compared to alvogyl or ZOE, it smells significantly stronger and is pleasant and spicy. This characteristic lessens discomfort and adds to the calming, euphoric aroma.

Neocone is an antibiotic-analgesic medication that contains polymyxine B sulfate, which acts on spirochetes, gram positive bacteria, and gram negative bacteria by inhibiting tyrothricin [25]. When used in conjunction with tetracaine hydrochloride as a local anesthetic, it has analgesic effects. Because colloidal silver is effective against streptococcus mutans, sangius, and salivarius, it is frequently used as a general wound dressing. There aren't any oral, FDA-approved over-the-counter or prescription medications that include silver at this time. Nonetheless, colloidal silver products are still accessible as dietary supplements and homeopathic treatments, along with Traumeel, which shown good results in the treatment of dry socket [19].

Traumeel is an anti-inflammatory lotion that contains 96% ethanol, liquid and solid paraffin, purified water, and cetostearyl alcohol. Compliant with German Homeopathic Pharmacopoeia (HAB) [25] during manufacturing. Then, these substances are referred to as "anti-homotoxic drugs"; they are mixtures of homeopathically manufactured herbal, mineral, biological, pharmaceutical, and/or biopharmaceutical constituents. Dental professionals will need to carefully consider their use and receive advice from the appropriate drug authorities' inquiry services.

For a clean socket bed to start healing, socket irrigation with the right solution is required. Antiseptics or antibiotic irrigating solutions that would improve the procedure are preferred by dentists. Hydrogen peroxide appearing to be one of the more traditional options [25] from the literature. This is based on historical reports of the use of hydrogen peroxide to treat orthopedic and general surgery wounds. It is also particularly useful in dental surgery, where its potent oxidizing agent causes food debris from the dry socket site to ooze and bubble out while releasing oxygen and killing anaerobes. But because hydrogen peroxide is corrosive, it has mostly been replaced.

Dental professionals should be aware of the implications of using antibiotic irrigant solutions, which are clinically effective but controversial because they raise concerns about the global issue of emerging antibiotic resistance in the community. Examples of these antibiotics include clindamycin, rifampicin, and chlortetracycline. These solutions are used at low doses topically, and their use is currently raising controversy [20, 25]. By reducing the number of anaerobes and increasing the amount of multi-resistant microorganisms, this therapy significantly altered the microbiota of the extraction socket [25].

Blood-based product delivery increases the potential for healing in dry socket wounds [26]. The patient's own blood is used to create Platelet-Rich Plasma (PRP), Platelet-Rich Fibrin (PRF), and Concentrated Growth Factors (CGF), a concentrated cocktail of growth factors that dictate the fate of cells during the proliferative stage of wound healing. The growth factor proteins, such as fibroblast growth factor and vascular endothelial growth factor, which stimulate angiogenesis and aid in the deposition of fibro-vascular granulation tissue on the dry socket wound bed, supply the signals required for cell proliferation and differentiation. A fast and healthy granulation tissue production approach is essential for wound healing [27, 28].

In order to accomplish photobiostimulation of the repairing cells during the proliferative stage in dry sockets, other technologies like Low Level Laser Therapy (LLLT) may also be used, leading to restorative effects akin to growth factor stimulation [25]. In a prospective randomized clinical trial, LLLT showed superior outcomes over Alvogyl alone. Further evidence of its effectiveness in pain management was provided by Kaya GS et al. When 104 dry socket patients were compared, LLLT outperformed both conventional medications, Alvogyl and SaliCept patch.

Their findings were explained by the molecular role that LLLT plays in improving immunomodulation and promoting the growth of healing cells. Aqsa et al. observed that LLLT exhibited a 4-day delay in granulation tissue growth and pain management when compared to CGF. In their investigation, they found that CGF-treated socket repair outperformed LLLT in producing 75% granulation tissue and totally removing pain symptoms by day 7 after treatment. They came to the conclusion that CGF is more effective than LLLT at producing granulation tissue, relieving pain symptoms within the first seven days after treatment, and facilitating an early restoration to regular oral functions [28]. After Low Intensity Pulsed Ultrasound (LIPUS) treatment, mechanotransduction actions may improve the tooth socket's ability to heal. In order to convert these external physical impulses into intracellular downstream biochemical signals, integrin is stimulated by the mechanical energy that ultrasound waves impart to the extracellular matrix. examined how LLLT and LIPUS affected the management of pain following tooth extraction and discovered that the LIPUS Group had considerably reduced pain scores than the LLLT Group. It has also been demonstrated that signal transduction with LIPUS promotes early bone repair in the tooth socket around dental implants [25].

CONCLUSION

Dry socket is a prevalent dental issue that has been treated in a variety of ways with different results. The management of dry sockets is updated in this article. The recommended invasive technique in this evaluation is gentle curettage followed by irrigation of the socket under local anesthesia. Alvogyl, ZOE, oil of clove, and other products with sedative and analgesic qualities that promote pain relief are the most effective in the early stages of dry socket intervention; in contrast, anti-inflammatory products like honey, turmeric, colloidal silver, and CECB pastille took a little longer to produce relief. For a dry socket to heal, granulation tissue development is essential. Modern therapeutic approaches to dry socket management modify angiogenesis, granulation tissue creation, and tissue regeneration targets; earlier approaches focused mostly on pain control, infection avoidance, and inflammation resolution. Subsequent arsenals comprise the application of bioactive goods, such as concentrated growth factors and platelet rich plasma; LLLT and LIPUS, which can start and spread fibro-vascular tissue invasion into the socket and finish the first stage of the healing process. While regenerative approaches to dry socket healing are supported by current research, the traditional strategy of managing infection, inflammation, and discomfort still holds sway.

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