

Review Article

Literature review of dry socket: etiology, pathogenesis, prevention, and management

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ABSTRACT

Dry socket/alveolar osteitis is a detrimental and excruciatingly painful post-extraction condition of the socket caused by the breakdown of a clot leading to the denudation of the socket that exposes underlying bone that is not protected by a blood clot or healing tissue and persists within or around the alveolus for days after the surgical tooth extraction with or without halitosis and suppuration. It is inevitable that dry socket will develop during routine oral surgery or dental procedures. The common factors that cause dry socket are smoking, poor oral hygiene, traumatic extractions caused by inexperienced dentists, previous bacterial infection, inflammation, fibrinolysis, and systemic disorders, in conjunction with oral contraceptives, menstrual cycle, and rapid irrigation of the socket after extraction with normal saline. The management of dry socket is directed towards palliative care. A substantial amount of research is required to provide a definitive treatment choice for dry socket. This literature review focuses on the pathogenesis, prevention, and management of dry socket.

Keywords: Dry socket, Alveolar osteitis, Extraction, Fibrinolytic activity, Oral contraceptives, Alveogyl

INTRODUCTION

Alveolar osteitis also known as dry socket is one of the most common postoperative complications after surgical removal of a tooth occurring 3 to 5 days after an extraction. It is a very painful inflammatory condition caused by the disintegration of the clot most commonly due to the fibrinolytic activity. The socket appears as a denuded sensitive bone covered in a film of grayish-yellow debris and necrotic tissue.^{1,2,3} Gingival inflammations is frequently associated with the presence of halitosis as well as ipsilateral regional lymphadenopathy. The pain and discomfort is usually localized however, it can radiate to the auricular and the temporal region. It can also radiate towards the ocular and the frontal region through the involvement of maxilla though this involvement is rare.^{3,4}

Dry socket occurs in 0.5-5% of regular extractions but in the extractions of impacted mandibular third molars it can reach up to 38%.^{3,5,6} Some other terminologies for dry socket are alveolitis sicca dorosa, localized osteitis, localized alveolar osteitis, necrotic socket, fibrinolytic alveolitis, septic socket, necrotic socket, localized osteomyelitis, and alveolalgia.^{7,8}

SIGN AND SYMPTOMS

A mixture of saliva and food debris may fill the socket. A slough can be present sometimes. The gingiva around the tooth can present redness, inflammation, tenderness, and oedematous. In most cases, there are no suppuration, swelling, or signs of a systemic infection, such as a fever or a systemic disturbance.

Following tooth extraction, over the first 24 hours patients' reports reduction in pain followed by a severe, debilitating, constant pain that continues to grow through the night, becoming most intense at 72 hours post-extraction. It is associated with foul taste and halitosis.⁶

PATHOGENESIS

Localized fibrinolysis (the conversion of plasminogen to plasmin, which dissolves fibrin crosslinks) within the socket leading to the loss of the blood clot is assumed to support the etiology of the dry socket.^{4,6} The plasminogen pathway can be activated directly (physiologically) or indirectly (non-physiologic). Tissue plasminogen activators and endothelial plasminogen activators are examples of direct extrinsic activators. Plasma components such as factor XII and urokinase are direct intrinsic activators. Trauma results in the release of direct activators to the alveolar bone cells whereas indirect activators are released by bacterial toxins.^{9,10}

Other risk factors that are responsible for the occurrence of dry sockets are mentioned as follows:

Age/gender

The age distribution in dry socket is influenced by the fact that the peak incidence occurs after the eruption of third molar usually between 20 to 40 years of age.^{3,11-13} Older adults are more likely to have dry socket than younger people due to the chances of decreased immunity.⁸ In a series of 4000 extractions, it was found that women had 50% higher chances of developing dry socket than men, although no difference was found in the incidence of dry socket related to gender by Colby.^{7,11,14}

Tobacco smoking/poor oral hygiene /pre-operative bacterial infection

Many authors demonstrated a statistical link between smoking and post-operative complications like dry socket. The prevalence of dry socket was substantially higher among smokers (12%) than in non-smokers (4%). It has been found that patients who have poor oral hygiene, as well as pre-operative periodontal infection at the site of extraction, are at higher risk of developing dry socket.¹⁵ *Streptococcus mutans* was linked to the development of dry socket as well as delayed healing at the extraction site.⁸

Operator's experience/surgical trauma /excessive irrigation and curettage of alveolus

Inexperienced surgeons may cause more trauma during extraction, particularly during surgical extraction of mandibular third molars. There is a higher incidence of dry socket when the extraction is performed by an inexperienced dentist, according to Oginni et al.^{8,16,17} Many writers reported that the most prevalent cause of

dry socket is trauma during surgical extraction of a single tooth.

The prevalence of dry socket after single extraction was 7.3 percent and 3.4 percent after several extractions, according to one study.^{10,18} It has been proposed that excessive irrigation and curettage may interfere with clot formation and harm the alveolar bone.^{4,7,8}

Medications

Dry socket is caused by medications such as oral contraceptives. According to one study, females who use oral contraceptives have an increased risk of developing dry sockets.^{19,20} Sweet and Butler discovered that an increase in the usage of oral contraceptives correlated with an increase in the occurrence of dry socket.^{2,7} Estrogen may play an important function in the fibrinolytic process. It is thought to increase factors II, VII, VIII, X, and plasminogen to stimulate blood clot lysis.^{7,21}

Design of flap/sutures

According to certain researches, the design of a flap and the application of sutures have an impact on the development of dry socket.²² As per one study, the modified triangle flap is more effective than the buccal envelope flap in reducing the incidence of dry socket.^{15,23}

Systemic condition

Dry socket may occur as a result of a defective or altered healing process due to immunocompromised conditions such as hypertension, diabetes mellitus.^{16,24} However, no evidence exists to prove any association between systemic diseases and dry socket.

PREVENTION AND MANAGEMENT

As dry socket is the most prevalent postoperative complication following extraction, several researchers have attempted to develop a viable preventative technique. There are numerous approaches and various strategies proposed to aid in the prevention of dry socket. As prevention is better than cure.

Systemic and topical antibiotics are said to be quite effective in the prevention of dry socket but their use is reserved for patients with compromised immune systems or multiple previous episodes of dry socket. Systemic antibiotics that are commonly used are clindamycin, penicillin, and metronidazole whereas among topical antibiotics tetracycline delivered in the form of powder, aqueous suspension, gauze drain and Gelfoam sponges are found to be very helpful according to many studies.^{8,25-28}

The other most effective antimicrobial therapy is chlorhexidine mouthwash in the concentration of 0.12%.

Most studies have found that the pre and perioperative use of chlorhexidine mouthwash greatly reduces the incidence of dry socket.^{14,28} However, some patients might complain of brown staining, but it is temporary and can be corrected by polishing.

Some studies proposed eugenol-containing dressing to prevent dry socket because of their sedative effect although the irritating local action of eugenol and the delay in wound healing related to prophylactic packing made it difficult to defend its use to prevent dry socket.²⁹⁻³²

Corticosteroid though cannot prevent the occurrence of dry socket yet it plays an important role in reducing the post-operative complications of dry socket.^{8,33}

Antifibrinolytic drugs such as para hydroxybenzoic acid (PHBA) and tranexamic acid have been demonstrated to minimize the occurrence of dry socket. PHBA also has antimicrobial properties but has been shown in animal tests to hinder bone repair. Tranexamic acid, on the other hand, is not well accepted and has not been shown to lessen the occurrence of dry socket.^{34,35}

Many literature has supported intra alveolar dressing as a treatment of dry socket however, they are known to decrease the wound healing process according to some studies.

Multiple studies were conducted to evaluate the efficacy of intra-alveolar dressings, according to one study it was concluded that zinc oxide eugenol is more effective as compared to Alvogyl.³⁶ Some research reports that packing with alvogyl induce significant inflammation and delay wound healing.²⁹⁻³¹

Faizel et al, on the other hand, conducted a study in which he claimed that alvogyl is preferable as an initial pain reliever and that Neocone has been the dressing material of choice for the management of dry socket.³⁷

With current emerging branches of wound healing in dentistry concentrated growth factor (CGF) and low level laser therapy (LLLT) have developed effective treatment options. These strategies help in wound healing by natural regenerative abilities of cells at the molecular level. CGF and LLLT illustrated better wound healing with respect to alleviating pain, decreasing inflammation and generating granulation tissue compared to standard techniques. In terms of capacity, CGF outperforms LLLT to create granulation tissue and eradicate pain symptoms in the first 7 days of treatment.³⁸

CONCLUSION

Dry socket is an inevitable and self-limiting condition. Patient assessment is necessary to evaluate the risk factors common to dry socket like tobacco smoking, poor oral hygiene, pre-existing bacterial infections, or

compromised immunity. Operators can also prevent the incidence of dry socket by proper tissue and instrument handling during surgical extraction, irrigation, and proper medication before and after the extraction. There is no specific treatment for dry socket. The management is mostly directed towards palliative care by first irrigating the socket with chlorhexidine, then applying an Alvogyl dressing and prescribing effective oral analgesics. The dressing is usually replaced in every 2 to 3 days depending on the healing of the socket. However, studies on the management of dry socket lack sufficient investigation and definite answers. There is currently no broadly acknowledged prophylactic measure available. More research and investigation are required to reach concrete conclusions.

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