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REVIEW ARTICLE

Comprehensive review on alveolar osteitis

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Abstract

Background: Dry socket also termed as alveolar osteitis is a post-extraction complication encountered more frequently. The socket exhibits exposed bone and lacks blood clot. The patient with dry socket complains of severe pain after 24–72 h of extraction. Various risk factors such as smoking, surgical trauma, age, sex, medical condition, and radiotherapy are involved in the pathogenesis of dry socket. Primary aim of treatment includes relief of pain. **Aim:** The aim of the study was to review the occurrence of post-extraction dry socket, its etiopathogenesis, predisposing factors, preventive method, and treatment options for dry socket. **Conclusion:** Dry socket is the common complication encountered after the extraction of 3rd molars and causes severe pain. With the known risk factors, preventive measures the occurrence of dry socket can be avoided. Treatment includes palliative care such as irrigation, debridement, curettage, and packing the socket with eugenol to relief pain. New agents such as plasma rich in growth factors and GECB can also be used. **Clinical Significance:** In the routine daily scenario, dry socket can be encountered in any surgical or non-surgical extraction cases. To avoid the occurrence of dry socket, proper knowledge about its cause, the clinical symptoms of dry socket, preventive measures, and the precautionary steps to be taken should be known. One must also be aware of the treatment to be done when the patient comes up with dry socket.

Keywords: Alveolar osteitis, dry socket, non-surgical, prevalence, radiotherapy, smoking

Introduction

This review aims to discuss the dry socket, its etiology, treatment plan, and the methods to prevent dry socket. Dry socket also termed as alveolar osteitis is one of the complications of extraction wound healing. In this condition, some or all of the bone within the extraction socket is exposed in the days following extraction. It is due to the bone not been covered by a persistent blood clot or by a layer of vital healing epithelium.[1,2]

It is one of the common post-operative problem which results in severe post-operative pain inside and around the extraction socket, the pain increases between the 1st and 3rd day after extraction.[3] Dry socket is usually associated with the extraction of impacted third molar.[4] Dry socket was first described by Cranford in 1896. As the extraction socket becomes dry in appearance due to loss of blood clot, hence the term. Other names for dry socket include alveolar osteitis, alveolitis, localized osteitis, alveolitis sicca dolorosa, localized alveolar osteitis, necrotic socket, and alveolagia.[5,6]

Onset

The occurrence of dry socket is seen usually 1–3 days after extraction. Reports show that about 95% of dry socket cases have occurred within a week after extraction.

Frequency of dry socket

It has been reported that the occurrence of dry socket accounts for about 0.5–5% of normal non-surgical dental extractions, whereas in the case of surgical extractions, it accounts for about 25–30%.[7,8]

Common site of occurrence

It was suggested by Amaratunga and Senaratne that insufficient blood supply to mandible, its increased bone density and its decreased capacity of producing granulation tissue causes dry socket in mandible, thus mandibular 3rd molar region is the most frequent site of occurrence of dry socket.[9]

Clinical Features

On intraoral examination dry socket has following clinical presentation:[1,10-12]

Dry socket lacks blood clot. Empty socket devoid of blood clot is a characteristic feature of dry socket, the patient complains of severe pain almost about after 24–72 h of extraction. In a few cases, the pain may radiate to ear and neck. On clinical inspection, food debris may be seen accumulated in socket, when the accumulated food debris is removed empty socket

with bare exposed bone is seen which is very sensitive to touch and extremely painful. Denuded bone wall can be seen. There is no pyrexia, no lymphadenitis associated with it, but the patient may complain of headache, dizziness, and insomnia. Surrounding gingiva becomes inflamed and edematous. The patient experiences foul taste and marked halitosis.

Symptoms associated with dry socket include:[11,13]

- Dull aching, throbbing pain in the region of dry socket, which ranges from moderate to severe in intensity.
- Radiated pain to ear, neck, or temporal region.
- Pain occurs usually after the 2nd–4th day of extraction and can last up to 10–40 days.
- Severe pain which does not get relieved even after using strong analgesics.
- Oral malodor with foul taste is common in cases of dry socket.

Etiopathogenesis

Main cause of dry socket includes trauma during extraction, bacterial infection, medical history type of flap, smoking, systemic disorder, and use of oral contraceptive.[14,15] There are various theories on the etiology of dry socket. These include flap design associated with dry socket theory by Haraji *et al.*[16] which explained that the incidence of dry socket is less with a modified triangular flap as compared to the buccal envelope flap. Menstrual cycle associated with the dry socket by Eshghpour *et al.*[17] in this study, they concluded that the incidence of dry socket is more when the extraction is carried out during the middle of menstrual cycle than during the menstrual period. Association of smoking and occurrence of dry socket by Bortoluzzi *et al.*,[18] the study reported more development of post-operative complications and associated pain in smokers. Use of analgesic in the incidence of dry socket by Al-Sukhun *et al.*, etc.,[19] this study reported significantly higher cases of dry socket in patients on ibuprofen group as compared to those on celecoxib group and placebo group.

Birn (1973) suggested the increased fibrinolytic activity in dry socket and the increase in fibrinolysis decreases the dissolution of blood clot before 2nd day postoperatively. He also showed that plasmin like activity in dry socket was not seen in the normal extraction site. Only when kinases are liberated during inflammation through activation of plasminogen which leads to lysis of blood clot.[20-23]

Predisposing factors for dry socket include:[24,25]

- Gender (occurs more frequently in females): According to a study conducted by Khan,[26] females show a higher prevalence of dry socket with his result showing 3.7% of females showing dry sockets as compared to male with 2.6%. The reason for this as suggested by some researchers is attributed to the hormonal changes along with the oral contraceptive pills which can lead to the fibrinolytic action in blood and in saliva during the monthly menstrual cycle.[27,28]
- Age: As per some literature, there are more chances of occurrence of dry socket with an increase in age as older patients are at greater risk of post-operative complications.[29]
- Trauma: Traumatic extraction plays a significant role in the occurrence of dry socket. The reason considered by researchers is that due to the inflammation of bone marrow after traumatic extraction, there is more liberation of tissue activators.[30] Similarly, in a study by Lilly *et al.*., it was found that the occurrence of dry socket is more in surgical extraction cases as compared to nonsurgical ones.[31]
- Smoking: Various studies have shown the dose-dependent relationship between smoking and dry socket occurrence. The study by Butler *et al.*., where 4000 surgically extracted mandibular 3rd molars were studied, showed that smokers where 5 times more affected with alveolar osteitis as compared to non-smokers.[32] The reason for this would be the introduction of a contaminant in oral cavity, as suggested by Blum.[2]
- Systemic diseases: Systemic diseases can be associated with dry socket occurrence. Chances of occurrence of dry socket in diabetic patients or immunocompromised patients are more due to altered healing process.[33]
- Microorganism and bacterial infections: According to various studies, bacterial infections are major risk factors for the development of dry socket. According to a study by Rozantis *et al.*., there seems to be an association of *S. mutans* and *Actinomyces viscosus* in the occurrence of dry socket.[34,35]
- Local anesthetics with vasoconstrictor: Lehner, in his study, showed that with an increase in infiltration anesthesia, there is an increase in the frequency of occurrence of dry socket. The reason is attributed to the vasoconstrictor present in anesthesia which causes temporary ischemia leading to the poor blood supply.[36]

Prevention

Various methods have been introduced by researchers for the prevention of dry socket. These include:

- Administration of antibiotics such as penicillin, erythromycin, and clindamycin which have been reported to be effective in preventing the occurrence of dry socket.[37,38]
- Use of 0.12% of chlorhexidine pre- and post-operatively has been reported to be effective in the prevention of dry socket.[39,40]
- Eugenol containing dressing: It was noted that eugenol containing dressing is effective in decreasing the incidence of dry socket[41] as eugenol has anti-inflammatory and analgesic effect. It also interrupts the action potential and thus decreases pain.
- "Gelatamp" Colloidal Silver gelatin Sponge: According to Wang *et al.*, gelatamp colloidal silver gelatin sponge can prevent the occurrence of dry socket.[42-44]
- Mode of application: Under aseptic conditions, "Gelatamp" is removed once the aluminum seal is opened. It should be used immediately. Small sponge size can be adjusted to fit in the wound cavity without squeezing. Then, the sponge is placed immediately in the wound.

Mechanism of action

Gelatamp is hemostatic and bactericidal in action. It stabilizes the blood clot, promotes hemostasis and coagulation. Huge surface area promotes platelet aggregation and form clot also gelatamp is effective against wide range of microorganisms. It remains in the alveolus and gets resorbed completely within 4 weeks.[45]

Precautionary steps to be followed after extraction to prevent the occurrence of dry socket:[46]

- Pre- and post-operative antibiotic therapy should be followed strictly.
- The patient should be advised strictly to avoid using tobacco/smoking, as smoking limits blood supply at the extraction site which can delay healing.
- Mouth rinse with warm salt water several times a day should be done.
- Keep the socket area cleaned, and gentle brushing is to be done around dry socket area.
- Avoid use of carbonated beverages.
- Avoid using straw.
- The patient should avoid spitting for at least a day after extraction.

Treatment Options

Local hemostatic

According to Wang *et al*., the use of local hemostatic decreases the risk of post-operative bleeding after tooth removal in patients on warfarin therapy.[47] They act by causing vasoconstriction, leading to platelet aggregation and formation of platelet plug.

Antibiotics

According to Svensson *et al*., the use of antibiotics (more commonly amoxicillin) in the management of dry socket is effective since it is bactericidal in action.[48]

Analgesic

The choice of analgesic ranges from NSAIDS to narcotic based drugs like codeine.

Surgical intervention/curettage

It involves administration of local anesthesia, debridement of socket, and primary closure by advancement flap.[49]

Low-level laser

Management of dry socket with curettage, irrigation followed by continuous mode diode laser irradiation has been proved to be beneficial.

Alvogyl and SaliCept patch

In a study by Kaya *et al*., effects of alvogyl and SaliCept patch were studied in the management of dry socket. Alvogyl provides a soothing effect to the tissue and relieves the pain rapidly. It has an effective antimicrobial action due to the iodoform present in it. It was suggested that application of alvogyl SaliCept patch directly in the socket after curettage and irrigation is effective.[50]

Use of eugenol

Use of eugenol on a gauze strip applied to dry socket has proved to be efficient in reducing post-operative dry socket pain, as shown by Burgoyne *et al*.[51] Mode of action is unknown, but researches show that eugenol has anti-inflammatory, analgesic, anti-oxidant, and antipyretic property also it is capable of interrupting action potential, thus decreasing pain.

Pastille GECB

Pastille GECB contains 3% guaiacol, 3% eugenol, and 1.6% chlorobutanol. This paste has more efficacy in reducing post-extraction complication and pain. The efficacy of pastille GECB was investigated by Abbas Haghighat *et al*.[52]

Use of plasma rich in growth factors (PRGF)

It was reported by Haraji *et al*. that application of PRGF reduces the pain associated with dry socket and accelerates its healing.[53]

Consequences of Dry Socket

Consequences of dry socket are due to the secondary complications of the intraoral dressings used. These include:

Myospherulosis

Bright *et al*.[54] explained myospherulosis related to the petrolatum base of tetracycline used as a preventive measure to avoid dry socket.

Neuritis

Topical application of tetracycline over a period of 6 months induces neuritis. Furthermore, foreign body giant cell reactions were seen after the placement of tetracycline treated polylactic acid as reported by Moore and Brekke.[55]

Necrosis of tissue

Eugenol at high concentration is cytotoxic and has an adverse effect on osteoblast and fibroblast, leading to necrosis and delaying in healing. Furthermore, it has been reported that eugenol is neurotoxic and is able to interrupt neural transmission.[29]

Differential Diagnosis[56]

Differential diagnosis for dry socket includes myofascial pain and subperiosteal abscess formation.

Conclusion

Occurrence of dry socket is more common in everyday oral surgery. Surgeon must identify the risk factors associated with the patient before extraction. Treatment of dry socket is palliative and limited. Use of post-extraction antibiotics and chlorhexidine rinses can be effective in reducing the incidence of dry socket.

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