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RESEARCH ARTICLE

Overview of Alveolar Osteitis In Dental Surgery

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Abstract

Alveolar osteitis, also known as dry socket, remains amongst the most commonly encountered complications following extraction of teeth. A great body of literature is devoted to alveolar osteitis addressing the etiology and pathophysiology of this condition. In this article, a comprehensive critical review of the causes, signs and symptoms, preventions as well as treatment will be discussed. A clear understanding of alveolar osteitis will reduce the incidence of it on patients undergoing dental extraction.

Introduction

Alveolar osteitis is the inflammationof the alveolar bone (alveolar process) of either the maxilla or mandible. It is also known as dry socket, or, less commonly, fibrinolytic alveolitis. This is classically seen as the postoperative complication of tooth extraction, which occurs commonly in extractions involving mandibular third molars.

Alveolar osteitis occurs during healing phase of extraction sockets. [1, 2] It is usually occurs where the blood clot fails to form or is lost from the tooth socket. This will lead to an empty socket where bone is exposed to the oral cavity, causing a localized alveolar osteitis limited to lamina dura. It is associated with increased pain and delayed healing time. [3]

Causes of Alveolar Osteitis

The causes of dry socket are not completely understood yet. [4] Under a normal condition, after the extraction of a tooth, blood is extravasted into the socket, and blood clot (thrombus) will be formed. [5] This blood clot is replaced with granulation tissue which consists of proliferating endothelial cells and fibroblasts which are surrounding alveolar bone and gingival mucosa.[5] Next, it is replaced by fibrillar bone and finally by mature woven bone. [3] On the other hand, the blood clot may fail to form because of poor blood supply. [6] The clot may be lost due to excessive mouth rinsing, or disintegrate prematurely due to fibrinolysis too. [5] During high levels of fibrinolytic activity in and around the tooth extracted socket, fibrinolysis-tissue activators released from damaged bone convert plasminogen to plasmin causing breakdown of the blood clot. Kinins are also activated which lead to pain sensation. [7]

Besides that, bacteria may secondarily colonize the socket, and caused further dissolution of the clot. [8] Bone tissue is exposed to the oral environment, and a localized inflammatory reaction takes place in the adjacent marrow spaces. [5] This localizes the inflammation to the walls of the socket, which become necrotic. [6] The necrotic bone in the socket walls is slowly separated by osteoclasts and fragmentary sequestrum may form. [5] It is a much more serious condition when bone is exposed at other sites in the human body. In the case of alveolar oesteitis, healing is retarded because tissue must grow from the surrounding gingival mucosa, which takes longer than the normal organisation of a blood clot. Some patients may develop short term halitosis, [8] which is the result of food debris stagnating in the socket and the subsequent action of halitogenic bacteria. [9]

These are predisposing factors:'

1. **Extraction sites:** Alveolar ostetis more commonly occur in the mandible than the maxilla, due to the relatively poor blood supply of the mandible and also due to higher tendency of food debris to stagnate in lower sockets. [4] It more commonly occurs in posterior sockets (molars) than anterior sockets (incisors and premolars), [3] possibly because of the size of the created surgical defect is relatively larger. It is especially associated with extraction of lower wisdom teeth, [5] where the incidence may be significantly more than 3%. [10]

2. **Infection:** Alveolar osteitis is more likely to occur where there is a pre-existing infection in the mouth, [3] such as chronic periodontitis or necrotizing ulcerative gingivitis. The oral floral in some individuals show haemolytic and these individuals may be predisposed to developing dry sockets. [4]

3. **Smoking:** There is increased risk of dry socket associated with the use of tobacco and smoking. It may be partially due to the vasoconstrictive action of nicotine on small blood vessels. [4]

4. **Surgical trauma**: Difficult tooth extraction can result in alveolar osteitis due to excessive force applied to the tooth, or excessive movement of the tooth burnishes the bony walls of the socket and crushes blood vessels, impairing the repair process. [4] Therefore, lead to release of direct tissue activators (Plasmin activating factors PAF) secondary to bone marrow inflammation. [11]

5. **Use of oral contraceptive:** Oral contraceptives contain combinations of estrogens and progesterone. The elevated levels of progesterone and estrogens in the body can result in dilation of the blood vessels, inflammation and delay healing of the gums. These hormonal changes may exaggerate the body's normal response to dental plaque, resulting in red, swollen gums that may bleed easily. Oral contraceptives also appear to lower a woman's pain tolerance level, which will make her more susceptible to pain in this condition. These changes may be especially pronounced around the lower front teeth. [12]

6. **Radiotherapy:** Radiotherapy directed at the bones of the jaws causes several changes to the tissue, resulting in decreased blood supply. [5]

Sign and Symptoms

A patient may first notice signs of a dry socket two to four days after extraction of the tooth by feeling moderate-to-severe pain that could last anywhere from ten to fourty days. Frequently, the patient affected by a dry socket will also complain of a bad odour or bad taste in their mouth. [14, 15]

1. The exposed bone of a dry socket is very sensitive and leads to moderate full aching pain to severe pain localized to the area or frequently radiating around the affected side of jaw and often to the ear.
2. A foul odour or taste in the absence of purulence or suppuration.
3. Absence of swelling, purulence, or lymphadenitis.
4. Upon visual inspection, the tooth socket will appear to be empty (minimal or no blood clot or granulation tissue present) and when looking down into the socket with mouth mirror, exposed bone is visible. It may also be partially covered with a greyish-yellow layer of necrotic tissue or accumulated debris.

Prevention

The prevention of alveolar osteitis has in the past involved both pharmacologic and surgical approaches.

1. **Antibiotic**

Use of antibiotic preparations placed into the tooth socket after extraction and also antiseptic rinses are commonly applied. Use of tetracycline-impregnated gelatin sponges or Gel-foam, [19, 20] clindamycin-impregnated Gelfoam,[21] lincomycin in Gelfoam,[22] systemic use of metronidazole,[23] systemic penicillins,[24] and systemic use of erythromycin[25] have all shown a statistically significant ability to reduce the incidence of alveolar osteitis. Preoperative administration of these drugs are appearing more effective than postoperative administration.[26]

2. **Chlorhexidine rinses**

A systematic review reported that there is some evidence that rinsing with chlorhexidine (0.12% or 0.2%) or placing chlorhexidine gel (0.2%) in the sockets of extracted teeth reduces the frequency of dry socket. Larsen, [27] in a prospective randomized double-blind study evaluating the incidence of alveolar osteitis in 278 impacted third molars, found a significant 60% reduction in incidence of dry socket in patients who rinsed 15ml chlorhexidine solution twice daily before one week of the extraction, as well as one week after extraction. Rango and Szkutnik [28] showed a 50% reduction in alveolar osteitis in patients who pre-rinsed for 30 seconds with a 0.12% chlorhexidine gluconate solution. Hermesch et al. [29] found a 38% reduction in the incidence of alveolar osteitis in patients who rinsed 30 seconds with 15 mL 0.12% chlorhexidine gluconate for 1 week before and 1 week after the extraction.

Another systematic review shown that there is evidence that prophylactic antibiotics reduce the risk of dry socket following third molar extractions of wisdom teeth [15] There is also evidence that antifibrinolytic agents applied to the socket after the extraction may reduce the risk of dry socket.[8]

3. **For women taking oral contraceptives**

It is suggested that dental extraction to be scheduled on days without estrogens supplementation, typically days 23–28 of the menstrual cycle.[3]

Prevention of alveolar osteitis can be exacted by following post-operative instructions, including:

1. Taking any recommended medications.
2. Bite on gauze as prescribed and change it only as prescribed.
3. Avoiding intake of hot fluids for one to two days. Hot fluids raise the local blood flow and thus interfere with organization of the clot. Therefore, cold fluids and foods are encouraged, which facilitate clot formation and prevent its disintegration.
4. Do not drink carbonated beverages for two to three days after tooth extraction.
5. Gently brush teeth adjacent to the extraction site.
6. Resist the urge to touch the extraction site with fingers or tongue.
7. Avoiding smoking. It reduces the blood supply, leading to tissue ischemia, reduced tissue perfusion and eventually higher incidence of painful socket.

8. Avoiding drinking through a straw or spit forcefully as this creates a negative pressure within the oral cavity leading to an increased chance of blood clot instability.

9. Eat soft foods and foods that do not have residuals, which are particles that may lodge in tooth socket.

Treatment

Treatment for alveolar osteitis is just palliative aimed at relieving symptoms, not a cure. [17] Treatment usually involves symptomatic support while the socket heals by host defence. On average time of 7-10 days is required for exposed bone to become covered with new granulation tissue, and efforts must be made to relieve patient discomfort during this time period.[11] Bloomer [29] has showed that alveolar osteitis can be prevented by immediately packing sockets with a eugenol-containing dressing. However, such measures also are known to delay wound healing.[31] Turner [32] used reflection of a flap, removal of bone particles, curettage, and removal of granulation tissue with irrigation but this method required fewer visits than zinc oxide– eugenol or iodoform gauze with eugenol techniques. Irrigation is used to remove debris, sequestrate, and bacteria from the denuded bone.[30] Fazakerley and Field [34] recommended removal of sutures and gentle irrigation with warm saline under local anesthesia before application of a protective dressing composed of zinc oxide and eugenol mixed into a semisolid consistency applied to an iodoform ribbon gauze. The packing should be changed every 2 to 3 days and removed once pain is reduced.

Choice of analgesics varies from a short course of non-steroidal anti-inflammatory drugs (NSAIDs), for example, Advil or Aleve to narcotic-based preparations such as acetaminophen with codeine, hydroxycodone, or oxycodone. Curetting the socket is not highly recommended due to the eliciting bleeding, and this procedure can increase pain. [30, 31, 33]

Conclusion

Overall, the incidence of dry socket is about 0.5–5% for routine dental extractions and about 25–30% for impacted third molars.

Females are more frequently affected than males due to the use of oral contraceptive rather than any underlying gender predilection. The majority of dry sockets occur in individuals aged between 20 and 40 which is when most dental extractions occur.

Other possible risk factors include periodontal disease, acute necrotizing ulcerative gingivitis, local bone disease, Paget's disease of bone, osteopetrosis, cemento-osseous dysplasia, a history of previously developing a dry socket with past extractions and inadequate oral hygiene. Nevertheless, it is very important to follow the post-operative instructions given by the dentist to prevent the chances of developing alveolar osteitis.

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