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POST-EXTRACTION OSTEOALVEOLITIS: A POST-EXTRACTION COMPLICATION

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Abstract

Post-extraction osteoalveolitis, also known as dry alveolitis, is one of the most common and painful complications of tooth extractions. It occurs as a result of the premature loss of a blood clot from the alveolus, leading to bone exposure and intense local inflammation. The main symptom is severe pain, which occurs 2-4 days post-extraction and radiates to neighboring regions. Risk factors include traumatic extractions, smoking, use of oral contraceptives, poor oral hygiene, and systemic conditions such as diabetes. The diagnosis is clinical, based on persistent pain and the appearance of the alveolus, and treatment is aimed at relieving symptoms through antiseptic irrigation, medicated dressings, and analgesics. Prevention plays an essential role in reducing the incidence of osteoalveolitis and involves the use of atraumatic techniques, rinsing with antiseptic solutions, avoiding smoking, and following postoperative indications. Although it is not an infection itself, osteoalveolitis can significantly affect the patient's quality of life, which is why early recognition and the application of appropriate treatment and prevention measures are essential for optimal healing.

Keywords: Osteoalveolitis, post-extraction complication, inflammation, prevention, tooth extraction.

Introduction

Post-extraction osteoalveolitis, also known as dry alveolitis, is one of the most common and painful complications that can occur after a tooth extraction. It is characterized by inflammation of the exposed alveolar bone as a result of premature lysis or the absence of blood clot formation in the alveolus, which prevents the normal healing process. Unlike other post-extraction infectious complications, osteoalveolitis is not associated with an acute bacterial infection, but rather with a local inflammatory process [1-3].

This complication generally affects between 1% and 5% of patients who undergo tooth extractions, but the incidence can increase up to 30% in the case of extractions of the lower impacted or semi-impacted wisdom teeth. Osteoalveolitis is more common in patients who smoke, those who use oral contraceptives, people with poor oral hygiene, and those who have undergone traumatic tooth extractions. Systemic factors, such as diabetes, the use of anticoagulant drugs, or immunosuppression, can also contribute to the increased risk of developing this condition [2,3].

The pathogenesis of osteoalveolitis is complex and involves several factors. Normally, after a tooth extraction, a blood clot forms in the alveolus, which has the role of protecting the exposed bone and initiating the healing process through the proliferation of fibroblasts and the formation of granulation tissue. In the case of osteoalveolitis, this clot either does not form

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properly or is destroyed prematurely, leading to exposure of the alveolar bone to the oral environment and irritants. The lack of this clot causes the appearance of a pronounced local inflammatory reaction, which causes intense pain and delayed healing [1-3].

Symptoms of post-extraction osteoalveolitis usually appear 2-4 days after extraction and include severe, persistent pain that does not subside to common analgesics, frequently radiating to the ear, temple, or submandibular region (Fig. 1). The alveolus appears bare, with exposed bone and surrounded by inflamed gum tissue, and patients frequently complain of an unpleasant taste and halitosis. Although this complication is not accompanied by fever or systemic inflammation, the discomfort it causes can considerably affect the patient's quality of life [1-4].

The importance of early recognition and prevention of osteoalveolitis is essential to avoid long-term complications. The postoperative protocol plays an essential role in prevention, and the use of antiseptics, recommendations related to avoiding smoking and hard or hot foods in the first days after extraction, are essential measures to reduce the risk. In addition, modern minimally invasive extraction techniques and the use of biomaterials for post-extraction alveolus protection are being developed and promise better results in preventing this complication [2-4].

Fig. 1. Clinical appearance of post-extraction osteoalveolitis, a) Post-extraction alveolus without blood clot, with exposed bone and inflamed mucosa, indicative of osteoalveolitis, b) Extensive view of the oral cavity, highlighting gingival inflammation and the absence of the normal healing process, characteristic of dry osteoalveolitis.

Etiology and predisposing factors of post-extraction osteoalveolitis

Post-extraction osteoalveolitis occurs as a result of an imbalance in the healing process of the dental alveolus, caused by the premature loss of the blood clot or its inability to form properly. This complication is the result of local and systemic factors, which influence both the biological mechanisms of tissue regeneration and the local inflammatory response [2-5].

Among the main causes of osteoalveolitis is the premature lysis of the blood clot, a phenomenon influenced by excessive fibrinolytic activity. The presence of bacteria in the alveolus, especially anaerobic species such as *Treponema denticola*, *Fusobacterium nucleatum,* and *Prevotella intermedia*, causes a rapid degradation of fibrin and prevents the initiation of the normal healing process. At the same time, traumatic extractions, which involve extensive tissue

sectioning and exposure of the alveolar bone, predispose to the occurrence of this complication by delaying local regeneration [3-5].

Local factors play an essential role in the appearance of osteoalveolitis. Smoking is one of the most important risk factors, as nicotine and other toxic substances in tobacco reduce vascularization and oxygenation of tissues, affecting the formation and stability of blood clots. Smoking also increases local fibrinolytic activity, accelerating premature clot degradation. Poor oral hygiene also contributes to the development of osteoalveolitis, as the accumulation of plaque in the post-extraction area causes an increased inflammatory reaction and accelerated enzymatic degradation of the blood clot [3-6].

Systemic factors also influence the incidence of osteoalveolitis. The administration of oral contraceptives causes an increase in estrogen levels, which intensifies fibrinolytic activity and increases the risk of blood clot lysis. Diabetes and other metabolic conditions affect the healing process by reducing the proper inflammatory response and local vascularization. In addition, prolonged use of nonsteroidal anti-inflammatory drugs (NSAIDs) can interfere with the clotting process and blood clot stability [4-7].

Post-extraction osteoalveolitis is a multifactorial complication, determined by the interaction between local and systemic factors. Understanding the etiology and predisposing factors is essential for the application of effective prevention measures that reduce the risk of developing this condition and facilitate the post-extraction healing process [5-7].

Postextracțional osteoalveolitis phytiopathology

The healing process of a post-extraction alveolus takes place in several stages and is dependent on maintaining a stable blood clot, which acts as a biological barrier protecting the exposed bone. In osteoalveolitis, this mechanism is disrupted, either by the absence of clot formation or by its premature lysis, which leads to delayed healing and the appearance of painful inflammation [6-7].

Initially, after tooth extraction, local bleeding causes the formation of a fibrin clot, which has the role of stabilizing bone structures and promoting the migration of fibroblasts and inflammatory cells necessary for the healing process. This clot contains growth factors that stimulate endothelial proliferation and the formation of granulation tissue. In the case of osteoalveolitis, either this clot does not form properly or is prematurely destroyed by excessive fibrinolytic activity. Increased levels of plasmin and plasminogen activators cause a rapid degradation of fibrin, preventing the initial stabilization of the post-extraction area [5-8].

Osteoalveolitis is also associated with a disproportionate local inflammatory response. In the absence of the clot, the alveolar bone remains exposed to the oral environment, favoring the infiltration of microorganisms and the accumulation of food debris. This leads to persistent local inflammation, characterized by an increased production of proinflammatory cytokines (*IL-1*, *IL-6*, *TNF-α*) and proteolytic enzymes, which maintain an irritant environment and delay tissue regeneration. Unlike classic post-extraction infections, osteoalveolitis does not show systemic signs of infection (fever, adenopathies), but only intense local discomfort [5,7-9].

In addition to inflammatory factors, reduced vascularity contributes to the onset of osteoalveolitis. Local hypoxia caused by tissue trauma, smoking, or systemic conditions such as diabetes affects cellular metabolism and prevents angiogenesis necessary for healing. Thus,

exposed bone does not receive nutrients and oxygen in sufficient quantities to initiate the formation of granulation tissue [7-9].

Post-extraction osteoalveolitis is the result of an imbalance in the normal healing process, caused by premature destruction of the blood clot, excessive inflammation, and poor vascularization. These interconnected mechanisms explain why this complication is so painful and difficult to treat, emphasizing the need for appropriate preventive measures to avoid its occurrence [5,7-10].

Clinical manifestations and diagnosis of post-extraction osteoalveolitis

Post-extraction osteoalveolitis is characterized by a distinct clinical picture, dominated by severe pain and delay in the normal healing process of the post-extraction alveolus. Unlike other infectious complications, osteoalveolitis is not accompanied by fever or severe edema, but causes considerable discomfort to the patient [8-12].

The main symptom is intense pain, which occurs 2-4 days after tooth extraction and progressively intensifies. It has a pulsatile, deep character and can radiate to adjacent areas, such as the ear, temple, or jaw. The pain does not respond to common painkillers and worsens during chewing. In addition, patients often complain of halitosis (unpleasant smell of breath) and a metallic or bitter taste in the oral cavity [9-12].

On clinical examination, the post-extraction alveolus appears hollow or contains only fibrinous debris, without the presence of an organized blood clot. The alveolar bone may be exposed, having a whitish appearance, and the surrounding mucosa is inflamed and slightly edematous. Tenderness on palpation is increased, and patients may have difficulty opening their mouths due to pain [9-13].

The diagnosis of osteoalveolitis is clinical and is based on the correlation of symptoms with the appearance of the alveolus. The differential diagnosis should be made with other post-extraction complications, such as alveolar infection (purulent alveolitis), osteomyelitis, or trigeminal neuralgia. Unlike acute bacterial infections, osteoalveolitis is not associated with fever, lymphadenopathy, or purulent discharge. Also, dental X-rays are useful for ruling out other conditions, such as root debris left in the alveolus or bone fractures [10-13].

An essential aspect in the diagnosis of osteoalveolitis is the evaluation of predisposing factors, such as traumatic extractions, smoking, use of oral contraceptives, or systemic conditions. Their identification allows the application of appropriate preventive measures to avoid the recurrence of the complication [10-14].

Post-extraction osteoalveolitis is a painful complication that is easily recognized clinically, due to the appearance of intense pain and the absence of a blood clot in the alveolus. Careful differential diagnosis and exclusion of other complications are essential to establish appropriate treatment and reduce patient discomfort [11-14].

Therapeutic options in post-extraction osteoalveolitis

The treatment of post-extraction osteoalveolitis aims to relieve pain, reduce local inflammation, and stimulate the healing process. Since this condition is not an actual infection, the administration of systemic antibiotics is not necessary in most cases [12-14].

Symptomatic therapy includes analgesics and nonsteroidal anti-inflammatory drugs (NSAIDs) for pain control. In patients with severe discomfort, short-acting opioid analgesics may be used [13-15].

Local treatment is essential and involves irrigation of the alveolus with antiseptic solutions, such as saline solution or 0.12% chlorhexidine, to remove necrotic debris. The application of medicated dressings with eugenol or hemostatic substances reduces pain and promotes tissue regeneration. In severe cases, repeat curettage and stimulation of the formation of a new blood clot may be necessary [13-16].

In addition to direct treatment, patients should adhere to strict oral hygiene and avoid risk factors such as smoking and eating irritating foods (Fig. 2). Correct therapy and the application of preventive measures contribute significantly to a quick and uncomplicated recovery [15-17].

Fig. 2. Management of post-extraction osteoalveolitis after curettage and application of local treatment, a) Post-extraction alveolus after curettage, with the application of a medicinal dressing to protect the exposed bone and stimulate healing, b) Hemostatic and antiseptic drug (probably eugenol and iodophore-based paste) intended for application in the alveolus to relieve pain and accelerate tissue regeneration.

Prevention and control factors of post-extraction osteoalveolitis

The prevention of post-extraction osteoalveolitis is essential to reduce the risk of developing this painful complication and involves a combination of preoperative, intraoperative, and postoperative measures. The purpose of these measures is to maintain a stable blood clot and promote normal healing of the alveolus [15-17].

Preoperative measures

Careful evaluation of the patient before extraction helps to identify risk factors. Patients who smoke, those who use oral contraceptives, or those with systemic conditions such as diabetes require additional prevention measures. It is recommended to reduce tobacco consumption at least 24 hours before extraction, and in the case of women taking oral contraceptives, it is preferable to schedule the intervention in the week with low hormone levels to reduce fibrinolytic activity [12,15-17].

Intraoperative measures

The extraction technique plays an essential role in the prevention of osteoalveolitis. Atraumatic extractions, with minimization of tissue damage and bone exposure, reduce the risk of complications. Excessive curettage of the alveolus should be avoided, as it can disrupt the natural process of clot formation. Abundant irrigation with sterile saline or antiseptic solutions (chlorhexidine 0.12%) helps remove tissue debris and reduces bacterial load [15-18].

Postoperative measures

Clear instructions given to the patient after extraction are crucial. It is recommended to avoid intense rinses during the first 24 hours to prevent the blood clot from dislodging. Patients should avoid smoking, alcohol consumption, and hard or hot foods, which may promote premature lysis of the clot. Applying cold compresses in the first few hours post-extraction can help reduce inflammation and discomfort [16,17].

Prophylactic use of oral antiseptics, such as rinsing with 0.12% chlorhexidine twice daily, has demonstrated efficacy in reducing the incidence of osteoalveolitis. Also, topical application of dressings with hemostatic gels or resorbable biomaterials can contribute to the protection of the alveolus [15-18].

The prevention of post-extraction osteoalveolitis requires a multidimensional approach, which includes correct surgical techniques, proper postoperative hygiene, and the elimination of risk factors. The application of these measures significantly reduces the incidence of the complication and ensures optimal healing of the alveolus [15,17-19].

Conclusions

Post-extraction osteoalveolitis is one of the most common and painful complications of tooth extraction, having a significant impact on patient comfort and the healing process. It is the result of an imbalance in the formation and maintenance of the blood clot, determined by local and systemic factors, which leads to exposure of the alveolar bone and a persistent inflammatory reaction.

The clinical picture is dominated by intense pain, which appears a few days after extraction and does not respond to usual painkillers. The diagnosis is predominantly clinical, based on the specific symptoms and the absence of a blood clot in the alveolus. Although osteoalveolitis is not an actual infection, it can delay healing and may require therapeutic interventions to relieve discomfort.

Prevention remains the main method of reducing the incidence of this complication. Atraumatic surgical techniques, proper irrigation of the alveolus, and avoidance of risk factors such as smoking and poor oral hygiene are essential. Clear postoperative instructions, the use of chlorhexidine, and alveolus protection materials can contribute to a significant decrease in the risk of osteoalveolitis.

Post-extraction osteoalveolitis is a preventable and treatable complication, but its early recognition and application of appropriate measures are essential for effective pain management and accelerated healing. Through a correct approach, based on modern extraction techniques and optimized postoperative care, this condition can be significantly reduced, improving the patient experience and post-extraction prognosis.

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