Dry Socket

Also called **Alveolar Osteitis**

Dry socket (alveolar osteitis) can hardly be termed a major infection but can be mistaken clinically for osteomyelitis which can rarely follow.

It is by far the most frequent painful complication of extractions. Nevertheless, it is uncommon overall.

Instead of a dark **blood clot**, there will just be whitish bone. The **pain** typically starts about 2 days after the tooth was extracted. Over time it becomes more severe and can radiate to the ear. Other symptoms of dry socket include **bad breath** and an unpleasant smell and taste in your mouth.

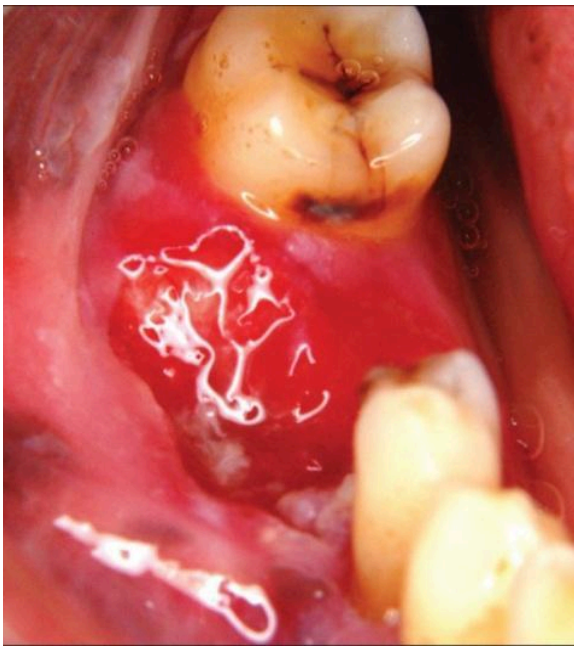
Clinical Features:

1. Women are more frequently affected.
2. Pain usually starts a few days after the extraction but sometimes may be delayed for a week or more.
3. It is deep-seated, severe and aching or throbbing.
4. The mucosa around the socket is red and tender.
5. There is clot in the socket, which contains, instead, saliva and often decomposing food debris.
6. When debris is washed away, whitish, dead bone may be seen or may be felt with a seal by granulations growing in from the gingival margins.

Possible aetiological factors for alveolar osteitis

- Excessive extraction trauma
- Limited local blood supply
- Local anaesthesia
- Oral contraceptives
- Osteosclerotic disease
- Radiotherapy

7. Pain often continues for a week, or two or occasionally longer.
8. Sequestration of the socket wall may sometimes be seen radiographically



Since alveolar osteitis is not primarily an infection, there is not usually any pyrexia (fever) and cervical lymphadenitis (swollen glands in the neck), and only minimal edema (swelling) and erythema (redness) is present in the soft tissues surrounding the socket.

Signs may include:

- An empty socket, which is partially or totally devoid of blood clot.[4] Exposed bone may be visible or the socket may be filled with food debris which reveals the exposed bone once it is removed.[1] The exposed bone is extremely painful and sensitive to touch. Surrounding inflamed soft tissues may overlie the socket and hide the dry socket from casual examination.
- Denuded (bare) bone walls.

Symptoms may include:

- Dull, aching, throbbing pain in the area of the socket, which is moderate to severe and may radiate to other parts of the head such as the ear, eye, temple and neck.[2][4][6][7] The pain normally starts on the second to fourth day after the extraction, and may last 10–40 days. The pain may be so strong that even strong analgesics do not relieve it.
- Intraoral halitosis (oral malodor).
- Bad taste in the mouth.

[1] *Wray, D; Stenhouse D; Lee D; Clark AJE (2003). Textbook of general and oral surgery. Edinburgh [etc.]: Churchill Livingstone. pp. 216–217.*

Aetiology:

- Alveolar osteitis is frequently unpredictable and without any obvious predisposing cause, but numerous possible aetiological factors exist.
- Difficult disimpactions of third molars frequently lead to painful alveolar osteitis. However, the blood supply to the area often appears to be critical.
- In healthy persons, alveolar osteitis virtually only affects the lower molar region where the bone is more dense and less vascular than elsewhere.
- Alveolar osteitis is also an expected complication of extractions in Paget's disease and, particularly, after radiotherapy where endarteritis causes ischaemia of the bone.
- Alveolar osteitis is also more frequent in susceptible patients when local anaesthesia is used.
- Loss of clot from the extraction socket was traditionally ascribed to bacterial proteolytic enzymes. However, it appears frequently to be due to excessive local fibrinolytic activity.
- The alveolar bone and other oral tissues have a high content of fibrinolysin activator (plasmin) which are released when the bone is traumatised. Nevertheless, once the clot has been destroyed, infection from the mouth is inevitable and anaerobes are likely to play a major role.
- The oestrogen component of oral contraceptives apparently enhances serum fibrinolytic activity and reportedly, is also associated with a higher incidence of alveolar osteitis.[2]

Some people may be more likely to get dry sockets after having a tooth extraction. That includes people who:

- smoke
- have poor oral hygiene
- have wisdom teeth extracted
- have greater-than-usual trauma during the tooth extraction surgery
- use birth control pills
- have a history of dry socket after having teeth extracted

Rinsing and spitting a lot or drinking through a straw after having a tooth extracted also can raise the risk of getting dry socket.

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[2] *Essentials of oral pathology and oral medicine, by R.A Cawson and E.W. Odell*

Causes

- The cause(s) of dry socket are not completely understood.
- Normally, following extraction of a tooth, blood is extravasated into the socket, and a blood clot (thrombus) forms. This blood clot is replaced with granulation tissue which consists of proliferating fibroblasts and endothelial cells derived from remnants of the periodontal membrane, surrounding alveolar bone and gingival mucosa.
- In time this in turn is replaced by coarse, fibrillar bone and finally by mature, woven bone.
- The clot may fail to form because of poor blood supply (e.g., secondary to local factors such as smoking, anatomical site, bone density and conditions which cause sclerotic bone to form).
- The clot may be lost because of excessive mouth rinsing, or disintegrate prematurely due to fibrinolysis.
- Fibrinolysis is the degeneration of the clot and may be caused by the conversion of plasminogen to plasmin and formation of kinins. Factors which promote fibrinolysis include local trauma, estrogens, and pyrogens from bacteria.
- Bacteria may secondarily colonise the socket, and lead to further dissolution of the clot. Bacterial breakdown and fibrinolysis are widely accepted as major contributing factors to the loss of the clot.
- Bone tissue is exposed to the oral environment, and a localised inflammatory reaction takes place in the adjacent marrow spaces.
- This localises 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 sequestra may form.[3] The bones of the jaws seem to have some evolutionary resistance to this process. When bone is exposed at other sites in the human body, this is a much more serious condition.

In a dry socket, healing is delayed 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, which is the result of food debris stagnating in the socket and the subsequent action of halogenic bacteria. The main factors involved in the development of dry socket are discussed below.

Extraction site

Dry sockets more commonly occur in the mandible than the maxilla, due to the relatively poor blood supply of the mandible and also because food debris tends to gather in lower sockets more readily than upper ones. It more commonly occurs in posterior sockets (molar teeth) than anterior sockets (premolars and incisors), possibly because the size of the created surgical defect is relatively larger, and because the blood supply is relatively poorer at these sites. Dry socket is especially associated with extraction of lower wisdom teeth. Inadequate irrigation (washing) of the socket has been associated with increased likelihood of dry socket.

Infection

Dry socket is more likely to occur where there is a pre-existing infection in the mouth, such as

- Necrotizing ulcerative gingivitis or chronic periodontitis.
- Wisdom teeth not associated with pericoronitis are less likely to cause a dry socket when extracted.
- The oral microbiota has been demonstrated to have fibrinolytic action in some individuals, and these persons may be predisposed to developing dry sockets after tooth extraction.
- Infection of the socket following tooth extraction is different from dry socket, although in dry socket secondary infection may occur in addition.

Smoking

Smoking and tobacco use of any kind are associated with increased risk of dry socket. This may be partially due to the vasoconstrictive action of nicotine on small blood vessels. Abstaining from smoking in the days immediately following a dental extraction reduces the risk of a dry socket occurring.

Surgical trauma

Dry socket is more likely to occur following a difficult tooth extraction. It is thought that 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. It has also been shown that dry socket is more likely to occur when an inexperienced surgeon performs the extraction, possibly because excessive force or excessive tooth movements are used.

Vasoconstrictors

Vasoconstrictors are present in most local anaesthetics, and are intended to increase the length of analgesia by reducing blood supply to the region which reduces the amount of local anaesthetic solution that is absorbed into the circulation and carried from the local tissues. Hence, use of local anaesthetics with vasoconstrictors is associated with an increased risk of dry socket occurring. However, frequent use of local anaesthetic without vasoconstrictors would not provide sufficient analgesia, especially in the presence of acute pain and infection, meaning that the total dose of local anaesthetic may need to be increased. Adequate pain control during the extraction is balanced against an increased risk of dry socket.

Radiotherapy

Radiotherapy directed at the bones of the jaws causes several changes to the tissue, resulting in decreased blood supply.

Menstrual cycle

The menstrual cycle could be a determinant risk factor in the frequency of Alveolar Osteitis. Studies have shown that because of hormonal changes, women in the middle of the menstrual cycle and the ones taking oral contraceptives (birth control pills) have a higher tendency of having Alveolar Osteitis after their tooth extraction surgery. It is recommended that elective surgeries be performed during the menstrual period in both oral contraceptives users and non users to eliminate the effect of cycle-related hormonal changes on the development of Alveolar Osteitis.

Pathology

- The initial event is destruction of the clot which normally fills the socket.
- This leaves an open socket in which infected food and other debris accumulates in direct contact with the bone.
- Bone damaged during extraction, particularly the dense bone of lamina dura, sies.
- The necrotic bone lodges bacteria which proliferate freely, protected from leukocytes unable to reach them through this avascular material.
- In the surrounding tissue, inflammation usually localised infection to the socket walls.
- Dead bone is gradually separated by osteoclasts and sequestra are usually shed in tiny fragments. Healing is by granulation from the base and walls of the socket.

Diagnosis

Dry socket typically causes pain on the second to fourth day following a dental extraction. Other causes of post extraction pain usually occur immediately after the anaesthesia/analgesia has worn off, (e.g., normal pain from surgical trauma or mandibular fracture) or has a more delayed onset (e.g., osteomyelitis, which typically causes pain several weeks following an extraction). Examination typically involves gentle irrigation with warm saline and probing of the socket to establish the diagnosis. Sometimes part of the root of the tooth or a piece of bone fractures off and is retained in the socket. This can be another cause of pain in a socket, and causes delayed healing. A dental radiograph (x-ray) may be indicated to demonstrate such a suspected fragment.

Prevention

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. Another systematic review concluded that there is evidence that *prophylactic antibiotics* reduce the risk of dry socket (and infection and pain) following third molar extractions of wisdom teeth, however their use is associated with an increase in mild and transient adverse effects. The authors questioned whether treating 12 patients with antibiotics to prevent one infection would do more harm overall than good, in view of the potential side effects and also of antibiotic resistance.

Nevertheless, there is evidence that individuals who are at clear risk may benefit from antibiotics. There is also evidence that antifibrinolytic agents applied to the socket after the extraction may reduce the risk of dry socket.

Some dentists and oral surgeons routinely debride the bony walls of the socket to encourage haemorrhage (bleeding) in the belief that this reduces the incidence of dry socket, but there is no evidence to support this practice. It has been suggested that dental extractions in females taking oral contraceptives be scheduled on days without oestrogen supplementation (typically days 23–28 of the menstrual cycle). It has also been suggested that teeth to be extracted be scaled prior to the procedure.

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

1. Taking any recommended medications
2. Avoiding intake of hot fluids for one to two days. Hot fluids raise the local blood flow and thus interfere with organisation of the clot. Therefore, cold fluids and foods are encouraged, which facilitate clot formation and prevent its disintegration.
3. Avoiding smoking. It reduces the blood supply, leading to tissue ischemia, reduced tissue perfusion and eventually higher incidence of painful socket.
4. Avoiding drinking through a straw or spitting forcefully as this creates a negative pressure within the oral cavity leading to an increased chance of blood clot instability.

- Since damage to bone appears to be an important predisposing factor, extractions should obviously be carried out with minimal trauma.

- Immediately after the extraction the socket edges should be squeezed firmly together and held for a few minutes until the clot has formed.
- In the case of disimpactions of third molars, where alveolar osteitis is more common, prophylactic antibiotics are often given.
- Their value is unproven and there is no indication for using antibiotics for routine dental extractions.
- However, in patients who have had irradiation for oral cancer or osteosclerotic Paget's disease where there is extensive infection, antibiotic cover should be given and the tooth removed surgically, with as little damage as possible to the surrounding bone.
- There remain a few patients who otherwise appear to be well but are especially prone to alveolar osteitis which follows every extraction under local anaesthesia including regional blocks. In such patients, dry socket may be preventable if general anaesthesia is used.

Treatment

Local conditions strongly favour persistence of infection and it is more surprising that the infection is well localised than that it responds poorly to treatment.

- It is important to explain this to patients and to warn them that they may have a week or more of discomfort.
- It is also important to explain that the pain is not due, as patients usually think, to a broken root.
- Treatment should aim to keep the open socket clean and to protect exposed bone.
- The socket should be irrigated with mild warm antiseptic or saline.
- The opening is filled with an obtundent dressing containing some non-irritant antiseptic to prevent food and debris from accumulating.
- This should be followed by frequent use of hot mouth rinses.
- Many socket dressings have been formulated, but a convenient proprietary preparation is Alvogel. It is easy to manipulate and patients report that it gives a sensation of warmth in place of the pain.
- Apart from being obtunded and antiseptic, the socket dressing should preferably be soft, adhere to the socket wall and be absorbable.
- Non-absorbable dressings must be removed as soon as possible to allow the socket to heal.

- Most cases become free from pain after one or two dressings. Dressing packed hard into the socket will delay healing.

Prognosis

If a dry socket occurs, the total healing time is increased. Postoperative pain is also worse than the normal discomfort which accompanies healing following any minor surgical procedure. The pain may last for seven to forty days.

Epidemiology

Overall, the incidence of dry socket is about 0.5 -- 5% for routine dental extractions, and about 25–30% for impacted mandibular third molars (wisdom teeth which are buried in the bone).

Females are more frequently affected than males, but this appears to be related to oral contraceptive use 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, although for any given individual it is more likely to occur with increasing age.

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. Other factors in the postoperative period that may lead to loss of the blood clot include forceful spitting, sucking through a straw, and coughing or sneezing.[3]

Etymology

The alveolar processes of the mandible or maxilla; *osteitis* is derived from *oste-*, from Greek, *osteon* meaning "bone"; and *-itis* means a disease characterised by inflammation.

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[3] *Daly, B; Sharif, MO; Newton, T; Jones, K; Worthington, HV (Dec 12, 2012). "Local interventions for the management of alveolar osteitis (dry socket).". Cochrane database of systematic reviews (Online). **12**: CD006968*

Osteitis generally refers to localised inflammation of bone with no progression through marrow spaces (compared with osteomyelitis).[4]

Often, the term alveolar osteitis is considered synonymous with "dry socket", but some specify that dry socket is a focal or localised alveolar osteitis.[5] An example of another type of osteitis is focal sclerosing/condensing osteitis.[6] The name dry socket is used because the socket has a dry appearance

[4] *Soames JV; Southam JC (1999). Oral pathology (3. ed., [Nachdr.] ed.). Oxford [u.a.]: Oxford Univ. Press. pp. 296–298.*
[5] *Wray, D; Stenhouse D; Lee D; Clark AJE (2003). Textbook of general and oral surgery. Edinburgh [etc.]: Churchill Livingstone. pp. 216–217.*
[6] *Soames JV; Southam JC (1999). Oral pathology (3. ed., [Nachdr.] ed.). Oxford [u.a.]: Oxford Univ. Press. pp. 296–298.*