Barodontalgia: Dental Implications at High Altitudes

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Abstract

Barodontalgia is a symptom of a pre-existing subclinical oral diseases rather than a pathological condition itself. It was considered earlier as a "flyer's toothache," barodontalgia is described as pain that occurs in the tooth utilizing changes in ambient pressure usually in people who fly or dive. It is the whole responsibility of the dental health professionals to provide the aviators with the best dental treatment as well as awareness about the hazards to the dental treatments at higher altitudes. This piece of writing gives sufficient information about the need and protocols to be followed especially for the patients commonly at higher altitudes. This article aims at providing adequate knowledge about barodontalgia and the responsibilities towards its prevention both by the dentist and the flight crew members.

Keywords: *Barodontalgia, Ambient pressure change, Toothpain.*

Introduction

Dentistry has changed over some years from prevention to management of oral diseases. Considering from varied professions, some people will be there who "rise from the ground" commonly known as air travel crews, pilots, and persons who keep travelling always for work. The dental health professionals might more and more come upon flight-related oral conditions which require treatment for the rising number of flight attendant and leisure pilots, air passengers, as well as military and airline pilots. Barodontalgia also known as Tooth Squeeze; or Flyer's Tooth; or Aerodontalgia. It is the pain in the oral cavity that results because of the pressure changes usually found in case of far above the ground altitudes in pilots and also for the deep sea divers who also go through severe changes in pressure.[1] Barodontalgia is a symptom of a pre-existing subclinical oral diseases rather than a pathological condition itself.[2] It was considered earlier as a "flyer's toothache," barodontalgia is described as pain in the tooth that occurs with variation in ambient pressure usually in people who fly or dive. It can be severe enough to cause inflight vertigo as well as premature flight cessation.[1]

Aerodontalgia was named during the world war II because of the pain experienced by aircrew in the flight but, this type of tooth pain was found in divers, therefore an additional suitable word, barodontalgia, later given to this phenomenon.[1] Barodontalgia affects both aircraft passengers as well as aircrew and underwater divers. Due to the change in pressure gradients teeth are affected due to injury and pain.[3] According to Boyle's Law "at a given temperature, the volume of a gas is inversely proportional to the ambient pressure," which can be used to explain the concept of barodontalgia.[2]

The barodontalgia phenomenon starts occurring at an altitude of about 3,000 m and at a water depth of 10 m where the ambient pressures are 0.75 and 1 atmosphere, respectively.[4] Some people have reported that they have felt pain in a tooth because of the high rise buildings these days plus the powerful lifts that are used with travel at very high speeds to reach great heights.[5]

Prevalence:

- It ranked 5th as complaint and 3rd as cause of chamber simulation termination.
- Usually above 3,000 ft. with 11% of aircrew affected.[3]
- Seen at 5,000-35,000 ft. but more common 9,000-27,000 ft.[6]
- 3-37% of barodontalgia is non-dental facial barotraumas.[1]

In the 1940s, the prevalence of barodontalgia was within a range of 0.7% and 2% and in the 1960s it is 0.3%.[7]Similarly, in the Luftwaffe, several cases of barodontalgia reported in 0.3% of high altitude-chamber. It was also reported that there were cases of barodontalgia of about 1 case per 100 flight-years in the Israeli Air Force.[8]

Classification:

1. **According to Fédération dentaire Internationale (FDI):** It is divided into four categories such as:- a) acute pulpitis, b) chronic pulpitis, c) necrosis of the pulp d) periapical abscess or a cyst.[9]
2. **In 1972, The pathology of barodontalgia** was specified by Strohaver. He divided his description into two types: a) direct barodontalgia b) indirect barodontalgia. In the direct type of barodontalgia, the atmospheric pressure is decreased and then it results inan indirect effect and is localized into moderate to severe that is generally formed at some stage in take-off, whereas, in the indirect type of barodontalgia pain results because of the stimulus of the superior alveolar nerves during the period of maxillary barosinusitis which is dull and also poorly defined that involves the posterior teeth which occurs during landing.[10]

It should be kept in mind that teeth that are normal in condition and are devoid of anycausal pathologies that will not get exaggerated by any changes in pressure. Barodontalgia can be found commonly in teeth that contain pre-existing dental pathology or undergone with any inappropriate dental treatments such as:[11]

a. Chronic pulpitis

b. Restored teeth

c. Maxillary sinusitis

d. Default restorations

e. Periapical cysts

Barodontalgia hasa chance of occurringat the time of initial pressure reduction from 14.7 psi to 12-8 psi.[12] A distinguishable sign is the pain that is consistently relieved on repressurization, distinguishes barodontalgia from pain in the upper jaw because of maxillary barosinusitis.

Manifestations due to pressure change:

1. **Barotrauma:** This is a type of condition that results as a variation count in pressure flanked by a gas space surrounded by the body as well as the surrounding fluid because of the lower atmospheric pressure. This might give rise to conditions like dental barotraumas, barodontalgia, barotitis –media, external otitic barotrauma, barotraumas related headaches, barosinusitis.[13]
2. **Barodontalgia:** This is a kind of pain that occurs by a variation in barometric pressure in an asymptomatic organ. Here it can be expected of pain that is correlated to periapical disease that can occur during ascent as well as descent and also it can disappear on returning to the ground level. It is being reported that toothache in barodontalgia is because of the rise in atmospheric pressure that will lead to spreading out of trapped air bubbles.[14]
3. **Tooth outburst:** Also well known as odontocrexis or barodontocrexis. When exposed to sudden changes in atmospheric pressure then a tooth explosion will occur in teeth that have pre-existing leakage restorations or in recurrent carious lesions. This detonation happens because of the unexpectedspreading out of gas bubbles fascinatedinside and underneath these restorations.[15]
4. **Barosinusitis:** This barosinusitis occurs as a result of negative air pressure formation in between the sinuses that leads to tenderness that causes toothache.[16]
5. **Prosthetic Considerations:** There might be a retention problem in both upper and lower dentures that are being troubled because of the variation in barometric pressure. Due to the effect of gravity suchvariation is more distinct in upper denture than lower denture.[17]
6. **Restorative Dentistry:** Fracture of restoration can occur due to variation in thermal contraction in restorative materials and low temperature at higher altitudes as compared to tooth hard tissue.[18]
7. **Periodontal considerations:** Due to change in pressure xerostomia and hyposalivationcan be seen as an imperative risk factors for decayed teeth. This might increase the risk of occurring periodontal infection and dryness of the oral cavity which can occur because of inhaled compressed dry gases in the aircraft.[19]
8. **Surgery Considerations:** To avoid the growth of sinusitis at higher altitudes, care should be taken for

the existence of any oroantral communication while extraction of maxillary teeth.[20]

Reason of pain due to pressure change:

a. During any underlying pathology, spreading out of gas with compensating rise in pressure inside the pulp chamber and root canal can be seen because of changes in external pressure.[21]

b. Pain during ascent pressure along with relief on descent pressure - Pulpitis

c. Toothache on descent along with relief on ascent - Necrosis

d. Toothache can be seen usually in the maxillary posterior teeth along with adjusted blood supply to the tooth.

e. Exposed nerve endings by direct pressure.

f. Faulty restoration can leads to microleakage.

Hypotheses to this phenomenon by Kollman: First, intent air bubbles get expands underneath a root filling or against dentin to activate nociceptors; Second, with the pain in the referred teeth, stimulation of nociceptors in the maxillary sinuses; Third, chronically inflamed pulp stimulates the nerve endings. He presented histological substantiation that shows that chronic inflammation of pulp that can exist even after a thin dentin layer covers the pulp, for example, like in a deep cavity preparation and also he strongly supported his last two hypotheses.[22]

Flight Restriction related to dentistry: The flight restriction for any patient in the flight is enforced when any kind of intrusion in the flight capabilities is doubted for any aircrew member:[23-25]

- Patients under any medications might be a source of dizziness or lack of concentration or maybe the reason for diarrhea.
- Intraoral stress changes can be found in patients who have undergone tooth extraction or other oral/ periodontal surgery after several hours.
- Variations in hazard of emphysema.
- The jet and helicopter pilots might face difficulty in wearing helmets comfortably in case of face swelling.
- Alteration in pressure changes can hamper the wound healing in cases of oroantral communication.
- Aircrew has to reschedule his flight in anticipation of his endodontic treatment is finished to avoid in-flight barodontalgia.

The dental health professionals recommended the aircrew not to flight until the toothache is subsided so that the patient can rest well. It is also suggested that appointment for dental check-up and treatment can be scheduled for a date with enoughperiod before the next planned flight.[26]

Prevention from barondontalgia:

a. Professionals like pilots and deep-sea divers should undergo the Hyperbaric Oxygen Therapy (HBOT) whenever the individual is set in a 100% compressed Oxygen chamber that set the body for maximum stress as well as compression.[25]

b. FDI suggests a yearly checkup for pilots, divers and submariners with dental hygiene instructions from dentists.[9]

c. Patients within 24 hours of dental treatment must not dive or fly in non-stressed cabins having a requirement ofanesthetic.

d. Existing dental pathologies should be checked and treated properly.

e. Barodontalgia can be prevented by putting a zinc oxide eugenol (ZOE) base in case of a reversible pulpitis as ZOE is well known for its sedative effects.[26]

f. People subjected to long-duration pressure changes then procedures like pulpectomy or cases like pulp capping of an exposed pulp should be avoided and alternatives treatment should be done. [14]

Recommendations:

a. Dental conditions like periapical pathology, dentin exposure, caries, and fractured cusps should be paid attention closely by the patients involved in diving or aviation.

b. The dental health professional should examine properly and ask the patient about the history of recent flying or diving if the patient has any symptoms of barodontalgia.

Conclusion

By the passing time,a rise in the number of people traveling by air can be observed and this also leads to a gradual rise in the number count of aircrew personnel. Therefore, aviation dentistry has amplified, it has to be

given importance, so that suitable diagnoses should be prepared. Barodontalgia must not be underestimated because of its safety risk to pilots, submarines, divers,and airline passengers. Special considerations for aircrew patients have to be made when dental treatments are planned. It is the whole responsibility of the dental health professionals to provide the aviators with the best dental treatment as well as awareness about the hazards to the dental treatments at higher altitudes.

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