



## Aviation Dentistry – A Review

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### **ABSTRACT:**

*The airline sector has grown in popularity in recent years, yet little is known about the dental issues related to flying at high altitudes. It is most common in frequent flyers, crew members, pilots etc. Due to the closed chamber pressure gets accumulated in these organs causing pain, discomfort, and organ dysfunction. The presence of dental abscesses, periodontitis, deep carious lesions and deep unlined restorations in oral cavity can stimulate severe pain due to the extreme altitude changes. With proper diagnosis, the various complications can be avoided. Dentists should pay special attention to crews and frequent flyers, due to change of pressure in-flight that cause different types of oro-facial pain. Thus, dentist needs to be well versed with these facts and should provide a Comprehensive treatment.*

**KEY WORDS:** *Aviation dentistry, Barodontalgia, Barotrauma, Odontocrexia, Barosinusitis.*

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### **I. INTRODUCTION:**

Dental practice has changed over the past few years, focusing mostly on prevention.

Aviation dentistry deals with the oral and dental health status of the aircrew members and frequent flyers which primarily deals with the diagnosis, disorders related to the oral and maxillofacial regions and their impact on those who travel to such an environment with abnormal change in atmospheric pressure<sup>1</sup>.

Due to changes in atmospheric pressure occurs as the person continues to travel at high altitude (about 18,000 feet and above). At the beginning of the twentieth century, after the innovation of modern flights, in-flight pathologic and physiologic conditions related to the oral and maxillofacial region has been reported<sup>1</sup>

The prevalence of caries increases in microgravity. There are people who will “rise from the ground” frequently as pilots, flight crew and those who travel frequently for work with the growth in the aviation sector escalates, the number of passengers flying, leisure pilots, flight attendants, airline and military pilots are growing notably.

During flight, the aircrew is responsible for the lives of the aircrew members and passengers, for successfully completing the flight, and for maintaining the aircraft in good condition. In-flight sudden incapacitation could jeopardise the flight's safety; thus, an individual's health status is an important part of the aircrew's operative fitness [1].

Most frequently in-flight complaints reported includes fracture of dental restorations, sharp or diffuse pain, tooth fractures, xerostomia etc. The most commonly encountered conditions include barodontalgia, barotrauma and odontocrexsis[2].

All of these conditions can be avoided only if the patients are instructed about the complications and restrictions in flying after dental treatment by the dentists, for which it is imperative for the dentists to be aware of such conditions and require immediate care[3]. The aim of this comprehensive overview is to enlighten the dentists regarding the concepts of aviation dentistry and to provide the dentists with some diagnostic tools as well as treatment guidelines Aviators.

#### DEFINITION OF AVIATION DENTISTRY:

The aviation dentistry primarily deals with the oral and dental health status of the aviators. It consists of principles of prevention and treatment, disorders or conditions which are related to the oral cavity and maxillofacial area and their impact on those who travel in such an environment where there is change in pressure than that of the normal atmospheric pressure such as paranasal sinuses, lungs, stomach, middle ear cavity etc [4].

#### SIGNIFICANCE AND SCOPE

Sick pulp often becomes painful at high altitude. The condition of pulp will dictate the selection of the teeth for restoration or abutment use and will also indicate time to institute conservative therapeutic treatment[5]. The role of decreased barometric pressure in the development of periapical lesions and there is dissemination of focal infection[6].

- The effects of decompression and oxygen breathing on the pH flow and lactobacillus acidophilus counts of saliva.
- Comparison of caries index of aviation cadets, inexperienced trainees and experienced flyers.
- The development of dental identification records drugs and filling materials evaluated by their effects on the dental pulps[7].

#### VARIOUS MANIFESTATIONS THAT OCCUR DUE TO CHANGE IN PRESSURE

- **Barotrauma**
  1. Barodontalgia
  2. Barometric tooth explosion
  3. Barosinusitis
- **Prosthetic Considerations**
- **Restorative Dentistry**
- **Periodontal considerations**
- **Oral Surgery**

**BAROTRAUMA** - condition caused by a difference in pressure between a gas space inside the body and the surrounding fluid due to the lower atmospheric pressure. Includes conditions like barodontalgia, external otitic barotrauma, barosinusitis, barotitis-media, barotrauma related headaches, dental barotrauma[4].

#### BAROTRAUMA OF NON-DENTAL ORIGIN

**Barotrauma** can commonly affect the ears, which are also called **aerootitis or barotitis**. It is observed that plane landing leads to extreme pain in the ear (the pressure change can create a vacuum in the middle ear that pulls the eardrum inward causing pain), dizziness (vertigo), bleeding or fluid coming from the ear (due to a ruptured eardrum) and ultimately hearing loss. Among all types of barotrauma, **pulmonary barotrauma is most dangerous**. **Head and face barotrauma** include the entities of external otitic barotrauma, barotitis-media, barosinusitis, barotrauma-related headache, dental barotrauma, and barodontalgia (the latter two will be discussed separately)[8,9].

## BAROTRAUMA OF DENTAL ORIGIN

**Barodontalgia** - pain caused by a change in barometric pressure in an otherwise asymptomatic organ. Pain related to periapical disease can appear during ascent as well as descent and disappears on returning to the ground level. Studies have shown that dental pain in barodontalgia is mainly due to increased atmospheric pressure resulting in expansion of trapped air bubbles[4].

### CLASSIFICATION OF BARODONTALGIA

**Barodontalgia is sub grouped into**

Direct barodontalgia and  
Indirect barodontalgia

The currently accepted classification of *direct barodontalgia* consists of 4 classes according to pulp/periapical condition and symptoms

CLASS	CAUSE	SYMPTOMS
Class I	Irreversible pulpitis	Sharp pain on ascent
Class II	Reversible pulpitis	Dull pain on ascent
Class III	Necrotic pulp	Dull pain on descent
Class IV	Periapical pathology	Severe persistent pain on ascent or descent

**BAROMETRIC TOOTH EXPLOSION** – also known as barodontocrexia or odontocrexia. It occurs in teeth having pre-existing leaked restorations or recurrent carious lesion resulting in tooth explosion when exposed to sudden changes of atmospheric pressure. It is due to sudden expansion of gas bubbles trapped beneath these restorations[4].

**BAROSINUSITIS** – also caused due to increased atmospheric pressure because of negative air pressure developed within the sinuses leading to their inflammation and ultimately dental pain[4]. **Aerosinusitis** can also lead to dental pain (hence called indirect barodontalgia).

**PROSTHETIC CONSIDERATIONS** – Retention of both maxillary and mandibular dentures are hampered due to changes in barometric pressure. These changes are more pronounced in maxillary than mandibular denture due to the effect of gravity[8].

**RESTORATIVE DENTISTRY** – Because of low temperature at higher altitudes there is differential thermal contraction in amalgam restoration as compared to tooth hard tissue resulting in the fracture of restoration[8].

**PERIODONTAL CONSIDERATIONS** – Hyposalivation and Xerostomia are the two important risk factors for carious lesions in teeth. Also it may result in increased chances of periodontal disease. Dryness of mouth can be due to breathing of dry compressed gases in the aircraft[8].

**ORAL SURGERY** – While extracting maxillary teeth the existence of any oro-antral communication should be ruled out so as to prevent the development of sinusitis at higher altitudes[10].

### PREVENTION

- Caries excavations and restorations should be completed before air travel.
- Leaky restorations should be replaced, during the restoration of a carious tooth, a thorough examination of the floor of the cavity should be done to rule out any penetration into the pulp chamber. In such cases a protective cavity liner should be applied (e.g., glass-ionomer cement).
- During multi-visit endodontic treatment, the temporary restoration must be placed properly, When oroantral communication is diagnosed; referral to an oral surgeon for its closure is indicated.

## FLIGHT RESTRICTIONS

Grounding of a patient is required when there is interference with the flight capabilities of the aircrew members.

- This can be caused by intake of medications, which causes side effects like headache, nausea and dizziness[3].
- Due to the intra oral pressure, the blood clot which is formed after the surgical procedure in patient's mouth can come out and it can lead to intra oral bleeding.
- So, here, flight restriction is needed until the symptoms subside.
- Restorations which are being done recently have a greater probability for fractures than the old ones. It is the duty of dentists to notify their patients (aircrew members) about the post-operative flight consequences and restrictions.

## TREATMENT

- Only a proper diagnosis can lead to a proper treatment.
- Lack of proper examination or lack of proper cooperation can lead to serious problems later, for those aircrew personnel. Therefore proper analysis, and treatment before planning to travel is must for aircrews.
- In case of any restoration, pulp capping technique is mostly used.
- The silent carious lesions carry changes in a pressure changed environment and should be treated[13].
- While extracting the maxillary premolars and molars, dentists have to rule out the existence of an oroantral communication. This communication can lead to sinusitis and consequences can occur upon exposure to a pressure changing environment.

To favour the retention of prosthesis, an implant supported prosthesis can be chosen.

## II. DISCUSSION

*Dental care* is an integral part of aircrew's operative fitness which could be jeopardized by a reduction in air density and air pressure at higher altitudes.

For the comfort of crew and passengers, aircraft pressure is maintained at high altitude by means of air cycle machines and outflow valves in spite of low atmospheric pressure outside[14].

Aviation dentistry is chiefly concerned with the oral and dental health status of the aviators with special emphasis on the prevention of disorders related to change in atmospheric pressure.

In the human body, various organs like facial sinuses, lungs, stomach, and middle ear contain gases which tend to expand at low atmospheric pressure. Due to closed chamber pressure gets accumulated in these organs causing pain, discomfort, and organ dysfunction.

The presence of dental abscesses, periodontitis, deep carious lesions and deep unlined restorations in the oral cavity can stimulate severe pain due to extreme altitude changes[15].

Kajol Shety et.al<sup>1</sup> in 2019, conducted a study on 170 Postgraduates and dental professionals in a private dental institution and found that 61.8% of the individuals are not familiar with the term Aviation dentistry and they showed that there is lack of knowledge about aviation dentistry among post graduates and dental professionals.

Kajol Shetty et.al[1] conducted study in 21st century, only 62.9% of the individuals were familiar with the term barodontalgia and only 45.3% of the individuals knew pulpitis was the cause for it. A study reported by Calder and Ramsey et al[11] (1983) where the incidence of barodontalgia during World War II which happened in 20th century was up to 1 to 8% among the military flight attendants and 9.5% of American aircrews reported at least one episode of barodontalgia (Calder and Ramsey 1983)[11]. This shows the lack of acquaintance by the dentists regarding aviation dentistry for several decades.

An in vitro study reported by Calder and Ramsey (1983)<sup>11</sup> found that the teeth with leaky restorations when subjected to exaggerated pressure produced a synergistic effect and reduced the size of venules leading to cessation of circulation that eventually leads to pulpal death. In the Kajol Shetty et.al<sup>1</sup> study the least knowledge was found to be about the term odontocrexia, of which only 12.9% were familiar with and the cause being fracture/leaky restorations was reported to be known only by 17.1%. Similar to barodontalgia, paucity of literature could be the reason for such a lack of knowledge about the term "odontocrexia" among dentists.

The responses to the causes of barotrauma and odontocrexia reported by the individuals were not appropriate as the original causes for those conditions were not chosen by the individuals, which shows the predicament of the dentists with respect to their knowledge about aviation dentistry. In the Kajol Shetty et.al study, the conditions reported by the dentists that needs flight restrictions are in accordance with the study reported by Zadik et al. (2006)<sup>12</sup> after analysing in-flight barodontalgia among 29 cases in military aircrew, the most common in-flight pain causes reported were recently restored teeth (29.6%), barosinusitis (18.5%), and pulp necrosis/periapical periodontitis (18.5%) (Zadik et al. 2006)

[12].

A cross sectional study by Mahtani et.al in 200 students of postgraduates and undergraduates about knowledge, awareness and attitude regarding barodontalgia and found that the attitude toward learning about

barodontalgia was very good as 82% were interested in learning and 80% of the students thought that "barodontalgia" should be included in the dental curriculum and they showed that dental students have moderate levels of knowledge and awareness regarding barodontalgia and showed a positive attitude toward learning barodontalgia. The postgraduates had better knowledge regarding barodontalgia than undergraduate students. Among the postgraduates, the endodontists were more knowledgeable than the other specialty students.

The MDS graduates were found to be more familiar with knowledge regarding aviation dentistry. This is justified as the increased years of experience among dentists was found to be associated with the knowledge they possess regarding aviation dentistry. The reason for the neglect and lack of awareness could be due to lack of knowledge regarding the conditions; inadequate research literatures and the unavailability of these contents in the dental curriculum regarding aviation dentistry.

### III. CONCLUSION

Aviation dentistry is an emerging science, which has been much neglected. The dental clinicians should take an initiative to raise awareness levels and sensitize the air travellers about this issue. The need of the hour is to promote the diagnostic tools and treatment guidelines to the aviation industry to ensure wellness of air travellers. Aviators and dentists should embrace all available opportunities for incorporating oral and dental health into aviators' physical standards, to promote their wellness.

### REFERENCES:

- [1] Shetty K, Manipal S, Mohan R. Aviation Dentistry: is it an Unexplored Field of Dentistry? A Cross-Sectional Study. *Journal of Aerospace Technology and Management*. 2020 Jun 5;12.
- [2] Kollmann W. Incidence and possible causes of dental pain during simulated high altitude flights. *Journal of endodontics*. 1993 Mar 1;19(3):154-9.
- [3] Zadik Y. Aviation dentistry: current concepts and practice. *British Dental Journal*. 2009 Jan;206(1):11-6.
- [4] Mandke L, Garg S. Aviation dentistry: New horizon, new challenge. *Int J Contemp Dent Med Rev*. 2015;3(350115):1-4.
- [5] Lyons KM, Rodda JC, Hood JA. The effect of environmental pressure changes during diving on the retentive strength of different luting agents for full cast crowns. *The Journal of prosthetic dentistry*. 1997 Nov 1;78(5):522-7.
- [6] Orban B, Ritchey BT. Toothache under conditions simulating high altitude flight. *The Journal of the American Dental Association*. 1945 Feb 1;32(3):145-80.
- [7] Anuradha P, Grover S. Aviation Dentistry: "the neglected field by dentists in India". A Review Article. *Journal of Indian Association of Public Health Dentistry*. 2010 Jul 1;8(16):36.
- [8] Lakshmi D. Aviation dentistry. *Journal of Clinical and Diagnostic Research: JCDR*. 2014 Mar;8(3):288.
- [9] Zadik Y, CHApNiK LE, Goldstein L. In-flight barodontalgia: analysis of 29 cases in military aircrew. *Aviation, space, and environmental medicine*. 2007 Jun 1;78(6):593-6
- [10] Nakdimon I, Zadik Y. Barodontalgia among aircrew and divers. *Aerospace medicine and human performance*. 2019 Feb 1;90(2):128-31.
- [11] Calder IM, Ramsey JD. Ondontecrexix—the effects of rapid decompression on restored teeth. *Journal of Dentistry*. 1983 Dec 1;11(4):318-23.
- [12] Y Zadik. Barodontalgia Due to Odontogenic Inflammation in the Jawbone; Source: Aviation, Space, and Environmental Medicine. 2006; 77 (8): 64 – 866.
- [13] Anuradha P, Grover S. Aviation Dentistry: "the neglected field by dentists in India". A Review Article. *Journal of Indian Association of Public Health Dentistry*. 2010 Jul 1;8(16):36.
- [14] Pathak S. Aviation dentistry: Past to present. *Journal of Dental Research and Review*. 2015 Jul 1;2(3):138.
- [15] Ambiru S, Furuyama N, Aono M, et al. Analysis of risk factors associated with complications of hyperbaric oxygen therapy. *J Crit Care* 23:295–300, 2008.