

Aeronautic dentistry

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Keywords:

Aviation, crew members, dentist

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Received: 27 April 2018;

Accepted: 28 May 2018

doi: 10.15713/ins.jcri.216

Abstract

Aeronautic dentistry is a developing science which studies the influence of flying and its effect on oral cavity. It has gained popularity in recent years and is frequently observed in flyers, crew members, pilots, etc. Due to the closed chamber, pressure gets accumulated in these organs causing pain, discomfort, and organ dysfunction. With proper diagnosis, the various complications can be avoided. Thus, dentist should be aware with these facts and provide a treatment inclusively. The main aim of this article is to appreciate the flying effects on dental health and to avert disorders allied with changes in atmospheric pressure.

Introduction

During flying, the aircrew is accountable for the survival of the aircrew members and passengers and for efficaciously finishing the flight. In flight, unexpected helplessness could jeopardize the flight's protection; thus, a person's fitness is utmost important. In the human body, there are several organs such as facial sinuses, lungs, stomach, and middle ear comprising gases which incline to enlarge at low atmospheric pressure. Due to closed chamber, pressure gets gathered in these organs causing pain, discomfort, and organ dysfunction. Extreme altitude changes may cause dental abscesses, periodontitis, deep carious lesions, and deep unlined restorations in the oral cavity which can stimulate severe pain.^[1]

What Is Aviation/Aeronautic Dentistry?

Aeronautic dentistry is one of the branches of dentistry in which we came to know regarding the study of dental aspect in aeronautic environment. This perspectivization branch in dentistry has shown its importance in the screening of oral cavity, treatment as well as forensic or legal point of view.^[2]

Head And Face Barotrauma

The occurrence of barotrauma is very well observed during flying, diving, or hyperbaric oxygen therapy. It shows the variation in

volume of the gas inside the body's rigid cavities which is linked with the variation atmospheric pressure, causing several harmful effects. It may lead to various conditions such as external otitic barotrauma, barotitis media, barosinusitis, barotrauma related headaches, dental barotrauma, and barodontalgia.^[3]

Barodontalgia

Barodontalgia (previously known as aerodontalgia) is a toothache encouraged due to variation in barometric pressure, in an asymptomatic tooth. Often, it is an exacerbation of preexisting subclinical oral disease which was observed during flying at altitudes of 600–1500 m and during diving at depths of 10–25 m and occurs due to the entrapment of gases in the closed chamber due to which it is unable to adjust to the internal pressure. Pain is generally sharp or squeezing in nature.^[4] Pain occurring on both ascend and descend is related to the periapical disease.^[5] During flight, On ascend it is associated with vital pulp tissue and on descend it is associated with pulp necrosis. The pathogenesis of barodontalgia was given by Strohaber in 1972, and he divided it into two main broad groups as direct and indirect types. In the direct barodontalgia, the reduced atmospheric pressure leads to direct effect on a tooth on the affected tooth and is localized, moderate to severe, which usually develops during take-off, whereas, in the indirect type, pain occurs due to the stimulation of the superior alveolar nerves at the time of maxillary barosinusitis and is dull, poorly

defined involving the posterior teeth and develops during landing.^[6]

Odontocrexis

When exposed to high altitude environment, preexisting leaked restorations or recurrent caries lesions beneath the restoration may cause tooth explosion due to the accidental expansion of gas which was trapped beneath the restorations.^[7] Calder and Ramsey reported that poor quality restorations with or without caries may cause tooth damage.^[8]

Endodontics

Since 1940, pulpitis is the chief reason of barodontalgia from the 1940s to date. Rossi recommended endodontic treatment in cases of deep dental caries, involving pulp and contraindicated direct pulp capping in such patients. As a precautionary measure, while executing multivisit endodontic treatment, the dentist should send the patient with temporary restoration as in a pressure-changing environment, and open unfilled root canals can cause facial emphysema as well as leakage of the intracanal infected content to the peri-apex tissues.^[9-11]

Restorative Dentistry

The arrested or secondary caries are minimal in our daily life, and as this lesion is not active, its progression toward the pulp tissue is usually less. In a study by Sognaes *et al.*, they observed that such lesions are prone to risks in a pressure-changed environment and should be removed.^[5] Hence, for deep carious lesions, indirect pulp capping technique (in which leathery/softened and wet pulpal dentine is not removed but sealed) should be done. It is optional for aircrews, which are daily exposed to barometric pressure changes. After carious tissue is removed, the clinician should carefully examine the cavity floor and should observe its approach toward pulp chamber and protective cavity liner (e.g., glass ionomer cement) should be applied before restoration of the cavity.^[12]

Prosthodontics

It has been observed that the retention of dentures in both the jaws is based on atmospheric pressure, adhesion, and gravity, and if there is a reduction in barometric pressure, it may lead to the impairment of the retention of complete denture. In crowns, pressure changes occur in microtubules of the cement layer, which result in a reduced retention of the crown.

Lyons *et al.* studied the retention of crowns to extracted teeth in environmental pressure changing conditions and concluded that the crowns cemented with glass-ionomer cement or zinc phosphate cement had reduced retention with the tooth which can be due to porosities present at the time of manipulation of zinc phosphate cement and glass-ionomer cement. The mechanism

behind to this is that these microporosities expand and contract on pressure changes leading to weakened cement.^[13]

Oral Surgery

Oroantral communication which is usually observed while extracting a posterior upper tooth may lead to sinusitis and has adverse values on exposure to a pressure-changing environment. Hence, the dentist has to rule out the presence of oroantral communication and if it is diagnosed should be referred to an oral surgeon for its closure.^[14]

Periodontal Considerations

Due to the decreased salivary flow and dryness of mouth, there is a high risk of caries and periodontal diseases. In the aircraft, this dryness of mouth can be due to the breathing of dry compressed gases.^[15]

The responsibility of dentists is to educate their patients about the importance of a healthy diet and encourage them toward upholding thorough oral hygiene.

Periodic Examinations

- Occult oral disease should be diagnosed as early as possible otherwise that could be a problem for aircrews.^[16]
- Defective (fractured or cracked) restorations, restorations with poor retention, and secondary caries lesions should be specially taken care of.^[13]
- To rule out occult pulp necrosis, various tests such as cold-test and/or peri-apical radiographs should be performed in teeth with preexisting extensive restorations.
- Panoramic radiographs are recommended additional occult dental pathologies and documentation purposes.
- High prevalence of bruxism among aircrews has been observed, and hence, dentists should look for signs of teeth attrition.

Flight Restriction

The restriction in the flight of a patient is required when some interference in the flight abilities is suspected in aircrew member.

- If a patient is on certain medications which may cause dizziness or lack of concentration (e.g., analgesics) or diarrhea (e.g., antibiotics).
- In patients undergoing tooth extraction or other oral/periodontal surgery, there will be changes in pressure intraorally after several hours.
- Increased hazard of emphysema.
- Facial swelling can prevent jet and helicopter pilots from wearing helmets comfortably.
- Wound healing can be hampered in cases of oroantral communication due to pressure changes.
- To avoid in-flight barodontalgia, aircrew should postpone his flight until the endodontic treatment is completed.

- Dentist should advise the aircrew not to flight until the pain is subsided and the patient can sleep well.

It is advisable that dental appointment should be scheduled for a date with a sufficient time interval before the next planned flight (e.g., weekend holiday).^[17-19]

Conclusion

Aviation dentistry, a new array in dentistry, is leading nowadays as number of people who travel by air are increasing these days, and hence, it leads to an increase in the number of aircrew personnel. Therefore, special care should be done before the problem gets worsen. Complete dental check-up is required and if treatment is required should be done before aircrew patients take off their flights.

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How to cite this article: Nagaraj T, Nigam H, Gogula S, Sumana CK, Saxena S. Aeronautic dentistry. *J Adv Clin Res Insights* 2018; 5: 75-77.

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