

Barodontalgia

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Abstract

Aviation dentistry is a science that deals with diagnosis, prevention, treatment, of conditions that are associated with oral cavity and maxillofacial area and their impact on people who travel, or on aircrew members. With the advancement of the airline industry in all areas, dentists should pay special attention to frequent flyers, due to change of pressure in-flight, that cause different types of oro-facial discomfort and pain.

This article provides information for the dental practitioner where special considerations have to be made when planning periodontal, restorative, endodontic, prosthodontic and surgical treatment to an aircrew patient. Proper diagnosis and treatment should be carried out before these conditions lead to serious complications to maxillofacial areas.

Keywords: Aviation Dentistry; High Altitude; Barodontalgia; Barotraumas; Odontocrexis.

Introduction

With recent innovations in dentistry, dental practice has changed considerably over the past few years, now focus is mainly emphasized on prevention rather than cure. Air travel has now become the chief means of transport in this present era, thus special attention should be paid towards oral and dental health of the crew members and air passengers.

Aviation dentistry is an art and science that deals with oral and dental health of frequent flyers and the aircrew members. According to various studies the prevalence of caries increases with microgravity [1]. With the growing number of air passengers, pilots, flight attendants, military and airline pilots, dentists have been increasingly encountered flight-related oral conditions which require immediate treatment. Moreover, dentists should take precautions of in-flight hazards when they treat aircrew members [2]. During

World War II, tooth pain experienced by an air crewmember in flight was given the name *aerodontalgia*. As this tooth-related pain was also observed in underwater divers, therefore a more appropriate term, *barodontalgia*, was subsequently coined for this phenomenon [3].

A proper diagnosis of the pain should be made, to treat barodontalgia at an earlier stage, as frequently it goes unnoticed due to negligence [3]. Thus it is advisable to have a better knowledge on aviation dentistry among both dentists and aviators.

Barotrauma is a condition which occurs due to a difference in pressure between gas spaces inside the tissues and the surrounding fluid. Barotrauma usually occurs during flying where the atmospheric pressure is lowered as a person flies at high altitudes. It involves medical conditions like external otitic barotrauma, barotitis-media, barosinusitis, barotrauma-related headaches, dental barotrauma, and barodontalgia which occurs due to pressure exerted on branches of trigeminal nerve [2].

Barotrauma of Non-Dental Origin

Pain which is observed is mainly due to the pressure which is exerted on various nerves and their branches because of the changes in the atmospheric pressure, as a person travels at high altitude, i.e. about 18,000ft and above.

Barotrauma commonly affect the ears, which are

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also called aerotitis or barotitis.⁴ It is observed that plane when the plane lands it causes 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) which ultimately leads to hearing loss [5,6] Barotrauma incidence is also observed in conditions such as respiratory tract infections, sinusitis or blockage of Eustachian tubes, these conditions, which causes congestion or blocking of free air-flow between organs or spaces [7].

Pulmonary barotrauma is commonly observed, in which the patient complains of pain and fullness in chest, shortness of breath, radiating pain to neck and shoulders and a feeling of light headedness. If immediate treatment is not given this condition can worsen and may lead to coma, seizure or stroke. Breathing deep at the time of ascent may help in preventing pulmonary barotrauma [8].

Barosinusitis is another symptom associated with higher altitudes. Normally, the air pressure difference is same between the external environment and the paranasal sinuses, but at high altitudes, there usually develops a negative air pressure between the two which leads to acute/chronic inflammation of the paranasal sinuses (mainly the frontal sinus). This condition is termed as barosinusitis, sinus barotrauma, aerosinusitis or sinus squeeze [7].

Precautions should be taken to relieve the pressure during take-off and landing by candy sucking, having chewing gum, yawning or breathing at intervals with the mouth open, the use of earplugs can help to slowly equalize the air pressure in the eardrum. Most important is that people should remain awake during ascent or decent.

Barotrauma of Dental Origin

Frequently cases are encountered of fractured dental restorations, tooth fractures, sharp or diffused pain have been reported [9] Dental barotrauma is mostly observed among the military personnel than in civilian air passengers or frequent flyers [10]. During World War II, various dental studies were carried out on the effect of altitude on oro-facial discomfort and pain and even a specialty program was offered in aviation dentistry in the US.

Barodontalgia (Dental Pain)

Barodontalgia is a symptom rather than a pathologic condition, in which barometric pressure changes in the external environment, which causes

dental pain or a flare-up of preexisting sub-clinical oral-maxillofacial disease caused by a change in barometric pressure. This problem is seen to occur, due to a small void which are present within a restored tooth or in an endodontically treated tooth.. Common oral defects which cause barodontalgia are dental caries, defective tooth restorations, pulpitis, pulp necrosis, apical periodontitis, periodontal pockets, impacted teeth and mucous retention cysts¹¹ it can be caused due to two reasons - either due to creation of pressure changes in the tooth, caused by carious activities or because of defects in it. It can also occur during ascent, as the pressure reduces, leading to dissolution of gases in the blood vessels, due to which bubbles enter the pulp. Treatment involves replacing the restorations having voids or microleakage, the endodontic retreatment or extracting the tooth [11].

Odontocrexis (Barometric Tooth Explosion)

During various clinical studies Calder and Ramsey noticed tooth fracture caused by a high-altitude which they coined the term, "odontocrexis", which means the physical disruption of tooth due to microleakage in restored tooth caused by barometric pressure changes [9,6]. The tooth damage was mainly associated with inferior quality of restorative materials which were used and in unrestored teeth with and without caries. This fracture was caused accidentally due to expansion of gas which was entrapped below the restorations [7]. Dislodgement of porcelain fused to metal restorations were due to pressure changes in microtubules of dental cements.

A recent research which was carried out on fractures of posterior teeth showed that mesio-occluso-distal restorations were diagnosed as a major predisposing factor to tooth fractures. In this study, mandibular first molar teeth were identified as being at risk; placement of cuspal coverage restorations may be considered to be a justifiable preventative measure [7].

Patients should be advised not to fly while having provisional restorations or temporary cement in their mouth. Leaky or faulty restorations should be diagnosed and replaced. Carious lesions should also be excavated and restored. Placement of cuspal coverage crowns could also be a preventive measure.

Teeth and Jaw Bones

Most of the common oral pathologic conditions

have been reported due to barodontalgia, such as dental caries, faulty restorations, pulpitis, pulp necrosis, apical periodontitis which includes jawbone cysts and granulomas, periodontal pockets, impacted teeth, mucous retention cysts, and vertical or horizontal root fractures.

Restorative dentistry Due to inhalation of pure oxygen in excess, the percentage of oxygen increases more than required this may cause corrosion of amalgam in restorations. One of the major clinical benefits of barodontalgia is that it can help dentists to diagnose caries at initial stages, microleakage in restorations and periodontal problems.

Endodontic Considerations

Rossi contraindicated direct pulp capping in aircrew patients and recommended endodontic treatment where pulp involvement was diagnosed so as to prevent sub-acute pulpitis and their hazards related to barometric pressure. Incomplete root canals may cause seepage of the intracanal infection to the periradicular tissues and cause subcutaneous emphysema.

Prosthesis Considerations

Retentions of dentures are mainly based on atmospheric pressure, adhesion and gravity. These for both maxillary and mandibular dentures especially maxillary dentures are completely dependent on it. Reduced atmospheric pressure can reduce the retentions of complete dentures [11]. In cases of crowns, pressure changes occur in microtubules of the cement layer, which causes loss of retention of the crown. The layers of cement under the crowns become dissolved due to microleakage [12]. According to studies if a crown was cemented with zinc phosphate cement or glass ionomer cement, the retention was reduced due to pressure changes. Dentists should consider using resin cement when they cement crowns and fixed partial dentures for patients, such as divers, who are likely to be exposed to pressure changes [13].

Periodontal Considerations

In flyers that fly at high altitudes, decrease in oxygen levels leads to decrease in salivation and dryness of mouth which can have a deleterious effect on teeth, fillings, gums and the mouth. A common complaint is xerostomia which may occur due to breathing of dry compressed gases in the aircraft which increases the risk of periodontal diseases [2].

Oral Surgery

When an upper posterior tooth is extracted, the dentist should be cautious and make sure that there is no existence of an oroantral communication. If it is involved, then due to pressure changes it can lead to severe sinusitis and pain.

Flight Restriction

Grounding of a patient is required when there is interference with the flight capabilities of the aircrew members [2]. This can be caused by intake of medications, which causes side effects like headache, nausea and dizziness. 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 [2], 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 [2].

Prevention

Dentists have the responsibility to educate their patients about the importance of a healthy diet and motivate them toward maintaining meticulous oral hygiene.

Special attention must be paid to prevention of dental problems and oral health maintenance by aircrew members in order to prevent in-flight complications owing to barodontalgia.

It is reasonable therefore that an ambulatory dental appointment should be scheduled for a date with a sufficient time interval before the next planned flight (e.g weekend holiday). Although routine dental restorative treatment does not require grounding, recent restorative treatment was reported as a major cause of barodontalgia. At the time of planning treatment, dentists must notify their aircrew patients (and even patients who planned a flight) 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. 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 [2]. To enhance the retention of prosthesis, an implant prosthesis should be the prosthesis of choice.

Conclusion

There is an increase in the number of people who travel by air. This leads to an increase in number of aircrew personnel. So, scope of aviation dentistry has increased and it should be given importance, so that proper diagnoses can be made and patients are treated before their conditions lead to serious issues. Special considerations have to be made when restorative, endodontic, prosthodontic and surgical treatments are planned for aircrew patients. Aviators and dentists should lay emphasis on all the available opportunities for incorporating oral and dental health into aviators physical standards, to promote their wellness. This article supplies the dental practitioner with some diagnostic tools as well as treatment guidelines. Principles of prevention, periodic examination, dental-related flight restriction (grounding) and dental documentation (for forensic purposes) have been described as well.

Aviation dentistry is an emerging science, which has been much neglected. With air travel gaining popularity, the in-flight dental hazards cannot be ignored anymore. 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 diagnostic tools and treatment guidelines to the aviation industry to ensure wellness of air travellers.

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