

Barodontalgia: A Clinical Entity

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ABSTRACT

Barodontalgia is the oral pain caused by the changes in the pressure caused due to altitude changes either on deep sea diving or inflight conditions. Barodontalgia is one of the important clinical entities which present with such overlapping signs and symptoms, that in normal clinical setup the pain due to barodontalgia goes unnoticed. Also the literature available in textbooks is also less informative and revealing of the nature of pain caused due to barodontalgia. Hence this article focuses on those untouched aspects of barodontalgia which are to be paid attention.

Keywords: Aerodontalgia, Barodontalgia, Barotrauma, Tooth Squeeze

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INTRODUCTION

In the present world, where there are increasing numbers of air passengers, pilots, and professional and amateur self-contained underwater breathing apparatus (SCUBA) divers, dentists may encounter conditions that require immediate treatment. One of these conditions is barodontalgia. Barodontalgia, which commonly affects air crew and aircraft passengers as well as underwater divers, is pain or trauma affecting teeth due to variations in pressure gradients (1). An explanation of barodontalgia comes from the Boyle's Law, stating that "at a given temperature, the volume of a gas is inversely proportional to the ambient pressure," (1) Barodontalgia is also defined as an oral (dental or nondental) pain caused by a change in barometric pressure in an otherwise asymptomatic organ (2). When a person descends deeper underneath the water surface, pressure exerted on the diver by the water increases and reduces the volume of gases in walled spaces such as teeth and sinuses. Similarly when a person climbs to high altitudes particularly in flight, outside pressure decreases, permitting the volume of gases to increase. The importance of understanding, preventing and, where necessary, treating barodontalgia is especially obvious when considering pilots of war aircraft. In the diving environment, this pain is commonly called "tooth squeeze," and the previous name "aerodontalgia," was used regarding its feature inflight.

More than 60 years have passed since the introduction of the concept of barodontalgia, still there is a lack of knowledge in the literature regarding this issue. Moreover, barodontalgia does not have sufficient space in literature. Hence this article reviews the literature regarding concept of barodontalgia, its etiology and pathogenesis, diagnosis, and prevention.

ETIOLOGY AND PATHOGENESIS

Barodontalgia is a symptom rather than a pathological condition, and in most cases reflects a flare-up of pre-existing oral disease, hence most common oral pathologies have been reported as possible sources of barodontalgia. The common etiologic pathologies for pain were faulty dental restorations and dental caries without pulp involvement (29.2%), necrotic pulp/periapical inflammation (27.8%), vital pulp pathology (13.9%) and recent dental treatment ("postoperative barodontalgia"; 11.1%). Barosinusitis was the main cause of pain origin in 9.7% of cases (3). Kollman (4) has reported three important hypotheses to explain this phenomenon: 1) expansion of trapped air bubbles under a root filling or against dentin that activates nociceptors; 2) stimulation of nociceptors in the maxillary sinuses, with pain referred to the teeth; and 3) stimulation of nerve endings in a chronically inflamed pulp.

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Several hypothesis regarding pathogenesis of barodontalgia have been proposed, direct ischemia resulting from the inflammation (5), indirect ischemia resulting from intrapulpal increased pressure as a result of the vasodilatation and fluid diffusion (6), the result of intrapulpal gas expansion. The gas is a by-product of acids, bases, and enzymes in the inflamed tissue (7), hyperemia in the pulp canal system caused by decompression (8). Sinusitis may also contribute to barodontalgia, although it may not be related to any tooth pathology. For example, Holowatyj (9) described a patient as having pain in his left infraorbital area, as well as in the maxillary left canine and maxillary left first molar during flight. Although no tooth pathology was present, the patient did have mild congestion in his left maxillary sinus, with referred pain in his maxillary teeth. Barosinusitis is distinguishable from barodontalgia, as the former will always occur on descent, whereas the latter always begins on ascent (10). Today there is no consensus over any particular etiological hypothesis and further studies are to be conducted regarding the pathogenesis of barodontalgia.

BARODONTALGIA IN DIVERS

Scuba diving is one of the liked sports in the world. Thus, it is important for dentists to be aware of dental-related problems that may arise for scuba divers. Pain has been reported to appear at depths ranging from 33feet to 80 feet. Pain due to barodontalgia in diving conditions affects more commonly the upper teeth than lower teeth (11), and vast majority of episodes appeared upon descent (12). Appearance of barosinusitis is usually upon descent, whereas barodontalgia is usually precipitated upon ascent (13). The features (i.e., affecting upper teeth more and appearing upon descent) may indicate a greater role

for maxillary sinus pathology in the etiology of in-diving barotrauma; however, further research is needed to confirm that.

BARODONTALGIA IN PILOTS

In recent times, the occurrence of in-flight dental manifestations of pressure changes are relatively low (compared to five decades before) because of the current pressurization measures taken in airplane cabins, high-quality dental care, and the improvement of oral health. Upper and lower teeth are found to be equally affected. The most affected intraoral areas are posterior upper (50.0%) and lower (37.5%) dentitions (14), with upper first molar (30.8%) and lower first molar (30.8%) the most affected teeth (15). Most episodes were characterized as sharp (76.9%) and localized (76.9%) rather than dull (23.1%) and diffuse (23.1%) (15). In-flight barodontalgia has been reported to occur at altitudes of 3,000-25,000 feet (15). The pain may cease on returning to approximate onset level (3,000- 10,000 feet) (15) or ground atmospheric level, but in many cases (61.5%) (2), such as when pain is caused by periapical disease, it has been reported to last as long as three days (16).

CLASSIFICATION

The currently accepted classification of barodontalgia consists of 4 classes according to pulp/periapical condition and symptoms (17,18):

Barodontalgia has also been classified as pulp/periapical-related (“direct”) barodontalgia and barotitis/ barosinusitis-induced (“indirect”) barodontalgia (19).

DIAGNOSIS

Barodontalgia is a symptom rather than a pathologic condition itself. Most of the common oral pathologies have been reported as possible sources of barodontalgia including dental caries, de-

fective tooth restoration, pulpitis, pulp necrosis, apical periodontitis, periodontal pockets, impacted teeth (20,21). Diagnosis begins with the identification of the offending tooth, which could be any tooth with existing restoration or endodontic treatment and/or adjacent anatomical structures (eg, maxillary sinus). The history is of greater importance. Data regarding recent dental treatments, on-ground preceding symptoms (swelling, sensitivity to cold, percussion), and pain onset/cessation (on ascent or descent) and the nature of the pain (sharp, dull) can direct practitioners toward the offending tooth. The presence or absence of a (faulty) restoration is a good starting point for dental examination. In facial barotraumas, barodontalgia is not a symptom of a pre-existing disease but of a pressure change-induced (new) pathologic condition. The term facial barotrauma generally refers to barometric-related trauma to facial cavities, including barotitis media (middle ear barotrauma), external otitic barotrauma, barosinusitis (sinus barotrauma), and dental barotrauma.

Referred pain from extraoral facial barotrauma (barotitis media, external otitic barotraumas, and barosinusitis) can be displayed as a toothache and should therefore appear in the differential diagnosis list of barodontalgia. Finally, in cases of oral pain during diving, dentists should rule out pain caused by the constantly forward-postured and clasped mandible (masticatory muscles contraction) needed to hold the breathing mouthpiece in position.

PREVENTION AND RECOMMENDATIONS

Barodontalgia is not common, yet it can pose a severe safety risk to divers, submariners, pilots and airline passengers. The Fédération dentaire internationale (FDI) has divided barodontalgia into 4 groups from moderate to severe (22), and have listed out a description of clinical symptom, findings and therapy. FDI also recommends an annual checkup for divers, submariners and pilots, with oral hygiene instructions from dentists. Also, patients should not dive or fly in nonpressurized

Table 1:

Class	Pathology	Features
I	Irreversible pulpitis	Sharp transient (momentary) pain on ascent
II	Reversible pulpitis	Dull throbbing pain on ascent
III	Necrotic pulp	Dull throbbing pain on descent
IV	Periapical pathology	Severe persistent pain (on ascent/ descent)

cabins within 24 hours of a dental treatment requiring anesthetic or 7 days following a surgical treatment. One of the most easiest ways to avoid barodontalgia is to maintain good oral health. When dealing with patients involved in diving or aviation, dentists should pay attention to areas of dentin exposure, caries, fractured cusps, fillings and periapical pathology. If a patient arrives in the office complaining of symptoms of barodontalgia, the examiner should establish whether there is a history of recent flying or diving. Examination should include an estimate of the age of restorations in the suspected area, screening for caries and poor-quality restorations, a percussion test on suspected teeth, an evaluation of the response to electrical stimulation or heat and cold, as well as a radiographic examination. One clinical benefit of barodontalgia is that it may help a dentist locate early caries, leaking restorations and periodontal abnormalities. The placement of a zinc oxide eugenol (ZOE) base was found to prevent barodontalgia when reversible pulpitis was the underlying cause. This is attributed to the well-known sedative affects of ZOE. It is also suggested that when treating people who are subjected to large pressure changes, it is best to avoid procedures such as capping of an exposed pulp. Rather, endodontic treatment is indicated. Recent studies (23) have shown that environmental pressure cycling affected the retention of crowns cemented with zinc phosphate and glassionomer cement.

Dental surgeons should consider cementing fixed prosthesis with resin cements for patients who are exposed to marked variations in environmental pressure, such as divers and submariners during escape drills. Endodontically treated teeth that have been open for endodontic treatment and temporarily sealed have been report to be explode on deep sea diving known as Odontocrexia, full porcelain crowns have been reported to shatter at a dive of 65 ft, hence meticulous oral health advice should

be given to the divers, all carious lesions should be restored, all ill fitting crowns should be replaced with a good cementing medium, active periodontal lesion treatment and completion of endodontic treatment should be done. It is sometimes recommended that if we are unable to complete the treatment before deep sea diving or flight, extraction may be the treatment of choice. Also removable dentures are not recommended rather a FPD or an implant is indicated.

CONCLUSION

The present article is aimed at upgrading information regarding barodontalgia. It is evident from the available literature that barodontalgia has been neglected in dental education and research in the recent years. Dentists, while treating pilot and diver patients, should use the data available for analysing the causes of barodontalgia. The incidence of in-flight barodontalgia and the incidence among divers, has found to be similar to that found about five decades before, hence better efforts are needed for further augmentation of speculative as well as hands-on knowledge of barodontalgia.

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