

Barodontalgia: Etiology, Features and Prevention

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Abstract Barodontalgia is a symptom that reflects a flare up of preexisting sub clinical oral disease. Deep sea divers, Aircrew members and passengers are at increased risk of experiencing barodontalgia due to exposure to increased air pressure. It is important for dentists to understand the etiology and features of barodontalgia in order to prevent it. This article reviews the literature regarding barodontalgia, its etiology, features, and prevention.

Keywords Barodontalgia, Tooth Pain, Barotrauma

1. Introduction

During World War II, the name Aerodontalgia was given to tooth pain experienced by air crew during flight. However, as this tooth-related pain was also observed in divers, a broader, more appropriate term, Barodontalgia, was subsequently given to this phenomenon [1].

With the increase in number of air passengers, pilots, and professional and amateur self-contained underwater breathing apparatus (SCUBA) divers, dentists come across Barodontalgia as an emergency situation often in their practice [2].

Barodontalgia is pain or trauma affecting teeth due to variations in pressure gradients and commonly affects air crew and aircraft passengers as well as underwater divers [3]. In rare instances, dental pain during flying or while diving has been indicated as a potential cause of an aircrew member or a diver suddenly becoming incapacitated, thus compromising the safety of the affected person as well as others [4–6]. This article reviews the literature regarding Barodontalgia, its etiology, features, and prevention.

2. Etiology

Barodontalgia is not a pathological condition itself. It is a symptom that reflects a flare up of preexisting sub clinical

oral disease. Most of the common oral pathologies have been reported as possible sources of Barodontalgia [1, 7, 8]. The most common etiologic pathologies for in-flight pain were faulty dental restorations and dental caries without pulp involvement(29.2%), necrotic pulp/ Peri apical inflammation(27.8%), vital pulp pathology (13.9%)and recent dental treatment(“postoperative Barodontalgia”)(11.1%)followed by Barosinusitis (9.7 % [9-12].

Previous reports have documented external Otitic Barotrauma (caused by expansion of air in earphone) [13] and Dental Barotrauma (Barometric pressure-related fracture of dental hard tissue and/or restoration) [14] to have caused Barodontalgia. These examples of facial[15] and dental[16] Barotrauma, respectively are unique along with Barosinusitis as Barometric-related pathologic conditions that are generated during flight from pressure changes rather than pressure-related flare-up of preexisting conditions.

3. Classification

Currently Barodontalgia is classified according to pulp/periapical condition and symptoms into 4 classes [17, 18] (Table 1)

Table 1. Classification of Barodontalgia [17]

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

Barodontalgia has also been classified as “Direct” Barodontalgia i.e. Pulp/Periapical-related and “Indirect” Barodontalgia i.e. Barotitis/ Barosinusitis induced [2, 19].

Table 2. Direct vs indirect barodontalgia [2]

	Direct barodontalgia owing to pulp disease with or without peri-apical involvement	Indirect barodontalgia
Cause	Pulp/peri-apical disease.	Barosinusitis, barotitis media.
Appearance	<i>Pulpitis</i> : during take-off/ascent. Pain usually appears during landing at the appearance-level. <i>Peri-apical periodontitis</i> : usually at high altitude (38,000 ft) during ascent or landing.	During landing. Pain usually continues on ground.
Symptoms	<i>Irreversible pulpitis</i> : sudden sharp penetrating pain. <i>Reversible pulpitis or necrotic pulp</i> : beating dull pain. <i>Peri-apical periodontitis</i> : continuous strong pain, swelling.	Toothache in upper premolar/molar region.
History	Recent dental treatment. Recent dental sensitivity (eg to cold drinks, percussion/eating).	Present acute upper respiratory infection. Past sinusitis.
Clinical findings	Extensive caries lesions or (faulty) restoration. Acute pain upon cold or percussion test.	Pain on sinus palpation. Pain upon a sharp change in the head position.
Radiological findings	Pulpal caries lesions and/or restoration close to pulp-horn. Peri-apical radiolucency. Inadequate endodontic obturation.	Opacity (fluid) on the maxillary sinus image.

4. Barodontalgia in Divers

Scuba diving is one of the fastest growing recreational sports in the world today. Hence dentists should be aware of the possibility Barodontalgia which may arise during scuba diving and methods to diagnose and treat the same. Tissue injury might occur during ascent or during descent due to Barodontalgia [20].

Barotrauma of Descent: Barotrauma is the process in which there is a failure of an enclosed gas- filled space to adjust its internal pressure to the surrounding external pressure, resulting in tissue damage [21]. The most common dental complaint experienced by divers is that of dental squeeze, also referred to as Barotrauma of descent [22]. This is due to conditions associated with exposed dentinal tubules or pulpal tissue. When the diver descends, air is forced into the pulp due to the increased pressure of the inspired air. The pain experienced is related to the diver's depth, and usually improves when the diver ascends, thereby relieving the pressure. Compressed air reaches the dentinal tubules or the pulp through Primary caries, recurrent caries along the margins of restorations, or leaking restorations [23]

Pulpitis due to recent dental treatment could be another possible cause of the dental squeeze [2]. Dental treatment invariably causes a slight degree of inflammation with subsequent swelling in the pulp, resulting in a tooth sometimes being sensitive for a few days after treatment. When pressure is applied to inflamed or bruised tissues, gasses formed due to the inflammation process are compressed and increase the pressure in the pulp cavity, resulting in pain. Hence, patient should be advised not to dive shortly after having a new restoration placed, especially not a deep dive. Similarly, after tooth extraction or minor oral surgery, the inflammation should also be allowed to

subside before diving, as pain and bleeding may be induced by increased pressure [24]

Barotrauma of Ascent: A second type of Barodontalgia is referred to as Barotrauma of ascent and is caused by compressed air that has been trapped in an enclosed space and then expands as the diver ascends. This kind of injury is seen in teeth with incomplete root canal treatments or neglected restorations [2]. During descent, compressed air slowly enters these teeth due to a poor physical seal between the tooth and restoration, but cannot escape quickly enough during ascent [22]. As the diver's depth decreases, there is pressure build- up within the tooth due to expansion of the trapped air, leading to severe pain and sometimes even fracture. Displacement of the intra- canal medicaments through the root apex has been reported [4]. In severe cases the pressure build-up in the tooth may lead to explosion of the tooth, called Odontocrexsis [25].

5. Barodontalgia during Flight

Aircrew members have been reported to be vulnerable to several flight-induced oral pathologic conditions including Barodontalgia [6, 7, 25, 26]. When a person reaches high altitudes in unpressurized airplane cabins, as the outside pressure decreases, the volume of the gases increases. This creates a problem in tooth chambers and canals, since the gases cannot expand or contract in a manner needed to adjust the internal pressure to match the external pressure [19].

During flying, Barodontalgia has been reported to occur across a broad range of altitudes, having been reported at altitudes as low as 5000 feet and as high as 35000 feet but is more common between 9000 and 27000 feet [1].

Table 3. FDI Classification of Barodontalgia [28]

	Chief complaint	Clinical finding	Diagnosis	Treatment
Class I	Sharp momentary pain during ascent (decompression) Asymptomatic on descent (compression) and afterward	Caries or restoration with inadequate base Tooth is vital No periapical pathosis	Acute pulpitis	Zinc oxide eugenol temporary followed by a well based permanent restoration after 2 weeks Endodontic therapy, if irreversible
Class II	Dull throbbing pain during ascent (decompression) Asymptomatic on descent (compression) and afterward	Deep caries or restoration Tooth is vital/ non vital No periapical pathosis	Chronic pulpitis	Root canal therapy Or Extraction of unrestorable tooth
Class III	Dull throbbing pain during descent (compression) Asymptomatic on ascent (decompression) and afterward	Caries or restoration Tooth is non vital Periapical pathosis is present	Necrotic pulp	Root canal therapy Or Extraction of unrestorable tooth
Class IV	Severe persistent pain after ascent (decompression) or descent (ascent)	Caries or restoration Tooth is non vital Definite Periapical pathosis is present	Periapical abscess or cyst	Root canal therapy And/or Surgery Or Extraction of unrestorable tooth

6. Prevention and Management

The Fédération dentaire internationale (FDI) has divided Barodontalgia into 4 groups from moderate to severe, and have listed out a description of clinical symptom, findings and therapy.

The treatment options for Barodontalgia are numerous, depending on the chief complaint, clinical finding and diagnosis. These treatments can range from palliative to definitive, subject to the accessibility of dental care, as some of the triggers could be in the course of activities such as flying or diving. These options have been elaborated by the FDI as in table. 3.

FDI also recommends that annual checkups be done for divers, submariners and pilots, with oral hygiene instructions from dentists. After a dental treatment requiring anesthetic or 7 days following a surgical treatment, patients should be instructed not to dive or fly in non-pressurized cabins for the next 24 hours [28]. Periodic oral and dental examinations, including periapical radiographs and vitality tests, are recommended for the prevention of Barodontalgia in high-risk populations (e.g., aircrews, divers). In addition, screening panoramic radiographs are recommended for these populations at 3-5-year intervals [19, 29]. Special attention needs to be paid for periapical pathosis, faulty restorations, secondary caries lesions, and signs of teeth attrition [30, 31].

7. Conclusions

Although rare, Barodontalgia can cause serious risk to Scuba divers, Submariners, Air crew and passengers. It is important for dentists to understand the etiology and features associated with Barodontalgia in order to help prevent it. Dentists can better tackle this phenomenon by adhering to the guidelines given by FDI. However, further research is required to completely understand the pathogenesis of Barodontalgia.

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