

BARODONTALGIA- AN AGONY FOR THE TOOTH

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Abstract: Barodontalgia is the oral (dental or non dental) pain due to changes in the barometric pressure. With the increase in the number of pilots, SCUBA divers, air passengers, may encounter related oral conditions as they are more subjected to changes in pressure. This is not a pathological condition but a symptom. The common pathologies include faulty restorations, caries, periapical inflammation. This article reviews the etiology, pathogenesis, diagnosis and prevention pertaining to Barodontalgia.

1. INTRODUCTION

The term barodontalgia refers to the pain a person experiences in one or more teeth while being subjected to high or low pressure. In 1940, during World War 2, the name aerodontalgia was given to tooth pain experienced air crew during flight. But since the tooth pain was also observed in divers, the name was changed to "Barodontalgia"^[1]. Barodontalgia is pain or trauma affecting teeth due to variations in pressure gradients and it commonly mistakes air crew as well as air craft passengers and also under water divers.^[2]

2. METHODOLOGY

Boyle's law is often used to explain this phenomenon which states that at a given temperature the volume of a gas is inversely proportional to the ambient pressure. This can be explained when a person is deep below the water surface the pressure created by the water increases, which eventually reduces the volume of gases in pulp chamber of the teeth and sinuses. Inversely when a person reaches high altitudes, the outside pressure decreases, which causes the volume of gas to increase. This creates a problem in the pulp chamber and canals since

the gases cannot expand or contract in order to adjust the internal pressure to match the external pressure^[2]. Resulting in pain, edema, or vascular gas embolism.^[3]

Barodontalgia is not a pathological condition rather is a symptom. In most cases it reflects as a flare up of pre-existing oral disease, hence most common pathologies have been reported as the possible sources of barodontalgia.^[4] The most common pathologies of which are faulty restorations, caries, periapical inflammation and recent dental treatment.^[5] Kollman refers to three important hypothesis to explain the phenomenon. First, expansion of the trapped air bubbles under root filling or against dentin that activates nociceptors; Second, stimulation of nociceptors in the maxillary sinus, with pain referred to the teeth; Third, stimulation of nerve endings in a chronically inflamed pulp.^[6] Retrospective studies have shown that most patients with clinically manifested barodontalgia had carious lesions or defective restorations extending into the dentin.^[7] Pulpitis with periapical inflammation or after dental restoration is reported to be the most common cause. The pathophysiology of pain occurs as a result of microcirculation of pulp.

3. CLASSIFICATION

The most widely accepted classification was given by given by Ferjentsik and Aker in 1982 and is based on the underlying causes and symptoms which was established in 1940.^[7]

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

Barodontalgia is subgrouped into direct (dental induced) and indirect (non dental induced pain).^[8,9] Direct barodontalgia comprises of pulp/periapical pathosis . Indirect includes barotitis, barosinusitis induced barodontalgia.

PATHOGENESIS

During the 1940s , there were several suggestions regarding the pathogenesis

- Direct ischemia resulting from the inflammation.^[8]
- Indirect ischemia resulting from intrapulpal induced pressure as a result of vasodilatation and fluid diffusion.^[10]
- The result of intra pulpal gas expansion. The gas is by product of acids, bases, and enzymes in the inflamed tissue.^[8]
- The result of gas leakage through the vessels because of barometric related reduced gas solubility. This theory was proposed by Orban et al.^[8,11]
- Hyperemia in the pulp canal system caused by decompression. This theory was also proposed by Orban et al^[12]
- Changes in barometric pressure in case of faulty or defective restorations may force the oral fluids to be sucked from the inner dentin fluids leading to pain.^[13]

However a healthy pulp is unaffected by any barometric changes.^[14]

BARODONTALGIA AT HEIGHTS

Aircrew members have been reported to be vulnerable to various flight induced oral pathologic conditions.^[5,15] During flying this condition has been reported to occur across a wide range of altitudes. This condition has been reported at altitudes as low as 5000 feet and high as 35,000 feet. But it is more common between 9000 and 24,000 feet.^[11] The upper and lower teeth are found to be equally affected. The most affected intraoral areas are posterior

upper and lower dentition. Out of which the upper and lower 1st molar being the most affected.^[3] When pain is caused by periapical disease, it has been reported to last for about 3 days.^[4] The pain generated during ascent is related to vital pulp and pain in the descent to pulp necrosis or facial barotraumas.^[16] It is considered that the pain associated with periapical lesions can arise both in ascent and descent of aircraft, but in most cases it occurs in descent.^[17]

BARODONTALGIA UNDER WATER

Scuba divers experience barodontalgia under water because of the high amount of pressure felt diving deep. Therefore dentists should be aware of the pain that may arise for SCUBA divers.^[6] It has been reported that pain appears at depth ranging from 33 feet to 80 feet. Pain due to barodontalgia in diving conditions affects more commonly upper teeth than the lower teeth.^[18] Another common problem encountered by the deep sea divers is that the dental squeeze also called as Barotrauma of descent that results in tissue damage.^[19]

The most common way for air from the pressurized tanks to enter a tooth is by being forced in through carious lesions or defective margins. As the atmospheric pressure decrease during ascent, the trapped gases may expand and enter dentin tubules, thereby stimulating nociceptors in the pulp causing pain.^[20] A study which was conducted by Calder et al mentioned that the physical properties of gas mixture used may contribute to barodontalgia. Another condition called as Odontocrexia meaning tooth explosion occurs when the gases gets entrapped in spaces between tooth and restoration during an increased pressure resulting in tooth fracture.^[20]

DIAGNOSIS.

The common oral pathologies have been reported as possible sources of barodontalgia including dental caries, defective tooth, restoration, pulpitis, pulp necrosis, and impacted teeth.^[4,20] Previous studies have documented the difficulty of obtaining a definitive diagnosis of the causative pathology, because the need to identify the offending tooth, restored tooth, endodontically treated tooth and adjacent anatomical structures (eg: maxillary sinus). However dentists cannot reproduce the trigger factor (ie barometric pressure change) with ordinary dental facilities.^[6] Therefore history is of greater importance. Data regarding the recent dental treatments, on ground preceding systems (swelling, sensitivity to cold, percussion, and so on) and also onset of pain or cessation on ascent or descent and nature of pain (sharp, dull, beating) and so on can direct practitioners towards the offending tooth. Barodontalgia cases involve teeth with faulty restorations, therefore the presence or absence of faulty restoration is a good starting point for dental examination.

PREVENTION AND MANAGEMENT

Though barodontalgia is uncommon, it should not be ignored or left unimportant, as it can pose a serious safety risk to divers, submariners, pilots, and airline passengers. The treatment ranges from palliative to definitive dental care. Vitality testing of all teeth is required for the detection and treatment of asymptomatic pulp necrosis.^[21,22] The FDI recommends annual checkups to be done for pilots, divers etc with good oral hygiene instruction from dentists. After a dental treatment that requires anaesthetic or 7 days following a dental treatment. Patients should be instructed not to dive deep or fly in non-pressurized cabins for the next 24hrs.^[21] Periodic dental examination followed by special attention to fractured or cracked restorations, secondary caries, lesions, periapical pathologies and management of inflammation. Panoramic or periapical radiographs can be a valuable diagnostic tool for investigating occult dental pathologies.^[14]

During restoration of a carious tooth, the clinician should carefully examine the cavity floor to rule out penetration to the pulp chamber and apply a cavity liner (eg: glass ionomer cement).^[10] The placement of Zinc Oxide Eugenol base was found to be prevent barodontalgia when reversible pulpitis was found to be the cause which is well attributed to the sedative effects of Zinc Oxide Eugenol.

During surgery especially in the posterior upper arch, when the sinus is augmented, the dentist should rule out the presence of any oro antral communication as it can lead to sinusitis when exposed to change in pressure. When Oro antral Fistula is diagnosed, a surgical closure is indicated.^[22] Prosthodontic considerations include retention of dentures in both the jaws that is based on atmospheric pressure, adhesion and gravity.

A study conducted by Lyons et al suggested using resin cements when luting a fixed prosthesis in patients who are exposed to variations in pressure.^[10,23] When influenced by pressure the resin cements maintain original bond strength and demonstrates least amount of micro leakage when compared with other cements.

4. CONCLUSION

Thus dentists should employ the preventive measures while treating a diver or pilot. A thorough dental examination, including periapical radiograph and vitality tests are recommended for the prevention of barodontalgia for people at risk.

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