

Swimmer's Calculus: A Review

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Abstract:- Dental calculus is a hard deposit that is formed by calcification of dental plaque primarily composed of calcium phosphate mineral salts which is deposited on natural teeth and restorations and is covered by a layer of unmineralized plaque. Swimming is one of the top recreational activities in developed countries, also one of the best forms of exercise. However, there is a lesser-known side-effect of regular swimming. The chlorine that is used in most pools to keep the water clean and kill bacteria, can actually deposit residue on the teeth, turning them brown. This phenomenon is known as swimmer's calculus. Awareness needs to be created among dental professionals and swimmers regarding prevention and management of swimmer's calculus.

Keywords:- calculus; swimmers; swimming; stains; chlorine.

I. INTRODUCTION

Calculus is defined as a hard deposit which is formed by mineralization of dental plaque on the surfaces of natural teeth and dental prosthesis, usually covered by a layer of unmineralized plaque. Hippocrates was the first person whose writings showed a relation between dental deposits and oral diseases. He noted the harmful effects of calculus on gums and teeth. Albucasis demonstrated the association between calculus and disease and removal of deposits. [21]. Swimming is one of the top recreational activities in developed countries, also one of the best forms of exercise which gives the whole body a workout. Swimming lessons are part of educational curriculum in many institutes across the globe. Competitive swimming is also a very popular Olympic sport. Professional swimmer spends long hours training in chlorinated water. Swimmer's calculus is defined as being a hard, brown tartar deposit that usually appears on both maxillary and mandibular incisors and canines. It generally occurs in swimmers who spend more than six hours a week in chlorinated water in swimming pools. According to ADA "Athlete swimmers, who often swim laps more than six hours a week, expose their teeth to large amounts of chemically treated water. Pool water contains chemical additives like antimicrobials, which give the water a higher pH than saliva, causing salivary proteins to break down quickly and form organic deposits on swimmer's teeth.[6] The result is swimmer's calculus or stain; hard, brown tartar deposits that appear predominantly on the front teeth. Studies regarding swimmer's calculus

initiated in early 1970. Calculus consists of both inorganic and organic components. Principle elements: • Calcium – 39% • Phosphorous – 19% • Carbon dioxide – 1.9% • Magnesium – 0.8% • Trace amounts of Na, Ba, Zn, Str, Br, Cu, Ag, Al, Fe, Fl Components: • Calcium phosphate – 75.9% • Calcium carbonate – 3.1% • Magnesium phosphate – traces and other metals Crystal forms: • Hydroxyapatite – 58% • Octa calcium phosphate – 21% • Magnesium whitlockite – 12% • Brushite – 9%. Four modes of attachment of calculus have been described 1. Attachment by mode of organic pellicle on the enamel surface 2. Mechanical interlocking in cemental resorption lacunae 3. Close adaptation of calculus under surface depressions to gently sloping mounds on the unaltered cementum surface 4. Penetration of calculus bacteria in cementum. Indices for calculus detection include Oral Calculus Index (OCI), Calculus Index – CI, Calculus Surface Severity Index (CSI), Calculus Rating, Marginal Line Calculus Index (MLC-I). The ways of detection include • Visual examination • Tactile examination • Radiographs. Advanced diagnostic aids include Calculus Detection Systems: PERIOSCOPE–Fiberopticendoscopy-based technology DETECTAR – Spectro-optical technology DIAGNODENT – Autofluorescence-based technology Calculus Detection + Removal Systems: PERIOSCAN – Ultrasound technology, KEYLASER – Laser-based technology.

II. EFFECTS OF CHLORINE ON THE TEETH

Chlorinated pools contain pH levels that can cause enamel erosion on the teeth. The pool water contains chemicals that break down salivary proteins quickly and form organic deposits on the anterior teeth. Staining takes place on the acquired enamel pellicle, the layer of peptides and proteins which have a thickness of one micron on the enamel surface. This staining is caused when antimicrobials from pool water, which naturally have a higher level of pH than saliva, contact salivary proteins and quickly break them down, resulting in organic deposits on the swimmer's teeth.[1] The CDC recommends the pH levels of pool water should be between 7.2 and 7.8. The free chlorine concentration should be at least 1 part per million in pools and at least 3 parts per million in swimming pools. Improper pool chlorination is one of the major causes of swimmer's calculus. If the pH of the swimming pool becomes less than 7 it is very much possible this could lead to the dissolving of tooth structures. This phenomenon has been reported to be more in gas-chlorinated pool.[4] When swimming pools are gas-chlorinated, hypochlorous acid is formed. Usually, this

acid can be balanced with the addition of a strong base, such as ash. if there is no enough base to counter the acid from the chlorine, the pool water can become acidic.[1] The symptoms of swimmer's calculus include tooth becoming discoloured, edge of the anterior teeth becoming transparent, in later stages, swimmers may feel extreme dental sensitivity when consuming hot or cold foods.[2]

III. PREVENTION OF SWIMMER'S CALCULUS

The use of fluoride on teeth surfaces before entering the swimming pools could be useful in safe guarding the teeth from any form of damage. The pH level of the pool should be anywhere between 7.2 and 7.8. The lower the pH level is, the more damage the chlorine will do to the teeth. Swimmers should get this information by talking to the authorities of the pool. Pool pH strips are common in local recreational supply stores, test the water before wading in. Swimmers should take a fresh bottle of water with them, when they get out of the pool, they should rinse their mouth out to get rid of any chemical deposits that have built up during their swim. Swimmers should also take a shower to remove any excess chlorine from their body. Keeping mouth closed while swimming is the easiest way to ensure that the harmful chlorine doesn't come into contact with the teeth. [3] Swimmers should consider wearing mouth guards if they find it difficult to close their mouth while swimming. Mouthguards are of three different types namely custom made, stock and boil and bite. Swimmers are advised to visit a dentist at least once in three months for a complete check-up and undergo scaling. Swimmers should brush their at least twice a day and also brush the tongue. Swimmers should consider using a toothpaste that helps replenish natural calcium to strengthen tooth enamel. Brushing teeth immediately after swimming fastens the process of demineralization of teeth due to exposure to acids in the pool environment.

IV. CONCLUSION

It is important for swimmers to schedule more frequent visits to the dentist to have these deposits professionally removed. If not removed, the deposits attract bacteria, which can develop into periodontal disease, putting swimmers at risk for bone loss, tooth loss, increased risk of certain cardiac and respiratory problems and all the other issues associated with diagnosis of periodontal disease. The use of fluoride on teeth surfaces before entering the swimming pools could be useful in protecting the teeth from any kind of damage. Studies have shown that the use of electric toothbrushes can significantly reduce stain and buildup on teeth.[6] Use of alternative methods such as UV light, hydrogen peroxide, ozonates, and bromine instead of chlorine in the swimming pool can avoid swimmer's calculus.[5] Hence awareness of swimmer's calculus must be created among swimmers.

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