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TONGUE BRUSHING – A REVIEW

Periodontology

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ABSTRACT

Tongue forms the largest niche for microbial colonies in the oral cavity. Tongue scraping and brushing can serve as excellent tools for decreasing the levels of streptococcus mutans and plaque in the oral cavity. In periodontal health and disease, bacteria colonizing periodontal pockets and tongue play a major role in the production of volatile sulphur compounds. These compounds are the causative factors of oral malodour. Hence, it would be of intense interest to review tongue cleaning and its effects on oral health and hygiene. The following review article attempts to highlight the potential need for tongue cleaning as part of daily oral hygiene and provides detailed discussion regarding its effect on halitosis, taste sensation, plaque accumulation and microbial load in the oral cavity.

KEYWORDS

INTRODUCTION

Normally the tongue has a reddish pink colour. However, it is frequently coated with a white, yellowish or even brownish layer, called the tongue coating.[1] Recent studies have evidently shown that the dorsum of the tongue is one of the prevailing centre for microorganisms in the mouth and is, therefore, a viable source of bacteria for dental plaque.[2] Tongue coating is composed of blood cells, desquamated epithelial cells, food remnants, nutrients and bacteria.[3,4] It was found that subjects with periodontal disease more often have a thick layer of coating compared to subjects with healthy periodontal tissues.[5] Gilmore and Bhaskar stated that, since habitual tongue brushing results in clinically clean (pink) tongue, tongue brushing should be advocated as a inevitable part of home oral hygiene procedures.[6] For centuries, tongue hygiene has been consistently practiced by many eastern and civilization cultures[7]. Tongue scraping and brushing are being recognized as appealing tools for reducing the levels of mutans streptococci and plaque in the oral cavity.[8] In periodontal health and disease, bacteria colonizing the tongue and periodontal pockets play a vital role regarding the production of volatile sulphur compounds.[9] Tongue brushing not only improves clinical appearance, but it will also reduce the levels of potentially pathogenic populations of bacteria.[10] In order to maintain a healthy periodontium a variety of tongue cleaning devices have been recommended for use in practice [32] (FIGURE-1). The purpose of this article is to review the potential need for tongue cleaning as part of daily oral hygiene practices.

EVOLUTION OF TONGUE CLEANING DEVICES

According to the noted dental historian, Menzies Campbell, 14 tongue scrapers were frequently sold separately and were in great demand because of the widespread presence of thick coating on the tongue.[10] Tongue scrapers were available in various sizes and shapes especially in the form of thin , long, flexible metal spatulas which can be bent in the shape of a "U" during use. They were also available in different shapes like hoes, sugar tongs, shovels, circular outline etc.[11]

The second tongue scraper is displayed in the British Dental Association Library, London, and was made in Birmingham, England, by Joseph Taylor.[11] In the Georgian Period (1740-1830) scrapers were made of silver, having sugar tongs or ring like pattern but they lack the spoon like ends.[12]

In 1892, Joseph King (York County, England) introduced an "improved" instrument for cleansing the tongue. It consists of a head *1/4* to 3/8 in wide and is made up of thin piece of metal which bent to form a circle or oval. The handle was about 2 inches long. [13]The scraper was curved to some extent and there was a hollow-ground inside to cluster away tongue debris .[13]

In 1895, a British patent was awarded to Will and Finck Co., a San Francisco firm, for introducing a tongue scraper which was attached to a toothbrush handle so that it can be fold into a channel or slot when the blade was not in use.[14]

In the 20th century few references were mentioned in dental literature about tongue scraping or cleaning. In 1915, one of the participant in the celebrated National Preventive Symposium gave a brief mentioning to tongue brushing.[15]

In 1920, Sarrazin stated that tonsils, teeth, and gingiva were contaminated and infected from bacteria on the tongue, particularly from the posterior region of the tongue and he suggested tongue scraping to be incorporated into daily oral hygiene practices.[16]

In the 1930's, hairy tongue was encountered as a serious problem due to the widespread, overzealous prescription of boron compounds in mouth rinses and dentifrices, especially sodium perborate and in order to treat this condition, dentists were asked to mechanically scrape the tongue surface with a cement spatula and to apply an aniline dye (such as gentian violet) solution. Patients with hairy tongue were then recommended to brush the tongue habitually with a toothbrush and to apply one of the dyes during bedtime.[17]

In 1951, a combined toothbrush-tongue scraper came into market. The scraper was made of smooth, curved plastic with a "patented vacuum-action groove that mildly sucks out the harmful bacteria.[18] Butler in 1964 developed a U- shaped, two-handled, plastic bristle tongue brush. He advocated that, during brushing procedure the brush could be firmly held by means of the two handles. In this way, gagging could be avoided as the brush would pull the tongue forward.[19]

TePe GOOD Tongue Cleaner (The Swedish Company TePe, Sweden) is fabricated using renewable raw materials, sugar cane and castor oil. This enables TePe to recirculate up to 95% of the CO_2 emissions during the products life cycle, offering a more sustainable choice to consumers and the industry, without compromising on product quality, design or hygiene.[20]

Tongue Cleaning Procedure (christensen Et Al 1998)[21]:

- Extend the tongue out of the mouth to the maximum as possible.
- Examine the location of the debris accumulation. Debris is usually located on the posterior most aspect of the dorsum of the tongue.
- Place the tongue cleaner/scraper as far posterior as possible, and apply force to scrape out the debris from the tongue. Many of them had the tendency to gag at this time, and practice is required to find out the right position in order to minimize the gag response.
- Pull the tongue cleaner slowly forward to the front of the mouth.
- Remove the debris from the cleaning device by placing it under stream of running water.
- Scraping procedure is repeated several times until further debris cannot be removed.
- Clean and dry the cleaning device and store it until the next use.[21]

COMPARISON OF ORAL MICROBE QUANTITIES FROM TONGUE SAMPLES AND SUBGINGIVAL POCKETS

A Longitudinal cohort study was conducted in North East Germany between 1997 and 2001 with 4308 participants and a 11-year follow-up included 2333 subjects (2008–2012). In this study, relative abundance of specific periodonto pathogenic bacteria taken from tongue samples and subgingival pocket samples were correlated significantly to corresponding levels of pocket depth (PD) and clinical attachment levels (CAL).They found a relevant correlation for four periodonto pathogenic bacteria (P.gingivalis,A.actinomycetemcomitans, F. nucleatum, and S. sanguinis) between a global oral habitat (the tongue) and a local site (the subgingival pocket sample) and they put forward a hypothesis that the tongue could serve as a reservoir for oral bacteria. In In 2006 Sao Paulo et al conducted a study to determine the prevalence and levels of pathogenic bacteria in the subgingival biofilm of chronic periodontitis lesions and healthy periodontal sites using the checkerboard DNA-DNA hybridization technique. 200 samples of subgingival biofilm from sites with periodontitis (probing pocket depth $\geq$ 4 mm and /or clinical attachment level $\geq$ 4 mm) and 200 samples from healthy sites of 14 patients with chronic periodontitis, as well as 200 samples from 3 periodontally healthy patients were obtained. The presence and levels of 11 pathogenic bacteria were determined using whole genomic DNA probes and the checkerboard method. The predominant species in all 600 samples included Corynebacterium diphtheriae, Enterococcus faecalis, Staphylococcus aureus, Acinetobacter baumannii and Escherichia coli. In particular, C. diphtheriae, E. coli, E. faecalis, P. aeruginosa and S. aureus were detected in higher counts in diseased sites of patients with periodontal disease compared to healthy subjects ($p < 0.05$). In conclusion, "non-oral" pathogenic bacteria are detected in high levels in periodontal sites of chronic periodontitis patients.[22] Moreover, the detection and quantification of tongue microbes might help us to rule out the risk of recolonization of debrided sites after periodontal therapy.[23]

TONGUE BRUSHING AND ORAL MALODOR

Tongue coating is one of the major factor for oral malodor in periodontally diseased as well as healthy people.[24] The fissures and crypts on the tongue contributes to accumulation of oral debris and microorganisms which in turn leads to volatile sulfur compound production .These volatile sulfur compounds primarily Hydrogen sulphide and methyl mercaptan are the principal components of oral malodor.[25] The amount of tongue coating was significantly greater in patients complaining of halitosis compared to those without halitosis. Some researchers found that back of the tongue is the primary source of bad breath among both healthy patients and those with periodontal disease. Though periodontitis is associated with halitosis, there is evidence that periodontally healthy individuals may also exhibit significant levels of oral malodor due to the accumulation of oral debris and microorganisms in the fissures and crypts of the tongue. The dorsum of the tongue is irregular and extensive, with cracks and papillary structures capable of retaining considerable amounts of substrates (dead leukocytes, shed epithelial cells), and it is an ideal site for the growth of microorganisms.[26] Ei Ei Aung et al, (2015) conducted a study evaluating the effects of different oral hygiene procedures on reduction of VSCs in subjects with oral malodour. Thirty male volunteers who matched with study criteria were divided randomly into two groups. Both groups performed tooth brushing, mouth washing with chlorine dioxide, tongue cleaning and combination of those in different sequence for five weeks. Significant reductions in VSCs were shown by adding mouthwash or tongue cleaning to tooth brushing from the second week to fourth week and greatest reduction in VSCs was found at the fifth week after the practice of all three oral hygiene regimens. Thus it can be concluded that tooth brushing alone does not significantly reduce oral malodor. Mouth washing and tongue cleaning significantly reduce oral malodor, while combined use of tooth brushing, mouth washing and tongue cleaning is considered one of the most effective regimens for oral malodor reduction.[27] Thus removal of tongue coating helps to improve halitosis by reducing the levels of periodonto pathogenic bacteria in oral malodor patients.

EFFECT OF TONGUE BRUSHING ON REMOVAL OF PLAQUE ACCUMULATION

Winnier et al (2013) evaluated the effects of tongue scraping and tongue brushing on existing plaque levels in children and reported that both tongue scraping and brushing resulted in significant reductions in plaque load within 10 days.[28] Vasilakis GJ et al (1985) evaluated the effects of daily mechanical tongue cleaning in experimental rats and found that tongue scraping or brushing diminishes plaque scores in the mouth.[29] Thus, in this new era of dentistry, it is important that research prove the need to include the tongue in all oral hygiene measures. Tongue scraping/brushing serves as an excellent tool for reducing the levels of plaque in the oral cavity.

EFFECT OF TONGUE BRUSHING ON THE MICROBIOLOGY OF THE TONGUE

Large quantities of periodonto pathogenic bacteria can be present on exfoliated epithelium from the tongue.[30] Subjects who habitually brushed their tongue had less bacterial and streptococcal counts on their tongues than non-tongue brushers.[31] Plaque is an important source for salivary mutans streptococci and the tongue provides the largest bacterial load compared to other oral tissues and makes the greatest contribution to bacteria. It has been found that habitual tongue brushing reduces the number of organisms present on the tongue which form plaque *in vitro* and that numbers and types of plaque organisms are altered by a regimen of daily tongue brushing.[28] Rupesh et al, (2011) evaluated the effects of tongue brushing in mutans streptococci levels and the results of the study showed that tongue scraping and tongue brushing demonstrated statistically significant decrease in salivary mutans streptococci counts after 10 days and also after 21 days.[28] In 1995, Quirynen M et al. initiated the full mouth disinfection treatment using chlorhexidine based mouthwashes (tongue was brushed with a 1% chlorhexidine gel for one minute and the mouth rinsed with a 0.2% chlorhexidine solution for two minute) with the aim of reducing periodontal pathogens from all areas of the mouth including pharyngeal niches (tongue, mucous membranes and saliva) in a single session, so that the disadvantage of reinfection during periodontal therapy could be minimized or avoided and also the transmission of pathogens from untreated periodontal pockets to the recently instrumented ones can be avoided.[32] Marsh et al (1994) proposed that the microflora of mucosal surfaces differs in composition from that of dental plaque. For similar reasons, the plaque microflora varies in composition at distinct anatomical sites on the tooth—for example, in fissures, on approximal surfaces, and in the gingival crevice. It is proposed that disease can be prevented or treated not only by targeting the putative pathogens but also by interfering with the processes that drive the breakdown in homeostasis. These views have been incorporated into a modified hypothesis (the "ecological plaque hypothesis") to explain the correlation between the plaque microflora and the host in health and disease, and to identify new strategies for disease prevention.[33] Shaikh HF et al 2018 stated that oral fissure is immensely populated with a number of polymicrobial colonies due to the skilled ability of microbes to adapt to various niches through increased rates of recombination of genes and they are also analogous to the enteral system.[34] Quirynen M et al (2004) studied the effect of twice daily tongue scraping and tongue brushing on tongue coating and microbial load. They found that 2 weeks of tongue brushing or scraping reduces the levels of aerobic and anaerobic bacteria on the tongue.[35] Thus it can be concluded that effective tongue brushing results in reduced bacterial load in oral cavity and would result in dramatic and significant improvement in dental health and hygiene.

EFFECT OF TONGUE BRUSHING ON TASTE SENSATION

Winkler S et al (1999) suggested that tongue brushing is particularly important for increasing taste sensation in geriatric patients who receive prostheses, because a dry mouth cannot recognize flavours of good well-prepared food.[36] Hyde RJ et al (1981) conducted a study in which each subjects attended several sessions to test different flavours, i.e sucrose, NaCl, citric acid and caffeine.[37] In one session, new toothbrush was used to clean the tongue and in another session the

tongue was cleaned with both toothbrush and dentifrice. The results showed that in younger individuals, the use of dentifrice reduced taste perception for sucrose. In both tongue cleaning procedures the sensitivity for citric acid was reduced. Tongue brushing alone decreased caffeine thresholds and increased NaCl thresholds.[37] The older subjects were affected similarly by both tongue treatments with a major influence of the dentifrice on caffeine thresholds. Thus it was concluded that tongue brushing with or without dentifrice can affect taste-perception thresholds.[37]

CONCLUSION

This review focused on searching for an evidence-based advice on whether habitual cleaning of the tongue should be part of daily oral-hygiene procedures. It is clear that the tongue forms the largest centre for microorganism in the oral cavity. Bacteria colonizing in the periodontal pockets and tongue play a major role in the production of volatile sulphur compounds in periodontal health and disease. Tongue brushing and scraping are being established as necessary tools for reducing the levels of mutans streptococci and plaque in the oral cavity. Tongue brushing on a regular basis, particularly aimed at removing the coating on the dorsum of the tongue and found to be fruitful in reducing oral malodour. Thus tongue cleaning would result in dramatic and significant improvement in dental health and hygiene

Figure-1

DIFFERENT TYPES OF TONGUE CLEANING DEVICES

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