

Miswak: A periodontist's perspective

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ABSTRACT

Meticulous plaque control on a daily routine basis is the single most important step to achieve good oral health. Herbal chewing sticks, commonly known as Miswak, are among the ancient and traditional oral hygiene aids popular in India, Pakistan, most of the Arabian countries, and several African countries. But nowadays, because of low cost, free availability, unique chemical composition, and spiritual beliefs, miswak is being used worldwide. A large number of studies have proved that miswak is as effective as, or even superior to the present day's most common oral hygiene aid, i.e., toothbrush. The aim of this review article is to discuss various pharmacological and therapeutic aspects of miswak and also to compare the effectiveness of miswak with modern toothbrushes in terms of oral hygiene practice.

Key words: Chewing stick, miswak, oral health, toothbrush

INTRODUCTION

An old but time-tested proverb “If the eyes are a window to the soul, then the mouth is the doorway to the body” reflects the importance of oral health. Even the evidences from the early civilizations like the Babylonian, Assyrian, and Sumerian suggest an interest in cleanliness of the mouth. Medical books of ancient India, Susruta Samhita and Charaka Samhita, have also stressed on oral hygiene and brushing teeth with herbal sticks.

Teeth-cleaning sticks, commonly known as Miswak or Siwak, are popular oral hygiene aids in India, Pakistan, most of the Arabian countries, and several African countries whereas toothbrushes with nylon bristles are the most common oral hygiene aid in most of the developed countries. Because of

free availability, unique chemical composition and religious beliefs, the use of miswak and other herbal products are increasing at an exponential rate in both developing and developed countries. The World Health Organization (WHO) has also recommended and encouraged the use of miswak as an effective tool for oral hygiene.^[1]

Recently, various authors have concluded that these chewing sticks or their extracts have therapeutic effect on gingival diseases.^[2,3] Sofrata AH *et al.* studied the antibacterial effect of miswak pieces and found it most effective against *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, and *H. influenza* whereas less effective against *Streptococcus mutans* and least effective against *Lactobacillus acidophilus*.^[4] A very recent study by Patel PV *et al.* showed significant improvement in plaque score and gingival health when miswak was used as an adjunct to tooth brushing.^[5]

It is quite surprising, despite the widespread use of miswak since ancient times; relatively little scientific attention has been paid to its oral health beneficial effects. So, the aim of this review article is to discuss various pharmacological and therapeutic aspects of miswak and also to compare the effectiveness of this traditional oral hygiene aid with that of modern toothbrushes. Internet database Medline/ Pubmed search for word “Miswak” resulted in 61 articles, “Miswak and oral health” showed 32 articles, “Miswak and Periodontal disease” and “Miswak and Periodontitis” revealed 24 and 7 articles, respectively. Only highly relevant articles from manual and Pubmed search in English language were considered for the present review article.

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Received: 13-Mar-2012

Revised: 02-May-2012

Accepted: 11-May-2012

Access this article online

Quick Response Code:



Website:

www.jaim.in

DOI:

10.4103/0975-9476.104431

DISCUSSION

Miswak-chemical composition and unique properties

Miswak is basically a pencil-sized stick 15 to 20 cm long with a diameter of 1 to 1.5 cm from *Arak* (*Salvadora persica*) or the Toothbrush tree. But, in areas where it is not available, sticks from other local shrubs/trees like orange (*Citrus sinensis*), lime (*Citrus aurantifolia*), and neem (*Azadirachta indica*) can also be used as teeth-cleaning aid.

The use of miswak for oral hygiene serves dual function, i.e., mechanical plaque control by friction between plant fibers and tooth surface and chemical plaque control due to its chemical composition. Each of these components has some specific role in oral health and its unique pharmacological and therapeutic properties can also be explained on the basis of its composition.^[6] Silica acts as abrasive material that removes stains and deposits from the tooth surface. Sodium bicarbonate has mild abrasive and germicidal effect. Tannic acid has astringent effect on mucus membrane and found to be good anti-plaque and anti-gingivitis. Resins serve a physical function and form a layer over the enamel which protects it from microbial action. Alkaloids show bactericidal effect and stimulate the gingiva. Essential oils have anti-septic effect and stimulate the flow of saliva. Vitamin C helps in healing and repair. Calcium and fluoride ions promote remineralisation of tooth structure and have mild anti bacterial action.

Oral microorganisms and miswak

Dental plaque, which is mainly composed of various aerobic and anaerobic bacteria, is the main etiological agent for initiation and progression of periodontal disease. Certain species, such as *A. actinomycetemcomitans*, *P. gingivalis*, *Prevotella intermedia*, and *Treponema denticola*, are more commonly associated with destructive periodontal disease.^[7]

It has been found that the bacteria cultivated from healthy sites consist predominantly of Gram-positive facultative rods and cocci (approximately 75%). The recovery of this group of microorganisms is decreased proportionally in gingivitis (44%) and periodontitis (10 to 13%). These diseases are accompanied by an increase in the proportion of Gram-negative rods, from 13% in health to 40% in gingivitis and 74% in advanced periodontitis.^[8]

Al-Lafi and Ababneh in 1995 reported that the use of miswak inhibits the formation of dental plaque chemically and also exerts antimicrobial effect against many microorganisms.^[9] Later on, Almas and Al-Bagieh in their *in vitro* study demonstrated that aqueous extract of miswak has growth-inhibitor effect on several microorganisms.^[10]

In 2002, Darout *et al.* used checker board DNA-DNA hybridization and stated that miswak has selective inhibitory

effect on salivary bacteria. They found that there were significantly higher levels of *A. actinomycetemcomitans*, *Prevotella melaninogenica*, *Campylobacter rectus*, *Peptostreptococcus micros*, *Veillonella parvula*, *S. mutans*, *Streptococcus anginosus*, *Actinomyces israelii*, *Capnocytophaga sputigena*, and *P. gingivalis*, and significantly lower levels of *P. intermedia*, *Fusobacterium nucleatum*, *C. sputigena*, *Eikenella corrodens*, *L. acidophilus*, *Streptococcus sanguis*, *Streptococcus salivarius*, *Streptococcus oralis*, and *Streptococcus mitis* in the miswak than in the toothbrush group.^[11] But, Al-Otaibi M *et al.* observed that the use of miswak, in contrast to toothbrush, significantly reduced the amount of *A. actinomycetemcomitans* in the subgingival plaque, which indicated that extracts from *Salvadora persica* might interfere with the growth and leukotoxicity of *A. actinomycetemcomitans*. The difference in results of these two studies could be explained on the basis of the different study design.^[12]

Benzyl isothiocyanate, a major component of *Salvadora persica*, exhibited rapid and strong bactericidal effect against oral pathogens involved in periodontal disease as well as against other Gram-negative bacteria, while Gram-positive bacteria mainly displayed growth inhibition or remained unaffected.^[13] Mansour MI *et al.* compared the bactericidal activity of alcoholic and aqueous extract of miswak and found that alcoholic extract was more bactericidal than aqueous extract.^[14]

Almas K *et al.* assessed the anti-microbial activity of eight commercially available mouth rinses (Corsodyl, Alprox, Oral B advantage, Florosept, Sensodyne, Aquafresh mint, Betadine, and Emoform) and 50% miswak extract against several microorganisms. It was observed that mouth rinse containing Chlorhexidine had maximum anti-bacterial activity while Cetylpyridinium chloride mouth rinse was with moderate and miswak extract was with low anti-bacterial activity.^[15]

Toothbrushes vs miswak in oral health

Bristle toothbrush, which is the most common and widely used aid for oral hygiene, was first time patented in America in 1887 and has since then undergone little change. The American Dental Association has described the range of dimensions of acceptable brushes: a brushing surface 1 to 1.25 inches (25.4 to 31.8mm long) and 5/10 to 3/8 inch (7.9 to 9.8 mm) wide, 2 to 4 rows of bristles, and 5 to 12 tufts per row.^[16] The diameter of commonly used bristles ranges from 0.0071 inches (0.2 mm) for soft brushes to 0.012 inches (0.3 mm) for medium brushes and 0.014 inches (0.4 mm) for hard brushes.^[17]

These tooth brushes are usually used with dentifrices which aid in cleaning and polishing the tooth surfaces.

Dentifrices are commonly available in the form of tooth pastes, tooth powders and gels. Dentifrices are made up of polishing/abrasive agents (calcium carbonate, silicon oxides, aluminium oxide etc.), binding/thickening agents (carrageenates, alginates, sodium carboxymethyl cellulose, colloidal silica etc.), detergents/surfactants (sodium lauryl sulphate), humectants (sorbitol, glycerine, polyethylene glycol etc.), antibacterial agents (triclosan, metallic ions, Zn citrate trihydrate, delmopinol etc.), flavouring agents (peppermint/spearmint oil) and therapeutic agents (as fluoride and pyrophosphates).

Most of the studies discussing the efficacy of miswak and modern tooth brush have shown a superior or comparable effect of miswak over the use of tooth brushes. Danielsen B *et al.* compared the efficacy of miswak and use of tooth brush and they found that the use of miswak was associated with a significant reduction of dental plaque and gingivitis along with comparable or superior oral hygiene effect.^[18]

Gazi *et al.* compared the periodontal status of habitual miswak and toothbrush users and showed that the former had lower gingival bleeding and interproximal bone height than the toothbrush users. They also suggested that 5 times a day use of miswak might offer a suitable alternate for tooth brushing in reducing plaque and gingivitis.^[19] However, Eid *et al.* reported that there were no significant differences in gingival or bleeding indices between miswak and modern toothbrush users.^[20] Sote EO also did not find any difference in plaque and gingival bleeding in chewing stick and toothbrush users.^[21]

Darout IA *et al.* conducted a study on 213 males, aged 20 to 65 years, to evaluate the periodontal status of miswak and toothbrush users. They reported that periodontal status of miswak users in Sudanese population is better than that of toothbrush.^[22] In a single-blind cross-over clinical study, after professional instruction of the proper use of miswak and toothbrush, miswak was found to be more effective than use of tooth brush for reducing plaque and gingivitis in a sample of male Saudi Arabians.^[23]

Although both miswak and toothbrush serve similar function, they vary in their design. Unlike a conventional toothbrush, the bristles of the Miswak lie in the same long axis as its handle. Consequently, the facial surfaces of the teeth can be reached more easily than the lingual surfaces or the interdental spaces. The angulation in the toothbrush enables it to adapt more easily to the distal tooth surfaces, particularly on the posterior teeth.^[24]

Two basic holds for miswak: pen-grip (three finger grip) and the palm-grip (five finger grip) have been documented in literature. In each case, the aim is to ensure firm but

controlled movement of the brush end of the Miswak within the oral cavity, so that every area of the mouth is reached with relative ease and convenience. The basic technique employed for removing plaque mechanically are similar to that for toothbrush and the chewing stick, i.e., vertical and horizontal brushing. The cleaning movement should always be directed away from the gingival margin of the teeth (away from the gums) on both the buccal and lingual surfaces.^[25]

Miswak chewing sticks have been found to be associated with high level of gingival recession and tooth wear. Eid MA *et al.* reported high level of gingival recession in Miswak chewing stick users. These findings could be explained on the basis of high frequency per day (5 times per day) and uninstructed manner of use of miswak.^[26,27] However, Johansson *et al.* correlated miswak use with high level of tooth wear.^[28] But despite these side effects, this traditional oral hygiene practice is so common in our population that it needs further investigations on modern scientific lines.

CONCLUSION

The present review article not only discusses the composition, prophylactic and therapeutic properties of miswak, but also describes the basics of toothbrush and dentifrices. Most of the studies on interaction of miswak with periodontopathogens favored the use of miswak as an oral hygiene aid.

The indigenous system of medicine like herbal chewing sticks (miswak) has been popular since ancient times; further long-term clinical trials are needed to evaluate the therapeutic and pharmacological effects of various chemical components of miswak. More and more studies should focus on clinical effectiveness of miswak as compared with the toothbrush on clinical periodontal parameters such as probing depth, gingival bleeding, clinical attachment level, etc. Effect of miswak should be evaluated separately on periodontally healthy and diseased individuals. Efficacy of Miswak should not be compared with toothbrush alone but also with various fluoridated and non-fluoridated dentifrices. The results from these studies would definitely open new vista in the field of dentistry in providing a foundation for various preventive oral health programs for rural and urban society of India.

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How to cite this article: Dahiya P, Kamal R, Luthra RP, Mishra R, Saini G. Miswak: A periodontist's perspective. *J Ayurveda Integr Med* 2012;3:184-7.

Source of Support: Nil, **Conflict of Interest:** None declared.