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Control of Dental Plaque with Saptachada Kshara - A Case Series

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ABSTRACT

Introduction: Dental plaque is bacterial aggregations adhering to the tooth surface in the oral cavity. It may further result in gingivitis and periodontitis. Majority of the persons affected with plaque may not give much attention unless they experience some other symptoms like gingival bleeding, halitosis, dryness of mouth and sensitivity. Dental plaque may be compared with Dantasharkara, one of the dantaroga according to Ayurveda.

Aim: For the case series under reference, Dantasharkara Uddharana (removal of plaque) with shastra is told in Ayurveda. But the procedure is not standardized. So, the second line of treatment Kshara and Madhu pratisarana [rubbing] is adopted here.

Case Report: In the present clinical study, 30 patients were registered to have a complaint of Dantasharkara. Each case was observed for prevalence according to age, gender, socioeconomic status, occupation, diet pattern, frequency of cleaning teeth, tooth discolouration, tooth sensitivity, halitosis, dryness of mouth, plaque index and gingival bleeding index.

Result: 250 mg Saptachada kshara pratisarana and 100ml Tilayastimadhu ksheera gandusha daily once for 30 days showed significant reductions in tooth discolouration, sensitivity, halitosis, dryness of mouth, plaque and gingival bleeding indices, with an improvement of 83%, 100%, 93%, 97%, 95% and 95% respectively. Statistical analyses were performed with SPSS software and are clinically significant with $p < 0.0001$.

Conclusion: Saptachada being a *pratisaraniya kshara dravya* is mentioned in *kushtaghna mahakashaya* and *sa krimya Vrana chikitsa*. Due to lekhanam, chedana, bhedana pachana, vilayana and kapha vata shamaka karma, kshara becomes responsible for samprapti vighatana of danta sharkara. Saptachada kshara pratisarana is safe, effective and has proved to have better patient's tolerance.

Key Words: Dental Plaque, Oral Hygiene, Saptachada Kshara, Tilayastimadhu ksheera, Plaque Index

INTRODUCTION

Dental plaque results from colonization and growth of microorganisms on the surface of teeth, if not treated in time may exacerbate the condition leading to gingivitis, periodontal diseases and even tooth loss. India reports more than 10 million plaque related cases every year. Oral hygiene plays a major role in once healthy living. Effective treatment can control plaque and its progression. As per classic *dantasharkara* explained in *mukharoga*, it is due to improper oral hygiene by which the vitiated *vata* dry the *Kapha* and *dantamala* [The waste precipitations on teeth] and so the teeth appear with yellow or brown colored precipitations and halitosis.¹ The treatment adopted in *dantasharkara* was *Saptachada kshara pratisarana* [rubbing].

Intolerance to hot and cold substances is the main side effect seen after scaling and root-planning. Acharyas had mentioned, *Danta Harsha chikitsa* (treatment for the sensitivity of tooth) after *Dantasharkara udharana* (removal of dental plaque). Milk boiled with *Tila* and *Yastimadhu choorna* was given for *gandoosha*.² Saptachada (*Alstonia scholaris*) is mentioned by *vagbhatta* in *aragwadiya Gana* (cleanses bad wounds), *krimija Vrana* (disinfect wound) and in *mukhapaka* (mouth ulcer). *Kshara* alleviates three dosas by *Lekhanam* (scarifying), *Chedana* (excision) and *Bhedana* (incision), *vilayana* (liquefies), *shodana* (cleanses) and *ropana* (healing) property.³ *Madhu* is mentioned in *Sandhaneeya* and *Sthapana mahakashaya*.⁴ It alleviates three doshas having *Vrana shodana*, *Sandhana*, *Ropana* and *krimihara* prop-

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erties. Honey migrating through the epithelium of the gingival crevice has got both bactericidal and rinsing function.⁵

Tila (*Sesamum indicum*) is *snigdho vrane lepana* (beneficial for the wound as an external paste) and *dantya* (wholesome for teeth).⁶ *Yastimadhu* (*Glycyrrhiza glabra*) comes under *sandhaneeya* and *shonitha sthapanagana* ie herbs that help in healing and checking of bleeding.⁷ *Tila* and *Yastimadhu* rich in calcium preserve the root around tooth and gums. *Gandusha* helps in treating several health conditions and nourishes the sense organs. It stimulates taste perception and increases salivation. Saliva contains Ptylin and lysosomes, which acts as bacteriosidal.

MATERIALS AND METHODS

The study was conducted at Amrita School of Ayurveda, Amritapuri. Thirty patients reporting at the outpatient department of Shalakya and diagnosed clinically as the case of dental plaque with chronicity less than 5yrs along with tooth discolouration, sensitivity, halitosis and dryness of mouth were included in the study. Patients with presence of extensive caries and fracture of teeth, use of orthodontic appliances in previous 6 months, continuous usage of mouthwashes in previous 6 months, history of allergy to dentifrices or history of any uncontrolled systemic diseases were excluded. The study procedure was explained to thirty patients participating in the study.

Scores of subjective criteria, plaque index and gingival bleeding index were recorded on the 1st and 30th day of treatment and were reassessed during the four follow-ups. The examinations were done by the investigator well trained with the procedure using mouth mirror and William's probe, inadequate illumination. Parameters used were Quigley and Hein plaque index and Loe and Silness gingival bleeding index.

Statistical significance of mean scores between before and after treatment were assessed using the paired t-test. Subjective parameters were assessed using the Wilcoxon sign rank test. Statistical analyses were performed with SPSS software for Windows.

Study design

The study was designed as an open-label clinical trial and the guidelines of the CONSORT statement were followed. The study protocol was reviewed and approved by the Institutional Ethics Board Committee on research. Written informed consent in agreement with the Declaration of Helsinki was obtained from all enrolled individuals. Clinical Trial Registry was also done. 30 Participants who were fulfilling the criteria were selected for the clinical study and were provided with enough their assigned products.

Subjective parameters

All selected participants were observed before and after treatment visit on the 30th day and as follow-ups on the 45th day, 60th day, 75th day and 90th day.

These consultations involved the assessment of

- Tooth discolouration
- Tooth sensitivity
- Halitosis
- Dryness of mouth. [Table no: 1]

Table 1: showing the Grading system for subjective parameters

Criteria	Score
Tooth discolouration	Present -1, Absent -0
Teeth sensitivity	Acceptable-0, Tolerable -1, Intolerable -2
Halitosis	Present -1, Absent -0.
Dryness of mouth	Present -1, Absent -0.

Patients with tooth discolouration, tolerable tooth sensitivity, halitosis and dryness of mouth were given score 1. The absence of these subjective criteria was given score 0. Patients with intolerable tooth sensitivity were given score 2.

Objective parameters

- The Plaque score was assessed using a standard scale called the Turesky Modification of the Quigley Hein Plaque Index and scored from 0 to 3. This index measures the thickness of plaque on the gingival one-third.
- Gingivitis was assessed using Gingival bleeding index on interdental space. Bleeding response to the horizontal pressure applied in the interdental area by a dental probe was recorded. After 30 s, bleeding at each gingival unit was recorded. Any change in gingival colour and oedema was noted.
- Used on all teeth (28, so wisdom teeth are excluded) or selected 6 teeth.
- No substitution of the missing tooth. Used on all 4 surfaces (M, O, D, L). [Table no: 2]

Table 2: showing the grading system for plaque index

Criteria	Scores
No plaque	0
A film of plaque adhering to the free gingival margin and adjacent area of the tooth.	1
Moderate accumulation of soft deposit within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye.	2
The abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.	3

On oral examination, a tooth with no plaque was given score 0 and those with mild plaque adhering to the free gingival margin and adjacent area of the tooth were given score 1. Moderate accumulation of plaque within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye were given score 2. The abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin was given score 3.

Therapeutic Interventions

Patients were administered with 250mg of *Saptachada kshara* along with 4 drops of *Madhu* for *Danta Pratisarana* (dental rubbing) in a circular pattern followed by 100ml of *Tila yastimadhu ksheera gandoosha*⁴(rinsing) for 30 consecutive days. (Table 3). The patient's tooth discolouration, sensitivity, halitosis, dryness of mouth, plaque index and gingival bleeding index were assessed before and after treatment and during the four follow-ups done in every 15 days for the next 2 months. The pre and post photographs were also taken.

Table 3: Shows the therapeutic intervention

Procedure	Medicine	Dose	Duration
Pratisarana	Saptachada kshara (2 min)	250 mg	30 days
Gandusha	Tila yastimadhu ksheera (5 min)	100 ml	30 days

RESULTS

Of the 33 participants enrolled in the study, three of them were considered dropped out due to an irregular visit to the hospital for follow-up.

Wilcoxon sign rank test showed a reduction in tooth discolouration, sensitivity, halitosis and dryness of mouth between BT and AT, follow-up 1, follow-up 2, follow-up 3, and follow-up 4, which is highly significant at all stages $P < 0.0001$ [Bonferroni Correction]. In subjective criteria, there is an improvement of 83%, 100%, 93% and 97% respectively. [Table no: 4,5,6,7].

Table 4: Shows the ranking of tooth discolouration

Tooth discolouration ranks	N rank	Mean rank	Sum of ranks	Z value	Asymp. Sig. (2-tailed)
Tooth_discoloration_AT – Negative rank	25 ^a	13.00	325.00	-5.000 ^b	0.001
Tooth_discoloration_BT Positive rank	0 ^b	.00	.00		
Ties	5 ^c				
Total	30				
Tooth_discoloration_FU1 – Negative rank	25 ^d	13.00	325.00	-5.000 ^b	0.001
Tooth_discoloration_BT Positive rank	0 ^e	.00	.00		
Ties	5 ^f				
Total	30				
Tooth_discoloration_FU2 – Negative rank	25 ^g	13.00	325.00	-5.000 ^b	0.001
Tooth_discoloration_BT Positive rank	0 ^h	.00	.00		
Ties	5 ⁱ				
Total	30				
Tooth_discoloration_FU3 – Negative rank	25 ^j	13.00	325.00	-5.000 ^b	0.001
Tooth_discoloration_BT Positive rank	0 ^k	.00	.00		
Ties	5 ^l				
Total	30				
Tooth_discoloration_FU4 – Negative rank	25 ^m	13.00	325.00	-5.000 ^b	0.001
Tooth_discoloration_BT Positive rank	0 ⁿ	.00	.00		
Ties	5 ^o				
Total	30				

Wilcoxon sign rank test showed reduction in tooth discolouration between BT and AT, follow-up 1, follow-up 2, follow-up 3, and follow-up 4 in subjects, which is highly significant at all stages $P < 0.0001$ [Bonferroni Correction]. Above table

makes it clear that 25 patients got reduction in tooth discolouration after treatment and 5 patients had the symptom persisted throughout the follow-up period.

Table 5: Shows ranking of tooth sensitivity

Tooth sensitivity ranks	N rank	Mean rank	Sum of ranks	Z value	Asymp. Sig. (2-tailed)
Tooth_sensitivity_AT – Negative rank	30 ^a	15.50	465.00	-5.069 ^b	0.001
Tooth_sensitivity_BT Positive rank	0 ^b	.00	.00		
Ties	0 ^c				
Total	30				
Tooth_sensitivity_FU1 - Negative rank	30 ^d	15.50	465.00	-5.069 ^b	0.001
Tooth_sensitivity_BT Positive rank	0 ^e	.00	.00		
Ties	0 ^f				
Total	30				
Tooth_sensitivity_FU2 - Negative rank	30 ^g	15.50	465.00	-5.069 ^b	0.001
Tooth_sensitivity_BT Positive rank	0 ^h	.00	.00		
Ties	5 ⁱ				
Total	30				
Tooth_sensitivity_FU3 - Negative rank	30 ^j	15.50	465.00	-5.069 ^b	0.001
Tooth_sensitivity_BT Positive rank	0 ^k	.00	.00		
Ties	5 ^l				
Total	30				
Tooth_sensitivity_FU4 - Negative rank	30 ^g	15.50	465.00	-5.069 ^b	0.001
Tooth_sensitivity_BT Positive rank	0 ^k	.00	.00		
Ties	5 ^l				
Total	30				

Wilcoxon sign rank test showed a reduction in the feeling of tooth sensitivity between BT and AT, follow-up 1, follow-up 2, follow-up 3, and follow-up 4 in subjects which is highly

significant at all stages $P < 0.0001$ [Bonferroni Correction]. From the table, it is clear that 30 patients had relief and it was sustained throughout all follow-ups.

Table 6: Shows the ranking of Halitosis

Halitosis ranks	N rank	Mean rank	Sum of ranks	Z value	Asymp. Sig. (2-tailed)
Halitosis_AT – Negative rank	28 ^a	14.50	406.00	-5.292 ^b	0.001
Halitosis_BT Positive rank	0 ^b	.00	.00		
Ties	2 ^c				
Total	30				
Halitosis_FU1 - Negative rank	28 ^d	14.50	406.00	-5.292 ^b	0.001
Halitosis_BT Positive rank	0 ^e	.00	.00		
Ties	2 ^f				
Total	30				
Halitosis_FU2 - Negative rank	25 ^g	14.50	406.00	-5.292 ^b	0.001
Halitosis_BT Positive rank	0 ^k	.00	.00		
Ties	5 ⁱ				
Total	30				
Halitosis_FU3 - Negative rank	25 ^g	14.50	406.00	-5.292 ^b	0.001
Halitosis_BT Positive rank	0 ^k	.00	.00		
Ties	5 ⁱ				
Total	30				
Halitosis_FU4 - Negative rank	25 ^g	14.50	406.00	-5.292 ^b	0.001
Halitosis_BT Positive rank	0 ^k	.00	.00		
Ties	5 ⁱ				
Total	30				

Wilcoxon sign rank test showed a reduction in tooth discolouration between BT and AT, follow-up 1, follow-up 2, follow-up 3, and follow-up 4 in subjects, which is highly significant at all stages $P < 0.0001$ [Bonferroni Correc-

tion]. Above table makes it clear that 28 patients got a reduction in tooth discolouration after treatment and 2 patients had the symptom persisted throughout the follow-up period.

Table 7: Shows the ranking of dryness of mouth

Dryness of mouth ranks	N rank	Mean rank	Sum of ranks	Z value	Asymp. Sig. (2-tailed)
Dryness_of_mouthAT - Negative rank Dryness_of_mouth-BT Positive rank	29 ^a	15.00	435.00	-5.385 ^b	.0001
Ties	0 ^b	.00	.00		
Total	1 ^c				
	30				
Dryness_of_mouth_FU1 - Negative rank Dryness_of_mouth_BT Positive rank	29 ^d	15.00	435.00	-5.385 ^b	0.001
Ties	0 ^e	.00	.00		
Total	1 ^f				
	30				
Dryness_of_mouth_FU2 - Negative rank Dryness_of_mouth_BT Positive rank	29 ^g	15.00	435.00	-5.385 ^b	0.001
Ties	0 ^h	.00	.00		
Total	1 ⁱ				
	30				
Dryness_of_mouth_FU3 - Negative rank Dryness_of_mouth_BT Positive rank	29 ^j	15.00	435.00	-5.385 ^b	0.001
Ties	0 ^k	.00	.00		
Total	1 ^l				
	30				
Dryness_of_mouth_FU4 - Negative rank Dryness_of_mouth_BT Positive rank	29 ^m	15.00	435.00	-5.385 ^b	0.001
Ties	0 ⁿ	.00	.00		
Total	1 ^o				
	30				

Wilcoxon sign rank test showed a reduction in tooth discolouration between BT and AT, follow-up 1, follow-up 2, follow-up 3, and follow-up 4 in subjects, which is highly significant at all stages $P < 0.0001$ [Bonferroni Correction]. Above table shows 29 patients got a reduction in tooth discolouration after treatment and 1 patient had the symptom persisted throughout the follow-up.

RESULTS ON OBJECTIVE PARAMETERS

Paired T-test was performed to evaluate the significant difference in the mean value of Plaque index and Gingival bleeding index. [Table no:8 and 9]

Table 8: Shows the ranking of Plaque index

Parameters	BT mean score	AT Mean score	Mean	% of Improvement	SD	SE	t value	df	Sig. (2-tailed)
Plaque_Index_BT Plaque_index_AT	2.00	.1667	1.83	95%	0.38	0.06	26.5	29	0.0001
Plaque_index_BT Plaque_Index_FU1	2.00	.1667	1.83	95%	0.38	0.06	26.5	29	0.0001
Plaque_index_BT Plaque_Index_FU2	2.00	.1667	1.83	95%	0.38	0.06	26.5	29	0.0001
Plaque_index_BT Plaque_Index_FU3	2.00	.1667	1.83	95%	0.38	0.06	26.5	29	0.0001
Plaque_index_BT Plaque_Index_FU4	2.00	.1667	1.83	95%	0.38	0.06	26.5	29	0.0001

Paired T-test was performed to evaluate the significant difference in the mean value of the Plaque Index. It was observed that there is a significant difference in mean values of before (2.00) and after treatment (0.1667) and it was main-

tained during follow-up 1, follow-up 2, follow-up 3, and follow-up 4. The result was statistically highly significant with $p < 0.0001$.

Table 9: Shows ranking of Gingival Bleeding index

Parameters	BT mean score	AT Mean Score	Mean	% of Improvement	SD	SE	t value	df	Sig. (2-tailed)
G.B_Index_BT G.B_Index_AT	2.10	.133	1.96	95%	0.67	0.12	16.1	29	0.0001
G.B_Index_BT G.B_Index_FU1	2.10	.133	1.96	95%	0.67	0.12	16.1	29	0.0001
G.B_Index_BT G.B_Index_FU2	2.10	.133	1.96	95%	0.67	0.12	16.1	29	0.0001
G.B_Index_BT G.B_Index_FU3	2.10	.133	1.96	95%	0.67	0.12	16.1	29	0.0001
G.B_Index_BT G.B_Index_FU4	2.10	.133	1.96	95%	0.67	0.12	16.1	29	0.0001

Paired T-test was performed to evaluate the significant difference in the mean value of Gingival Bleeding Index. It was observed that there is a significant difference in mean values of before (2.10) and after treatment (0.133) and it was maintained during follow-up 1, follow-up 2, follow-up 3, and follow-up 4. The result was statistically highly significant with $p < 0.0001$.

Overall effect of therapy Improvement

The effect of *Saptachada kshara pratisarana* treatment was assessed for follow-ups done every 15 days for the next 2 months. [Table no. 10]

Table 10: Overall effect of therapy Improvement

Improvement	Percentage of Improvement
Complete improvement in Tooth sensitivity	100%
Marked improvement in Tooth discolouration,	83%
Halitosis	93%
Dryness of mouth	97%

Figure 1: Comparison of before and after treatment.

All the 30 patients got improvement in sensitivity, 25 patients got improvement in discolouration, 28 patients got improvement in halitosis and 29 patients got improvement in dryness of the mouth. The use of *Saptachada kshara* is safe, effective and proved to have better patient's tolerance. The alternate hypothesis is accepted i.e. *Saptachada kshara pratisarana* is effective in the management of dental plaque.

DISCUSSION

Classics explains this condition as *dantasharkara* in mukharoga. Due to improper oral hygiene, there is the accumulation of annamala (food debris) on the teeth or Kapha

dehydrated by Vata, adhering to teeth becoming hard it takes the shape of thick adherence like the sand gravels and emitting a bad odour. If not treated in time it leads to dantanam gunahari (destroys the natural qualities of the tooth). Dental plaque is bacterial aggregations adhering to the tooth surface in the oral cavity. It is a sticky colorless deposit at first, but when it forms tartar it is often brown or pale yellow. The build-up of dental plaque can give rise to gingivitis and periodontitis. By considering the nidana (causative factors) and Lakshana (symptoms) of dantasharkara, the therapies are adapted. Standard treatment techniques in contemporary science are Scaling, root planning and flossing.⁵

For the case under reference, *dantasharkara uddharana (removal of plaque)* with *shastra* is told in Ayurveda. But the procedure is not standardized. So, the second line of treatment *kshara and Madhu pratisarana* [rubbing] is adopted here. In the present study, it was observed that majority i.e. 46 % of patients were belonging to the age group between 20-25yrs and 63% of participants were females. The educational status of the present study reveals that 30% of the patients are students, whereas 17% of the patients belonged to the house-wife category and businessmen. 77% of the participants were having the habit of brushing only once daily.

Kshara due to pachana, vilayana and kapha vata karma becomes responsible for samprapti vighatana of danta sharkara. As vitiation of *vata kapha dosha* is responsible for the disease. When the *kshara* is applied over a particular place there will be erosion of the dead tissues and the healthy tissues get exposed, thereby initiating healing. Here *kshara* was mixed with *madhu* as it is *yogavahi*, and promotes *sandana*, *shodana* and *ropana gunas*. Kshara to fulfil the definition of *shodana dravya* can remove mala from body⁸. *Lekhana, chedana and bhedanaguna* of *kshara* helps to disintegrate the plaque from its site thereby reducing plaque index. It has *vrana ropaka* and *mukha dourgandhyahara* property, which helps in the reduction of sensitivity and halitosis.

Sensitive teeth are typically the result of worn tooth enamel or exposed tooth roots. So, the wound healing activity of Saptachada and Madhu helps in reducing sensitivity. Tila is Snigdho vrane lepane and has an antibacterial effect. Polyunsaturated fatty acid in Tila reduces free radical injury occurring in the oral cavity and thus helps to reduce plaque-induced gingivitis. Tila and Yastimadhu used in gandusha are rich in calcium and it preserves the root around tooth and gums⁹. They also help slough off plaque while helping build tooth enamel. Gandusha generates antioxidants which damage the cell wall of microorganisms and kill them. This will attract the lipid layer of bacterial cell membranes, and cause it to stick or get attracted, and pulled to the oil. During gandusha, the oil gets emulsified and surface area of the oil gets increased.¹⁰ The process of emulsification of oil begins upon 5 min of gandusha. This liquid will coat the teeth

and gingiva and inhibits bacterial co-aggregation and plaque formation.¹¹ Thus, plaque building bacteria responsible for dental caries, gingivitis, periodontitis and bad breath are removed from the oral cavity. The salivary flow rate may be a contributing factor in the incidence of caries, and reduction in salivary output may result in rapid deterioration in oral health.¹² Normal salivary pH is 6.2 to 7.6. Being alkaline, *kshara pratisarana* (Potential of Hydrogen 8.4) also helps to make salivary Potential of Hydrogen in neutrality. Gandusha is also of help to resolve symptoms of dry mouth and chapped lips.

Saptachada kshara's gradual but sustained chemical action removed the debris from the site and it helps in the formation of healthy granulation tissue thereby introducing a long healthy pattern in the depth of the tissue.¹³ Its antibacterial activity helps to control the infection as well as reduce the bacterial density which leads to the speedy recovery of the disease.¹⁴

CONCLUSION

The clinical trial was conducted to see the effectiveness of Saptachada kshara in dental plaque. 250mg *Saptachada kshara pratisarana*, daily once for 30 days showed significant reductions in tooth discoloration, sensitivity, halitosis, dryness of mouth, plaque and gingival bleeding indices, which are statistically significant.

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Patient Consent

The patients voluntarily gave his/ her consent to have their case documented and published.

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