Original Article

Role of *Laksha Churna* and *Madhu Pratisarana* after ultrasonic scaling in the management of *Dantasharkara* (dental calculus): An open-label, standard controlled randomized clinical trial

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Abstract

Background: Dental calculus is one of the major problems in dentistry, which is characterized by calcified mass that forms on and adheres to the surface of teeth resulting in bad breath, receding gums and chronically inflamed gingiva. It can be correlated with *Dantasharkara* (dental calculus), which is characterized by the collection of hardened accumulation of *Mala* (tartar) at the junction of teeth and gums. Ultrasonic scalars are used for the removal of dental calculus for convenience. In texts, *Laksha Churna* (powder of *Laccifer lacca* Kerr) has been mentioned as *Vranaropaka* (wound healing) and indicated for the eliminating plaque through cleaning and polishing tooth surfaces. **Aim:** This study was aimed to evaluate the clinical efficacy of local application of *Laksha Churna* and *Madhu* (honey) *Pratisarana* after *Dantasharkara Nirharana* (scaling of dental calculus) in the management of *Dantasharkara* (dental calculus). **Materials and methods:** Patients having calculus deposition, fulfilling the inclusion criteria were selected. In group A, *Pratisarana* with *Laksha Churna* (powder) 1 g and *Madhu* as per requirement was given, whereas in group B, chlor-hexidine gluconate 0.2% for gargling was given for 2 weeks. Ultrasonic scaling was done in both groups before given trial drugs. The outcomes were calculated on the base on changes in score of the subjective parameters like pain, inflammation of gum, bleeding gums, halitosis as well as objective parameters like oral hygiene index, debris index, calculus index, gingival index, and periodontal index. For analysing the effect of the result, Wilcoxon signed-rank test for nonparametric paired data and paired t-test for quantitative parametric paired data was applied. **Results:** After analysing the data, it was found that Ultrasonic scaling of dental calculus followed by *Pratisaraṇa* of honey with *Laksha Churna* provided statistically significant improvement in calculus index (97.77%) in debris index (84.44%), in oral hygiene index(96.66%), in gingival index (83.33%)and showed 96.15% improvement in periodontal index, whereas Ultrasonic scaling of dental calculus followed by gargling with chlorhexidine gluconate 0.2% provided 80% improvement in calculus index, 70% in debris index, 90% in oral hygiene index, in gingival index by 73.06%, and 93.75% improvement periodontal index which was statistically significant. **Conclusion:** The present study indicates *Dantasharkara Nirharana* followed by *Pratisarana* of *Laksha Churna* and *Madhu* is comparatively more effective than conventional standard treatment protocol (ultrasonic scaling and chlorhexidine gluconate mouth wash) in the management of dental calculus.

Keywords: *Danta Sharkara,* dental calculus, *Laksha Churna*, *Pratisarana*, ultrasonic scaling

Introduction

In today's scenario due to hectic lifestyle, people do not have enough time to focus on their health. Poor routine health also includes oral hygiene which may lead to dental problems like dental calculus, toothache, stained teeth, cavities, or tooth sensitivity. Among them, dental calculus is the most common problem in the society which usually occurs due improper brushing and faulty dietary habits such as junk food, soft drinks, tobacco addiction, and using more cooked food instead of hard and raw food, etc.[1] Dental calculus is one factor in the initiation and progression of a variety of oral diseases. The global epidemiology of frequent dental problems indicate prevalence of dental calculus, average gingival scores among selected adult groups from different countries ranged from 0.99

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to 1.23.[2] According to the modern science, dental calculus is a hard deposit that forms by the mineralization of dental plaque and is usually covered by a layer of unmineralized plaque. Precipitation of mineral salts into plaque starts between the first and the 14th day of plaque formation. The calculus can be classified into supragingival and subgingival. The supragingival calculus is located coronal to the gingival margin; white or whitish yellow in color. The sub-gingival calculus is located below the crest of the marginal gingiva, is dark brown or greenish black in color, firmly attached to the tooth surface.[3] Negligence of oral care may give rise to different oral diseases. According to Modern Science, scaling is the first treatment for the removal of supragingival and subgingival calculus. *Ayurveda* classics have given guidelines for daily care of the oral cavity under the heading "*Dinacharya*" (daily regime).[4]

Ayurveda text had described the *Mukha Roga* (diseases affecting the oral cavity) and mentioned the diseases of dental under the heading of *Danta* (teeth), *Dantamula* (gum) disease.[5] There are eight types of *Danta Rogas* (dental disorders) described in the text, where *Dantasharkara* (dental calculus) has been described as one of the *Danta Roga*. When gravel like dirt is deposited and fixed on teeth, destroying the normal characteristic of teeth, it is known as *Dantasharkara*.[6] The symptoms of *Dantasharkara* and calculus are similar and thus are correlated. The line of treatment for *Dantasharkara* is removal of *Dantasharkara* without harming gingiva followed by *Pratisarana* (local application) with *Laksha Churna* and *Madhu* (honey) and also the treatment of *Dantaharsha*.[7] Acharya Vagbhatta has mentioned same line of treatment for *Dantasharkara* but *Kshara Churna* has been mentioned instead of *Laksha Churna*.[8] Acharya Sushruta has mentioned *Dantasharkara Nirharana*, that can be compared with scaling. *Pratisarana*[9] is gently rubbing over teeth with the tip of a finger. By *Pratisarana,* mechanical pressure is exerted which removes food debris, food impaction, plaque, calculus and bacterial colonies. It helps to remove remaining calculus after scaling.Very few research works has been carried out considering this problem. In addition, when the scaling procedure is carried out, it may be cause inflammation or infections in gums, while *Pratisarana* helps to remove remaining calculus as well as improves the health of gums.

Aims

The aim of this study is to compare the efficacy of *Dantasharkara Nirharana* (ultrasonic scaling) followed by *Pratisarana* of *Laksha Churna* and *Madhu* in the management of *Dantasharkara* (dental calculus*)* with ultrasonic scaling and chlorhexidine gluconate mouth wash.

Materials and methods

For the clinical study, patients complaining of symptoms of *Dantasharkara,* fulfilling the inclusion criteria were selected irrespective of religion, caste from the O. P. D of *Shalakya Tantra* Department or referred from other department of hospital of Akahnadanad Ayurveda Collage, Ahmedabad. Approval was obtained from the Institutional Ethics Committee of Government Akahnadanad Ayurveda College, Ahmedabad; (GAAC/PG/ethics/2018 -19/104, dated:1/8/2018). The study has also been registered at clinical trials registry-India (CTRI) CTRI/2019/03/018295. Informed consent was obtained from all the participants before including them in the present study.

Inclusion criteria

Patients from the age group of 18–50 years having *Dantasharkara* calculus deposition; patients having the supra-gingival calculus deposition with any of the symptoms, like pain, inflammation, bleeding gums and halitosis were included for the present clinical trial.

Exclusion criteria

Patients' age below 18 and above 50 years having the sub-gingival calculus deposition were excluded; patients having any systemic disorder; patients having any known communicable disease, Hb% below 8 g%, who required surgical intervention for dental disease, having artificial dentures, crowns and fillings, mouth ulcer, having more than 2nd degree mobile teeth were also excluded from the present clinical trial.

Laboratory investigation

Routine haematological tests like haemoglobin %, total leukocyte count, differential white blood cell count, red blood cell (RBC) count, platelets count and erythrocytes sedimentation rate and urine routine and micro examination that includes pH, pus cells, red blood cells, epithelial cells, crystals, casts, urea was carried out to only before the treatment to assess status of the patients before the clinical trial and to exclude other pathologies.

Methods

For the present clinical trial, screening of 46 patients complaining of *Dantasharkara* was done, among them, 30 patients qualified the inclusion criteria and were selected for the present clinical trial.Flow chart showing general status of patient according to consolidated structure of reporting clinical trial is mentioned in Figure 1.

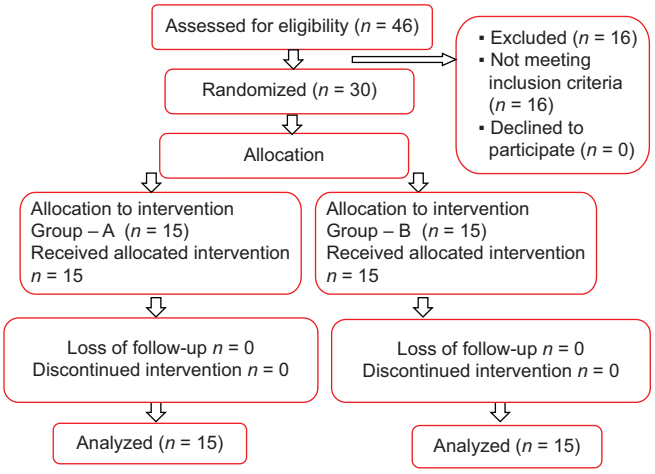

Figure 1: Consort 2010 flow diagram

Table 1: Drug and posology of the clinical trial

Group	A	B
Drug	*Laksha Churna*	Chlor-hexidine gluconate 0.2%
Dosage form	*Churna*	Liquid
Dose	1 g twice in a day	10 ml in 1:1 dilution (1 part solution and 1 part water) twice in a day
Time	100-200 *Matra Kala* (2-4 minutes)	100-200 *Matra Kala* (2-4 min)
Mode of administration	Local application	Local application
Duration (days)	2 weeks	2 weeks

Grouping

Thirty clinically diagnosed and confirmed cases of dental calculus were selected and randomly divided into two groups following computer generated randomization allocation chart which was obtained by http://www.randomization.com. Fifteen patients were registered in each group-A (*Laksha Churna* and *Madhu Pratisarana*) and group B (chlor-hexidine gluconate 0.2% for gargling).

Drug posology

Before the administration of the trial drug, *Dantasharkara Nirharan* (ultrasonic scaling) was performed. The details of drugs used for trial have been mentioned in Table 1.

For the present clinical trial in group A *Laksha Churna*[7] *Pratisarana* with *Madhu* was given in the dose of 1 g twice a day for local application for 100–200 *Matra Kala* (2–4 min.) for 2 weeks, While in group B chlor-hexidine gluconate 0.2%[10] Liquid 10 ml in 1:1 dilution (1 part solution and 1 part water) twice in a day for 2 min. was given for 2 weeks for gargling. For the present clinical trial, *Laksha Churna* was procured from local market, and authenticated by the pharmacognosy laboratory of IPGT and RA, Jamnagar.

Application of medicated paste or powder in oral cavity (*Pratisarana Karma*)

Preparatory procedure

Room with sufficient daylight and devoid of direct atmospheric influences like dust, wind etc., was selected. Required drugs and instruments for *Pratisarana*[11]was collected. Patient was asked to sit on chair in straight position near wash basin.

Therapeutic procedures

Laksha Churna was taken in required (1 g) quantity and *Madhu* was also taken as per requirement (approximately equal to *Laksha Churna*) quantity and was mixed properly to make paste. The paste was applied all over the teeth and gingiva with index finger then rubbed and gently pressure was given for 3–4 min in clockwise, anticlockwise and round direction. Routine oral hygiene methods including proper technique and time of brushing, was also explained to the patients of both the groups.

Post-therapeutic procedures

After performing the *Pratisarana*, patient was asked to do gargle with lukewarm water.

Pathyapathya: (Do's and don'ts)

During the course of treatment patients were advised to take freshly cooked, easily digestible, diet such as barley, green gram, bitter guard, lukewarm water etc. Calcium rich food and eating whole fruits were also advised. Regular mouth wash with normal water or lukewarm water was also advised. Gargling was also advised after each meal and to brush teeth twice a day.

Patient were asked to avoid chocolates, sweets, confectionary items, heavy to digest food items and hard foods, sticky foods, spicy or sour food i.e. pickles, curd and butter milk. Patients were asked to avoid taking too much use of any preparation of sugar cane like sugar, sugarcane juice, jaggery and caffeine. They were also asked to avoid to sleeping in prone posture and for day sleeping.

Follow up

After completion of therapies, follow up was done for 2 months at the interval of 15 days to assess the status of patient and long-standing effect of the drugs.

Criteria for assessment

Assessment was done on the basis of subjective criteria that included pain, inflammation of gum, bleeding gums, halitosis as well as objective criteria like oral hygiene index,[12] debris index, calculus index, gingival index[13] and periodontal index[14] [Table 2].

Statistical analysis

General data were subjected to suitable statistical analysis such as descriptive statistics for demographic data, Wilcoxon signed-rank test for nonparametric paired data, and paired *t*-test for quantitative parametric paired data was applied. After preparing the master chart of all the required data in the Microsoft Excel worksheet, statistical calculations were made with the help of Sigma Stat 3.5 software and In Stat 3 software product software by Aspire software international. The results were interpreted as significant ($P < 0.01$), highly significant ($P < 0.001$) and insignificant ($P > 0.05$).

Observation on demographic data

Status of registered patients

Total 46 patients were assessed for screening purpose. Among them, 30 patients came under inclusion criteria and were selected for the present clinical trial.

Out of 30 patients, 15 patients were registered in group A while 15 patients in group B. All patients in group A and group B completed the treatment.

Thirty patients were studied in this series out of which maximum number of the patients i.e. 43.33% belonged to the age group of 21–30 years, among them 70% were female. Majority of them (46.67%) were house wives. Majority patient of trial were coming from urban area and Hindu (70%). Fifty percent patients of this trial were graduates and belonging to upper middle class of society (56.67%). 93.33% patients were having inflammation of gums, 96.67% of the patients were having halitosis, bleeding gums was observed in 56.67% of the patients,

Table 2: Criteria for the assessment of therapy

Criteria	Score	Criteria
Subjective criteria		
Pain	0	No pain
	1	Occasional pain with low intensity
	2	Frequent pain with moderate intensity
	3	Continuous pain with severe intensity which increases during mastication
Inflammation of gums	0	Absence of inflammation
	1	Mild inflammation, slight change in color, and in texture of the marginal or papillary gingival unit
	2	Moderate inflammation, glazing redness, edema of the marginal or papillary gingival unit
	3	Severe inflammation, marked redness, edema of the marginal or papillary gingival unit
Bleeding gums	0	No bleeding
	1	Bleeding point appears on probing
	2	Several isolated bleeding points or a single fine line of blood appears
	3	The interdental triangle fills with blood shortly after probing
	4	Profuse bleeding occurs after probing; blood flows immediately into the marginal sulcus
Halitosis	0	Absence of bad odor
	1	Presence of mild bad odor
	2	Presence of severe bad odor
Objective criteria: Oral hygiene Index=CI+DI		
CI	0	No calculus present
	1	Supra-gingival calculus covering not more than one-third of the exposed tooth surface
	2	Supra-gingival calculus covering more than one-third but not more than two-thirds of the exposed tooth surface or the presence of individual flecks of sub-gingival calculus around the cervical portion of the tooth or both
	3	Supragingival calculus covering more than two-thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth or both
DI	0	No debris or stain present
	1	Soft debris covering not more than one third of the tooth surface or the presence of extrinsic stains without other debris regardless of surface area covered
	2	Soft debris covering more than one third, but not more than two-thirds of the exposed tooth surface
	3	Soft debris covering more than two thirds of the exposed tooth surface
GI	0	Absence of inflammation/normal gingival
	1	Mild inflammation; slight change in color; slight edema; no bleeding on probing
	2	Moderate inflammation; redness; edema; moderate glazing; hypertrophy; bleeding on probing
	3	Severe inflammation; marked redness; edema and hypertrophy; ulceration; tendency to spontaneous bleeding
PI	0	Negative
	1	Mild gingivitis
	2	Gingivitis
	4	Early notch-like resorption of the alveolar crest
	6	Gingivitis with pocket formation
	8	Advanced destruction with loss of masticatory function

CI: Calculus index, DI: Debris index, GI: Gingival index, PI: Periodontal index

pain was present in 40% of the patients. 43.33% patients were suffering from *Danta Sharakara* (dental calculus) from more than 1 year. 26.67% of the patients were having past history of *Danta Sharakara*. Maximum patients i.e., were vegetarian in present trial, 40% were doing *Vishamashana* (irregular diet intake) 83.33% of patients were taking *Madhura Rasa* (sweet taste) dominant diet followed by 60% of patients who were taking *Lavana Rasa* (salty) and 53.33% of the patients were taking *Amla Rasa* (sour) dominant diet. 86.67% of patients were taking *Snigdha Guna* (sticky) dominant diet while 70% of patients were taking *Guru Guna* (heavy) dominant diet. 46.67% of patients were having poor appetite, 36.67% of the patients were having *Mandagni,* (poor digestion), 60% of the patients were having *Madhyama Koshtha* while 63.33% of the patients were having irregular bowel habit. *Vata-Pittaja Prakriti* was observed in 50% of the patients. 53.33% patients were having habit of chewing on one side. 63.33% patients were brushing their teeth only once in morning, 36.67% of the patients were using medium tooth brush. Twig was used by 30% of the patients. Majority of the patients i.e. 90% were using tooth paste as cleansing material, 46.67% of the patients were changing their tooth brush after 6 months. 93.33% of the patients were using tap water for mouth wash. 93.33% of the patients were doing improper method of tooth-brushing,

76.67% of the patients adopted horizontal brushing technique. In dental examination of teeth, all the patients were having calculus deposition over their teeth, sensitivity was present in 33.33% of the patients. 40% of the patients were having pain in teeth. Mal occlusion was observed in 36.67% of the patients. Carious teeth were observed in 33.33% of the patients. 93.33% of the patients had discoloration of tooth and 20% had mild pain in *Danta*. On gingival examination, 93.33% of the patients were having abnormal color of gingiva whereas 90% of the patients were suffering from inflammation of gums and 53.33% of the patients had bleeding gums.

Eighty percent of patients were taking tea, while 16.67% of the patients had addiction of chewing tobacco. The 43.33% of patients had habit of jaggary eating, 50% of patients had habit of taking sugar. 40% of the patients were taking *Alpa* or, *Pramita Ahara,* (low quantity of food) 36.67% of the patients were taking *Ruksha* (dry)*, Tikshna* (irritant) *Ahara,* 50% of the patients were taking *Ushna* and fifty percent of the patients were having *Guru Aahara* (food heavy to digest) 50% of patients were taking milk daily while 43.33% of patients were taking curd. 63.33% of the patients were taking more cooked food against raw food, 53.33% of the patients were taking dairy products. 30% of the patients were not doing tooth cleaning or were had wrong way of tooth brushing, using of improper mouthwash was observed in 90% of the patients.

Results

In 30 registered patients, group A (*Laksha Churna* and *Madhu Pratisarana*) 15 patients treated with 1 g *Laksha Churna* twice a day with *Madhu* for *Pratisarana* up to 2 weeks after performing ultrasonic scaling, provided positive improvement of 97.77% in calculus index, improvement of 84.44% in debris index, 96.66% improvement in oral hygiene index, improvement in gingival index by 83.33% and showed improvement in periodontal index by 96.15%.

Group B (chlor-hexidine gluconate 0.2%); where 15 patients were treated with chlor-hexidine gluconate 0.2% mouth wash 10 ml in 1:1 dilution (1 partsolution and 1 part water) twice in a day for 2 weeks provided 80% improvement in calculus index, 70% improvement in debris index, 90% improvement in oral hygiene index, improvement in gingival index by 73.06% and showed 93.75% improvement in periodontal index [Table 3].

On assessing the effect of therapies on associated symptoms it was found that relief in pain in group A was 80.30% and in group B was 68.75%, relief in inflammation of gums by 83.33% in group A and 67.85% in group B, bleeding gums had positive improvement in group A of 85.71% and group B of 71.42%, halitosis showed positive improvement in group A of 84.44% and group B of 75% [Table 4].

Discussion

Dental calculus is caused by a build-up of dental plaque, which forms after eating. Once dental calculus attaches itself to teeth, it can't be removed with a toothbrush. The calculus can be removed by scaling, but it reforms again within a short period. Hence the formation of calculus should be prevented to avert its side effect by good oral hygiene which is the best means of prevention. *Ayurvedic* aspect of oral hygiene may be effective in prevention or recurrence. The prime line of treatment as told in the classics is removal of the *Sharkara* by *Shastra* followed by *Pratisarana*.[15]

In present clinical trial, maximum number of the patients i.e., 43.33% belonged to the age group of 21–30 years. The studies have shown that the incidence of calculus increases during 16–30 years.[16] Most of people are not aware of dental diseases as it is painless in the early stages. Majority of the patients were having faulty food habits (*Vishamashana* in 40%) leading to improper formation of *Rasa Dhatu* (primary product of digested food). The 43.33% of patients registered for present clinical trial had excessive use of jaggery, and sugar, and 23.33% patients had habit of taking chocolates or drinking cold drinks. The data is also suggestive of the current trend and food habits in present day life style and its role in dental disorders.

Present study shows that a maximum i.e. 83.33% of patients were taking *Madhura Rasa* dominant diet. Excessive intake of *Madhura* (sweet), *Amla* (sour), *Lavana* (Salty) *Rasa* leads to increased *Kapha*, which plays an important role in the pathogenesis of disease. Studies show that people who smoke cigarettes or use other tobacco products are more likely to have dental calculus on their teeth and under their gums.[17]

63.33% patients were cleaning the teeth only once in the morning while 36.66% patients were having the habit of cleaning the teeth at bed time also. This indicates the lack of knowledge for the maintenance of oral hygiene resulting in plaque formation and then chronic periodontal disease. Maximum number of the patients, i.e. 36.67% were using medium tooth brush followed by 30% soft and 23.33% were using hard brush. Thirty percent were using twig. In fact, the manner in which a brush is used affects the action and abrasion to a greater degree than the bristle hardness itself. Majority of the patients, i.e. 90% were using tooth paste as cleansing agent and 10% were using tooth powder. This is because toothpaste is easy to use with the toothbrush compare to tooth powder and may be because of its sweet taste liked by most of the people. The present study shows that 46.67% of the registered patients were changing their tooth brush after 6 months. With regular use, most brushes wear out in about 3 months. Long after, the bristles lose their cleaning effectiveness.

According to the present study, 93.33% of the patients were advocating improper way of tooth brushing, 76.67% the patients adopted horizontal brushing technique, due to lack of knowledge of the correct brushing technique. The fibers of the brush will remove food debris and microbial plaques from the sulcus of gingiva but may be due to unidirectional movement which debris at interdental area, pits, and fissure area and more or less at cervical area may not be removed.

Table 3: Effect of therapies on objective criteria

Objective criteria	Group	Mean value		Different	Percentage	Paired *t*-test				Significance
		BT	AT			SD (±)	SE (±)	*t*	*P*	
CI	A (*n*=15)	2.40	0.40	2	97.77	0.50	0.13	10.80	<0.001	HS
	B (*n*=15)	2.20	0.46	1.73	80	0.41	0.51	10.14	<0.001	HS
DI	A (*n*=15)	2.33	0.66	1.66	84.44	0.72	0.18	7.39	<0.001	HS
	B (*n*=15)	2.26	0.73	1.53	70	0.59	0.15	7.02	<0.001	HS
Oral hygiene index	A (*n*=15)	1.86	0.400	1.46	96.66	0.35	0.09	9.26	<0.001	HS
	B (*n*=15)	1.86	0.20	1.66	90	0.35	0.09	11.88	<0.001	HS
GI	A (*n*=15)	1.60	0.40	1.20	83.33	0.63	0.16	5.72	<0.001	HS
	B (*n*=15)	1.53	0.53	1.00	73.06	0.64	0.16	4.71	<0.001	HS
PI	A (*n*=15)	1.40	1.46	0.93	96.15	0.82	0.21	3.70	<0.001	HS
	B (*n*=25)	0.80	0.26	0.53	93.75	0.41	0.10	3.36	<0.001	HS

†Increase. BT: Before treatment, AT: After treatment, SD: Standard deviation, SE: Standard error, HS: Highly significant, CI: Calculus index, DI: Debris index, GI: Gingival index, PI: Periodontal index

Table 4: Effect of therapies on signs and symptoms

Symptoms	Mean	BT	AT	Different	Percentage	W	T+	T−	Number of pairs	*P*	Significant
Pain											
A	Mean score	1.26	0.33	0.93	80.30	66	66	0	11	<0.001	HS
	SD (±)	1.03	0.88								
	SE (±)	0.26	0.12								
B	Mean score	1.13	0.53	0.66	68.75	36	36	0	8	<0.001	HS
	SD (±)	0.83	0.51								
	SE (±)	0.21	0.13								
Inflammation of gums											
A	Mean	1.73	0.40	1.33	83.33	105	105	0	14	<0.001	HS
	SD (±)	0.96	0.50								
	SE (±)	0.24	0.13								
B	Mean	1.53	0.60	0.93	67.85	105	105	0	14	<0.001	HS
	SD (±)	0.63	0.50								
	SE (±)	0.16	0.13								
Bleeding gums											
A	Mean score	0.86	0.33	0.53	85.71	28	28	0	7	<0.01	S
	SD (±)	0.74	0.48								
	SE (±)	0.19	0.12								
B	Mean score	1.00	0.53	0.46	71.42	28	28	0	7	<0.01	S

This plays a major role in the initiation of the disease. Improper technique and bristles damage the enamel and its frequent use leads to increased friction leading to injury to the enamel and causes abrasion of tooth surface.

93.33% of the patients had inflammation of gums as their associated complaint. 96.67% of the patients had halitosis while 56.67% of the patients had bleeding gums and 40% of the patients had pain. Inflammation is the result of physical irritation of gums and presence of bacterial toxic by-products in the calculus. There is always a positive correlation between the calculus and prevalence of gingivitis.[18] All the patients had calculus deposition over their teeth. Forty percent of the patients had pain in teeth along with calculus deposition. Mal occlusion was observed in 36.67% of the patients. Carious teeth were observed in 33.33% of the patients. Sensitivity was present in 33.33% of the patients. Studies showed that calculus status was not significantly associated with caries, but there was a high association between gingivitis and plaque status with calculus accumulation.[19]93.33% of the patients had abnormal color of gingiva. Ninety percent of the patients were suffering from inflammation of gums. Bleeding on palpation was present in 53.33% of the patients. As dental calculus builds, it starts to creep under the gums and attack the surrounding tissue. The eventual result is gum disease, which can lead to tooth loss if not treated.[20]

Probable mode of action of *Pratisarana* (application of medicated paste/powders in oral cavity)

Pratisarana mainly possesses two types of therapeutic efficacy by rubbing with finger locally. It mainly possesses *Shodhana* (mechanical removal of food particles, plaque, and calculus) and *Ropana* (healing) properties.

Shodhana

By *Pratisarana* mechanical pressure is exerted on gums in the direction of the gingival sulcus which remove food debris, food impaction, desquamated epithelial cells, plaque, bacterial colonies, and some part of calculus too. By pressure, it clears sticky bio-film on tooth surface which responsible for growing microorganism.

Ropana

By *Pratisarana* gentle massage was done. Due to gingival massage, it stimulates the gingival epithelial cell and leads to regeneration of the gingiva thus helping in keratinization and this process may help in retarding the inflammation at vascular, cellular, and immune level. It may increase the defence mechanism of gingiva. *Pratisarana* increases the rate of crevicular fluid production, which inhibits bacterial diffusion into the tissues as it has phagocytic leukocytes and enzymes.

Probable mode of action of *Laksha Churna*

Laksha Churna pacifies *Pitta* and *Kapha*. The drug by its scraping property produces *Lekhana* of vitiated *Kapha* and *Mala* that can be correlated with plaque. *Laksha* is having *Vranaropaka* (wound healing) property, which may help to restore the gingiva to prevent the recurrence of calculus and collection of debris through cleaning and polishing of the tooth surfaces which helps to check the gingival and periodontal diseases. With *Shodhaniya (*cleansing*)* property, it may clean local *Mala* and oral cavity. It dries up the excessive fluid and decreases the inflammation.[21]

It is having a mild abrasive action which aid in eliminating plaque through cleaning and polishing tooth surface. It may also restore natural luster and also enhances enamel whiteness. Its coloring agent imparts its color to soft debris which can be rinsed easily from tooth surfaces and hence may help in plaque control.

Aleuritic acid, a major constituent of lac resin,[22] is a potential substitute for alpha hydroxy acids and is valued for its antioxidant action.[23] Antioxidants have been proven to be beneficial in controlling plaque, gum disease prevention, and healing gum disease. It cause the degradation of mineral deposits, making them water soluble. The calcified dental plaque is composed of calcium carbonate which is converted to calcium bicarbonate becoming water soluble.

Probable mode of action of *Madhu*

Madhu (honey) pacifies all three *Dosha*, and has *Vrana Shodhana* (wound cleansing), *Ropana* (healing), *Lekhana* (scraping), and *Krimihara (*disinfectant*)* property.[24] *Madhu* stimulates the saliva flow which provides a protective coating for the oral tissues. Saliva contains a large number of leukocytes that migrate through the epithelium of the gingival cervices and has bactericidal effect and rinsing function. Honey contains small amounts of all the Vitamins B and Vitamin C.[25] These vitamins are most needed for the healing process of gingiva. Vitamin C is said to have crystal inhibiting properties and prevents plaque deposits. The antibacterial properties of honey can be attributed to its low pH (3.6), a thermo-labile substances called inhibit and its hygroscopic properties.

Madhu contains an enzyme that produces hydrogen peroxide which is believed to be the main reason for the antimicrobial activity of *Madhu*. The studies show that honey not only stops the growth of bacteria which produces dental plaque, it also reduces the amount of acid produced which stops the bacteria from producing dextran. Dextran is gummy polysaccharide, a component of dental plaque that the bacteria produce to adhere to the surface of the teeth.[26]

Probable mode of action of chlorhexidine gluconate 0.2% mouthwash

Chlorhexidine gluconate is a chemical antiseptic. It has bactericidal and bacteriostatic action. It has been shown to have an immediate bactericidal action and a prolonged bacteriostatic action due to absorption on the pellicle coated enamel surface. If it is not deactivated, chlorhexidine lasts longer in the mouth than other mouth washes. It is a cationic compound that binds to the surface, plaque bacteria and soft tissues of the mouth thus inhibiting bacteria colonization. Its antimicrobial agent reduces both plaque and gingivitis.[27] It causes some side effects that include: Staining of teeth, altered taste, dryness and soreness of mucosa, enhanced and supra-gingival calculus formation.[28]

Conclusion

Both the local application of *Laksha Churna* along with honey and chlorhexidine gluconate 0.2% gargling administered after ultrasonic scaling had provided statistical highly significant result in calculus index, debris index, oral hygiene index, gingival index, periodontal index, and significant relief in halitosis, pain, inflammation of gums, and bleeding gum in the patients of dental calculus. The combined therapy of ultrasonic scaling followed by *Laksha Churna* and *Madhu Pratisarana* due to its cleansing property to, cure *Danta Sharkara* and improve dental health, thus these can be the choice of drugs for the management of *Danta Sharkara*.

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Conflicts of interest

There are no conflicts of interest.

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