Original Research Article

The Effectiveness of Acacia Arabica Gum as an adjunct to The Non-Surgical Treatment of Chronic Periodontitis

Abstract

the presented study was designed to show the pharmacological effect of Acacia Arabic gum as the Non-Surgical treatment of chronic periodontitis and it was estimated in A hospital based double blinded, randomized clinical trial using split mouth technique, conducted in *the Khartoum Dental Teaching Hospital* (KDTH). All patients diagnosed with chronic periodontitis according to American Academy Periodontology. As *used* split mouth technique, 88 sites (44 scaling and root planning and gum *Arabic*) had been enrolled randomly as intervention group, (44 sites scaling and root planning + distilled water) as a control group. Plaque Index (PI), Gingival Index (GI), Bleeding On Probing (BOP) , periodontal probing depth (PPD) , Clinical Attachment Loss (CAL) , measurements and scores in addition to Interleukin 1β (IL-1β) was done *on* day 0 and day 30. *(*47.7%) of the study were males and (52.3%) were females with the mean age was 40.7 years ±12.7. PI, GI, BOP, PPD, CAL and IL1β measurements showed a significant reduction in *the AA group* (P< 0.05). This study concludes that the adjunctive use of a pulsating jet containing Acacia Arabica (AA) as an irrigation solution was efficient in reducing plaque index, gingival index, and BOP, PPD, CAL, as well as IL 1β level in subjects with chronic periodontitis.

Key words: periodontitis, chronic periodontitis, Acacia Arabic, IL 1β, non-surgical treatment.

1. Introduction

Periodontal illness, to boot said as gum illness, is besides a bunch of inflammatory conditions moving the tissues shut the teeth [1]. In its early stage, stated as disease, the gums become swollen, red, and should bleed [2]. In its extra serious kind, stated as disease, the gums can regress from the tooth, bone is lost, then the teeth would possibly loosen or fall out [3]. disease is commonly as a result of organism at intervals the mouth infecting the tissue round the teeth. Factors that increase the danger of illness embody smoking, diabetes, HIV/AIDS, history, and positive medications. Identification is by inspecting the gum tissue round the teeth every visually

and with a glance and X-rays creating a shot to seem out bone loss round the teeth [4]. Treatment involves sensible oral hygiene and regular skilled teeth cleanup. Prompt oral hygiene embodies daily brushing and flossing. IN positive cases, antibiotics or medical science would possibly even be prompt. Globally 538 million of us were computable to be affected in 2015 [5].nearly those over the age of thirty unit of measurement affected to some extent, and relating to seventieth of these over sixty 5 have the condition, males unit of measurement affected extra generally than females [6] .

In the early stages, disease has some symptoms, and in many individuals the illness has progressed significantly before they get treatment.

• Redness or hemorrhage of gums whereas brushing teeth, exploitation floss or biting into heavy food (e.g., apples) (though this might to boot occur in disease, where there's not any.

• exhalation, or dangerous breath, and a persistent bimetal vogue at intervals the mouth• tissue recession, leading to apparent lengthening of teeth (this would possibly even be caused by heavy-handed brushing or with a stiff toothbrush)

• Deep pockets between the teeth and to boot the gums (pockets unit of measurement sites where the attachment has been step by step destroyed by collagen-destroying enzymes, stated as collagenases)

• Loose teeth, at intervals the later stages (though this could occur for various reasons, as well) of us need to notice tissue inflammation and bone destruction unit of measurement largely painless. Hence, of us would possibly wrong assume painless hemorrhage once teeth cleanup is insignificant, although this could be an emblem of progressing disease during this person [7]. Periodontitis is associate degree inflammation of the periodontium, i.e., the tissues that support the teeth.

• cementum, or outer layer of the roots of teeth.

• alveolar bone, or the bony sockets into that the teeth unit of measurement anchored, and• medical specialty ligaments (PDLs), that unit of measurement the tissue fibers that run between the solid matter and to boot the alveolar bone. The primary reason for disease is poor or ineffective oral hygiene, [8] that finally lands up at intervals the buildup of a mycotic [9][10] [11] [12] and organism matrix at various contributors unit of measurement poor nutrition and underlying

medical issues like genetic disorder [13] .Diabetics ought to be meticulous with their homecare to manage illness [14] .New finger prick tests unit of measurement approved by the Food and Drug Administration at intervals the North yank country, and have gotten utilized in dental offices to identify and screen of us for possible borne in upon causes of gum illness, like genetic disorder. IN some of us, disease progresses to disease – with the destruction of the tissue fibers, the gum tissues become freelance from the tooth and gathered fissure, stated as a Sub tissue microorganism (those that exist beneath the gum line) colonize the medical specialty pockets and cause additional inflammation at intervals the gum tissues and progressive bone loss. Samples of secondary causes unit of measurement those things that, by definition, cause organism plaque accumulation, like restoration overhangs and root proximity.

Gum arabic, to boot stated as gum sudani, acacia gum, Arabic gum, gum acacia, acacia, gum arabic, Indian gum, and by various names, [15] is also a natural gum consisting of the hardened sap of two species of the tree (sensu lato) tree, tree African country [16] (now stated as Senegalia Senegal) and Valhalla (Acacia) Seyal [17].

A nilotica (Acacia.arabica) may perhaps be an attainable supply of antimicrobial agents [18] .In another study at intervals that Kalaivani and Methew reported that A.nilotica (Acacia arabica) demonstrates highest activity against 3 microorganism (E.aureus and enteric bacteria typhi) and 2 fungous strain (Candida albicans and Aspergillus Niger) [19] .Scavenging activity of the bark powder extract in varied solvents victimization maceration method was reported by Del we have a tendency to [20] .Another study was assigned by Kalaivani T and Mathew L.nilotica (Acacia arabica) is certainly accessible supply of natural antioxidants, that may well be used as a supplement to facilitate at intervals the medical care of atom mediate diseases like what is more, the high scavenging property of (Acacia arabica) might even be owing to radical teams existing at intervals the phenoplast compounds that is in a position to scavenge Rehman et al reported the activity of tree nilotica (Acacia arabica) against hepatitis Virus in liver infected cells [21] .

among Sudanese college kids, they studied tooth decay expertise and quantification of Streptococcus mutants and true bacteria subrings in their spit, their results recommended that a regulation at intervals the oral microflora might contribute to the interference of tooth decay they recommended using a combination of probiotics and prebiotics as a preventive methodology [22] .it's conjointly renowned that GA contains cyanogenic glycosides and variety of alternative

totally different types of enzymes (such as oxidases, peroxidases and pectinases) that exhibit antimicrobial properties against bound organisms like Porphyromonas animal tissue and Prevotella Widespread of antibiotic resistance has been considering several antibiotics futile against some vital diseases, thus there is Associate in Nursing inflated necessity not solely to minimize antibiotic use and develop non-antibiotic based treatment but also to lift the profile of disease prevention [23]. Some of the foremost common flavoring medications utilized in recent clinical trials for odontology infections is Turmeric (Curcuma longa). Curcumin (diferulolymethane), the yellow colored bioactive constituent of turmeric has been postulated to own an intensive spectrum of biological actions. Curcumin has been used wide in ayurvedic medicine for long period, because it is nontoxic and incorporates a sort of therapeutic properties as well as inhibitor, analgesic, medicinal drug, antiseptic activity, and anticarcinogenic activity. Topical drug delivery of 2% turmeric gel once used as Associate in Nursing adjunct to scaling and root planning showed vital reduction within the protein activity of microorganisms. many recent studies have shown that genus Curcuma extract are often a decent adjunct for scaling and root coming up with [24].

Other study made by Singhal *etal* Sayed that Acacia arabica leads to better clinical outcomes in patients with mild to moderate chronic periodontitis with effective antiplaque and anti-gingivitis action. It may be recommended adjunct to SRP for maintenance in patients with mild to moderate chronic periodontitis [25]. The objectives of this study is measure of the clinical parameters (PI, GI, PPD, BOP, CAL) immediately (baseline) and after gum arabic treatment and to compare difference in the treatments outcomes of adjunctive methods {AA +SRP} compared to {SRP+ placebo} in all clinical parameters and IL1β Pg /ml).

2.Material & method

The present case-control study was carried out after getting approval from Institutional Ethical Committee and a consent form was signed by all patients. And the research was approved by the ethical committee of the Khartoum dental teaching hospital. The participants of this study were adults of 20 years and more of both sexes with the minimum of 20 teeth. Periodontal measurement was performed in a dental chair by the candidate using a plain dental mirror and Williams marking periodontal probe to measure bleeding on probing(BOP), plaque index (PI) ,Gingival index (GI) the Probeable pocket depth (PPD) were scored at six sites per tooth (mesio buccal, mid-buccal, distobuccal, mesiolingual, mid-lingual, distolingual) as well as clinical attachment loss (CAL) . Purposive sampling technique was applied to select a representative study sample from the attending patients in Khartoum dental teaching hospital. Data was

collected in forms of a history sheet, ―periodontal chart‖ for measurement of periodontal parameters and GCF samples. Then data was transferred to Microsoft Excel sheet. Following the data entry; data cleaning was performed. Then data were analyzed using Statistical Package for Social science (SPSS) version 22 based on the objectives of this research, paired t-test, McNamara Test was used to assess the pretreatment and post treatment changes within each group (intragroup comparison) and independent t-test was used for intergroup comparison. The collected data was coded and locked in a password-protected computer of the principal investigator computer to ensure confidentiality and privacy of patient data.

2.1Material

A pale white powder with particle size of 75-100 micron as readymade powder prepared by Sudanese Gum Arabic Board Riyadh, Khartoum State- Sudan.

2.2 Study design

This study is A hospital-based double-blinded randomized parallel clinical trial using a split-mouth technique whose aim was to compare the effect of Acacia Arabica and distilled water in 88 sites of patients with chronic periodontitis who referred to department of Periodontology at the Khartoum Dental Teaching Hospital (KDTH), Khartoum, Sudan, during the period from July 2017 to December 2017 This study was approved in the ethics committee of information and research department at National Medicine and Poison Board (NMPB) and administrative authority of Khartoum dental teaching hospital (KDTH).

2.3 Study participants

The participants of this study were adults of both sexes with the minimum of 20 teeth. All patients were recruited for this study population who met the following inclusion criteria patients diagnosed as chronic periodontitis according to American Academy of Periodontology (AAP 1999) were systemically healthy, with at least periodontal pockets ≥4mm on both sites of the jaw.

2.4 Methodology

In this study the unit of comparison was quadrant (sites). The teeth of a total 44 patients were split into two parts. to represent a quadrant as the study group and the other on the

other side are control group "88 sites. Periodontal measurement was performed in a dental chair by the candidate using a plain dental mirror and Williams marking periodontal probe to measure bleeding on probing (BOP), plaque index (PI) ,Gingival index (GI) the Probable pocket depth (PPD) were scored at six sites per tooth (mesio- buccal, mid- buccal, disto-buccal, mesio-lingual, mid-lingual, disto-lingual) as well as clinical attachment level (CAL) . simple random sampling technique was applied to select a representative study sample from the attending patients in Khartoum dental teaching hospital. Restricted randomization was used to allocate the GA and placebo irrigation to 44 participants, since the study was doubled blind, the trial principle examiner performed all clinical measurements and collected samples and for the immunological analysis, as well as the periodontal therapy while the irrigation (GA and DW irrigation) has been done by oriented general practitioner (other than the principal examiner) who had been trained to this practice, for the sleek of blinding. The study site was randomly selected for each group; they were randomly classified into two groups as follow using tossing a coin.

1. Experimental group (group A) study group who received gum arabic irrigation using Waterpik irrigator following the root surface debridement.
2. Control group (group B) who received distilled water (control) irrigation using Waterpik irrigator following the root surface debridement.

2.5 Study design

2.5.1 Gum Arabic as irrigation dosage

A concentration of 1 gram of gum arabic powder prepared by Sudanese Gum Arabic Board was dissolved in 10 ml in distilled water then loaded in Waterpik model (made in the USA) irrigator —120 ml of gum arabic irrigation.

2.5.2 Placebo formula

Distilled water irrigation using Waterpik irrigator, (Hydropulseur /irrigator) WP 360E2, ©2011 water Pik, Inc. designed in the USA, made in China. Following scaling and root planning by Hand instruments scalers (Curettes) and Ultrasonic device (SATELEC, France) similar protocol for both intervention and placebo was followed.

2.5.3 Oral irrigation protocol

Professional irrigation was done using Waterpik model Hydro pulseur irrigator WP-360E2. Waterpik 360 (8 ounces per min flow rate, 1450 pulse per min and 45 psi pressure) with a 120 ml reservoir was filled with either GA or DW. initially, the Waterpik jet stream was directed at a 90 angle to the gingival margin of the most posterior teeth for 30 second following scaling and root planning then suctioning and drying during the introduction of the intervention to avoid crossover effect of two interventions" contamination of two interventions". Every patient had received the same oral hygiene instructions and full mouth scaling and root planning. For each patient, we applied the two arms of intervention, GA, and DW for a period of one month a recall visit was scheduled every week with 10 min for single visit. Two teeth in opposite arch or cross arch were used for intervention and placebo. For the purpose of the blinding, the irrigation solution was applied by an oriented general practitioner on both sites (intervention and placebo).

GCF collection, periodontal examination and periodontal Treatment were done by the principal investigator, the measurements was done on the baseline before the examination and after one month using a dental mirror and William's marking periodontal probe, while the irrigation was done at day 0, 7, 15, 21 using the Waterpik irrigator every week for one month.

The pockets surround the teeth was measured at six surfaces (mid buccal, mesio buccal, distobuccally, mid lingual, mesiolingual and dentilingual) Clinical Attachment loss (CAL).

2.5.4 Measurement of GCF IL-1β level by ELISA

Interleukin-1 (IL-1) is one of several cytokines produced by activated mononuclear phagocytes and other cell types including keratinocytes and endothelial cells. Interleukins (IL- 1β), a potent stimulator of bone resorption, has been implicated in the pathogenesis of periodontal destruction. The IL-1β level was assessed by Human IL-1β ELISA Kit (Human IL-1β ELISA MAX TM Deluxe set, Biolegend R, CA, USA) at day 0 and day 30 for all sites of interventions and placebo. Gingival crevicular fluid (GCF) sample has been collected to evaluate the proinflammatory interleukin 1β (Il-1β) level from the periodontal pocket by using endodontic paper points size 30 (ZOGEAR Absorbent Paper Point 0.2 taper, Shanghai, China). From each participant, a total of 2 samples have been taken pre and post treatment. Total of 88 samples was

been obtained from all participant. Cotton rolls and saliva ejector was used to prevent contamination with saliva, following Brills techniques for collections GCF "the paper point had been inserted within the pocket until resistance is encountered and was left for 30 seconds, the samples were delivered into sterile cryogenic vial tube and stored at -80ć until IL1β analysis, as part of the protocol of institute of endemic disease laboratory. The GCF samples had been taken before the clinical measurement to avoid blood contamination and stimulating the GCF flow:

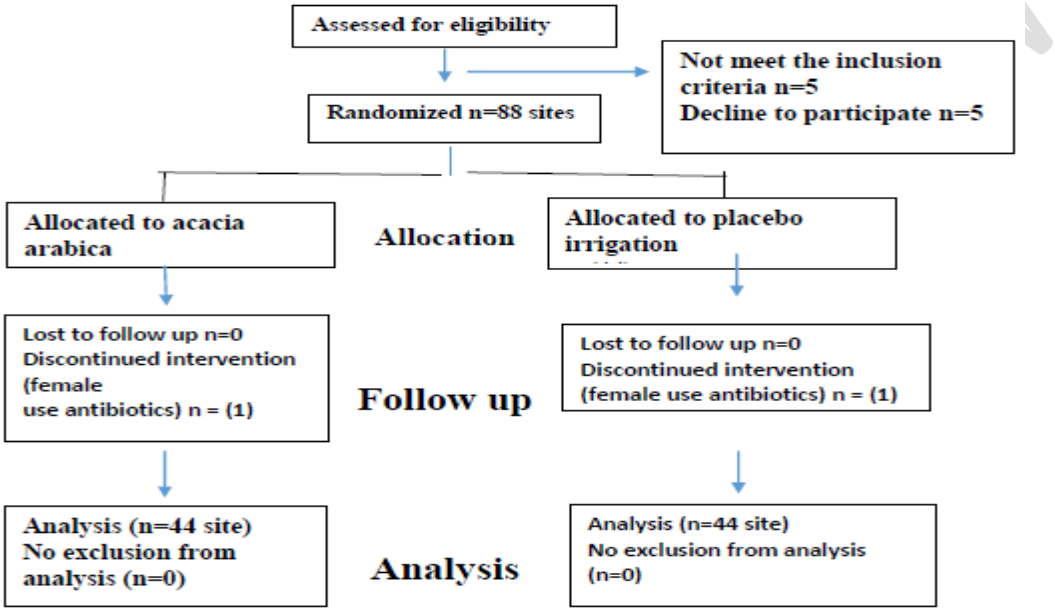

Fig.1 Consort flowchart study

2.3.4Statistical analysis

Data was analyzed for Mean values by using Statistical Package for Social Sciences (SPSS) version 22. [26].

3. Result

3.1 Periodontal parameters

The average value for PI, GI, PPD, CAL scores were obtained from the allocated sites score was present Table (1) during different time intervals for each group. At baseline, the mean PI of the

experimental group was (2.23 ± 0.77) and for placebo group was (2.15 ± 0.73). By day 30 both group had showed a decrease in PI mean (0.91 ± 0.77) and (1.0 ± 0.84) for the control group, both group showed a reduction in the PI mean from baseline that was statistically significant difference (P. value < 0.05). The GI mean showed (1.91 ± 0.29) for experimental group and (1.89 ± 0.31) for control group which presented a statistical significant difference by the end of the trial (P value < 0.05). The PPD mean as well showed (3.37 ± 1.68) at experimental group, where the control shows (3.32 ± 1.65) at baseline. Both group showed statistically significant difference (p.value <.05) Where the CAL mean in intervention and placebo was (3.81 ± 2.67), (3.82±2.22) respectively which presented a statistical difference by the end of the trial (p.value <.05).

Table No (1): (Mean ± SD) Of the Clinical Parameters

		Before			**After**			
Group		***Mean*±**		***SD mm***	***Mean***	**±**	***SD mm***	***P value***
Experimental group	*PI*	2.23	±	0.77	0.91	±	0.77	0.001**
	GI	1.91	±	0.29	0.57	±	0.73	0.001**
	PPD	3.37	±	1.68	2.55	±	1.73	0.001**
	CAL	3.81	±	2.67	2.98	±	2.34	0.022*
Control	*PI*	2.15	±	0.73	1.00	±	0.84	0.001**
	GI	1.89	±	0.31	0.61	±	0.69	0.001**
	PPD	3.32	±	1.65	2.51	±	1.90	0.005**
	CAL	3.82	±	2.22	3.21	±	2.72	0.059

Values are means ±SE, NS=not significant, * Denotes mean values significant at (P<0.05), **Significant= (P<0.01), *** Significant =(P<0.001).

bleeding on probing (BOP) before and after the intervention was present in table 2, the total number of sites with bleeding on probing was 41 before intervention and 3 has no BOP. After intervention 37 (90.2%) of them they have no BOP.

Table No (2): Shows Bleeding on probing before and after intervention

Bleeding After Intervention	**No bleeding After Intervention**	**Total**	***P. value***
4	37	**41(experimental group)**	
9.8%	90.2%	**100.0%**	
0	3	**3**	**0.001**
0%	100%	**100.0%**	
4	**40**	**44 (control)**	
9.1%	**90.9%**	**100.0%**	

Values are means ±SE, NS=not significant, * Denotes mean values significant at (P<0.05), **Significant= (P<0.01), *** Significant =(P<0.001).

The means± standard deviations of GCF IL-1β before and after intervention were (148.9 ± 79.7) and (98.00 ±85.6) in experimental group (P= 0.004) and (122.8 ±79.2) and (113.1 ± 88.2) in control (P= 0.586) and the level of both groups. presented in table (3).

Table No (3): Mean ± standard deviation of IL 1 β level pretreatment and post-treatment of both groups

Before		**After**		**Mean diff**
Mean ± ***SD***		***Mean*** ± ***SD***		***P value***

Gum arabic	148.92	±	79.71	98.00	±	85.69	50.92	0.004**
Distal water	122.82	±	79.22	113.14	±	88.27	9.68	0.586

Values are means ±SE, NS=not significant, * Denotes mean values significant at (P<0.05), **Significant= (P<0.01).

Fig.2: GCF sampling by paper point size 4

Fig.3: collection of sample in cryo-vial

4. Discussion

Periodontitis diagnosis and classification were established commonly on basis of clinical assessments (parameters), in spite of understanding of etiology and pathogenesis of periodontal destruction and assessment of the gingival health Armitage et al. [27] [28]. Most authors agreed that PI is (quantitative assessment) of plaque do not provide information regarding periodontal disease activity in specific sites, previous study that periodontitis is initiated in susceptible individuals by sub gingival plaque biofilm and that tissue destruction appears to be largely mediated by host response in specific bacteria and their product [29]. On the other hand, GI is also attributed to Löe and Sinless, which is assessing the severity of gingivitis based on color, consistency, and bleeding on probing. Furthermore, this study showed that there was a statistically significant reduction in both PI and GI after intervention in GA group (PI, GI with (P.value 0.001). A study conducted by Pradeep A. et al who used Acacia Arabica in the form of powder and gel in group of patients with chronic gingivitis the investigator found reduction in GI and PI scores by gum tone gel was significantly higher than the placebo gel group and similar to the chlorohexidine gel group and they claimed that the positive clinical effects of gum tone gel can be attributed to its main ingredients, such as Acacia Arabica [30]. In the present study all the participant had the same level of oral hygiene status at baseline due to effect of non-surgical periodontal therapy which would make the distinct improvement in PI and GI scores that documented in both groups after one month, however, the improvement was more evident among the group who received the GA irrigation compared to the control group who received the placebo irrigation, The reduction in PI, GI readings in the control group could be ascribed to the mechanical effect of irrigator device or from Hawthorne effect which suggested that patients regularly appear to improve solely from the effects of being placed in clinical trial. [31] [29]. On the other hand, also our study agrees with studies evoked by Tangoed et al by using toothpaste containing Acacia Arabica and compares it to regular toothpaste. The study exhibited a clear reduction in PI and GI scores among the Acacia Arabica group compared with the regular toothpaste group and they suggested that using of AA in the formula of toothpaste may reduce the inflammation in gingivitis patients and regular brushing with Acacia Arabica can be recommended as an oral hygiene aid [32]. Furthermore, the result of the present study was not in accordance with the observation of Gazi who compared the effect of Acacia Senegal chewing gums as compared to sugar-free gum in a group of participant, the author found no statistically

significant difference between two groups in PI and GI scores among the first group. This difference could be due to two different study populations or methods, Gazi in his study the population was a dental student with a high standard of oral hygiene. The difference could be due to the difference in the methodology they used. The short duration of the trial (one week) also could be a reason for a non-significant difference between the effects of intervention and control group. In the present study the statistically significant reduction of PI in the case group could be due to antimicrobial effect of Acacia Arabica which is supported by Clark et al.1993, who demonstrate the action of GA on the suppression of *P. gingivalis and p. intermedia* cultures and protease inhibitors activities. It was claimed that PPD reflects the damage to supporting structure while CAL reflects the cumulative effect on periodontal disease. In similar obtained by Ramesh Wari who found statistically significant difference in PPD ($p < .05$) and CAL ($p < .05$) reduction observed with use of *Acacia arabica gel and they concluded that Acacia Arabica leads to better clinical* outcomes in patients with mild to moderate chronic periodontitis. And they suggested that Greater reduction in PPD and CAL could be attributed to the antiprotease inhibition of *P. gingivalis* and *P. intermedia* by GA gel [33]. On the other hand, bleeding on probing (BOP) reflects histological, clinical and bacteriological alterations associated with periodontal disease [32]. In the present study, 41 of the participants had gingival bleeding before the intervention. After intervention 37 (i.e. 90.2%) of them did not present gingival bleeding, which indicated that, GA had a significant reduction in BOP% among this is patients similar to the findings reported by Tangade et al. and they were suggested that this reduction might be due to astringent and anti-inflammatory effects of GA [34]. Furthermore, there is no participant develop bleeding after intervention so that the GA is biocompatible material and can be used for daily use without complication [35]. This Study was agreed with study obtained by Ghazala that compared Salivary Interleukin-1β and Matrix Metalloproteinase-8 Levels in Individuals with Chronic Periodontitis and found that this inflammatory marker was measured in patient's saliva again after 2 weeks and there was a reduction in their levels [36].

Conclusion This study concludes that the adjunctive use of a pulsating jet containing AA as an irrigation solution was efficient in reducing plaque index, gingival index, and BOP, PPD, CAL, as well as IL 1β level in subjects with chronic periodontitis.

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