

EFFICACY OF BARBERRY AQUEOUS EXTRACTS DENTAL GEL ON CONTROL OF PLAQUE AND GINGIVITIS

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Abstract- Herbal extracts have been successfully used in dentistry as tooth cleaning and antimicrobial plaque agents. The aim of this study was to evaluate the clinical effects of a dental gel containing barberry extracts (from *Berberis vulgaris*) on gingivitis and microbial plaque control. A double blind clinical trial study was conducted in a dormitory on 45 boys aged 11-12 years having the same socioeconomic conditions. These students were divided into 3 groups; the first group (25 students) using barberry gel, and the second group (10 students) using placebo gel without active ingredient. To compare the activity of our gel with an active antiplaque, a third group of 10 students using Colgate® antiplaque toothpaste was also considered. At the beginning all subjects were examined for plaque index (PI) and gingival index (GI). These tests were re-evaluated after 21 days of using the above mentioned dentifrices. The results showed that barberry gel has reduced the PI for about 56%. This reduction was 18.5% for placebo and 44% for Colgate® antiplaque groups. Considering means of PI (Δ PI) and GI (Δ GI) of different groups, there was significant difference between barberry and placebo gel's groups and between placebo and Colgate® groups, but the difference between barberry and Colgate® groups was not significant. This study indicates that the barberry dental gel effectively controls microbial plaque and gingivitis in the school aged children; therefore, the use of barberry dental gel is strongly recommended.

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Key words: Barberry gel, barberry dentifrice, gingival index, plaque index

INTRODUCTION

Gingivitis is the most common periodontal disease in children and adolescents. Clinically, it involves an inflammation of the gingival tissues next to the tooth. Microscopically, it is characterized by the presence of an inflammatory exudate and edema, destruction of collagenous gingival fibers, and ulceration and proliferation of the epithelium facing the tooth and attaching the gingival to it (1).

Despite of the changing concepts on the etiology

of periodontal disease, bacterial plaque is still considered as an etiologic factor for periodontal diseases(1), and oral self care (for plaque control) is still an essential step in the prevention and treatment of gingivitis (2).

Bacterial plaque is composed of soft bacterial deposits that adhere firmly to the teeth and form a complex, metabolically interconnected, highly organized bacterial system consisting of dense masses of microorganisms embedded in an inter microbial matrix. In sufficient concentration, this microbial matrix can disturb the host-parasite relationship and cause dental caries and periodontal diseases (1).

Due to the difficulties in achieving perfect plaque control, the administration of some antiplaque agents was suggested as an adjuvant treatment to tooth

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brushing. Makerem *et al.* has shown that herbal agents have effective antiplaque characteristics which make them appropriate as possible antiplaque and tooth cleansing agents (3).

Berberine is an alkaloid agent which has previously shown high antimicrobial effects (4). This alkaloid is the most active alkaloid (isoquinolines group) extracted from the root and stem of the plant barberry which grows in Europe, Africa, America and central Asia and also Iran (4-7). Besides antimicrobial effects, berberine is also effective in the treatment and control of gastroenteritis bacterial infections. It has been also approved by the Indian Institute of Medical Sciences, New Delhi as an intraconjunctival injection for the treatment of chronic trachoma (7).

The aim of this study was to evaluate the clinical effectiveness of a dental gel containing barberry aqueous extract (1% berberine) on gingivitis and microbial plaque in a group of children in Mashhad, Iran.

MATERIALS AND METHODS

Plant material

The *Berberis vulgaris* plant was collected from the heights of village "Baghmich" 60 kilometers from the city of Mashhad in December 1997 (Fig. 1).

Preparation of test Material

A dental gel was prepared (using Soxhlet method) with alkaloids extract of root and barks of barberry plant as the test material. The aqueous extract was estimated according to berberine contents of the gel which contained equivalent to 1% berberine that was



Fig.1. *Berberis vulgaris*.

formulated at pH=5 in Mashhad School of Pharmacy (8). A placebo gel (the dental gel without barberry extract) and a commercial dentifrice (Colgate® toothpaste) was also prepared. Neither the barberry gels nor the placebo gels had any abrasive or detergent components.

Study design

A double blind clinical trial study was conducted on 45 boys (aged 11-12 years) who were residents in a dormitory and had the same socioeconomic condition. None of the subjects had systemic problems or had undergone any kind of orthodontic treatment. We obtained informed consent from all of the participants and their parents.

These students were divided into three groups. The first group (25 students) was given the dental gel with barberry extracts, the second group (10 students) the normal dental gel (placebo) and the third group of 10 students the regular Colgate® antiplaque toothpaste. None of the subjects use any mouth rinse or any other toothpaste during the study period and they all used the same type of toothbrush (Mina, Ghoods Plastic Co. Iran) and they all were given the same type of food during the study period.

Before starting therapy, all subjects were examined for plaque index [PI, Turesky method (9)] and gingival index [GI, Leo and Silness method (10, 11)]. These tests were repeated after 21 days of using the above mentioned dentifrices. The subjects were asked to brush their teeth with a half covered brush with a gel or the toothpaste for 3 minutes, three times a day under the supervision of their parents'.

The data were collected and subjected statistically to ANOVA test and Tukey-HSD procedure.

RESULTS

The mean plaque index before and after using barberry gel, placebo and Colgate® is shown in Figure 2. According to data, the *barberry* gel has reduced the PI for about 56%. This reduction was 18% for placebo and 44% for Colgate® groups. The mean differences of plaque Indices (Δ PI) of case, control and Colgate® groups are shown in Table 1.

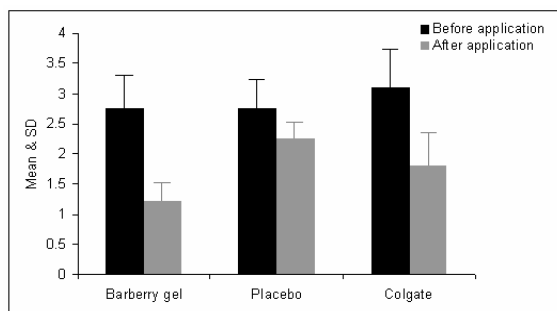


Fig. 2. Mean and SD of plaque index of 11-12 years old boys before and after using barberrry gel, placebo gel and Colgate®.

The results show that there were significant differences between mean differences of PI in all groups ($P < 0.001$). The Tukey-HSD procedure showed that there was significant difference between barberrry and placebo gel's groups ($P < 0.001$). Also there was a significant difference between mean Δ PI in placebo and Colgate® groups ($P < 0.001$), but the difference between mean Δ PI of barberrry and Colgate® was not significant.

The mean gingival index before and after using barberrry gel, placebo gel and Colgate® groups in the 3 groups is shown in Figure 3. According to these data, the barberrry gel has reduced the GI, for about 33.55%. This reduction was 18.50% for placebo and 37.37% for Colgate® groups. The mean difference of gingival index between barberrry gel, placebo and Colgate® groups is shown in Table 2. There were significant differences between mean differences of gingival index (Δ GI) in all three groups ($P = 0.0019$). The Tukey-HSD procedure showed that there was significant difference between mean Δ GI of barberrry and placebo gel groups ($P < 0.01$). Also there was a significant difference between mean Δ GI of Colgate® and placebo groups ($P < 0.001$), but the difference between mean Δ GI in barberrry gel and Colgate® groups was not significant.

Table 1. Mean differences of plaque indices (Δ PI) of 11-12 year- old boys, before and after using test gel, placebo gel and Colgate®.

Group	N	Mean		
		difference PI	SD	Std Err
Barberrry gel	25	1.545	0.5311	0.1062
Placebo gel	10	0.559	0.2360	0.0787
Colgate®	10	1.405	0.6605	0.2089

Abbreviation: N, number; GI, gingival indices; SD, standard deviation, Std Err, standard error.

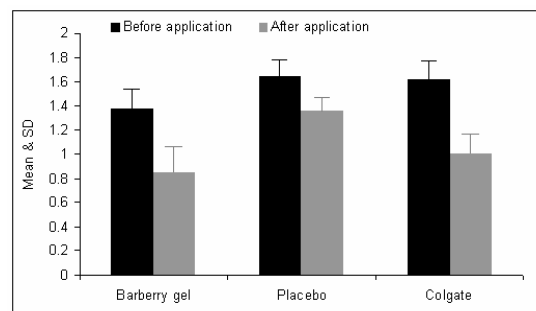


Fig. 3. Mean and SD of gingival index (GI) of 11-12 years old boys before and after using barberrry gel, placebo gel and Colgate®.

DISCUSSION

In this study it has been observed that the placebo gel could control the plaque index (PI) and the gingival index (GI) and it can reduce each of them up to 18.5%. This reduction of both indices may be partially due to the mechanical brushing which to some extent eliminates and controls the microbial plaque. In a previous study done by Makarem *et al.* on the efficacy of a dentifrice containing 3 herbal extracts (on dental plaque and gingivitis) in 12-13 year old boys, it was observed that both the plaque index and gingival index decreased significantly in test compared to placebo group (3). The efficacy of herbal extract's dentifrice in the previous study was higher than the present study which could be explained by the simultaneous use of toothpaste during brushing.

Despite the fact that toothpaste requires a certain degree of abrasion in order to reduce or prevent extrinsic stains from forming and a low or nonabrasive paste is unable to prevent extrinsic stains, in our study neither the dental gel with barberrry nor the placebo dental gel had no abrasive or detergent (12). However, the dental gel with barberrry reduced the PI in the testing group up to

Table 2. Mean differences of gingival indices (Δ GI) of 11-12 year- old boys, before and after using test gel, placebo and Colgate®.

Group	N	Mean		
		difference GI	SD	Std Err
Barberrry gel	25	0.4621	0.2007	0.0410
Placebo gel	10	0.2740	0.0936	0.0296
Colgate®	10	0.5680	0.1682	0.0532

Abbreviations: N, number; GI, gingival indices; SD, standard deviation, Std Err, standard error.

56% which was significantly different from the PI in the placebo group ($P < 0.001$). This could be explained by the antimicrobial property of berberine. On the other hand, the effectiveness of the dental gel with barberry on decreasing PI was not significantly different with that of Colgate® antiplaque toothpaste (Table 1).

Petal had studied effect of *Cichorium intybus* on the PI in 20-50 years aged persons with periodontitis for 21 days treatment. The results showed 11.7% reduction, which is lower than the results of our study. The low results may be related to the low antibacterial activity of the *Cichorium intybus* extract and formulation of the paste (13). Mullally and co-workers studied the effects of 3 herbal extract in Paradontax toothpaste on controlling of the PI and GI in 70 volunteers for 28 days comparing the results with Colgate® regular toothpaste. At the end of 28 days application they found that there was no significant difference between the PI and GI in both case and control groups (14). These results were similar to that of barberry gel and that of Colgate® antiplaque toothpaste. These findings show the role of toothpaste and mechanical brushing.

In conclusion, this study indicates that the barberry dental gel is effective in controlling microbial plaque and gingivitis in school aged children; considering the fact that we did not observed any side effect with the dental gel with barberry during the study period, this gel may be recommended to be used as a dentifrice but further studies are needed.

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Conflict of interests

The authors declare that they have no competing interests.

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