Int J Clin Exp Physiol. 2022;9(4):139-141
www.ijcep.org

Original Article

Efficacy of Apricot Kernel Decoction on Salivary Sialic Acid Level in Periodontitis

Yusong Kim

ABSTRACT

Background and Aim: This study was designed to explore the clinical utility of apricot kernel decoction on salivary glycoproteins in patients with periodontitis. **Methods:** The salivary samples were obtained from 123 subjects divided into 4 groups, namely healthy individuals (healthy), non-treated patients with periodontitis (control), chlorhexidine-treated patients with periodontitis (chlorhexidine) and both decoction and chlorhexidine-treated patients with periodontitis (decoction + chlorhexidine). Salivary sialic acid level was measured by means of Surface Enhanced Raman Spectroscopy (SERS). Calculus and gingival Index were evaluated by means of Greene and Vermillion and Löe. **Results:** The values of salivary sialic acid in decoction + chlorhexidine group were significantly lower than chlorhexidine group ($P<0.05$) and control group ($P<0.01$). On the other hand, in decoction+ chlorhexidine group, Calculus and Gingival Index decreased significantly compared with control group and chlorhexidine group ($P<0.01$, $P<0.05$, respectively). **Conclusion:** Our data suggest that decoction of apricot kernel can be used as mouthwash for the treatment in periodontitis.

Key words: Apricot kernel, Salivary sialic acid, Periodontitis, Healthy individual, Gingival index.

INTRODUCTION

Periodontitis are the most frequent oral diseases affecting 50% of the human adult population.[1] Periodontitis affects the supporting structures of the teeth and it may result in loss of gingival tissue, underlying alveolar bone, and tooth.[1] It has been suggested that the enzyme neuraminidase that is responsible for cleaving Sialic Acid (SA) may propitiate plaque formation and periodontitis.[2] Molecules in saliva have been proposed as useful biomarkers in the diagnostics of several human diseases.[1,3] The simplicity of its recollection and non-person invasiveness are advantages as a diagnostic instrument in certain conditions affecting humans. SA is an important salivary biomarker that is correlated to systemic inflammation.[4] SA has the chemical formula $C_{11}H_{19}NO_9$. SA is part of the glycolipids and glycoproteins that traverse the cellular membrane. A relevant function of this SA attached to the cell membranes is to regulate innate immunity.[3-5] The dominant form of SA in human fluids, including saliva, is N-acetylneuraminic acid.[6] Several clinical studies have indicated that SA is present in several proteins correlated with periodontitis,[2] and that it is over expressed in the course of this oral disease.[7] Periodontal diseases need a biomarker for accurate diagnosis, feasible early detection of disease evolution, and evaluation of the applied therapy's efficacy to treat this condition.[8] Apricot kernel is an important source of dietary protein as well as oil and fiber.[9] The kernel is added to bakery products as whole kernel or grounded and also consumed as appetizers in many countries. Apricot kernel is a species with important economic value in Democratic People's Republic of Korea, including sweet kernel and bitter kernel. The existing germplasm has high-quality and healthy kernel oil, which possess 95% of unsaturated fatty acids ratio and more than 70% of mono-unsaturated fatty acids. In addition, it is also rich in proteins, minerals, vitamins, dietary fibers and trace elements required by the human body. And also, it is traditional Koryo herb medicine in Korea that contains amygdalin as their major effective ingredient.

Some authors have reported the apricot kernels' antioxidant properties and the efficacy of kernel production by roasting in some diseases, but there has been no research to use the decoction of apricot kernel as traditional medicine for the treatment of Periodontitis. In this study, we assessed the effect of the decoction of apricot kernel against Periodontitis.

MATERIALS AND METHODS

Patients

Approval by local ethical committee was obtained before commencing the study. This study included four groups: The healthy group consisted of 21 volunteers who had normal gingiva and absence of loss of attachment as determined by probing. They were healthy with no systemic diseases. The 102

Yusong Kim
Postgraduate School, Pyongyang University of Medical Sciences, Pyongyang, Democratic People's Republic of Korea.

***Correspondence**

Yusong Kim
Postgraduate School, Pyongyang University of Medical Sciences, Pyongyang, Democratic People's Republic of Korea.
Email: shyping202124@126.com

History
- Submission Date: 03-10-2022;
- Review completed: 07-12-2022;
- Accepted Date: 28-12-2022.

DOI : 10.5530/ijcep.2022.9.4.34

Article Available online
http://www.ijcep.org/

Cite this article: Kim Y. Efficacy of Apricot Kernel Decoction on Salivary Sialic Acid Level in Periodontitis. Int J Clin Exp Physiol. 2022;9(4):139-41.

patients with periodontitis who were selected based on radiographic evidence of alveolar bone loss and having at least 6 to 8 sites with a probing pocket depth of ≥ 5mm. They were randomly divided three groups: the control group consisted of non-treated 30 patients and the chlorhexidine group consisted of 35 patients who were received only 10 ml 0.2% chlorhexidine rinse for 60 sec once a day. The decoction + chlorhexidine group consisted of 37 patients who were received the rinse with apricot kernel decoction. They rinsed 10ml decoction for 2 min twice a day after above-mentioned chlorhexidine rinse. The treatment cycle of each group was 15 days. During the study all subjects were banned smoking and drinking.

Preparation of Apricot Kernel Decoction

Apricot Kernel was obtained from Mannyon pharmaceutical company, DPR Korea and identified by comparison with the voucher specimen deposited at National drug certification institute of Pyongyang, DPR Korea. Dried kernels were cleaned and weighed. Decoction was obtained in boiling water at a ratio of 3:100 of kernel to water for one hour. The decoction was then kept in the refrigerator at 45°C.

Saliva Sample

Saliva samples used in this study were collected from persons attending the outpatient clinics of the department of Endodontology, Dental Science Faculty, Pyongyang University of Medical Sciences.

Assay of Salivary Sialic Acid

The Raman equipment and experimental details for the SERS measurements are given in.[10] The SERS spectra were collected in the spectral range 400-1800 cm^{-1}. The intensity of either one of the trios of lines-1002, 1237, and 1391 cm^{-1} or 910, 1171, and 1360 cm^{-1} after fluorescence subtraction were used to compare with a calibration curve for the SERS obtained from SA. To record the SERS spectra, 75μL in a proportion 2:1 of 2.5 x 10^{-3} M citrate-reduced Ag-NP and saliva was placed in an aluminum container.

Calculus Index

The presence of supra and subgingival calculus was evaluated by the average index with a score from 0 to 3.[11]

Gingival Index

The presence or absence of gingival inflammation was evaluated by the gingival index score ranging from 0 to 3 and the average was calculated.[12,13]

Statistical Analysis of Data

Data was analyzed using Statistical Package for the Social Sciences (SPSS) 10.0 software. Student *t* test, Analysis of Variance (ANOVA) test were carried out for comparison between the three groups. The values were expressed as the mean ± SD.

RESULTS

Table 1 showed that in non-treated patients, the level of SA in saliva was larger than the level in healthy individuals. In decoction + chlorhexidine group, the level of SA in saliva was significantly decreased compared with control and chlorhexidine group (P<0.01 and P<0.05), but increased compared with healthy group (P>0.05).

As shown in Figure 1, in decoction + chlorhexidine group gingival index was significantly decreased compared with control and chlorhexidine group (P<0.01 and P<0.05). In both chlorhexidine and decoction + chlorhexidine group, the column of this index was lower than control group.

Table 1: Effect of decoction on salivary sialic acid.

	N	SA in Saliva (mg/dL)
Healthy	21	4.73 ± 2.31
Control	30	13.12 ± 6.94
Chlorhexidine	35	10.17 ± 6.08*
Decoction + chlorhexidine	37	7.12 ± 5.23**△

Each value represents the mean ± SD. *P<0.05 and **P<0.01 as compared with Control group. △ P<0.05 as compared with chlorhexidine group.

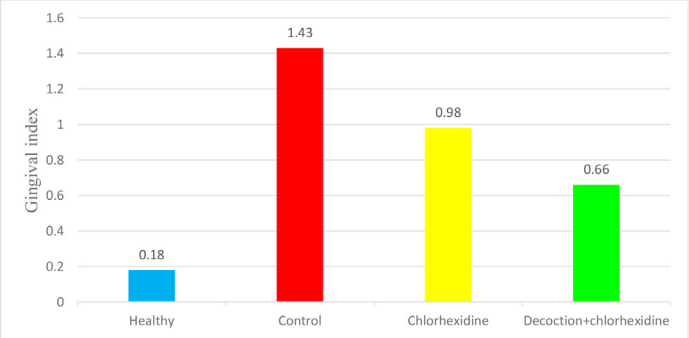

Figure 1: Gingival index.
Each value represents the mean ± SD. *P<0.05 and **P<0.01 as compared with control group. △ P<0.05 as compared with chlorhexidine group.

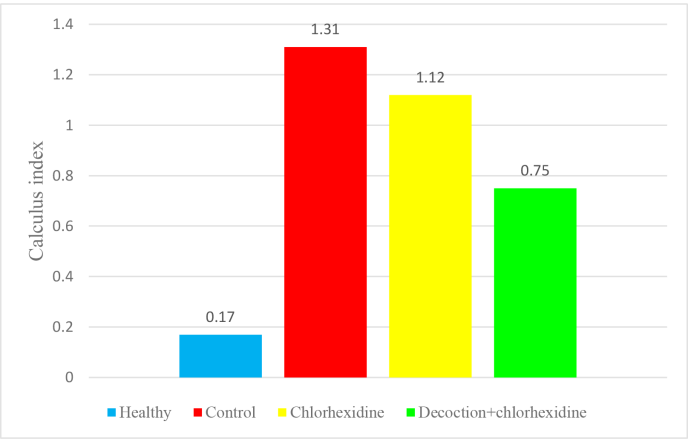

Figure 2: Calculus index.
Each value represents the mean ± SD. **P<0.01 as compared with control group. △P<0.05 as compared with chlorhexidine group.

The column in decoction + chlorhexidine group significantly decreased compared with control and chlorhexidine group (P<0.01 and P<0.05). Calculus index in chlorhexidine group decreased compared with control group, but there was no significant between two groups.

DISCUSSION AND CONCLUSION

Saliva is a convenient medium, because its collection is non-invasive, and the donation process is stress free for the patient; hence, multiple collections can be performed without imposing any discomfort on the patient. Moreover, saliva is also easy to store and transport.[3] Many studies have shown that the salivary glycoproteins may be the biochemical indicators of oral diseases such as periodontitis and gingivitis. SA concentration is calibrated by centrifugation from the complex constituted human fluids, which requires elaborate chemical

processes to isolate it, to subsequently comparing its absorbance at certain wavelengths with calibrated absorbance from chemical reagents.[14] Recently, researches have shown that SA may be easily detected by the alternative method of SERS produced by citrate-reduced silver nanoparticles (cit-Ag-NP), and they have demonstrated its sensitivity.[10] Determination of SA by SERS using cit-Ag-NP is a technical approach that requires simple saliva processing. So, we used this technology for the assay of SA in saliva in this study. According to our results, in decoction + chlorhexidine group, the level of SA in saliva was significantly decreased compared with control and chlorhexidine group ($P<0.01$ and $P<0.05$), but significantly increased compared with Healthy group ($P<0.05$). In present study, SA levels in periodontitis-affected patients are larger than the levels in healthy subjects. This corroborates previous literature reports that also measured SA in patients with periodontitis. Our result showed that the increasing SA level in saliva indicated the progress of periodontitis and decoction of apricot kernel may prohibit the process of inflammation in periodontium. We considered that the dynamic changes of SA in saliva can be associated with gingival and calculus status in periodontitis. Thus, we observed the changes of gingival and calculus index in healthy and control groups and the effect of decoction compared with chlorhexidine group on the changes of these indices in periodontitis. Gingival and calculus index in decoction + chlorhexidine group were significantly decreased compared with control and chlorhexidine group ($P<0.01$ and $P<0.05$). Until now, few studies related to Apricot kernel were limited to demonstrate its main ingredients, biological components, pharmacological properties such as antioxidant and anti-inflammation and clinical effect in some diseases such as bronchitis and cancer, but there has been no research to use its decoction as herbal medicine-mouthwash in dental disease. Our study suggests that apricot kernel could be used one of the efficient agents for treatment in periodontitis.

ACKNOWLEDGEMENT

I am thankful to Mr. Songgun Pak, Lecturer, Biochemistry department, Pyongyang University of Medical Sciences, for estimation of SA levels in the study.

CONFLICT OF INTEREST

The author declares no conflict of interest.

ABBREVIATIONS

SA: Sialic Acid; **SERS:** Surface Enhanced Raman Spectroscopy; **cit-Ag-NP:** Citrate-Reduced Silver Nanoparticles.

REFERENCES

1. Sculley DV, Langley-Evans SC. Periodontal disease is associated with lower antioxidant capacity in whole saliva and evidence of increased protein oxidation. Clin Sci (Lond). 2003;105(2):167-72. doi: 10.1042/CS20030031, PMID 12650638.
2. Ide M, McPartlin D, Coward PY, Crook M, Lumb P, Wilson RF. Effect of treatment of chronic periodontitis on levels of serum markers of acute-phase inflammatory and vascular responses. J Clin Periodontol. 2003;30(4):334-40. doi: 10.1034/j.1600-051x.2003.00282.x, PMID 12694432.
3. Pfaffe T, Cooper-White J, Beyerlein P, Kostner K, Punyadeera C. Diagnostic potential of saliva: current state and future applications. Clin Chem. 2011;57(5):675-87. doi: 10.1373/clinchem.2010.153767, PMID 21383043.
4. Schauer R, Kamerling JP. Chemistry, biochemistry and biology of sialic acids. New Compr Biochem. 1997;29:243-402. doi: 10.1016/S0167-7306(08)60624-9.
5. Liu J, Duan Y. Duan Y. Saliva: a potential media for disease diagnostics and monitoring. Oral Oncol. 2012;48(7):569-77. doi: 10.1016/j.oraloncology.2012.01.021, PMID 22349278.
6. Varki A, Kannagi R, Toole BP. Chapter 44. Glycosylation changes in cancer. In: Varki A, Cummings RD, Esko JD, Freeze HH, Stanley P, Bertozzi CR, Hart GW, Etzler ME, editors. Essentials of glycobiology. 2nd ed. Cold Spring Harbor, (NY): Cold Spring Harbor Laboratory Press; 2009.
7. Davis G, Gibbons RJ. Accessible sialic acid content of oral epithelial cells from healthy and gingivitis subjects. J Periodont Res. 1990;25(4):250-3. doi: 10.1111/j.1600-0765.1990.tb00912.x, PMID 2142734.
8. Colburn WA, Keefe DL. Biomarkers in drug discovery and development: from target identification through drug marketing. J Clin Pharmacol. 2003;43(4):329-41. doi: 10.1177/0091270003252480, PMID 12723454.
9. Femenia A, Rossello C, Mulet A, Canellas J. Chemical composition of bitter and sweet apricot kernels. J Agric Food Chem. 1995;43(2):356-61. doi: 10.1021/jf00050a018.
10. Hernández-Arteaga A, de Jesús Zermeño Nava J, Kolosovas-Machuca ES, Velázquez-Salazar JJ, Vinogradova E, José-Yacamán M, *et al.* Diagnosis of breast cancer by analysis of sialic acid concentrations in human saliva by surface-enhanced Raman spectroscopy of silver nanoparticles. Nano Res. 2017;10(11):3662-70. doi: 10.1007/s12274-017-1576-5.
11. Greene JC, Vermillion JR. The simplified oral hygiene index. J Am Dent Assoc. 1964;68:7-13. doi: 10.14219/jada.archive.1964.0034, PMID 14076341.
12. Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand. 1963;21:533-51. doi: 10.3109/00016356309011240, PMID 14121956.
13. Löe H. The Gingival Index, the plaque index and the retention index systems. J Periodontol. 1967;38(6):Suppl:610-6. doi: 10.1902/jop.1967.38.6.610, PMID 5237684.
14. Aminoff D. Methods for the quantitative estimation of N-acetylneuraminic acid and their application to hydrolysates of sialomucoids. Biochem J. 1961;81(2):384-92. doi: 10.1042/bj0810384, PMID 13860975.

Cite this article: Kim Y. Efficacy of Apricot Kernel Decoction on Salivary Sialic Acid Level in Periodontitis. Int J Clin Exp Physiol. 2022;9(4):139-41.