Journal of
Periodontology
&
Implant Dentistry

Research Article

Effect of Omega-3 Fatty Acid in Treatment of Patients with Moderate Gingival Inflammation

Niloufar Jenabian[1]•Ali Akbar Moghadamnia[2]•Mahtab Hamzeh[3]•Soheil Azarakhsh[4]• Amirhosein Shakoorpour[5]*

[1]Assistant Professor, Department of Periodontology, Babol University of Medical Sciences, Babol, Iran
[2]Professor, Department of Pharmacology, Babol University of Medical Sciences, Babol, Iran
[3]Postgraduate Student, Department of Pediatric Dentistry, Babol University of Medical Sciences, Babol, Iran
[4]Postgraduate Student, Department of Endodontics, Babol University of Medical Sciences, Babol, Iran
[5]Periodontist, Babol University of Medical Sciences, Babol, Iran
*Corresponding Author; E-mail: dr.mh61@yahoo.com

Received: 22 April 2012; Accepted: 13 July 2012
J Periodontol Implant Dent 2012;4(2): 73-76
This article is available from: http://dentistry.tbzmed.ac.ir/jpid

Abstract

Background and aims. Gingivitis is a common periodontal disease which involves different parts of gingiva to various degrees and severity. Unsaturated fatty acids have the potential to decrease the inflammation and can be effective in treatment of gingivitis. The aim of this study was to evaluate the effect of omega-3 unsaturated fatty acids in treatment of moderate gingivitis.

Materials and methods. This evaluation is a double blind clinical trial which was performed on 50 patients, 20 to 40 years old, with moderate gingivitis. Patient with same oral hygiene were assessed during 28 days and divided in to two groups. The test group received omega3 unsaturated fatty acids and the control group got the placebo for 10 days. Gingival Index (GI; Loe & Silness) and bleeding On Probing (BOP; Barnet) were recorded on the ramfjord teeth in the day of the prescription and the 5, 10 and 20 days after that. Data were analyzed by Friedman and Man-Whitney statistical tests.

Results. The indices showed decrease in both groups significantly ($p<0.0001$), but the omega3 unsaturated fatty acid was more effective (GI and BOP =$p<0.0001$) compared to the placebo group.

Conclusion. Results of present study showed that good oral hygiene and using omega-3 unsaturated fatty acid are effective in treatment of gingivitis.

Key words: **Gingivitis, inflammation, omega-3 fatty acid.**

Introduction

Plaque-induced gingivitis is the most common gingival disease and is the inflammatory response of gingival tissues to local factors such as microbial plaque.[1,2]

In acute and chronic inflammatory conditions the amount of equizanoid products which are derivatives of arachidonic acid, increases in blood and tissues.[3] Eicosanoids level increases clearly in periodontal inflammatory conditions, and due to its proliferative and chemotaxic effects as a result of 5- lipoxigenase catalyzation pathway, it has a significant role in the pathogenesis of gingival and periodontal inflammation.[4]

Most of the inflammatory responses in pathogenic conditions are progressive and need pharmacological interventions[5]. Since the basic ingredients of equizanoids are derived from different nutritional sources, it can be concluded that the level of inflammatory derivatives of arachidonic acid can be controlled through diet.[4]

Unsaturated fatty acids are named based on the location of the first double link of methyl carbon called carbon omega (ω). Unsaturated fatty acids are classified in two groups due to the location of the first double link, omega-3 and omega-6. Omega-6 fatty acids consist of linoleic acid (LA) and arachidonic acid (AA). Omega-3 fatty acids are composed of alphalinolenic acid (ALA), eicosapentaenoic acid (EPA**)** and dexahexanoic acid (DHA). Both are metabolized by the same enzymes, elongase and desaturase that results in kind of competition between them: Omega-3 unsaturated fatty acids inhibit metabolism of omega-6 unsaturated fatty acids and vice versa.[6-9]

Bendyk et al (2009), showed that concentration of omega-3 fatty acid in soft tissues of rats which were fed with fish oil was significantly higher than the control group. Rats which were fed with omega-3 fatty acids and infected by bacteria, showed alveolar bone height reduction less than in the control group.[10]

Kesavalu et al (2006) conducted a study on rats which were fed with fish oil (omega-3) and corn oil (omega-6) for 22 weeks and then infected by *P. gingivalis*. The results showed reductions in proinflammatory cytokine genes (TNF) and increases in interferon-producing genes (IFM) and superoxide dismutase (SOD). Rats in the omega-3 group showed significantly lower levels of alveolar bone loss. Long-chain unsaturated fatty acids n-3 derived from fish and fish oil significantly reduce inflammatory factors such as eicosanoids, cytokines and adhesion molecules. They act directly through replacement of arachidonic acid which is a precursor of eicosanoids, prevention of arachidonic acid metabolism, increasing anti-inflammatory agents and prevention of expression of inflammatory genes and indirectly affect the activity of transcription factors.[3] The aim of this study was to evaluate the effects of omega-3 fatty acid in the treatment of patients with moderate gingival inflammation.

Materials and Methods

A double-blind clinical trial was performed on 50 patients who referred to the Department of Periodontology, Faculty of Dentistry, Babol University of Medical Sciences. The project was approved by the Ethic Committee of Babol University of Medical Sciences. An informed consent form was signed by each participant. The following inclusion criteria were used: at least 24 teeth, moderate gingival inflammation (GI=2), pocket probing depth less than 3-mm and ability to cooperate and fill in the questionnaire. Patients had taken no anti-inflammatory drugs and antibiotics three weeks prior to the study and had no history of periodontal treatment in the past 3 months, deep restorations or any other predisposing local factors for gingivitis, systemic disease, smoking, pregnancy and breast feeding. All the patients received oral hygiene instructions (OHI) and used the same brushing method (Bass technique) and the same kind of toothbrush (Oral-B, Oral-B Laboratories, Ireland) and tooth paste (Nasim, Paxan Corporation, Iran). Silness and Loe plaque index (PI) was used for all the patients, by a trained examiner before and one week after OHI. When all the patients reached plaque index less than 30%, they were randomly divided into two groups. The first group received 1000 mg of omega-3 (Nutritive Pharmaceutical Inc. Kelowna BC Canada V1X 4K6), and the second group used 1000 mg of glucose daily for 10 days. The same capsules (gel form) were used to cover both medicaments. Gingival index (GI, Loe & Silness), bleeding index (BI, Barnett) and plaque index (PI, Silness & Loe) were recorded at baseline and 5, 10 and 20 days later for Ramfjord teeth.[5]

Statistical Analysis

Data was analyzed by Friedman and Mann-Whitney U tests due to inter- and intra-group abnormal distribution of data and $P<0.01$ was considered statistically significant. SPSS software was used.

Results

A total of 45 patients with 23 (12 women and 11 men, mean age, 28.05 ± 5.406) in omega-3 fatty acid group and 22 patients (12 women and 10 men, mean age, 26.7 ± 5.24) in the placebo group participated in this study.

According to Friedman test, intra-group figures of GI and BI decreased in both groups (P<0.0001). Inter-groups comparison based on Mann-Whitney U test showed significant reduction of BOP in the test group after five days (P<0.0001) and significant reduction of BOP compared to the placebo group (Figure 1). There was significantly more reduction of PI in the test group 5, 10 and 20 days after using the drug compared with the placebo group (P<0.005, P<0.0001 and P<0.0001, respectively, Figure 2).

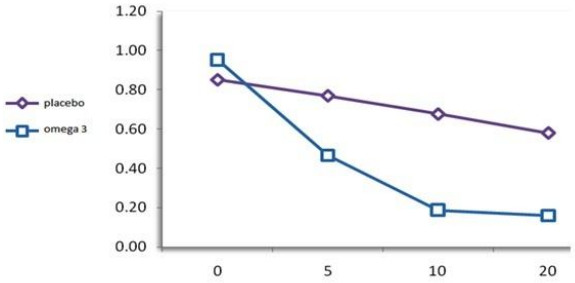

Figure 1. Mean changes of BOP in the omega-3 and glucose groups 0, 5, 10 and 20 days after using medicaments

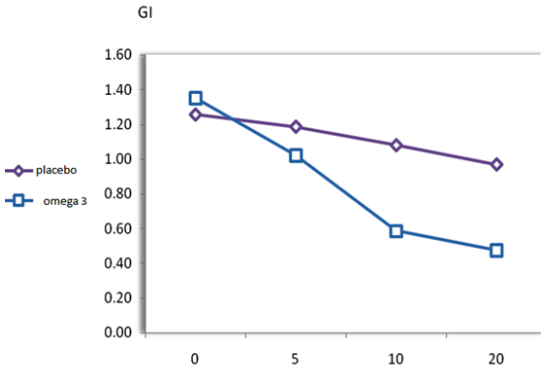

Figure 2. Mean changes of GI in the omega-3 and glucose groups 0, 5, 10 and 20 days after using medicaments

Discussion

Inflammation may affect different parts of the body. One of the most common features of inflammation is quantitative change of mediators such as equzanoids and cytokines. Omega-3 is suggested to have anti-inflammatory effects therefore its deficiency may contribute to inflammatory situations, and adding it to the diet in the case of inflammation may be clinically beneficial[3]. According to the findings of several studies about anti-inflammatory effects of omega-3 fatty acid[6,12-15], we used it in treatment of gingival inflammation. In both the test and placebo groups significant reductions in GI and BOP were observed (p<0.0001) but significantly more reduction was found in the test group (P<0.0001). Reduction of GI and BOP in both groups could be related to SRP and plaque control, but more significant reduction in the test group may be partly due to the use of omega-3 fatty acid. Several studies have investigated the anti inflammatory effect of omega-3 fatty acid but there is limited information about its clinical effects. Campan et al (1996) observed that using n-3 fatty acids is effective in reducing gingival inflammation in human models with gingivitis.[16] Campan et al (1997) showed that using fish oil can significantly reduce gingival index, but they did not find significant differences between the test and control groups. They concluded that n-3 fatty acids can reduce inflammation.[17] These results are consistent with results of the present study, which confirms the beneficial effect of using omega-3 fatty acid. Omega-3 polyunsaturated fatty acids have been demonstrated to compete with arachidonic acid as substrates for cyclooxygenase and lipoxygenase pathways, reducing the synthesis of arachidonic acid.[18] Therapies which reduce the synthesis of proinflammatory arachidonic acid mediators by blocking the cyclooxygenase and lipoxygenase pathways have proven beneficial in the treatment of both experimental gingivitis and clinical periodontitis.[19] Omega-3 polyunsaturated fatty acid metabolism also produces modified end products from both cyclooxygenase and lipoxygenase pathways, which are less inflammatory. Cyclooxygenase metabolism of EPA results in PGI_3 which has strong anti-inflammatory properties, including preventing platelet aggregation and promoting vasodilation, and thromboxane A_3 which has markedly reduced pro-thrombic and proinflammatory affects compared with thromboxane A_2.[3]Conversely Eberhard et al (2006) reported that washing gingivitis sites with n-6 fatty acid significantly reduce GCF compared to n-3 fatty acid.[4] This controversy may be attributed to local delivery of these medicaments in the aforementioned study.

Conclusion

Results of the present study indicate that using omega-3 fatty acids in conjunction with good oral hygiene are effective in the treatment of gingivitis.

Acknowledgment

This study was supported by Council of Research and Technology of Babol University of Medical Sciences.

References

1. New man MG, Takei HH, Klokke VPR, Carranza FA. Clinical periodontology. 10th ed. Philadelphia: W.B. Saunders Company; 2007. p119-20.
2. Behrozi S, Tahmasebi R. Evaluate incidence of gingivitis and dependent factors among 6-18 years old students in Booshehr city (Iran) 1380-1381. Journal of Boshehr University of Medical Science 2002; 2: 152-60.
3. Calder PC. Polyunsaturated fatty acids and inflammation. Prostaglandins Leukot Essent Fatty Acids 2006; 75: 197-202.
4. Eberhard J, Heilmann F, Açil Y, Albers HK, Jepsen S. Local application of n-3 or n-6 polyunsaturated fatty acids in the treatment of human experimental gingivitis. J Clin Periodontol 2002; 29: 364–9.
5. Treschow AP, Hodges LD, Wright PF, Wynne PM, Kalafatis N, Macrides TA. Novel anti-inflammatory omega-3 PUFAs from the New Zealand green-lipped mussel, Perna canaliculus. Comp Biochem Physiol B Biochem Mol Biol 2007; 147: 645-56.
6. Omrani GH, Mazloom Z, Savid M, Rashidi AA. Effect of omega-3 fatty acids on glycaemic control and lipid profile in patients with type 2 diabetes. Iranian Journal of Diabetes and lipid Disorders 2003; 2(1):11-6.
7. Matsuyama W, Mitsuyama H, Watanabe M, Oonakahara K, Higashimoto I, Osame M, Arimura K. Effects of Omega-3 Polyunsaturated Fatty Acids on Inflammatory Markers in COPD. Chest 2005; 128: 3817-27.
8. Shariati M, Khaksary haddad M, Jafari H, Rezaeezadeh A, Bahadoran M. Effect of dietary fish oil and corn oil on blood biochemical factors in diabetic rat. Iranian South Medical Journal 2005; 8: 8-14.
9. Jafarinaveh HR, Taghavi MM, Shariati M, Rezaei Zade A, Khaksari M. The effect of dietary polyunsaturated fatty acid on skin wound healing in chronic diabetic rat. Journal of kerman University of Medical Sciences 2005; 12: 99-109.
10. Bendyk A, Marino V, Zilm PS, Howe P, Bartold PM. Effect of dietary omega-3 polyunsaturated fatty acids on experimental periodontitis in the mouse. J Periodontal Res 2009; 44: 211-6.
11. Moghaddas H, Shirzad Sh, evaluation clinical effect of IRSHA mouth wash on microbial plaque and gingival inflammation in gingivitis. Iranian dental journal .march 2006; 1: 35-38.
12. Kesavalu L, Bakthavatchalu V, Rahman MM, Su J, Raghu B, Dawson D, et al. Omega-3 fatty acid regulates inflammatory cytokine/mediator messenger RNA expression in Porphyromonas gingivalis-induced experimental periodontal disease. Oral Microbiol Immunol 2007; 22: 232–9.
13. Khaksari-Haddad M. Omega-3 fatty acids and wound healing in diabetes. Journal of Semnan University of Medical Sciences 2004; 5: 121-32.
14. Taghavi MM, Khaksari M. Acceleration of skin wound healing in chronic diabetic rat by topical application of fish oil. Journal of Semnan University of Medical Sciences 2002; 3: 61-73.
15. Goldberg RJ, Katz J. A meta-analysis of the analgesic effects of omega-3 polyunsaturated fatty acid supplementation for inflammatory joint pain. Pain 2007; 129: 210-23.
16. Campan P, Planchand PO, Duran D. Polyunsaturated omega-3 fatty acids in the treatment of experimental human gingivitis. Bull Group Int Rech Sci Stomatol Odontol 1996; 39: 25-31.
17. Campan P, Planchand PO, Duran D. Pilot study on n-3 polyunsaturated fatty acids in the treatment of human experimental gingivitis. J Clin Periodontol 1997; 24: 907-13.
18. Offenbacher S, Odle BM, Green MD, Mayambala CS, Smith MA, Fritz ME, et al. Inhibition of human periodontal prostaglandin E2 synthesis with selected agents. Agents Actions 1990; 29: 232-8.
19. Salvi GE, Williams RC, Offenbacher S. Nonsteroidal anti-inflammatory drugs as adjuncts in the management of periodontal diseases and peri-implantitis. Curr Opin Periodontol 1997; 4: 51-8.