

Evaluation of the Effect of Antioxidants in the Management of Symptoms in Temporomandibular Disease Patients as Compared to the Conventional Regimen

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Abstract

Background: The temporomandibular joint is undergoing an inflammatory phase and free radical production has increased. They could be the catalyst for such processes or their main source. Oxidative stress occurs when the body's ability to eliminate free radicals is insufficient; hence, these antioxidants are beneficial to prevent the development of many inflammatory disorders. **Materials and Methods:** Fifty patients were included in the present study. Then, they were divided randomly into two groups – a control group where in conventional treatment regimen is followed and a study group where additional antioxidants were added. Pre-operative pain is evaluated using VAS from 1 to 100, mouth opening is evaluated with interincisal distance. Patient was recalled on days 28 and 90 and evaluation done using same scales. Results were subjected to descriptive statistics and Student's t test for inferential statistics. **Results:** The mean baseline pain score VAS in the control group was 63.20 and in the study group was 66. Four weeks into the study, the scores were, respectively, 47 and 30.6 and at the end of 90 days, it was 27.60 in both the groups. The mean interincisal opening at baseline was 25 cm in the control group and 24.2 cm in the study group. After 4 weeks, the control group had a mouth opening of 28.2 cm whereas the study group had a better opening of 37.8 cm. At the end of 90 days, both the groups had a interincisal opening of 31.6 cm. Statistical analysis showed that there was a significant improvement in the pain and interincisal opening among the control group and study group at 4 weeks into the trial. After 90 days, the results in both groups were similar with no difference in the pain and interincisal opening. **Conclusion:** The present study concluded that it has emphasized the potential benefits of anti-oxidants in managing the troublesome TMD. Dietary as well as therapeutic supplementation could be of use in treating the condition and provide the patients with a faster symptomatic relief.

Keywords: Antioxidants, Free radicals, Temporomandibular disorders, Visual analog scale.

INTRODUCTION

Temporomandibular disorders (TMD) are defined as a subgroup of craniofacial pain problems that involve the temporomandibular joint (TMJ), masticatory muscles, and associated head and neck musculoskeletal structures. The signs and symptoms of these complex disorder are multiple and include difficulties with mastication, speaking, and other orofacial functions. They are also frequently associated with acute or persistent pain. Chronic cases of TMD pain may lead to impairment of work and social interactions, resulting in an overall reduction in the quality of life.^[1]

The main goal of treatment for TMDs is elimination or reduction of pain and joint sounds and a return to normal TMJ function. Treatment involves a soft diet, behavior and

habit modification, pharmacological therapy, interocclusal splints, physiotherapy, intra-articular injections of various drugs, arthrocentesis, arthroscopy, or in extreme cases open joint surgery.^[2]

In most cases of TMD, an inflammatory process is seen in the TMJ and there is an increase in the amount of free radicals. They might be either the source or the perpetuating factor.

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When the free radical cleansing capacity is inadequate, there is oxidative stress, which often lead to worsening of symptoms in TMD as well as inflammatory conditions of other joints.^[3,4]

The common free radicals or reactive oxygen species (ROS) produced in the joint are peroxide, superoxide, hydroxyl radical, and peroxynitrite.^[5] Our body gets rid of the excess ROS using natural antioxidants such as Vitamin C (ascorbic acid), Vitamin E, glutathione, and various other enzymes.^[6] In situations where there is inability of body to eliminate these ROS, it can be counteracted by antioxidant supplementation through diet or pharmacotherapy. Studies have shown that antioxidant therapy in TMJ pain disorder seems to yield promising results and hence this research has been carried out to evaluate the effect of antioxidants in the management of symptoms in TMD patients as compared to the conventional regimen.

MATERIALS AND METHODS

Trial design

A randomized and control trial was performed to evaluate the effectiveness of antioxidants in TMD

Research population

Fifty patients from outpatient section of Department of Oral and Maxillofacial Surgery were divided randomly into two groups – a control group where in conventional treatment regimen is followed and a study group where additional antioxidants were added. Randomization was done using lot method and the patients were allocated into particular groups. Informed consent was taken from the patients and institutional ethical committee clearance was obtained for the study

Inclusion criteria

Patients of age group 20–40 years with full complement of molar teeth and normal radiographic appearance of TMJ and absence of systemic illness with complaints of pain and/or clicking and/or deviation in the TMJ region unilaterally or bilaterally were included in the study.

Exclusion criteria

Radiographic evidence of osseous changes in the TMJ apparatus, presence of systemic diseases, missing teeth, and malocclusion were excluded from the study.

The study population is randomly divided into two groups – control and study groups

Group A: Control group –

Patients were advised routine mouth opening and TMJ exercises and were advised alternate heat and cold application for a period of 10 min twice a day for a period of 3 months. Anti-inflammatory medication (Trypsin + chymotrypsin combination) is given for 3 days and analgesic (Aceclofenac + Paracetamol) is given SOS.

Group B: Study group –

Along with the same regimen, antioxidants were added.

Tab Limcee chewable tablets (Vitamin C) – 1 tablet/day and SM Fibro Capsule containing minerals, and carotenoids, like alpha lipoic acid, beta-carotene, elemental copper, elemental selenium, lycopene, Vitamin E, and zinc sulfate. One tablet/day is given for 28 days

Treatment evaluation

All the measurements were recorded by a single observer who was unaware of the group into which the patient belonged to. The patients were blinded regarding the treatment that was administered to the other group to avoid bias. Pre-operative pain is evaluated using VAS from 1 to 100, mouth opening is evaluated with interincisal distance. Patient was recalled on days 28 and 90 and evaluation done using same scales.

Statistical analysis

The data were analyzed using Statistical Package for the Social Science (SPSS) version 20.0 (IBM SPSS Corp.; Armonk, NY, USA). Results were subjected to descriptive statistics and student *t*-test for inferential statistics. $P < 0.05$ was considered statistically significant.

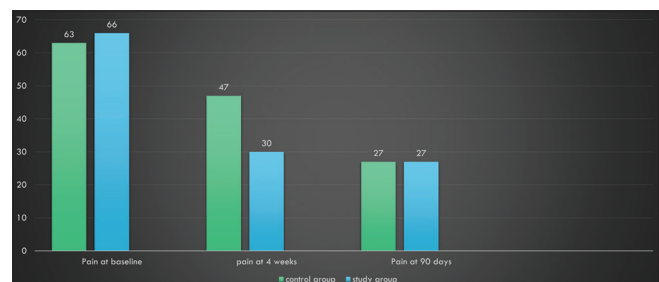
RESULTS

The mean age in the groups was 34.52 and 34.4 years. The mean baseline pain score VAS in the control group was 63.20 and in the study group was 66. Four weeks into the study, the scores were, respectively, 47 and 30.6 and at the end of 90 days, it was 27.60 in both the groups (Graph 1)

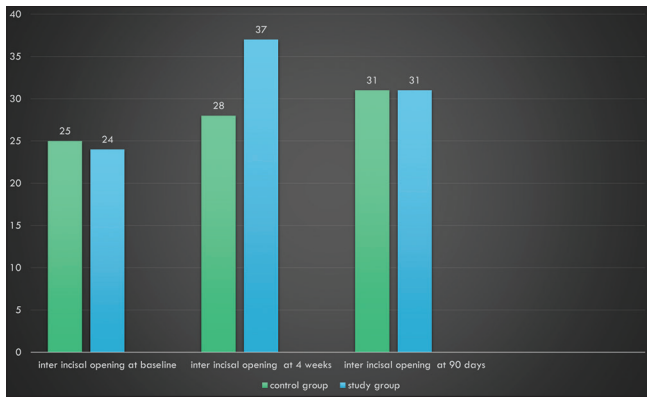
The mean interincisal opening at baseline was 25 cm in the control group and 24.2 cm in the study group. After 4 weeks, the control group had a mouth opening of 28.2 cm whereas the study group had a better opening of 37.8 cm (Graph 2). At the end of 90 days, both the groups had a inter incisal opening of 31.6 cm.

Improvement in the interincisal opening in study group is evident in the picture (Figure 1).

Statistical analysis showed that there was a significant improvement in the pain and interincisal opening among the control group and study group at 4 weeks into the trial.



Graph 1: Comparison of pain between groups (VAS)



Graph 2: Comparison of inter incisal opening between groups

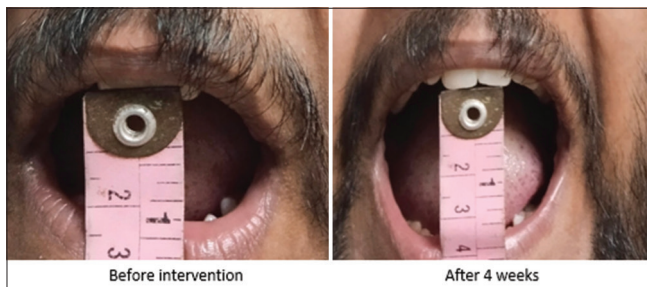


Figure 1: Mouth opening before and after intervention

After 90 days, the results in both groups were similar with no difference in the pain and interincisal opening.

DISCUSSION

TMJ disorders are a pathological condition affecting 5–12% of the population, and approximately 15% of all cases develop chronic TMJ disorders which diminishes their life quality.^[7] Common TMJ problems include arthralgia, myalgia, myofascial pain, disc displacement disorders, degenerative joint disease, subluxation, and headache attributed to TMD. Management of TMD ranges from simple self-care practices and conservative treatments to injections and open joint surgery. Treatment should begin with conservative, non-surgical therapies, with surgery left as the last resort. Surgical procedures consist of arthrocentesis, arthroscopy, open arthroplasty, and TMJ replacement. Most patients with TMDs can be treated with non-invasive, nonsurgical, and reversible interventions.^[8]

Although the exact etiological mechanisms of TMJ disorders are not known, osteoarthritic changes may be associated with hard-tissue destruction due to proteolytic enzymes and inflammatory mediators.^[9] Accumulation of free radicals may be associated with the inflammation in TMJ and failure in elimination of free oxygen radicals by enzymatic and non-enzymatic antioxidative mechanisms may cause an imbalance leading to oxidative stress. Accumulation of lipid hydroperoxides in membranes disrupts its function causing it to collapse. Stable aldehydes such as malondialdehyde are formed, which may also damage cell membranes in the TMJ.^[10,11]

Mechanical stress worsen the pathophysiological sequelae triggered by the oxidative stress in TMJ disorders.^[12] Vitamin C, Vitamin E, and carotenoids are excellent antioxidants that protect cells from damage by oxidants, and their blood concentration levels are primarily determined by dietary intake. Moderate or high Vitamin C intake was shown to have a substantially lower risk of developing knee pain.^[13] Vitamin C is a cofactor in the hydroxylation of lysine and proline and, therefore, is required in the cross-linking of collagen fibrils in bone. Vitamin C stimulates alkaline phosphatase activity, a marker for osteoblast formation. Multiple studies have reported beneficial effects of Vitamin C intake on the bone mineral density.^[14] Vitamin B complex was found to be significantly better than placebo in reducing chronic TMD pain within a span of 2 weeks.^[15] Antioxidant alpha-tocopherol significantly reduced pain parameters in a placebo-controlled and double-blind trial following a 3-week supplementation period for patients with rheumatoid arthritis.^[16] Results from a randomized and double-blind comparison study with alpha-tocopherol and diclofenac have shown that morning stiffness and pain were significantly reduced by Vitamin E, with similar effectivity and less side effects as compared to regular drug therapy by diclofenac.^[17,18] Antioxidant-enriched margarine containing a mix of alpha-tocopherol, lycopene, palm oil carotenoids and lutein, and Vitamin C as a supplement was found to have consistent and significant relief of clinical symptoms for rheumatoid arthritis.^[19] Trace elements such as copper, zinc, and selenium act as antioxidants since they are part of specific antioxidant enzymes activity, especially super oxide dismutase, catalase, and glutathione peroxidase activities.^[20] Dietary recommendations of consuming more fruits especially the ones with maximum antioxidant levels have a positive impact on reducing the incidence of pain in osteoarthritis of joints.^[21]

Our study also yields results that are in line with previously published studies. Although not much research have been conducted in the past, most of them shows significant improvement in overall joint function with dietary or therapeutic antioxidant supplementation. According to our trial, there was a significant improvement in the pain, analyzed with VAS and the interincisal opening among the control group where in only exercise was advised and the study group in which additional anti-oxidant supplementation was done. Although the results were comparable in both groups at the end of 90 days, the initial reduction in symptoms motivated the study group population to actively perform exercises over the trial period.

Limitations

Antioxidants were prescribed only for a period of 4 weeks after which both groups continued exercises alone. Further research needs to be done with a prolonged course of antioxidants and more number of participants. From the above results, we feel that increasing the duration of these drugs could provide a faster and long lasting healing response from the joint.

CONCLUSION

This randomized and control study has emphasized the potential benefits of anti-oxidants in managing the troublesome TMD. Dietary as well as therapeutic supplementation could be of use in treating the condition and provide the patients with a faster symptomatic relief. It is of importance that the etiology is still left untreated though this intervention is able to provide an improvement in quality of life. Thus, continued use of antioxidants could yield a promising result in the management of TMJ disorders. Hence, further research is warranted in this context.

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