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Review Article

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REVIEW ON NUTRACEUTICALS USED FOR THE TREATMENT OF OSTEOARTHRITIS

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ABSTRACT

Osteoarthritis (OA) is a degenerative inflammatory condition of the joint cartilage that currently affects approximately 58 million adults in the world. It is characterized by pain, stiffness, and a reduced range of motion with regard to the arthritic joints. These symptoms can cause in the long term a greater risk of overweight/obesity, diabetes mellitus, and falls and fractures. Although the current treatment of OA is characterized by non-steroidal anti-inflammatory drugs (NSAID), opioids, and cyclooxygenase (COX-2-specific) drugs, this may affect a variety of vital organs with long-term use so nowadays great interest has been applied to nutraceutical supplements, which include a heterogeneous class of molecules with great potential to reduce inflammation, oxidative stress, pain, and joint stiffness and improve cartilage formation. The purpose of this review is to describe the potential application of nutraceuticals in OA, highlighting its mechanism.

KEYWORDS: Osteoarthritis, Cartilage, NSAID, COX, Stiffness, Nutraceuticals.

INTRODUCTION

Osteoarthritis (OA) is a degenerative inflammatory condition of the joint cartilage that currently affects approximately 58 million adults, with an estimated increase to 78.4 million by 2040.[1] This inflammation is characterized by pain, stiffness, and a reduced range of motion with regard to the arthritic joints. These symptoms can cause a greater risk of overweight/obesity, diabetes mellitus, and falls and fractures in the long term. Factors predisposing to OA could be classified as local biochemical factors, including joint injury, joint space, and physical activities, and general factors, such as sex, age, comorbidities like obesity, and nutrition disorders.[2]

Current Treatment for OA suggests three types of approaches, which can be also combined if necessary. The first approach includes pharmacological treatment, which is characterized by non-steroidal anti-inflammatory drugs (NSAIDs), opioids, and cyclooxygenase (COX)-2-specific drugs. However, it has only a "palliative" role by reducing symptoms but not considering the essential problem of the cartilage disorder. In addition, conventional therapies can cause (especially for long periods of consumption) possible side effects, which can reduce compliance for the appearance of gastrointestinal problems, cardiovascular effects, and others.[3] The second approach regards lifestyle change, a non-pharmacological approach characterized by rehabilitation to facilitate healthy body composition, physical activity, and the optimization of an appropriate nutrition plan and a nutraceutical treatment.[4] In this context, a chronic nutritional intervention associated with conventional therapies was demonstrated to improve OA condition (joint of knee, hip, and hand) compared with only pharmacological treatments. If lifestyle changes and medications are not enough, the third approach is surgery. Nevertheless, in recent years, a great interest has been applied to nutraceutical supplements, which include a heterogeneous class of molecules with great potential to reduce inflammation, oxidative stress, pain, and joint stiffness and improve cartilage formation.[5]

NEUTRACEUTICALS USED FOR MANAGEMENT OF OSTEOARTHRITIS (OA)

1. Glucosamine

Glucosamine is commonly used in clinical practice for OA patients for its analgesic and anti-inflammatory effects. Glucosamine is a water-soluble amino monosaccharide available in two forms (glucosamine sulfate and glucosamine hydrochloride), which is a normal constituent of glycosaminoglycans (GAGs) in cartilage matrix and in the synovial fluid and consequently present in high quantities in articular cartilage.[6]

Glucosamine have the capability to reduce the levels of inflammatory cytokines interleukin (IL) and tumor

necrosis factor (TNF). Glucosamine appears to also have immune-modulatory activity by inhibiting the expression and/or activity of catabolic enzymes, such as phospholipase A2, MMP.[7]

2. Vitamin D

Vitamin D is well known to be obtained from sun rays, fatty fish, and fortified food, lipophilic molecule, which was recommended in order to improve calcium absorption, bone mineral density, and vitamin D deficiency rickets/osteomalacia. Although it can be obtained both through foods, such as mushrooms fatty fish, and vitamin D-fortified products, and through the cutaneous synthesis in response to ultraviolet-B exposure, vitamin D deficiency leads to the degradation of bone. So Conjugate preparation along with Vitamin D is used for Arthritis because it mainly blocks inflammatory factors that degrade bone.

3. Vitamin C

Vitamin C or ascorbic acid is especially found in citrus fruits, red and green peppers, tomatoes, strawberries, broccoli, Brussels sprouts, turnips, and other leafy vegetables. It is a water-soluble molecule with highly effective antioxidant properties due to its reactivity with numerous aqueous-free radicals. A deficiency of this molecule can be associated with a higher risk of various diseases including scurvy, anemia, capillary hemorrhage, muscle degeneration, infections, bleeding gums, poor wound healing, atherosclerotic plaques, and neurotic disturbances. In addition, dietary intake of vitamin C seems to be associated with a decreased risk of cartilage loss and OA in humans, probably by the reduction of oxidative stress, as highlighted by different studies.[8,9]

4. Collagen

Collagen is an extracellular matrix protein localized in the skin, tendons, cartilage, and bone, which is usually contained in foods, such as fish and meat. Type II collagen is the major component (90–95% of total collagen content) of the articular cartilage, forming the fibrils that give cartilage its tensile strength. It is also generally commercialized as a nutritional supplement obtained by the action of proteases, which hydrolyze the gelatine. In fact, the bioavailability of undenatured collagen is very low because it is not hydrolyzed and thus physiologically available for enteric absorption. However, it has been demonstrated that bioactive di- or tripeptides containing proline and hydroxyproline could be absorbed into the blood circulation and exert anti-OA activities.[10]

5. Hyaluronic acid

HA is a mucopolysaccharide constituted by repeated monomers of 1,4-D-glucuronic acid and 1,3-N-acetylglucosamine. This molecule is particularly present in the synovial fluid with excellent viscoelasticity, high moisture retention capacity, high biocompatibility, and hygroscopic properties, thus acting as a lubricant, shock absorber, joint structure stabilizer, and water balance and flow resistance regulator. HA is considered the treatment of choice for people with knee/hip OA, working slowly if compared with steroid treatments, but its effect may last considerably longer. Although HA injection has shown great advantages in improving the clinical symptoms of OA patients, it must be administered repeatedly into the joint cavity. The need for multiple injections of HA is a major drawback of the therapy because of the proportional increase of side effects with the repeated injections and the discomfort of repeated clinic visits. For these reasons, considering the disadvantages of HA injection, it is more favorable for the symptoms of OA to be relieved by oral administration.[11, 12]

6. Curcumin

Curcumin, the most important curcuminoid in turmeric (Curcuma longa), has been well-studied in OA disease, showing chondroprotective, antioxidative, and anti-inflammatory effects.

7. Omega-3 fatty acids

Omega-3 fatty acids are present in fish oil, flaxseed, and other dietary supplements. Omega 3 fatty acids exist in α-linolenic acid (ALA), eicosapentaneoic acid (EPA), and docosahexaenoic acid (DHA). Plant oils such as flaxseed, soybean, and canola oils are enriched with ALA whereas DHA and EPA are found in fish and other seafood. Increased levels of omega-3 fatty acid leads to decreased production of pro-inflammatory cytokines, cartilage degrading enzymes, and arachidonic acid. Reduction in arachidonic acid leads to reduction in tumor necrosis factor. Intake of omega-3 supplements with standard rheumatoid arthritis medication may help to manage rheumatoid arthritis than medication alone. It was also reported that in newly diagnosed RA, the use of omega-3 supplements with anti-rheumatic medication can be effective in reducing symptoms and they may need less pain-relief medication.[13]

8. Vitamin E

Vitamins E or Tocopherol mainly get through germ, sunflower, safflower oil, or nuts, and function in boosting immunity against various diseases, which helps in maintaining bone integrity, energy production, and anti-oxidant activity. The dietary anti-oxidants prevent oxidative damage, by free radicals scavenging which are the most common cause of inflammatory disease. Vitamin E is a fat-soluble vitamin. It has anti-oxidant properties; lower serum concentration may increase susceptibility to RA due to its protective role. The effects of Vitamin E on rheumatoid arthritis have been proven in many clinical trials.[14]

CONCLUSIONS

In conclusion, nutraceuticals may represent a valid strategy in OA management in association with conventional therapies. However, larger and longer studies are urgently required to definitively consider this unconventional approach in clinical practice, In the

future the need is to focus on combinations of nutraceuticals without any deterioration, for synergistic and efficacious effects.

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