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PHONOPHORESIS AS AN EFFECTIVE THERAPEUTIC APPROACH FOR KNEE OSTEOARTHRITIS: A REVIEW ARTICLE

Parul Sharma*

Assistant Professor, School of Physiotherapy, Delhi Pharmaceutical science and research university, New Delhi

***Corresponding Author Email: drparulsharma.sharma@gmail.com**

ABSTRACT

Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterized by the loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis associated with pain, particularly after prolonged activity and weight-bearing; whereas stiffness is experienced after inactivity. It is the most frequent joint disease with prevalence of OA in India is reported to be in the range of 17%–60.6%. OA is more common in women than men. Therefore, innovative and cost-effective approaches that can prevent the development and progression of OA are urgently needed to decrease pain and swelling, enhance osseointegration and minimize wear, osteolysis and loosening, to decrease the costs and side effects of oral drugs.

***Key words**:*

KEY WORDS

Osteoarthritis, prevalence, therapeutic approach

INTRODUCTION

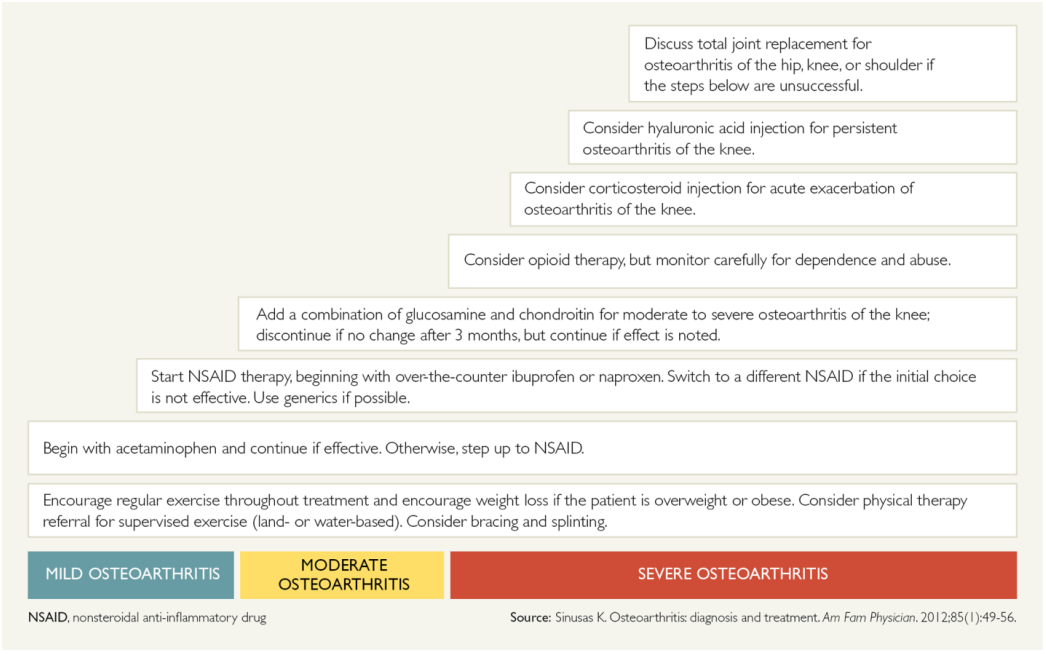
Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterized by the loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis. There is remodeling of subarticular bone, osteophyte formation, ligamentous laxity and weakening of periarticular muscles. Pathological changes in the late stage of OA include softening, ulceration, and focal disintegration of the articular cartilage. Synovial inflammation also may occur. Typical clinical symptoms are pain, particularly after prolonged activity and weight-bearing; whereas stiffness is experienced after inactivity. It is probably not a single disease but represents the final end result of various disorders leading to joint failure. It is also known as degenerative arthritis, which commonly affects the hands, feet, spine, and large weight-bearing joints, such as the hips and knees. Among the chronic rheumatic diseases, hip and knee osteoarthritis (OA) is the most prevalent and is a leading cause of pain and disability in most countries worldwide. Its prevalence increases with age and generally affects women more frequently than men. OA is strongly associated with aging and heavy physical occupational activity, a required livelihood for many people living in rural communities in developing countries. (Chandra Prakash Pal, Pulkesh Singh et al, 2016).

PREVALENCE

Osteoarthritis is the second most common rheumatologic problem and it is the most frequent joint disease with prevalence of OA in India is reported to be in the range of 17%–60.6%. OA is more common in women than men, but the prevalence increases dramatically with age. Nearly, 45% of women over the age of 65 years have symptoms while radiological evidence is found in 70% of those over 65 years. OA of the knee is a major cause of mobility impairment, particularly among females. OA was estimated to be the 10th leading cause of nonfatal burden.

MAJOR RISK FACTORS:

Obesity is one of the leading and greatest modifiable, risk factors for the development of osteoarthritis (OA). It is a progressive degenerative disorder that leads to joint damage, chronic pain, muscle atrophy, decreased mobility, poor balance and eventually physical disability. Arthritis is becoming pandemic globally and its presence with obesity and diabetes is being observed more commonly than ever.



REVIEW OF LITERATURE: (METHODOLOGY)

Ultrasound (US) treatment has been used as a non-invasive modality for the management of OA for more than 60 years because of its reputed ability to relieve pain, reduce edema, increase the range of motion, and accelerate tissue repair via thermal and non-thermal mechanisms (mechanical effects). US can be administered in either a continuous or a pulsed mode. Pulsed US produces non-thermal effects and is beneficial for cartilage health, whereas continuous US aims to generate thermal effects that could enhance fibrous tissue extensibility, increase tissue metabolism, promote capillary permeability, and elevate the pain threshold. (Lang Jia, Yan Wang et al, 2016).

According to recent study, phonophoresis of ketoprofen allows the attainment of higher local concentrations, whereas systemic exposure is lower. The results indicate that, in contrast to sham phonophoresis, ultrasound can increase the transdermal delivery of ketoprofen. (Barbara Cagnie et al, 2003).

Ultrasound treatment modalities have been proven to promote repair of full-thickness articular cartilage defects, have resulted in formation of hyaline cartilage life repair tissue at the sites of defects, softened and dissipated condensed fibrous connective tissue and delayed progression of early OA. Ultrasound may be administered in either continuous or pulsed mode. Pulsed ultrasound produces nonthermal effects and is used to aid in the reduction of inflammation, whereas continuous ultrasound generates thermal effects to alleviate pain. When ultrasound is used with specific medicaments to enhance transdermal absorption of a compound, significant amounts of the compound are absorbed by the subcutaneous circulation. (Sahar Ahmed Abdalbary, 2016). The thermal effects and benefits of ultrasound are well documented.4-6 However, the mechanical or non-thermal effects have a much greater influence on TDD. It is these cellular level mechanical phenomena that result in increased skin permeability, thus permitting greater drug delivery to desired tissues. 0 These concerns and rising costs in developing new drugs, have contributed to the exploration of alternative methods of drug delivery. Transdermal drug delivery is one such method. (Aaron M. Wells, 2010).

Effects of focused low-intensity pulsed ultrasound (FLIPUS) therapy on the functional and health status of patients with knee osteoarthritis (KOA). A total of 106 subjects with bilateral KOA were randomized sequentially into two groups. Group I received FLIPUS + diclofenac sodium, and group II received sham FLIPUS + diclofenac sodium. In conclusion, FLIPUS is a

safe and effective treatment modality for relieving pain and improving the functions and quality of life of patients with KOA. (Lang Jia, Yan Wang et al, 2016).

According to one study, the effects of phonophoresis of piroxicam with ultrasonic therapy were more significant than using only ultrasonic therapy, although both in reducing the VAS pain score. (Wanwadee Luksurapan, Jariya Boonhong, 2013).

Deniz et al. studied effectiveness of pulsed and continuous diclofenac gel phonophoresis with topical diclofenac gel treatment in knee osteoarthritis. They showed that both continuous and pulsed ultrasound diclofenac gel phonophoresis is more effective for pain and functional status of patients with knee osteoarthritis than topical application of diclofenac gel. (Mustafa Aziz Yıldırıım, Demet Uçar and Kadriye Öneş, 2015).

Pharmacologic agents should complement these conservative approaches. Use of topical and intra-articular agents to decrease dependence on oral agents may minimize systemic toxicity. Furthermore, medical treatment of pain may improve. (Saulat Mushtaq, Rabeea Choudhary, 2011).

Adverse effects of topical NSAIDS are dry skin, erythema, irritation, paresthesias, and pruritis were reported most commonly, especially among the topical NSAID, vehicle and placebo groups. Of the systemic AEs, gastrointestinal complaints and headache were reported most frequently, among both topical and oral NSAID groups. Anemia, LFT and renal abnormalities, and "severe" gastrointestinal AEs. (MJ. Kohler and L. Fraenkel, 2010).

RESULT AND DISCUSSION:

Various management techniques are available for the treatment of OA, there are presently no therapies that modify the onset or progression of OA-induced structural damage. The aims of managing knee OA are to relieve pain, delay complications, and prevent disease progression.

Clinical guidelines for managing knee OA, which have been published by the American College of Rheumatology (ACR), the American Academy of Orthopedic Surgeons (AAOS), and the European League Against Rheumatism (EULAR), recommend conservative treatments (i.e., self-management programs, strengthening, low-impact aerobic exercises, weight loss, and neuromuscular education) as well as pharmacologic treatments (i.e., nonsteroidal anti-inflammatory drugs and tramadol). Nonpharmacologic interventions, which are the cornerstones of osteoarthritis therapy, include the following: Patient education, Heat and cold, Weight loss, Exercise, Physical therapy, Occupational therapy, Unloading in certain joints (eg, knee, hip). A physiatrist may help in formulating a nonpharmacologic management plan for the patient with osteoarthritis, and a nutritionist may help the patient to lose weight. A referral to an orthopedic surgeon may be necessary if the osteoarthritis fails to respond to a medical management plan. Surgical procedures for osteoarthritis include arthroscopy, osteotomy, and (particularly with knee or hip osteoarthritis) arthroplasty. (Myat Thae Bo2, 2016).

Mesenchymal stem cell therapy continues to be a promising investigational approach to knee osteoarthritis, the variability in mesenchymal stem cell injection, including timing, frequency, and culturing mode, warrant further research, as does the possible long-term risk. (Carlos J Lozada, 2018).

Many physical modalities such as ultrasound electrical stimulation and low-level laser therapy have been used as an adjunct for clinical improvement. (Myat Thae Bo2, 2016). Different electrotherapeutic modalities which are commonly employed to alleviate symptoms of knee OA are Ultrasound therapy (0.5-5MHz), Transcutaneous Electrical Nerve Stimulation (2-10 Hz) and Neuromuscular Electrical Stimulation (50-100 Hz). Pulsed Electrical Stimulation (PES) is another electrotherapy treatment where low frequency current (100 Hz) is believed to promote synthesis of chondrocyte Type 2 collagen and aggrecan, and suppression of matrix metalloproteinases and Interleukin 1(IL 1), hence having a positive effect on chondrocyte function through gene regulation. The effectiveness of electrotherapeutic modalities along with physiotherapy, surgery and other measures are reviewed. It has been found that available studies on PES have discussed limited conclusions about its role. (Bijeet Bardoloi, Chungki Bhutia et al, 2017).

CONCLUSION:

The phonophoresis is a effective therapeutic approach for knee osteoarthritis. But yet there is lot of scope for improvement in therapeutic treatment for knee osteoarthritis in future so that the oral administration

and the side effects of pharmacological agents may reduce.

Conflict of Interest:

Conflict of interest declared none.

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***Corresponding Author:**
Parul Sharma*
Email: drparulsharma.sharma@gmail.com