

Efficacy of Physical Modalities in Knee Osteoarthritis: Recent Recommendations

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Introduction

Osteoarthritis (OA) is the most common form of arthritis, causing major implications for individual and public health care in elderly population. With the increasing trend of obesity, increased life-span and aging, the lifetime risk for the development of symptomatic knee OA is estimated to be 45% [1].

Although OA is traditionally viewed as a form of degenerative arthritis focusing on the cartilage pathology, cumulative research has demonstrated that knee OA is fundamentally a disorder of deranged biomechanics manifesting with damage throughout articular structures, such as synovitis, meniscal extrusion and bone marrow lesion [2].

Currently, no disease-modifying treatments for knee OA is available. Therefore, available treatment options include palliative, pharmacological and non-pharmacological modalities. These treatments are aimed to relieve joint pain, improve joint function and quality of life. Although pharmacological treatments are widely used to treat these patients, non-steroidal anti-inflammatory drugs (NSAIDs) can result in high incidence of side effects, especially of the upper gastrointestinal tract while some drugs are of limited evidence [3].

Thus, many physical modalities such as ultrasound [4,5], electrical stimulation [6,7] and low level laser therapy [8] have been used as an adjunct for clinical improvement.

Ultrasound

In a recent systematic review [5] which was conducted after selecting ten clinical trials (645 patients) according to the eligibility criteria such as excluding trials with concurrent treatments in order to explore the therapeutic ultrasound with sham or no intervention on pain, physical function and safety outcomes in patients with knee OA, the authors advised that therapeutic ultrasound beneficial for knee pain relief and physical function improvement in patients with knee osteoarthritis.

On sub-group analysis for the duration of ultrasound treatment, the results showed that both four week and eight-week treatments relieve pain. In addition, the authors reported that both continuous and pulsed ultrasound could relieve pain. However, the pooled analysis results for improvement of 50 meters walking time did not support therapeutic ultrasound, highlighting the requirement for further trial for this outcome measure.

Electrical Stimulation

According to the updated systematic review [7], using the Bayesian network meta-analysis, a method of combining all available direct and indirect evidences on the relative treatment effects, the authors selected 27 interventional RCTs in knee osteoarthritis and investigated the effectiveness of six kinds of ES therapies such as high-frequency transcutaneous electrical nerve stimulation (h-TENS), low-frequency transcutaneous electrical nerve stimulation (l-TENS), neuromuscular electrical stimulation (NMES), interferential current (IFC), pulsed electrical stimulation (PES), noninvasive interactive neuro-stimulation (NIN).

The results showed that IFC most likely to be the best treatment option among the six treatment methods in pain relief. These findings barely changed in sensitivity analysis after excluding the trials of low methodological quality and small sample size (sample size of an individual group <15). Although evidence was limited due to the heterogeneity and small number of included trials, the recommendation level of the other ES therapies either uncertain (h-TENS) or not appropriate (l-TENS, NMES, PES and NIN) for pain relief in knee osteoarthritis.

Low-level Laser Therapy (LLLT)

It has been considered a promising therapeutic intervention, mainly because of its stimulatory effects on tissue metabolism and ability to modulate the inflammatory process after injury. However, the first meta-analysis [8] in 2015 which high-quality nine studies (PEDro score of ≥ 7) with 518 patients showed no therapeutic benefit of LLLT compared with placebo for KOA patients with respect to pain relief or functional improvement, including right after therapy or at week 12 after therapy. The results of the interaction of laser light with the tissue depend on several factors such as the energy density, wavelength, output, number and timing of treatment sessions as well as the optical properties of the tissue.

According to the WALT table of recommended doses [9], the optimal energy density for KOA is supposed to be a minimum of 4 J per point. The WALT guidelines recommend daily treatment for 2 weeks or treatment every other day for 3e4 weeks (totaling 6 to 12 sessions). Variation in the effectiveness of LLLT in KOA patients be related to a variety of factors. At present it is still difficult to determine the optimal dosage, treatment schedule, energy density, output and wavelength. This may explain why a high degree of heterogeneity was observed in several outcomes.

Conclusion

According to these findings, further high-quality RCT is still required to prove the effectiveness of electrical stimulation and LLLT in treatment of knee osteoarthritis although there consistent findings in the positive response of ultrasound in other meta-analysis [10,11]. In addition, future studies should investigate the usefulness of these modalities in delaying the structural progression/improving the structural outcomes such as synovitis, cartilage thickness or bone marrow lesions by using the sensitive imaging methods such as the musculoskeletal ultrasound or magnetic resonance imaging.

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