

BENEFITS OF HIGH-POWER LASER THERAPY IN TREATING KNEE OA

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Most clinicians are familiar with knee osteoarthritis (OA), but when pressed on its exact mechanisms regarding pain and inflammation, there can be some confusion. Often, clinicians incorrectly jump to the “bone on bone” causal assumption regarding the source of pain for OA diagnoses. Prior to the advanced stages where this may be the case, there are numerous tissues in the knee that are innervated and can become pain generators during both the initial and late stages of OA. These include the joint’s intra-articular and periarticular structures, including menisci, adipose tissue, synovium, and periosteum.¹ While cartilage is a-neural, as the cartilage’s extra cellular matrix breaks down and collagen and proteoglycans are lost, this degradation can lead to inflammatory responses in the joint that can promote pain.

Cartilage’s pathological process will eventually enter fibrillation, where the articular cartilage surface begins to roughen and progress towards fissuring, at which point cartilage begins to break off from the subchondral bone. This will expose areas of the periosteum which are highly



innervated. When pressure is applied on this tissue, pain ensues. This is accompanied by additional pain and inflammation as the body tries to “clean up” the joint space.

In the late phases of OA, fissuring leads to eburnation of the joint surface and is often accompanied by bone spur formation as the body tries to repair the damaged boney surface. At this point, compression of the joint surface often becomes acutely painful and more invasive treatments are introduced that may include injections, arthroscopy, and potentially joint replacement surgery.¹

When managing knee OA, it is important to promote early intervention to slow and/ or avoid the late stage sequelae. Often, the health care system fails to educate individuals that OA is a process, not simply a diagnosis that results in joint replacement surgery. This can lead to patients feeling unempowered when it comes to managing their condition. Psychological counseling is recommended in chronic OA cases to help address depression and other related considerations²

It has been shown that when joint inflammation and pain are addressed early, it can have a significant impact on the health and

longevity of the joint. This can have dramatic implications on joint mechanics, ROM, strength around the joint, and ultimately improved weight bearing and functional status. When ineffectively managed, knee OA can significantly impact quality of life and is associated with increased morbidity and mortality risk.³

This is significant given that knee OA impacts over 27 million Americans annually.¹

Early treatment for knee OA centers around decreasing pain and improving function. While physical therapy that consists of stretching and strengthening exercises has been shown to significantly benefit this patient population,^{4,5} the initial focus of most plans of care center around reducing pain and inflammation at the knee. This is accomplished via oral medications that include steroidal and non-steroidal anti-inflammatory medications (NSAIDs), opioid agonists (e.g., Tramadol), acetaminophen (paracetamol), and interleukin-1 inhibitors.¹ If these are not successful, intra-articular injection of corticosteroids or hyaluronic acid may be introduced to further improve pain and function.¹

Given the unwanted side-effects of many pharmaceuticals, clinicians should be aware of modalities that are supported in the literature that help reduce synovial pain and inflammation. High-power laser therapy can help by eliciting photobiomodulation in areas where damaged tissue and inflammation reside. Due to the cost associated with Class 4 equipment, it is often overlooked.

While there is mounting evidence to support these mechanisms and the benefits of using laser on arthritic pathology,^{6,7} endorsements from different professional groups have been mixed. The European League Against Rheumatism (EULAR) suggested in 2003 that low level laser therapy (LLLT) in addition to other non-pharmacological approaches should be considered when planning optimal treatment for osteoarthritis.³

Recommendations from other groups have been less clear. The 2013 knee OA recommendations from the American Association of Orthopedic Surgeons (AAOS) were neither for nor against modalities (including electrotherapeutic modalities), based on conflicting research. However; no mention of low-level laser therapy (LLLT) was made in their review. As an aside, they found manual therapy results to be inconclusive as well, while they found strong evidence against the use of acupuncture for treating knee OA.⁵

The *Journal of Orthopedic and Sports Physical Therapy (JOSPT)* recently updated their guidelines on *Knee Pain and Mobility Impairments: Meniscal and Articular Cartilage Lesions Revision 2018*. Again, no mention of laser was in the update, but they did support use of “biofeedback and muscle stimulation to patients following meniscus procedures to increase quadriceps strength, functional performance, and knee function.”⁴ It should be noted that *JOSPT* has supported use of LLLT in its *2017 Clinical Guidelines for Treating Cervical Dysfunction and*

2014 Clinical Practice Guidelines for Treating Heel Pain/Plantar Fasciitis.

Why would laser be effective in helping these patients? When looking at the pain-generating components of early OA, it becomes clear. The most common symptoms of OA are inflammation and swelling of the synovia.⁷ High-power laser has the ability to quickly reduce peripheral pain via its impact on peripheral nerves and the endocrine system, while providing lasting relief due to its ability to reduce inflammation in arthritic joints via its impact on cytokines.^{3,6,7} High-power lasers' impact on peripheral nerve tissue is not well known by many clinicians. Its ability to reduce the conduction velocity and compound action potentials (CAP) of sensory nerves (C and A delta pain fibers), can reduce the pain signal produced from a peripheral joint once threshold levels of irradiance are reached during a treatment.^{8,9} This can lead to analgesic effects lasting up to 24 hours after a treatment.⁸

By reducing pain and inflammation at the knee, patients can often progress their weight bearing status and increase their activity levels, which can help prevent a host of co-morbidities which often exacerbate their condition: increased weight gain, Type 2 Diabetes, and central sensitization in the most severe cases.¹

Due to the prevalence of knee OA, clinicians should consider adding laser to their arsenal in the fight against this disease.

This non-invasive modality has the ability to address pain in unique ways that other treatment options cannot. While it is not currently the standard of care, as high-power laser continues to gain recognition in the fight against pain and inflammation, it has the potential to become the modality of choice when treating this challenging patient population.

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