Therapeutic Laser in the Management of Arthritis

Applying laser therapy to the arthritis patient by using a combination of application techniques can provide considerable relief in many cases.

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Arthritis is the most common cause of disability in the United States according to the Center for Disease Control and Prevention and affects nearly 19 million adults.[1] Arthritis is a broad category that covers over 100 different manifestations. Osteoarthritis and rheumatoid arthritis are common and well known. There is also childhood, general, gouty arthritis, psoriatic arthritis and systemic lupus erythematosis. Fibromyalgia is also considered a rheumatoid condition.

Commonly occurring symptoms include pain, aching, stiffness, and swelling in or around the joints. Some forms of arthritis, such as rheumatoid arthritis and lupus, can affect multiple organs and cause widespread symptoms. Arthritis is more common in adults age 65 and over but occurs in all age groups. Nearly two out of three of the people with arthritis are younger than 65. Women have an incidence of 24.4% and men 18.1% in all age groups. It affects all races and ethnic groups.[2]

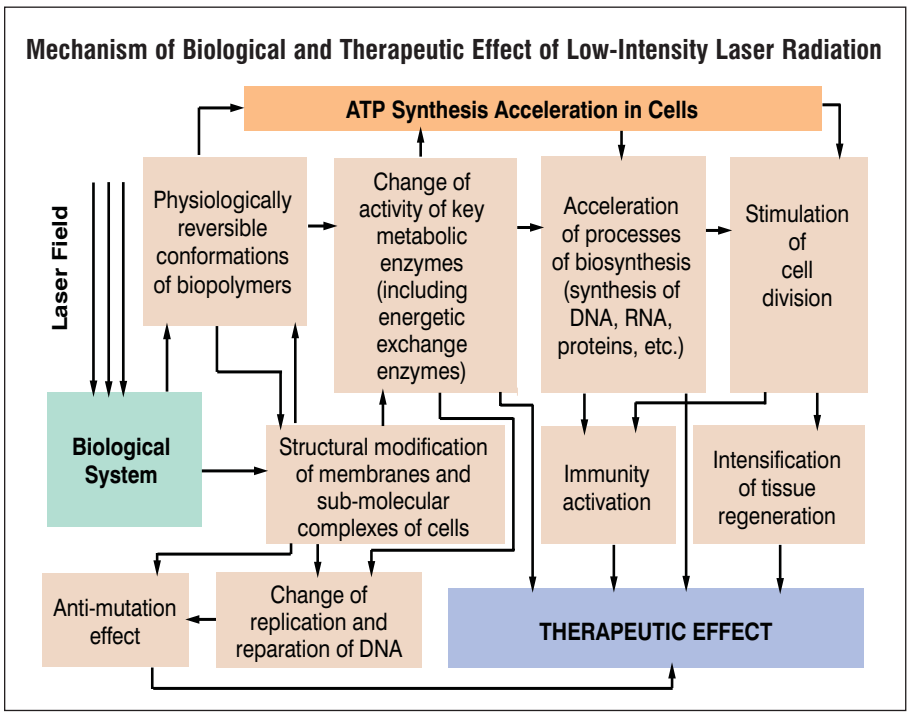

Figure 1. *Flowchart of some of the most commonly observed biochemical effects of therapeutic lasers (Courtesy of MedicalQuant).*

Studies of Efficacy

Laser therapy can be an effective adjunctive therapy in the management of arthritis as demonstrated by the following studies:

- Palma found that red light laser blocks the increment of prostaglandin e1 and bradykinine in the plasma fibrinogen level.[3]
- Campana observed that after injection of calcium pyrophosphate into rats in order to induce arthritis-like symptoms, that the untreated group exhibited a strong diffuse inflammatory reaction. No inflammation was observed in the laser group.[4]
- Skinner stimulated human embryonic fibroblast cells with a GaAs laser. Maximum increase of collagen production and cell biostimulation occurred after four episodes of laser therapy at 24 hour intervals.[5]
- Lievens found an increase in ingrowths of perichondrium in rat ear cartilage treated with a GaAs laser daily for four days. The untreated ears showed no change.[6]
- Glazewski used a GaAs laser to treat 224 patients with rheumatoid arthritis. Shortening of NSAID duration,

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dose reduction and improved responses were observed.[7]

- Molina compared two groups of test subjects: one group receiving aspirin alone and the other group receiving aspirin and GaAs or HeNe laser. The GaAs laser/aspirin group had the best response.[8]
- Soriano reported good results in treating a group of 938 patients with osteoarthritis using a GaAs laser. Acute conditions responded better than chronic. Results ranged from 38% in chronic hip and knee conditions to 84% to 100% in all other areas.[9]
- Antipa attempted to establish the efficacy of laser therapy in various types of rheumatoid and non-rheumatoid diseases. His five-year study included 514 patients with osteoarthritis, 326 patients with non-articular rheumatism and 82 patients with inflammatory rheumatism. He compared four groups: 1) GaAs laser only, 2) GaAs and HeNe laser, 3) placebo laser, and 4) classic anti-inflammatory medication. Results were determined by local responses and pain scale changes. Conclusion: the combined laser group yielded the best results (equal to or better than anti-inflammatory therapy).[10]
- Simunovic reports that patients with osteoarthrosis in upper extremity joints had 70% pain relief and improved function following combined local irradiation and trigger point irradiation.[11]
- Gartner performed a double blind study on stage III and IV ankylosing spondylarthritis utilizing a GaAs and HeNe laser. A three week treatment course was utilized consisting of 20 to 30 minutes per day for five days per week. Spinal range of motion and related laboratory tests were unchanged but pain scores, morning stiffness and frequency of nocturnal awakening were significantly reduced.[12]

Biochemical Response to Low Level Laser Therapy

Figure 1 outlines many of the effects observed in the research studies listed above.

Laser-related research has demonstrated a number of interesting biochemical responses that can have a positive clinical effect. These effects include:

- Stabilization of the cell membrane
- Enhancement of ATP synthesis
- Stimulated vasodilation along with increased histamine, NO and serotonin[13]
- Acceleration of leukocyte activity
- Increased Prostaglandin synthesis[14]
- Reduction in Interleukin-1 levels
- Increased angiogenesis[15]
- Enhanced superoxide dismutase[16]
- Decreased C-reactive protein and neopterin levels

Research in laser and light therapy has documented that red and near-infrared light reduces pain by a combination of these responses:

- Increases in b-Endorphins
- Blocked depolarization of C-fiber afferent nerve[18]
- Decreased Bradikynin levels
- Ion channel normalization[19]

A comprehensive clinical approach when utilizing therapeutic laser should activate all three of the observed effects of laser therapy. They are primary, secondary, and tertiary effects and are summarized below:

Primary effects are due to photoreception—the direct interaction of photons with cytochromes—and are very predictable and unique to phototherapy. Photoreception is generally followed by transduction, amplification, and photoresponse. The latter can be classified as either secondary or tertiary.

Secondary effects occur in the same cell in which photons produced the primary effects and are induced by these primary effects. Secondary effects include cell proliferation, protein synthesis, degranulation, growth factor secretion, myofibroblast contraction and neurotransmitter modification—depending on the cell type and its sensitivity. Secondary effects can be initiated by other stimuli as well as light.

Tertiary effects are the indirect responses of distant cells to changes in cells that have interacted directly with photons. They are the least predictable because they are dependent on both variable environmental factors and intercellular interactions. They are, however, the most clinically significant. Tertiary effects include all the systemic effects of phototherapy. Primary, secondary, and tertiary events summate to produce phototherapeutic activity.

Treatment Techniques

There are several different treatment techniques commonly used when utilizing therapeutic lasers.

The first technique is tissue saturation. As the name implies, this involves utilizing a stationary contact over the target tissue long enough to obtain an optimal therapeutic dose. This will initiate many of the primary and secondary effects mentioned above (see Figures 2 and 3).

The second technique is to stimulate lymphatic system and the vascular system. This is accomplished by moving the emitter in small circular motions over the treatment site. This will aid in optimizing the tertiary effects mentioned above (see Figure 4).

Lymphatic photobiostimulation for the neck is usually applied ever the scalene nodes. Treating over the thoracic and/or lymphatic ducts are also common sites of laser biostimulation.

The third technique is to stimulate body, ear, or hand acupoints. This also has a tertiary effect on the body in that stimulating the meridian pathway will cause global responses (see Figure 5).

Discussion

Applying laser therapy to the arthritis patient by using a combination of the techniques mentioned above can provide considerable relief in many cases. Arthritis is often a systemic condition. It is important to assess each individual and treat several areas, if necessary. The laser treatment schedule should be individualized to the patient. It usually consists of a course of three to five applications per week for three to four weeks. A two to three week rest should be completed

FIGURE 2. *Treatment of the mid to lower cervical region utilizing a GaAs IR laser. (Courtesy of Apex Energetics)*

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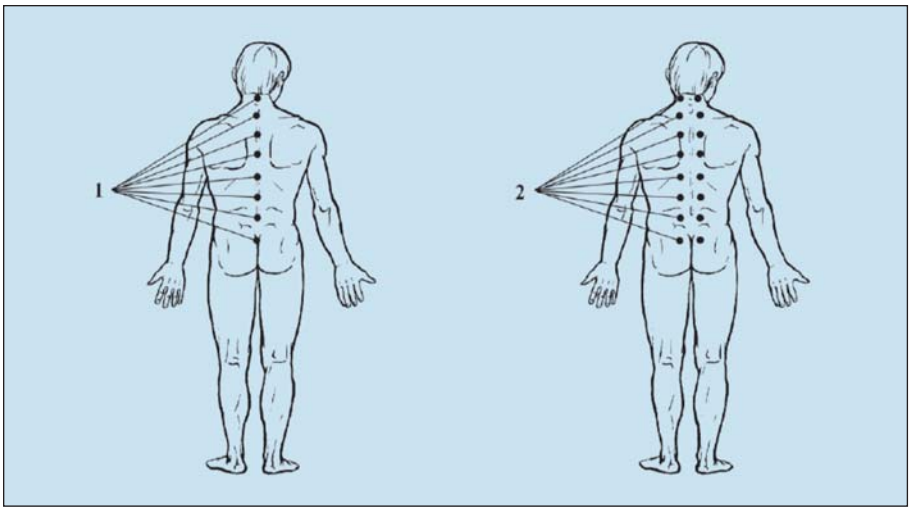

FIGURE 3. *Commonly used sites for applying laser therapy to the neck and paraspinal region. (Courtesy of MedicalQuant)*

before repeating the treatment course. It is important to initiate the therapy with shortened treatment times and gradually increase to a full dose. This will minimize the likelihood of the patient experiencing a significant pro-inflammatory response following the first couple of treatments. ■

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FIGURE 4. *Stimulation of the Left Scalene lymph nodes with a GaAs laser. (Courtesy of Apex Energetics)*

FIGURE 5. *Stimulation of acupoint LI4 utilizing an acupoint probe. (Courtesy of Apex Energetics)*

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