Clinical Overview and Applications of Class IV Therapy Lasers

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Disclaimer

Please read these statements carefully before utilizing any of the information within this manual. It is the sole responsibility of the therapist to gain the knowledge of and comply with any and all federal, national, state, province, and local laws regarding the use of therapeutic lasers for any condition. The information contained within this text is presented for educational purposes only and is designed as an addition to formal training in laser therapy. It is neither complete nor comprehensive for any of the conditions addressed and each condition should be evaluated on an individual basis for therapy. This manual is not a substitute for professional advice, care, diagnosis or treatment. All persons involved with the publication of this text expressly disclaim any and all responsibility or legal liability for any kind of loss or risk, personal or otherwise, which is the result of the direct or indirect use of any of the material within this book.

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Overview

Medical lasers have become an integral part of many clinical procedures. From routine surgery to cosmetic applications, many types of laser are used in medical practices around the world. Today, lasers for therapeutic applications such as pain management are beginning to gain increased recognition. Lasers for photobiostimulation have been researched for many years and have reported significant results in various laboratory and clinical settings. Low level lasers have been investigated and deployed for several years and have had results when treating certain conditions. There are limitations for these systems based on excessive treatment times when treating deeper tissues or larger areas. Recently more powerful lasers with innovative delivery systems and output parameters have entered the clinical setting and have shown excellent results. These higher power systems are able to treat a wider range of disorders while also allowing for reasonable treatment times. This text is to help in effectively using Class IV laser therapy in your practice.

Methods and Equipment

There are many laser and LED devices being sold for laser therapy. Class IV lasers are now being used with excellent results in many applications. Lasers with higher output power and appropriate therapeutic wavelengths allow the clinician to rapidly deliver an effective therapeutic dosage to deeper tissue. This efficient application of laser energy greatly reduces treatment times. Many conditions often require multiple areas of treatment such as tracing a nerve. These more powerful laser devices allow the clinician to treat multiple areas and large surrounding areas in a reasonable time, making it easier on the user and more effective for the patient.

Treatment guidelines in this text are from the many listed references as well as clinical experience using the LCT-1000 Deep Tissue Therapy Laser™ manufactured by LiteCure. This device is a 10W laser with dual wavelength output of 808 nm and 980 nm. These wavelengths are chosen to have maximum depth of penetration based on a variety of skin types while having therapeutic advantages. The treatment times listed below are based on the lasers ability to deliver 10W of output power. If you are using a lower power unit then the treatment times would be adjusted accordingly.

When using a higher power unit or even a lower power unit with a small beam size, it is important to note that darker skins, or any other pigmentation on the skin, including moles and tattoos, will absorb a greater proportion of the laser energy. It is important to get feedback from your patient as to their comfort level. When treating a pigmented area, the hand piece should be moved more rapidly, or simply moved further away from the patient's skin. This will reduce the possibility of thermal discomfort.

Please read and refer to the user manual provided by the laser manufacturer for operating instructions and other safety requirements.

Contraindications of Laser Therapy

- Do not apply infrared light to abdominal or lumbosacral points in pregnant females.
- Do not apply infrared light to the epiphyseal lines in children.
- Do not apply infrared light to the thorax or over the pacemaker itself in patients with pacemakers.
- Do not apply infrared light over the thyroid gland, ovaries and testicles.
- Do not apply infrared light to patients who are taking drugs that have heat or light sensitive contraindications, such as but not limited, to certain types of steroids.
- Do not treat over a suspected tumor or any cancer.

Warnings and Recommendations for Safe Operation of Therapy Lasers

NEVER look directly into the distal end of any hand piece connected to an active laser device.

NEVER, direct the laser light directly into the eyes, or direct the laser beam at anything other than the area to be treated WITH or WITHOUT the appropriate laser-emission protective eye wear. Indirect or direct eye contact with the output beam, or with scattered laser light from any reflective surfaces will cause serious damage, irreparable corneal and/or retinal damage, and possible blindness to one or both eyes.

DO NOT allow any reflective object to fall into, or obstruct the path of the laser energy produced by the laser device. The operator, all assistants, and the patient must remove all reflective objects (such as rings, metal watchbands, and jewelry) prior to treatment with the laser. Indirect or direct eye contact with the output beam or with scattered laser light from any reflective surfaces from the laser will cause serious damage, irreparable corneal and/or retinal damage, and possible blindness to one or both eyes.

DO NOT remove protective eye wear until the operator returns the laser device to a safe mode.

AVOID the use of flammable solvents, anesthetics, oxidizing gases such as nitrous oxide (N^2O) and oxygen or endogenous gases. The high temperatures produced in normal use of the laser equipment may ignite some material, for example cotton or wool, when saturated with oxygen. The solvents of adhesives and flammable solutions used for cleaning and disinfecting should be allowed to evaporate before the laser equipment is used.

ALWAYS wear the protective eye wear supplied by the manufacturer of the laser in use. Ensure that the eye wear has appropriate optical density for the wavelength of operation. All personnel present during device operation must wear this eye wear.

ALWAYS turn the device OFF, prior to adjusting or preparing the hand piece or probe.

ALWAYS post Warning Signs for Class IV laser products.

ALWAYS place “Laser In Use” signs at location entrances where people will use the laser device.

NEVER leave this device in an operational mode unattended.

NEVER allow untrained personnel to operate the laser unless directly supervised by a properly trained and experienced individual.

DO NOT leave the key in the key switch when the service not in use. This will prevent unauthorized and/or unqualified use of the device as well as inadvertent laser emissions.

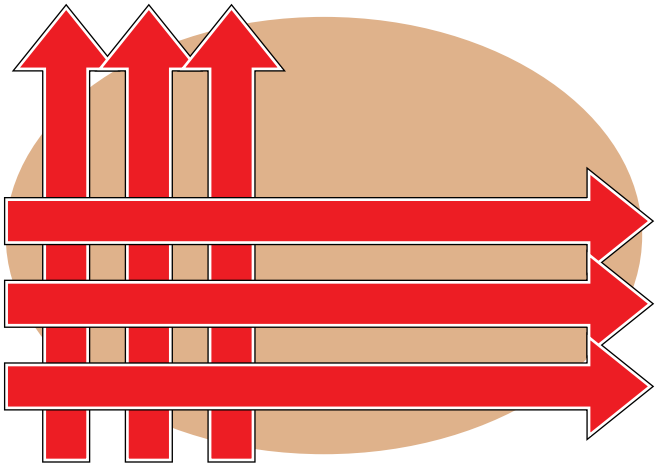
Check national, state and local laws regarding the usage of lasers and laser registration.

Designate at least one person (e.g. Laser Safety Supervisor) responsible for providing training on all operating and safety procedures at each facility that utilizes the laser.

Individuals planning to use the laser system should attend laser orientation and education sessions to achieve operational proficiency.

General Treatment Principles

A Class IV therapy laser is a powerful tool that may be utilized to reduce the pain and inflammation associated with a variety of conditions. The following guidelines are based on user experience and published clinical work. The clinician will develop individual protocols based on their own experience, type of practice and variety of patients seen.



For most Class IV therapeutic lasers there is no need to touch the skin to be effective. Treatment should be delivered to exposed skin. **DO NOT TREAT THROUGH CLOTHING OR BANDAGES** as the properties of these materials will vary and in all cases will absorb some laser light making the treatment less effective. The probe must be perpendicular to the skin and not approaching at an angle. 50% of the treatment should be delivered along a vertical plane and 50% in a horizontal plane. The area to be treated and a significant surrounding margin should be covered slowly in a 'painting' or 'serpentine' motion. The treatment probe should be moved at a rate of approximately 1-3 in./sec.

The following clinical guidelines are designed to show areas to be treated and dosages for specific indications. In general, dosages are delivered to the area of pain, the surrounding tissues, and along the nerve pathway for the specific area experiencing pain. **Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.**

Setting Treatment Expectations

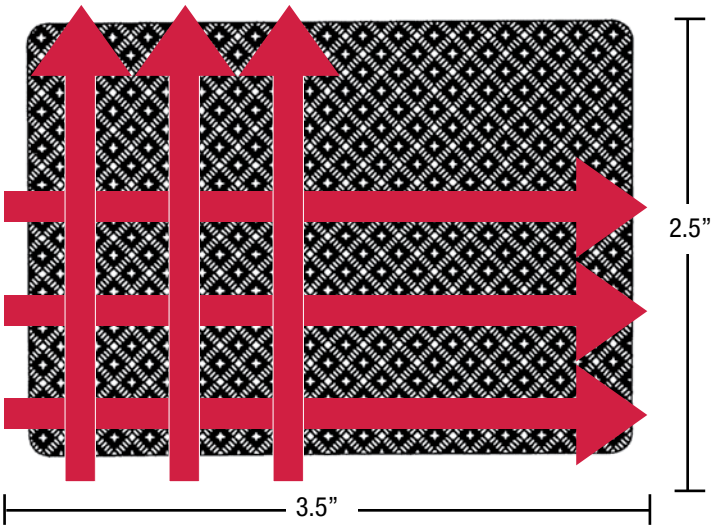
Patients and clinicians need to understand the possibilities and limitations of the application of a deep tissue laser. Chronic pain may require several treatments before a beneficial effect is achieved. Deeper tissues may require multiple treatments before significant benefits are derived. Therefore an arthritic finger will usually respond immediately as opposed to a painful lower back that may require several visits. Likewise, a sore calf muscle that occurred during a recent sporting event will usually respond much faster than a neck that is sore from a car accident that occurred a decade ago.

A typical treatment regimen may consist of 3 treatments spaced one day apart during the first week, two treatments the following week and one treatment in week three. If no benefit is derived after the 6 to 10 treatments, then the patient's options need to be reviewed in light of their individual condition and needs.

Treatment Methods and Durations

The treatment time is directly proportional to the output power of the laser you are using. A laser capable of emitting 10 watts of output power provides unprecedented depth of penetration and speed of treatment. The goal of any treatment is to deliver the photons to the damaged or painful areas of the body. Treatment plans for a variety of disorders are included in the following sections.

In cw (Continuous Wave) mode at (10 watts) power, a laser will output 600 Joules of energy into the tissue in one minute. Spreading this energy over an area roughly the size of a standard playing card would deliver appropriate levels of energy into the body (~10 J/cm2) Therefore mentally dividing the area to be treated into playing card size segments may be a guide to overall treatment duration. So a patient with severe pain in the sacral area may require an area equivalent to six playing cards, therefore treatment would take approximately 6 minutes and deliver 3,600 Joules, assuming cw mode at 10 watts. When assessing total area to be treated, it is important to factor in at least 'one playing card width' around the margin of the pain. A wider treatment area involves more structures and enhances the overall beneficial effects.



Treatment Settings

During treatment the patient should not feel any thermal discomfort, or excessive heat on the skin, it should be a soothing warmth. Feedback from the patient is critical.

Instruct the patient to tell the user if the warmth is uncomfortable. If the patient expresses any discomfort, the power output should be reduced. The list below gives examples of other cases where a lower power may be appropriate.

The patient has dark (Fitzpatrick Scale 5 or 6 see below) skin.

The patient has a heavy sun tan.

When treating areas with dense hair growth, such as the nape of the neck.

The patient has a tattoo or pigmented lesion in or around the treatment area.

Treating an area which is sensitive to heat.

In these cases, the treatment times may need to be increased slightly. For example if the output setting is 5 W, cw then the length of time to treat the same area equal to a size of a playing card will be 2 minutes rather than the one minute at 10W. Power output may be increased in one Watt increments to arrive at the highest output that is comfortably tolerated by the patient. The patient should NEVER, feel thermal discomfort during or immediately after treatment. Advise the patient to give feedback on their individual comfort level. If any discomfort is apparent, then lower the power setting and treat in a similar manner.

Skin Type	Skin Color	Characteristic Response to Sun
I	White; Very Fair; Red Or Blond Hair; Blue Eyes; Freckles	Always burns, never tans
II	White; Fair; Red Or Blond Hair; Blue, Hazel, Or Green Eyes	Usually burns, tans with difficulty
III	Cream White; Fair With Any Eye Or Hair Color; Very Common	Sometimes mild burn, gradually tans
IV	Olive/Light Brown; Typical Mediterranean Caucasian Skin	Rarely burns, tans with ease
V	Brown; Mid-Eastern Skin Types	Very rarely burns, tans very easily
VI	Black	Never burns, tans very easily

The “thermal relaxation time” (this is the amount of time it takes a target to heat up and then cool down) of skin is between 3 and 10 milliseconds. Therefore by moving the hand piece, heat will not build up in any particular area. If the hand piece of the laser is designed for a divergent beam then pulling the hand piece further away from the surface of the skin will also decrease the power density. When treating over heavily pigmented skin and/or tattoos you should pull the hand piece away from the skin (~6 in.) and move your hand at a faster pace. (~4 to 6 in./sec).

In cases where the patient has no, or limited sensation, and is not able to respond to increases in temperature, treat at a lower setting.

When treating over tattoos use caution as pigment absorbs more laser output. Reduce output power and/or treat moving the hand piece faster across the surface.

Clinical Applications

***The following are treatment recommendations only. The practitioner is the person who determines the settings and protocol to use when treating each individual patient.

Pain Associated with Arthritis

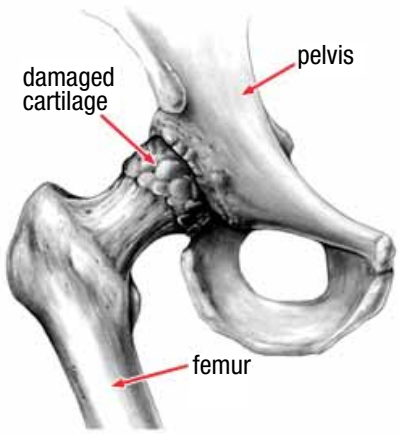
Arthritis literally means “inflammation of a joint.” In some forms of arthritis, such as osteoarthritis, the inflammation arises because the smooth covering (articular cartilage) on the ends of bones become damaged or worn.

In other forms of arthritis, such as rheumatoid arthritis, the joint lining becomes inflamed as part of a disease process that affects the entire body. Some other types of arthritis are: seronegative spondyloarthropathies, crytalline deposition diseases, and septic arthritis.

Osteoarthritis

The most common type of arthritis is osteoarthritis. It results from overuse, trauma, or the degeneration of the joint cartilage that takes place with age. Osteoarthritis is often more painful in joints that bear weight, such as the knee, hip, and spine, rather than in the wrist, elbow, and shoulder joints. However, joints that are used extensively in work, sports or joints that have been damaged from fractures or other injuries may show signs of osteoarthritis. Other disorders that injure or overload the articular cartilage may lead to osteoarthritis.

In osteoarthritis, the cartilage covering the bone ends gradually wears away. In many cases, bone growths called “spurs” develop at the edges of osteoarthritic joints. The bone can become hard and firm (sclerosis). The joint becomes inflamed, causing pain and swelling. Continued use of the joint is painful.



This drawing of an arthritic hip shows how the cartilage covering the leg bone (femur) and the acetabulum of the hip become damaged over time.

Rheumatoid Arthritis

Rheumatoid arthritis is a long-lasting disease. It is estimated that 1% of the population throughout the world have rheumatoid arthritis. Women are three times more likely than men to have rheumatoid arthritis. The development of rheumatoid arthritis slows with age.

Rheumatoid arthritis affects many parts of the body, but mainly the joints. The body’s immune system, which normally protects the body, begins to produce substances that attack the body. In rheumatoid arthritis, the joint lining swells, invading surrounding tissues. Chemical substances are produced that attack and destroy the joint surface.

Rheumatoid arthritis may affect both large and small joints in the body and also the spine. Swelling, pain, and stiffness usually develop, even when the joint is not used. In some circumstances, juvenile arthritis may cause similar symptoms in children.

The Application of Laser Therapy to the Arthritic Patient

Laser therapy, with its primary action of pain relief and anti-inflammatory actions, is an ideal modality for the treatment of the arthritic patient. The biochemical cascade of events initiated by laser therapy inhibits the inflammatory cycle, relieves pain and therefore halts the destructive forces within the cells. This allows the body to begin to reverse the damage and start to heal.

Before therapy is initiated, gather all of the baseline data necessary to monitor the progression of treatment. Joints should be measured, range of motion should be determined, scales of pain should be considered and when possible even strength should be established. All of this data should be updated on a weekly basis to determine the progress of the therapy.

The Application of Laser Therapy to the Arthritic Patient *(continued)*

These general guidelines should be followed:

- Treat directly over the area of pain, keeping the hand piece perpendicular to the skin at all times.
- Position the patient so that they are comfortable and the entire therapeutic dosage can be delivered with a minimum amount of effort by the patient.
- Apply at least 25% - 50% of the determined therapeutic dosage while placing the joint through a passive range of motion.

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Entire Hands	6-7	1,500 - 2,500	2:45 - 4:00	Every day for three days then every other day until resolved
Wrist	7-9	2,000 - 3,000	3:15 - 5:00	Every other day for two weeks then maintenance therapies
Elbow	5-7	3,000 - 5,000	5:00 - 8:15	Every other day for two weeks then maintenance therapies
Shoulder	7-10	6,000 - 8,000	10:00 - 13:15	Every day for three days then every other day until resolved
Hip	10-14	8,000 - 11,500	13:45 - 19:15	Every other day for two weeks then maintenance therapies
Knee	7-10	5,600 - 8,000	9:00 - 13:00	Every day for three days then every other day until evaluation
Ankle	7-9	4,000 - 5,000	6:30 - 8:15	Every other day for two weeks then maintenance therapies
Foot/Toes	7-8	3,500 - 5,000	5:45 - 8:15	Every other day for two weeks then maintenance therapies
Spinal Region *(Cervical, Thoracic Or Lumbar Region)*	7-10	6,000 - 8,000 *region*	10:00 - 13:15	Every other day for two weeks then maintenance therapies

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Achilles Tendonitis

General Therapy Protocol:

- This protocol can be applied to all tendonitis disorders.
- Apply therapy at least two to three inches above the origin of the tendon and at least two or three inches below the insertion.
- Manually place the tendon through gentle range of motion exercises while administering therapy.

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Achilles Tendonitis	7 - 8	2,500 - 3,000 J	4:30 - 5:00	For three days then every other day until resolved

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Adductor Muscle Injuries

These injuries are deep and require a large dosage for proper photobiostimulation.

Therapy to this region would include disorders to the:

- Adductor *longus/brevis/magnus m.*
- Inguinal Ligament Disorders Such As Strains
- Injury To The *rectus addominis m.* Insertion
- *ilio-psoas m.* Strains
- *piriformis m.* Injuries
- *ilio-tibial* Band Injuries

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Adductor Muscle Injuries	9-10	3,500 - 5,000	6:00 - 8:15	Every day for three days then every other day until resolved

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Ankle & Foot

General Therapy Protocol:

- Apply therapy to the entire foot and ankle regardless of where disorder is located.

- Therapy should be applied to the entire circumference of the target anatomical structure with at least 50% of the energy being applied directly over the problem area.

- Any neuropathy of the distal limb should be irradiated at a lower level initially and evaluated in 24 hours. Decreasing the power density by lifting the hand piece off the tissue is a way of accomplishing this.

- Always place the structures through a manual range of motion when applying the last 25% - 50% of the therapy.

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Sprained Or Strained Ankle	7-8	3,500 - 4,500	6:00 - 7:30	Every day for three days then every other day until resolved
Degenerative Osteoarthritis	7-9	4,000 - 5,000	6:30 - 8:30	Every other day for two weeks then maintenance therapies
Tarsal Tunnel Syndrome	7-8	3,500 - 4,500	6:00 - 7:30	Every other day for two weeks then maintenance therapies
Morton's Neuroma	6-8	3,000 - 4,500	5:30 - 7:30	Every day for three days then every other day until resolved
Neuropathy Of The Foot *(see also Diabetic Neuropathy)*	5	2,000 - 3,000	3:00 - 5:00	Evaluate during therapy and again in 24 hours.
Fractures/Stress Fractures	8-10	4,500 - 6,500	7:30 - 11:00	Every day for three days then every other day until evaluation

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Increase The Microcirculation Associated With Bell's Palsy

General Therapy Protocol:

- Therapy should be applied along the course of the seventh cranial (facial) nerve.
- Protective eye shields should be worn at all times during the application of this therapy.

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Bell's Palsy	7-9	1,800 - 3,000	3:00 - 5:00	Every day for three days then every other day for two weeks, then evaluate

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Cervical Spine

General Therapy Protocol:

- From the back, with the chin resting on the chest, apply therapy from the base of the skull to the second thoracic vertebrae distally and laterally encompassing all of the *trapezius m.* distally to the acromion process of the scapula.

- Laterally, with the neck flexed in the opposite direction, photobiostimulation should include the entire region bounded by the *sternocleidomastoid m*.

- Therapy should be applied slowly cranially to caudally and then applied at right angles to the initial application.

- The position of the handpiece should be at right angles to the target tissue at all times.

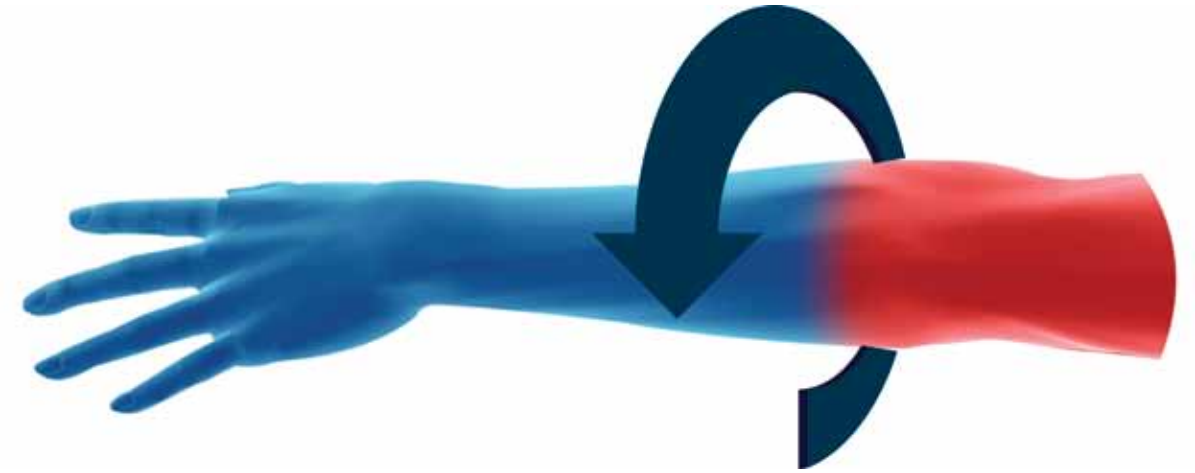
Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Soft Tissue Injuries Sprains & Strains	7-8	4,800 - 6,000	8:00 - 10:00	Every day for three days then every other day until resolved
Degenerative Osteoarthritis	7-8	4,800 - 6,000	8:00 - 10:00	Every other day for two weeks then maintenance therapies
Cervical Radiculopathy	7-8	4,800 - 6,000	8:00 - 10:00	Every other day for two weeks then maintenance therapies
Disc Herniation With Or Without Radiculopathy	7-8	4,800 - 6,000	8:00 - 10:00	Every day for three days then every other day until resolved
Facet Joint Syndrome	6-7	4,500 - 5,500	7:30 - 9:15	Every other day for two weeks then maintenance therapies

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Elbow Joint *(Epicondylitis)*

General Therapy Protocol:

- Apply a higher percentage of the dosage proximally if the triceps or brachio-radialis is involved or a higher percentage distally if the flexor/extensor muscles are involved.
- Apply therapy to the entire circumference of the joint addressing both the medial and lateral epicondyles.
- Apply the last 25% - 50% of the therapy while placing the joint through normal range of motion.



Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Medial Or Lateral Epicondylitis	8-9	3,000 - 4,000	5:00 - 6:30	Every day for three days then every other day until resolved
Biceps /Triceps Tendonitis	8-9	3,000 - 4,000	5:00 - 6:30	Every other day for two weeks then maintenance therapies
Olecranon Bursitis	7	4,000 - 5,000	6:30 - 8:15	Every other day for two weeks then maintenance therapies
Degenerative Osteoarthritis	8-10	5,000 - 6,000	8:15 - 10:00	Every day for three days then every other day for two weeks then evaluate to determine protocol
Ulnar Nerve Pathologies	7-8	2,500 - 3,500	4:00 - 6:00	Every other day for two weeks then maintenance therapies

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Treatment Of The Pain Associated With Fibromyalgia

Fibromyalgia is a chronic condition characterized by widespread pain in the muscles, ligaments and tendons, as well as fatigue and multiple tender points — places on the body where slight pressure causes pain. Signs and symptoms of fibromyalgia can vary, depending on the weather, stress, physical activity or even the time of day. Common signs and symptoms include:

- **Widespread pain.** Fibromyalgia is characterized by pain in specific areas of your body when pressure is applied, including the back of your head, upper back and neck, upper chest, elbows, hips and knees.

- **Fatigue and sleep disturbances.** People with fibromyalgia often wake up tired and unrefreshed even though they seem to get plenty of sleep. Some studies suggest that this sleep problem is the result of a sleep disorder called alpha wave interrupted sleep pattern, a condition in which deep sleep is frequently interrupted by bursts of brain activity similar to wakefulness. So people with fibromyalgia miss the deep restorative stage of sleep. Nighttime muscle spasms in your legs and restless legs syndrome also may be associated with fibromyalgia.

- **Irritable bowel syndrome (IBS).** The constipation, diarrhea, abdominal pain and bloating associated with IBS are common in people with fibromyalgia.

- **Headaches and facial pain.** Many people who have fibromyalgia also have headaches and facial pain that may be related to tenderness or stiffness in their neck and shoulders. Temporomandibular joint (TMJ) dysfunction, which affects the jaw joints and surrounding muscles, also is common in people with fibromyalgia.

- **Heightened sensitivity.** It's common for people with fibromyalgia to report being sensitive to odors, noises, bright lights and touch.

The cause of fibromyalgia is unknown. Current thinking centers around a theory called "central sensitization." This theory states that people with fibromyalgia have a lower threshold for pain because of increased sensitivity in the brain to pain signals. Researchers believe repeated nerve stimulation causes the brains of people with fibromyalgia to change. This change involves an abnormal increase in levels of certain chemicals in the brain that signal pain (neurotransmitters). In addition, the brain's pain receptors (neurons) — which receive signals from the neurotransmitters — seem to develop a sort of memory of the pain and become more sensitive, meaning they can overreact to pain signals. In this way, pressure on a spot on the body that wouldn't hurt someone without fibromyalgia can be very painful to someone who has the condition. But what initiates this process of central sensitization isn't known.

Laser Therapy to the Fibromyalgia Patient

A multilevel approach should be used in handling the fibromyalgia patient due to the variety of symptoms and the unknown etiologies. Laser therapy should first be applied to those areas deemed most painful to the patient. These areas that should be considered:

- The base of the skull and cervical region
- C5, C6 and C7 and first four thoracic vertebrae and the *trapezius* and *supraspinatus m.*
- The *pectoralis major m.* region
- The lateral and medial epicondyles of the humerus
- The hips
- The knees

The initial therapeutic dose should be lower than the usual therapeutic dose and then increased as the patient responds and improves. Patients should be evaluated every 24 hours when therapy is initiated and as the dosages are increased.

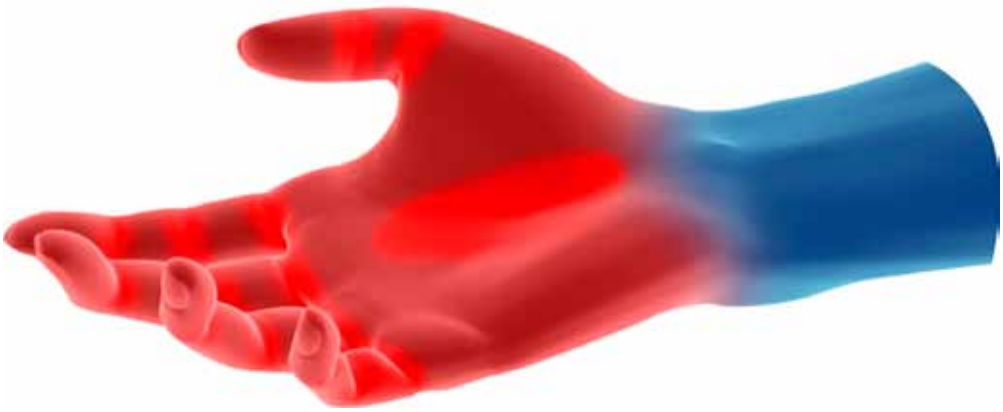
Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Initial Therapy Session	5-6	750 - 900 per point	1:15 - 1:30	Apply therapy to those areas exhibiting the most pain. I.E.: Cervical region, elbows, knees
Second Therapy Session	6-7	900 - 1,000	1:30 - 1:45	Apply therapy to original areas or start to expand to new affected areas
Third Therapy Session	6-7	900 - 1,000	1:30 - 1:45	Progress should be evident and dosages can be increased in all affected areas
Continued Therapy Sessions	7-8	1,000 - 1,300	1:45 - 2:00	Every other day until maintenance level is reached

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Hand & Digits

General Therapy Protocols:

- Apply the majority of the therapy to the most involved surface.
- When treating any of the digits always treat the entire circumference of the joint.
- Gentle range of motion movements should be accomplished during therapy.



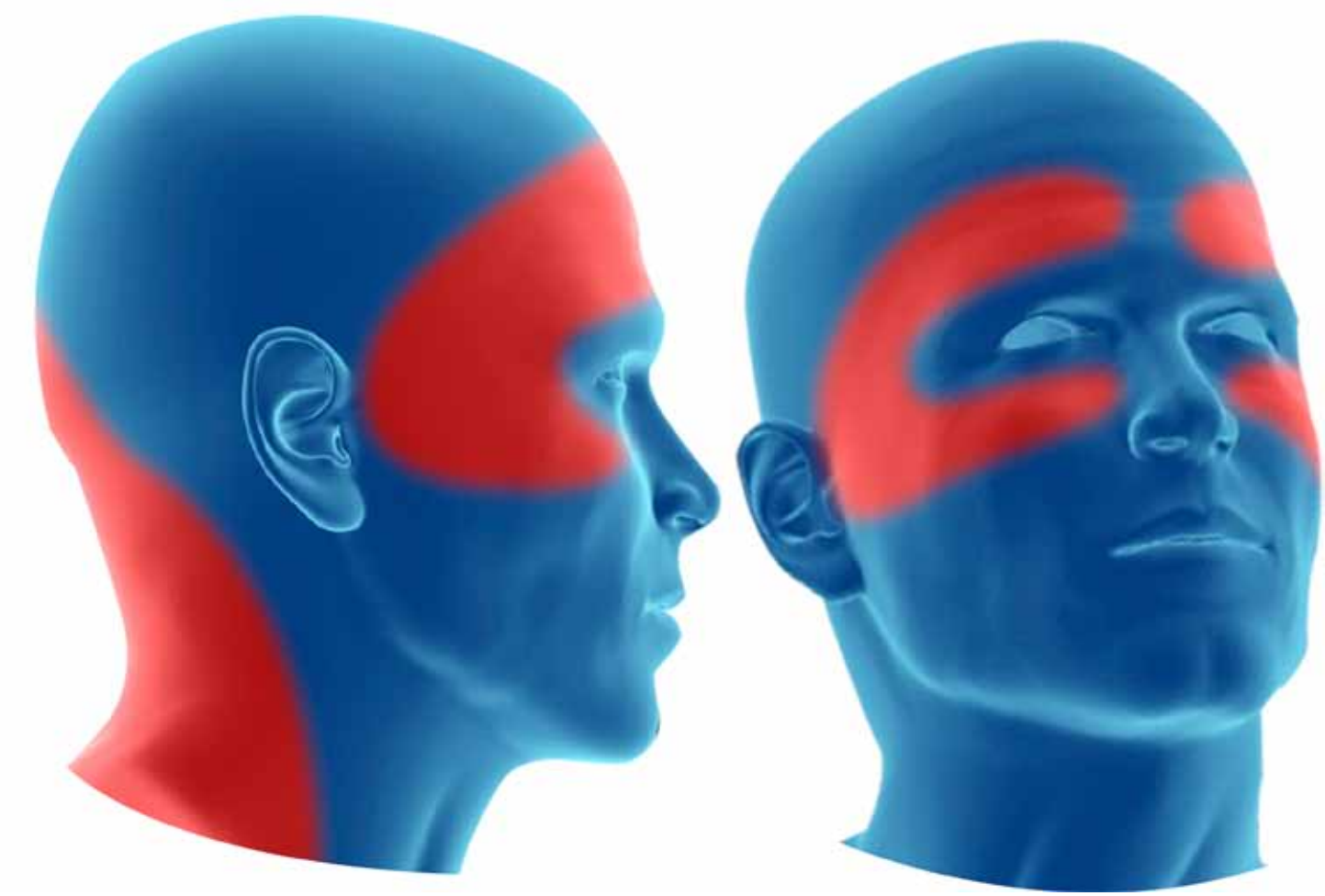
Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Each Joint	6-7	150 - 300	0:15 - 0:30	Every day for three days then every other day until resolved
Soft Tissue Injury Strains/Sprains	6-7	1,500 - 2,500	2:45 - 4:00	Every day for three days then every other day until resolved
Degenerative Osteoarthritis	7-8	2,000 - 3,000	3:00 - 5:00	Every other day for two weeks then maintenance therapies
Dupuytran's Contracture	6-7	1,500 - 2,500	2:45 - 4:00	Every day for three days then every other day until resolved or a maintenance protocol is established
De Quervains Disease	6-7	1,500 - 2,500	2:45 - 4:00	Every day for three days then every other day until resolved or a maintenance protocol is established
Fractures	7-8	2,000 - 3,000	3:00 - 5:00	Every other day for two weeks then maintenance therapies

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Headaches

General Therapy Protocol:

- Eye protection must be worn when administering photobiostimulation around the structures of the face and the head.
- Initiate therapy at the most severely affected areas and then apply to all other areas involved with the type of headache exhibited.



Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Tension Headaches				
Forehead	6-8	850 - 1200	1:30 - 2:00	Every day for three days then every other day until resolved
Temples	6-8	500 - 700	0:45 - 1:15	
Sinus	6-8	400 - 600	0:40 - 1:00	
Neck	8-10	3800 - 5000	6:00 - 8:00	
Total Treatment Time		**5640 - 7200**	**9:00 - 12:00**	
Migraine Headaches				
Forehead	6-8	850 - 1200	1:30 - 2:00	Everyday for three days then every other day until maintenance therapy is established
Temples	6-8	500 - 700	0:45 - 1:15	
Sinus	6-8	400 - 600	0:40 - 1:00	
Neck	8-10	3800 - 5000	6:00 - 8:00	
Total Treatment Time		**5640 - 7200**	**9:00 - 12:00**	
Cervicogenic				
Forehead	6-8	850 - 1200	1:30 - 2:00	Every other day for two weeks then maintenance therapies
Temples	6-8	500 - 700	0:45 - 1:15	
Sinus	6-8	400 - 600	0:40 - 1:00	
Neck	8-10	3800 - 5000	6:00 - 8:00	
Total Treatment Time		**5640 - 7200**	**9:00 - 12:00**	

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Hip Area

General Therapy Protocol:

- With almost all hip disorders back problems co-exist and should be examined, evaluated and treated.
- Therapy should be applied anteriorlly and posteriorlly with the majority of the therapy being applied to the area eliciting the most pain.
- When possible, apply a portion of the therapy while manually placing the joint through a passive range of motion.

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Trochanteric Bursitis	8-12	6,500 - 10,000	11:00 - 16:30	Every day for three days then every other day until resolved
Degenerative Osteoarthritis	10-14	8,000 - 11,500	13:15 - 19:15	Every other day for two weeks then maintenance therapies
Capsulitis / Synovitis	8-12	6,500 - 10,000	11:00 - 16:30	Every other day for two weeks then maintenance therapies
Trauma / Sprains & Strains	8-12	6,500 - 10,000	11:00 - 16:30	Every day for three days then every other day until resolved
Piriformis Syndrome	8-12	6,500 - 10,000	11:00 - 16:30	Every other day for two weeks then maintenance therapies
Fractures	10-14	8,000 - 11,500	13:15 - 19:15	Every day for three days then every other day until resolved

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

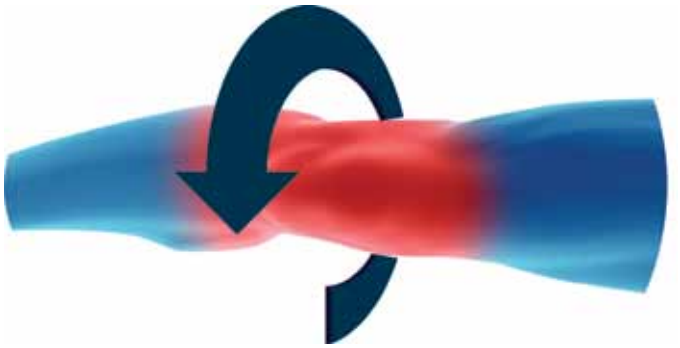
Knee Joint

General Therapy Protocols:

- Treat around the entire circumference of the knee with at least 60% of the therapy directed at the compartment most severely afflicted.

- Apply at least 75% of the therapy while the knee is in the extended position of 110 - 120°.

- The last 25% of the therapy should be administered to the knee while it is maneuvered through its range of motion without causing any pain or stress to the joint.



Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Ligamentous Injuries	7-8	5,000 - 6,500	8:15 - 11:00	Every day for three days then every other day until resolved
Meniscal Strains / Sprains	7-8	5,000 - 6,500	8:15 - 11:00	Every other day for two weeks then maintenance therapies
Supra / Infrapatellar Tendonitis	7-10	5,600 - 8,000	9:15 - 13:15	Every other day for two weeks then maintenance therapies
Degenerative Osteoarthritis	7-10	5,600 - 8,000	9:15 - 13:15	Every day for three days then every other day for three treatments then a maintenance program
Chondromalacia Patella	7-8	5,000 - 6,500	8:15 - 11:00	Every other day for two weeks then maintenance therapies
Patellar Tendinitis	7-8	5,000 - 6,000	8:15 - 11:00	Every day for three days then every other day until resolved
Patellofemoral Syndrome	7-8	5,000 - 6,000	8:15 - 11:00	Every day for three days then every other day until resolved

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Disorders of the Lumbar Spine

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Lumbar Muscle Strains/Sprains	8-10	4,000 - 5,000	6:30 - 8:15	Every day for three days then every other day until resolved
Degenerative Osteoarthritis	8-12	4,000 - 6,000	6:30 - 10:00	Every other day for two weeks then maintenance therapies
Spinal/Foraminal Stenosis	8-10	4,000 - 5,000	6:30 - 8:15	Every other day for two weeks then maintenance therapies
Disc Herniation With Radiculopathy	8-10	4,000 - 5,000	6:30 - 8:15	Every day for three days then every other day until resolved
Facet Joint Syndrome	6-8	3,000 - 4,000	5:00 - 6:30	Every other day for two weeks then maintenance therapies

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Pain Associated with Neuropathy

There are three broad types of neuropathy associated with diabetes sensory, autonomic and motor:

- Sensory or peripheral neuropathy (usually referred to as neuropathy) affects the nerves that carry information to the brain about sensations from various parts of the body - how hot or cold something is, what the texture of something feels like, the pain caused by a sharp object or heat, etc. This is the most common form of diabetic neuropathy.

- Autonomic neuropathy affects the nerves that control involuntary activities of the body, such as the action of the stomach, intestine, bladder and even the heart.

- Motor neuropathy affects the nerves that carry signals to muscles to allow motions like walking and moving fingers. This form of neuropathy is very rare in diabetes.

Sensory neuropathy can lead to pain, numbness or tingling in the extremities and, ultimately, an inability to feel heat, cold, pain or any other sensation in affected areas. Autonomic neuropathy can lead to impotence in men, bladder neuropathy (which means the bladder is unable to empty completely), diabetic diarrhea, or bloated stomach. Motor neuropathy can lead to muscle weakness.

The Etiology Of Peripheral Neuropathy And Why Laser Therapy Is Beneficial

Peripheral neuropathy is a general term for diseases that cause damage to the nerves outside of the brain and spinal cord. While diabetes is a frequent cause of neuropathy, it is not the only cause. Nutritional deficiencies (B-12 and folate), chemical exposures, pressure on nerves, or medications (such as some of those used for chemotherapy or to treat AIDS), can also cause neuropathy. Theories abound as to why exactly neuropathy occurs in people with diabetes. In general, diabetic neuropathy is thought to be a result of chronic nerve damage caused by high blood sugars. Nerves are surrounded by a covering of cells, just like an electric wire is surrounded by insulation, called Schwann cells. One theory suggests that excess sugar circulating throughout the body interacts with an enzyme in the Schwann cells, called aldose reductase. Aldose reductase transforms the sugar into sorbitol, which in turn draws water into the Schwann cells, causing them to swell. This in turn pinches the nerves themselves, causing damage and in many cases pain. Unless the process is stopped and reversed, both the Schwann cells and the nerves they surround die.

The application of photobiostimulation to these cells prevents or reverses these biochemical processes that cause this damage. The resulting increased circulation removes excess fluid from the Schwann cells, thereby removing any possible pressure necrosis to the rest of the nerve cell, and provides a vehicle to remove cellular waste such as sorbitol.

Another theory is that certain intracellular metabolites, such as myoinositol, become depleted, leading to nerve damage. Other theories hold that pathways such as the protein kinase C pathway are triggered by chronic high blood sugars, resulting in several diabetes complications, including neuropathy.

Laser therapy applied to these nerve cells stimulates the mitochondria within the nerve cell and increases the respiratory rate of these individual cells. Therefore, intracellular metabolites do not have a chance to become depleted and the production of any destructive protein kinases is halted

Pain relief is also accomplished in the diabetic patient through the following mechanisms:

1. Increased nerve cell action potentials
2. Ion channel normalization
3. Blocked depolarization of C-fiber afferent nerves

Healthy nerve cells tend to operate at about -70 mV, and fire at about -20 mV. Compromised cell membranes have a lowered threshold as their resting potentials average around this -20 mV range. That means that normal non-noxious activities, such as touching, produce pain. Laser therapy can help restore the action potential closer to the normal -70 mV range.

This is accomplished by ion channel normalization. Photobiostimulation promotes normalization in Ca++, Na+ and K+ concentrations across the cell membrane, resulting in pain reduction as a result of these ion concentration shifts.

The pain blocking effect of photobiostimulation can be pronounced, particularly in low velocity neural pathways, such as non-myelinated afferent axons from nociceptors. Laser irradiation suppresses the excitation of these fibers in the afferent sensory pathway.

After evaluation of protocol at 24 hours, administer approximately 1,500 Joules to each foot.

Caution: Due to the lack of sensation, care should be taken in delivering energy.

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 5 W min:sec	Therapies/Week
Initial Therapy	3	1,500 - 2,200	5:00 - 7:00	Evaluate during therapy and again in 24 hours
24 Hour Evaluation	3-5	1,500 - 3,000	5:00 - 10:00	Apply to each foot and examine in 24 hours
48 Hour Evaluation	5-7	2,500 - 4,000	8:00 - 13:00	Initiate therapy at the spine and continue distally along the nerve pathways
Maintenance Therapy	5-7	2,500 - 4,000	8:00 - 13:00	Every day for three days then every other day until goals are obtained

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

The Application Of Laser Therapy To The Diabetic Patient

There are several general therapy protocols when applying photobiostimulation to the diabetic patient:

1. The first step is to bring blood glucose levels within the normal range to prevent further nerve damage. Blood glucose monitoring, meal planning, exercise, and oral drugs or insulin injections are needed to control blood glucose levels. Although symptoms may get worse when blood glucose is first brought under control, over time, maintaining lower blood glucose levels helps lessen neuropathic symptoms. Importantly, good blood glucose control may also help prevent or delay the onset of further problems.

2. People with neuropathy need to take special care of their feet. The nerves to the feet are the longest in the body and are the ones most often affected by neuropathy. Loss of sensation in the feet means that sores or injuries may not be noticed and may become ulcerated or infected. Circulation problems also increase the risk of foot ulcers.

3. Initially laser therapy should be applied to the distal limbs to establish a tolerance of the therapy. An example of this is to apply 1,500 Joules to one foot and reevaluate the patient in 24 hours.

> **a.** Decrease the power density when applying this therapy by holding the hand piece at least two inches from the skin.

4. Proceed to include bilaterally therapies and therapies that start at the spinal level and proceed down the entire length of the nerve pathway.

On the third day of therapy, apply 2,500 – 3,000 Joules to each distal limb, following the neural pathways.

After evaluation, therapy continues starting at the spine and following the nerve pathways distally administering approximately 6,000 Joules/day as a minimum.

Plantar Fasciitis

General Therapy Protocol:

• Apply therapy to the entire circumference of the foot and making sure to irradiate the Achilles tendon, the insertion of the *peroneus brevis*, *longus* tendons and the *plantar fascia*.

• At least 60% of the therapy should be applied to the painful areas with the remaining energy applied throughout the anatomical area.

• Manually place the ankle and even the metatarsals through a gentle range of motion while the last portion of therapy is applied.

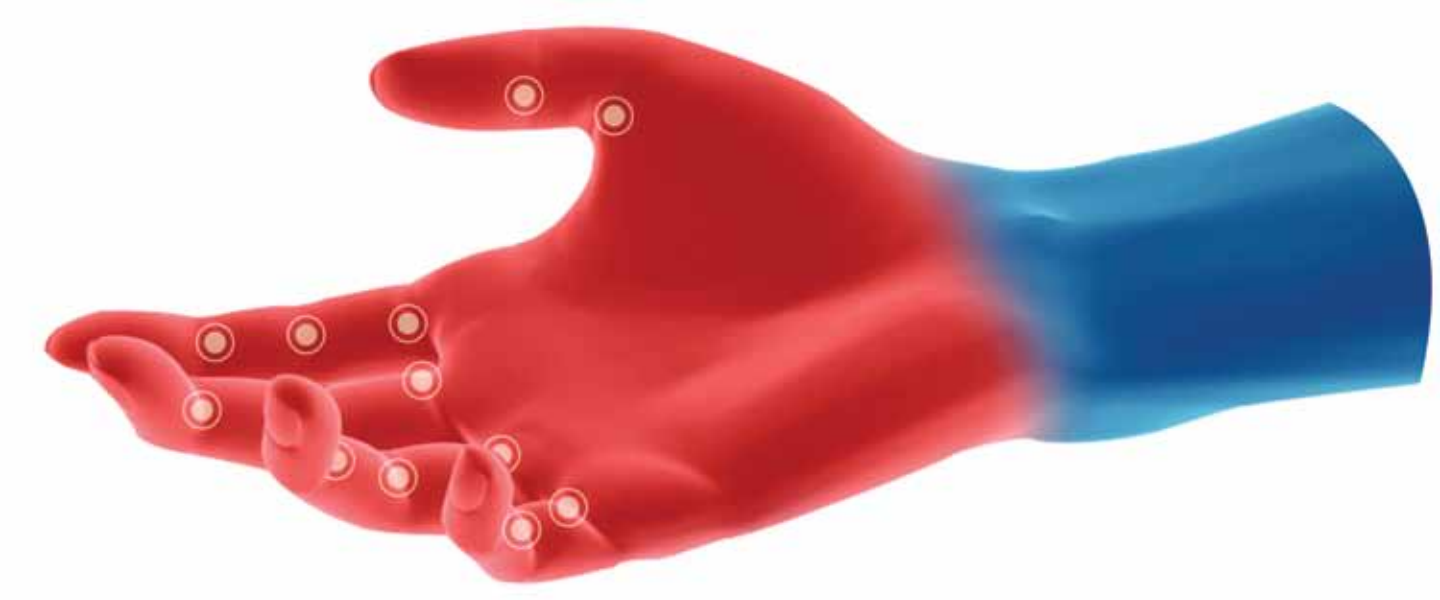
Conditions	Dosage Joules/cm²	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Plantar Fasciitis	7-8	3,500 - 4,000	5:45 - 6:45	Every day for three days then every other day until resolved

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Rheumatoid Arthritis

General Therapy Protocol:

- Gather baseline data including measurements of the joints and strength testing before therapy is initiated.
- Therapy should be applied to the entire hand with the majority delivered over the dorsal aspect and focusing on the individual joints.
- While therapy is applied to the joints and hand, the hand should be manually placed through range of motion exercises.
- The regime for this therapy is long. Normal therapy ranges from 12 to 24 therapy sessions depending on the severity and the stage of the individual's condition.



see also Hand (page 17)

Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Entire Hand	6-8	2,000 - 3,000	3:15 - 5:00	Every day for three days then every other day until maintenance level established
Each Joint	6-7	150 - 300	0:15 - 0:30	Every day for three days then every other day until resolved

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Rotator Cuff Injury

General Therapy Protocol:

- After obtaining a specific diagnosis for the disorder, investigate any coexisting pathologies within the cervical spine or upper body musculature that may also require therapy.

- Without initiating pain, manually place the joint through its normal range of motion while applying therapy.

- Therapy should be applied toward the center of the joint from the superior, anterior and posterior positions followed by application over the entire shoulder region.

- Therapy can be preceded or followed by applying therapy to the cervical region supplying innervations to the shoulder region and to the pectoral musculature that is strained through compensatory use during a shoulder injury.

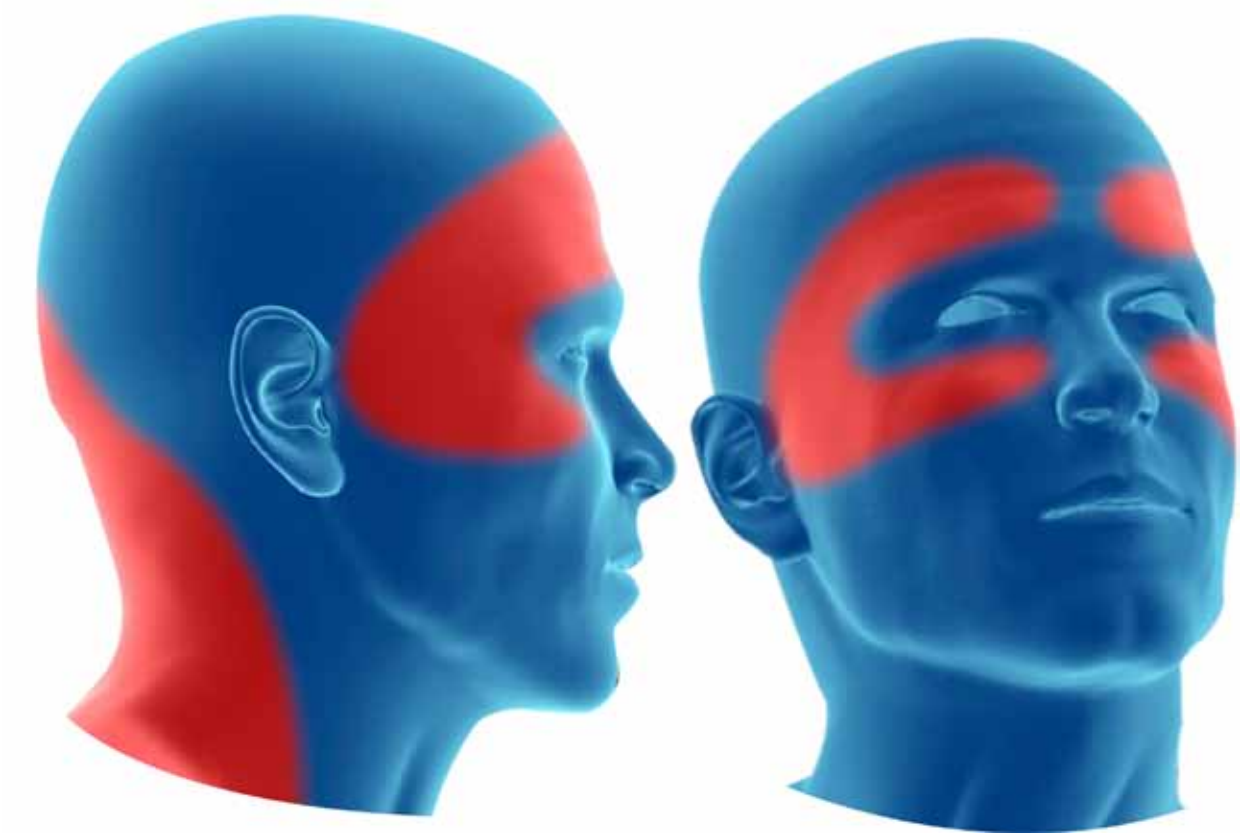
Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Ligamentous Injury	7-8	5,500 - 6,500	9:30 - 11:00	Every day for three days then every other day until resolved
Tendonitis/Bursitis	7-8	5,500 - 6,500	9:30 - 11:00	Every other day for two weeks then maintenance therapies
Repetitive Stress Injury	7-8	5,500 - 6,500	9:30 - 11:00	Every other day for two weeks then maintenance therapies
Adhesive Capsulitis (Frozen Shoulder)	8-10	6,500 - 8,000	11:00 - 13:15	Every day for three days then every other day until resolved
Acromioclavicular Joint Dysfunction (Trauma, Separation,Arthritis)	7-9	5,500 - 7,000	9:30 - 12:00	Every other day for two weeks then maintenance therapies
Rotator Cuff Injury	8-10	6,500 - 8,000	11:00 - 13:15	Every day for three days then every other day until evaluation

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Sinusitis

General Therapy Protocol:

- Before any therapy of the sinuses is initiated, eye protection must be in place.
- If there is a significant amount of mucous, this must be loose and draining before therapy begins. This can be accomplished with a saline flush.
- This initial dose should be approximately 75% of the total dose required for therapy. This allows further drainage to occur avoiding any pressure buildup within the sinus.



Conditions	Dosage Joules/cm²	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Sinusitis	6-8	1250 - 1800	2:00 - 3:00	Every day for three days then every other day until resolved

see also ‘headaches’

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

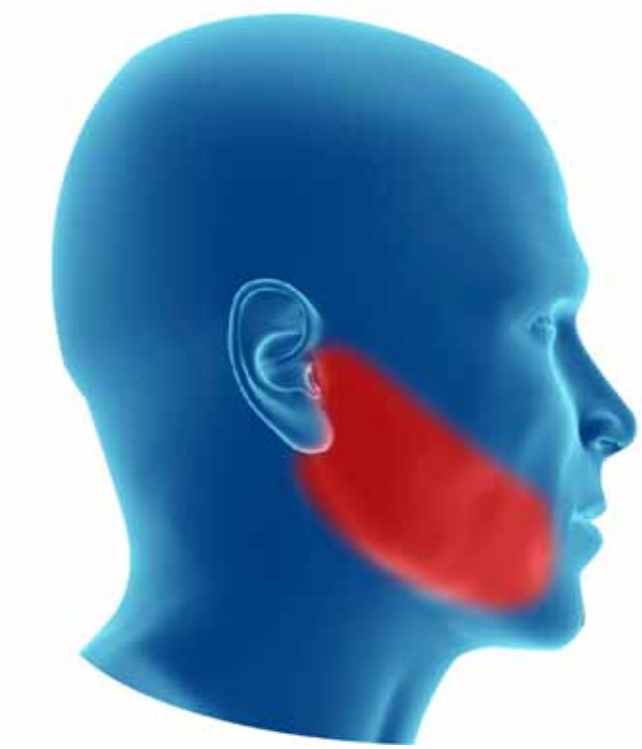
TMJ

Temporomandibular Joint Disorder, Temporomandibular Joint Dysfunction, Myofacial Pain Dysfunction Syndrome

Temporomandibular joint syndrome, also known as temporomandibular joint disorder or TMJ, is a painful condition involving the joint that opens and closes the mouth. The temporomandibular joints are the small joints in front of each ear that attach the lower jaw (mandible) to the skull. The disorder may affect the jaw joint or both the joint and the muscles surrounding it.

Class IV laser therapy provides relief from pain and halts the inflammatory cycle within the joint to allow healing to occur.

Localized therapy should be applied to the entire region of the masseter and temporalis muscles and the zygomatic arch. Dosage should be consistent with the size of the area and the acuteness or chronicity of the condition. An average dose would be ~1,500 Joules administered bilaterally.



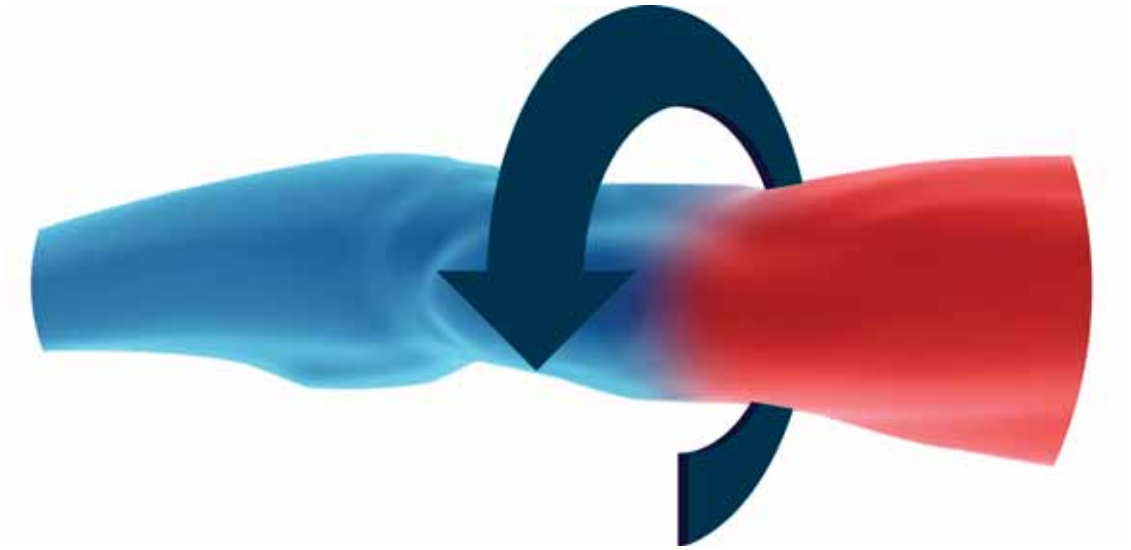
Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
TMJ	8-9	1,200 - 1,800	2:00 - 3:00	Every day for three days then every other day for three treatments then a maintenance program

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Thigh & Leg Muscle Injuries

General Therapy Protocol:

- Rule out any thrombophlebitis before initiating therapy.
- Total dosage will vary dependent on the size of the muscle however the entire injured muscle and surrounding areas should be treated from origin to insertion.
    - Therapeutic dosage should be applied at 8 to 10 Joules/cm^2.
    - Average therapy would be 5,000 - 7,500 Joules.
- Apply a portion of the therapy while placing the muscle through normal passive range of motion exercises.
- Muscles included in this anatomical area:
    - *Hamstrings*
    - *Biceps Femoris*
    - *Semitendinosis*
    - *Semimembranosus*
    - *Quadriceps*
    - *Rectus Femoris*
    - *Vastus Medialis*
    - *Vastus Intermedius*
    - *Vastus Lateralis*
    - *Psoas Major*
    - *Iliacus*
    - *Sartorius*



Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Thigh & Leg Muscles	8-10	5,000 - 7,500	8:15 - 12:30	Every day for three days then every other day for three treatments then a maintenance program

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

The Thoracic Spine

General Therapy Protocol

- The patient should lay face down with a small pillow or cushion in the center of the chest.

Conditions	Dosage Joules/cm²	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
MyoFasciitis	7-9	4,000 - 6,000	7:00 - 10:00	Every day for three days then every other day until resolved
Degenerative Osteoarthritis	8-10	5,000 - 6,500	8:00 - 11:00	Every other day for two weeks then maintenance therapies
Compression Fractures	9-12	5,500 - 7,500	9:00 - 12:30	Every other day for two weeks then maintenance therapies
Trauma/Sprains & Strains	7-10	5,000 - 6,500	8:00 - 11:00	Every day for three days then every other day until resolved
Kyphosis	7-10	5,000 - 6,500	8:00 - 11:00	Every other day for two weeks then maintenance therapies

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

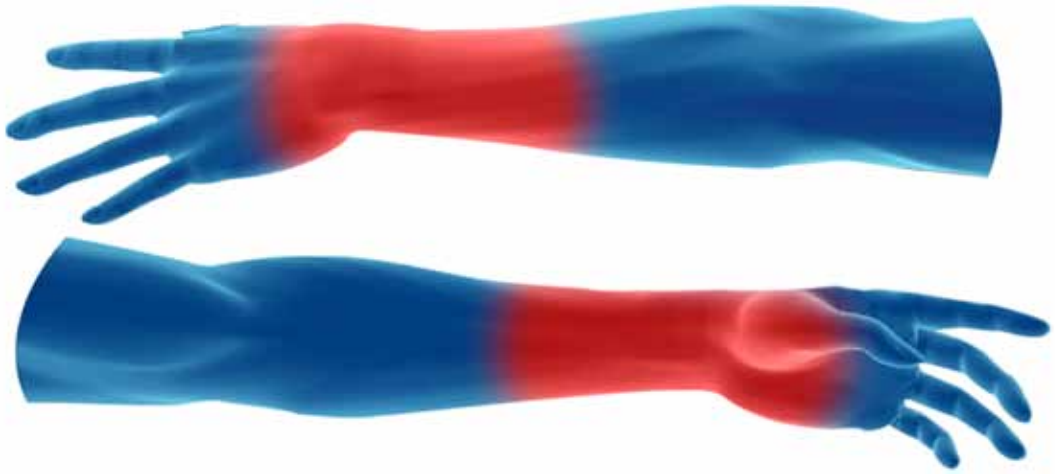
Wrist Injuries & Disorders

General Therapy Protocol

• Apply therapy to the entire circumference of the joint including the flexor and extensor muscles proximally.

• At least 25% of the therapy should be administered while the joint is placed through normal range of motion.

• It is often beneficial to apply therapy to the cervical spine in conjunction with direct therapy of the wrist. This would require approximately 1000 Joules to each lateral side.



Conditions	Dosage Joules/cm^2	Total Energy Joules	Time at 10 W min:sec	Therapies/Week
Carpal Tunnel Syndrome				
Wrist	7-9	2,000 - 2,500	3:15 - 4:00	Every day for three days then every other day until a maintenance program can be established
Elbow	7-9	1,200 - 2,500	2:00 - 4:00	
Cervical Spine	7-9	1,000 - 1,500	1:45 - 3:00	
Degenerative Osteoarthritis	7-9	1,200 - 2,500	2:00 - 4:00	Every other day for two weeks then maintenance therapies
Peripheral Nerve Compression	7-9	1,200 - 2,500	2:00 - 4:00	Every other day for two weeks then maintenance therapies
Flexor Or Extensor Tendinitis	7-9	1,200 - 2,500	2:00 - 4:00	Every day for three days then every other day until resolved
Fractures	9-10	2,500 - 4,000	4:00 - 6:30	Every other day for two weeks then maintenance therapies

Many practitioners will also treat the cervical spine area from C1 to C4 when treating painful conditions.

Notes

Notes

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