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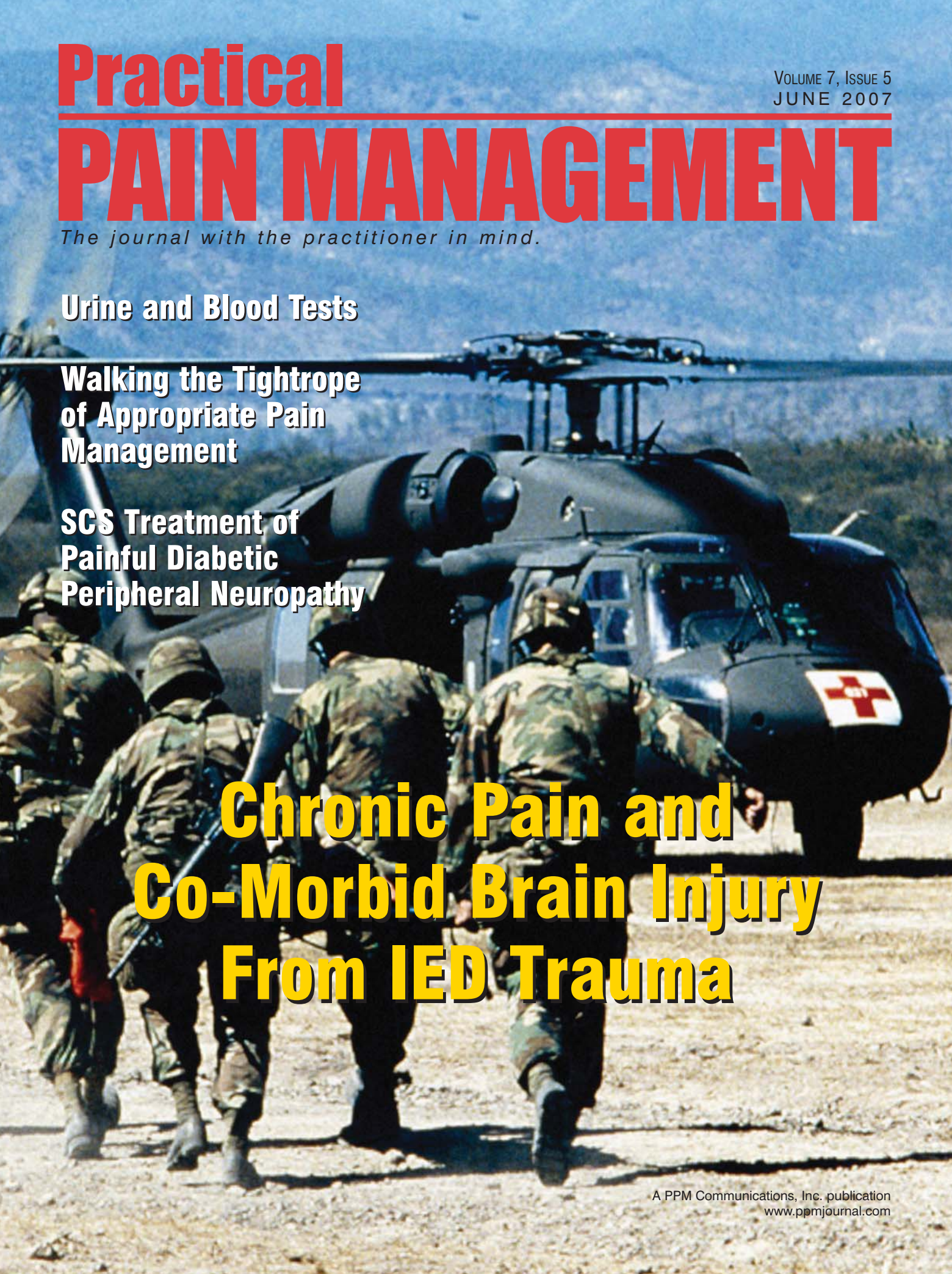

Chronic Pain and Co-Morbid Brain Injury From IED Trauma

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Treatment of Chronic Neck Pain Utilizing Low Level Laser Therapy

Therapeutic laser can provide considerable relief of neck pain and associated conditions.

By William J. Kneebone, DC, CNC, DIHom, FIAMA, DIACT

Neck pain affects approximately 10% of the American population. It is one of the most common neuromusculoskeletal conditions seen by health care practitioners. Sources of neck pain include conditions that compress, destroy, or irritate pain-sensitive tissues such as the annulus fibrosis, posterior longitudinal ligament, and the zygapophyseal joint capsule. Cervical nerve root involvement usually results in pain and neurological findings along the distribution of the nerve. Referred pain can occur from visceral involvement and may also be confused with primary shoulder conditions and peripheral nerve entrapment.[1]

Common conditions associated with neck pain are degenerative disc disease, disc herniations, and degenerative joint disease of the zygapophyseal joints. The exact cause of neck pain in an individual can be unclear. This is due to the fact that approximately 50% of the population has degenerative joint disease. These are often incidental findings that are observed in patients following whiplash injuries and in repetitive occupational injuries.[2] A history of whiplash injury is a significant contributor in the development of chronic neck pain.[3] The chronic pain associated with cervical sprain/strain are most likely to effect the facet joints, the intervertebral disc, and the upper cervical ligaments. C2-3 is most commonly associated with occipital headaches and C5-6 is most often associated with cervical, axial, and referred arm pain.

Cervical facet joint involvement can be responsible for a significant portion of chronic neck pain. The pain associated with facets overlap both myofascial and discogenic patterns.[4] Neuro-anatomic studies reveal that the facet joint is richly innervated and contains both free and encapsulated nerve endings. The facet capsule is richly innervated with C-fiber and A-delta fibers. Many of these nerves are at a high threshold and likely to generate pain. Local pressure and capsular stretch can mechanically activate these nerves.

These neurons can also be sensitized or excited by naturally occurring inflammatory agents, including substance P and phospholipase A. Physiological changes in the spinal cord, particularly the complexes of the dorsal horn, implicate excitatory amino acids such as substance P, glutamate, gamma-aminobutyric acid (GABA), and N-methyl-D-aspartate (NMDA).[5]

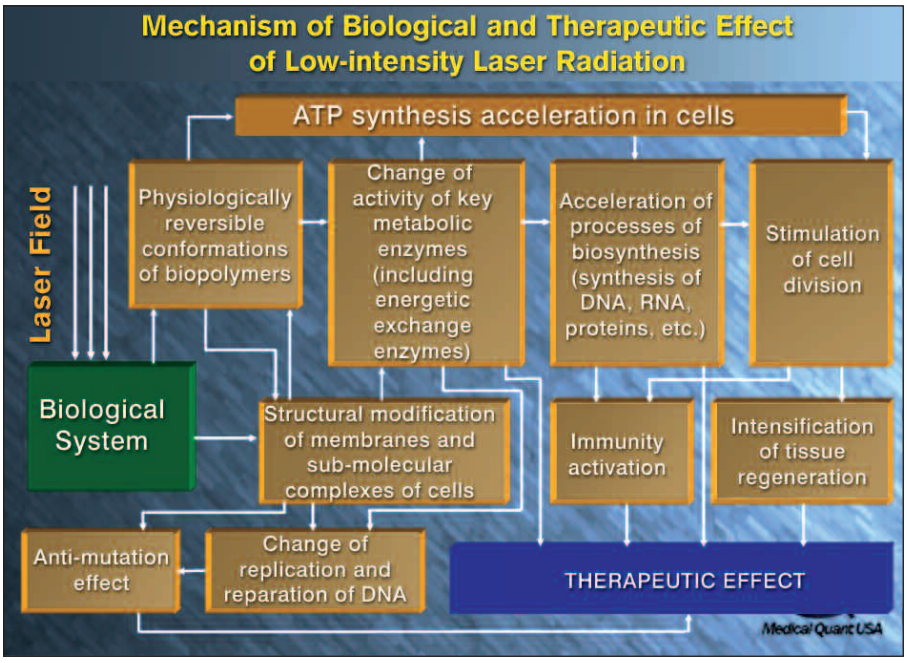

FIGURE 1. *Flowchart of some of the most commonly observed biochemical effects of therapeutic lasers.*

Biochemical Effects of Laser Therapy

I have discussed a number of biochemical effects that have been observed with laser therapy/phototherapy in previous articles.[6-7] Several of these effects directly relate to the management of the patient with chronic neck pain. Three of the most prevalent features of patients suffering from chronic neck pain are inflammation, pain, and edema.[6] Injured cells and tissues emit enzymes that encourage the receipt of photons more readily than healthy cells and tissues. Primary photoacceptors, which are activated by light, are thought to be flavins, cytochromes, and porphorins.[7,8]

These photo-acceptors are located in the mitochondria and can convert light energy into electro-chemical energy. Chromophores, in the form of porphyrins have been shown to play an important role. Small amounts of singlet oxygen have been shown to accumulate in tissues irradiated with laser light.[9] Singlet oxygen effects the formation of ATP in the mitochondria.[10]

Laser-related research has demonstrat-

ed a number of interesting bio-chemical responses that can have a positive clinical effect in the chronic neck pain patient. These effects include:

- Stabilization of the cell membrane[11]
- Enhancement of ATP synthesis[12]
- Stimulated vasodilation along with increased histamine, NO and serotonin[13]
- Acceleration of leukocyte activity
- Increased Prostaglandin synthesis[14]
- Reduction in Interleukin-1 levels[15]
- Increased angiogenesis[16]
- Enhanced superoxide dismutase[17]
- Decreased C-reactive protein and neopterin levels[18]

Research in laser and light therapy has documented that red and near infrared light reduces pain by a combination of the following responses (see also Figure 1):

- Increases in b-Endorphins
- Blocked depolarization of C-fiber afferent nerves[19]
- Axonal sprouting and nerve cell regeneration[20]
- Decreased Bradikynin levels
- Ion channel normalization[21]

Therapeutic laser treatments have been shown to be considerably successful at reducing pain and inflammation. Mizokami observed excellent to good results in 81% of the patients he treated with occipital neuralgia and 79% of the patients with neck, arm, and shoulder pain;[22] Caccherrelli achieved considerable relief in patient with cervical myofascial pain;[23] and Toya achieved successful results in 82% of patients with neck and low back pain.[24]

Therapeutic Laser Effects

A comprehensive clinical approach when utilizing the therapeutic laser should activate all three of the observed effects of laser therapy, namely primary, secondary, and tertiary effects.

Primary effects are created by direct photoreception of photons with cytochromes resulting in increases in ATP production and changes in cell membrane permeability and are generally followed by transduction of light into cellular energy, amplification of the signal and a photo-response.

Secondary effects—although less predictable than primary effects because of varying cell sensitivity due to internal and external environmental factors—occur in the same cell and are induced by these primary effects. Secondary effects include cell proliferation, protein synthesis, degranulation, growth factor secretion, myofibroblast contraction, and neurotransmitter modification.

Tertiary effects—the least predictable because they are dependent on both variable environmental factors and intercellular interactions—are, nonetheless the most clinically significant effects and include all the systemic benefits of phototherapy.

All three of these effects can be achieved by using a laser therapy device that will provide adequate depth of penetration in the target tissues to achieve a therapeutic dose of light energy. This means a GaAlAs or a GaAs laser should be used because these types of lasers will provide adequate depth of penetration. The average depth of penetration with the GaAlAs laser is 1-3 cm and 3-5 cm with the GaAs laser.[25]

History and Examination

The pharmacy department at Auburn University defines the etiology of a disease as a sequence consisting of two parts: causal events occurring prior to some initial body response and mechanisms within the body to the characteristic manifestations of the disease.[26]

Accordingly, a comprehensive case history and orthopedic/neurological examination of cervical region should be performed prior to the initiation of laser therapy. This provides us with some possible insights into the causation factors of the condition as well as providing a functional baseline so that we a have a standard for comparison during and after treatment. Treatment should address causal factors as well as the subsequent cascade of tissue injury, inflammation, etc. to comprehensively reduce and eliminate pain generators.

FIGURE 2. *Tissue saturation of the lower cervical region.*

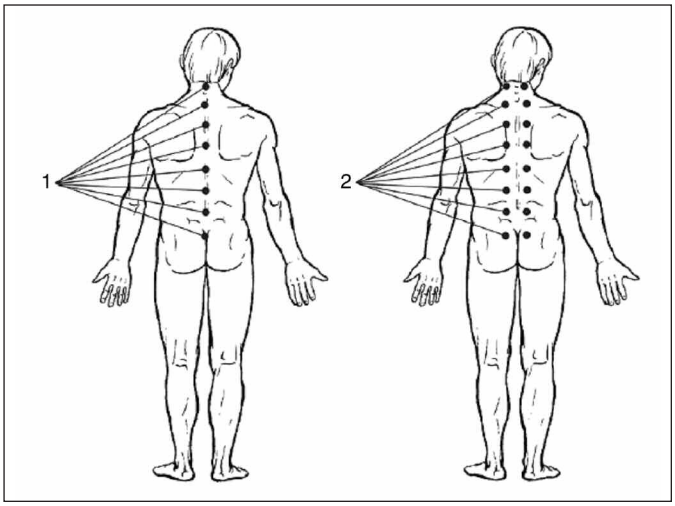

FIGURE 3. *Commonly used sites for applying laser therapy to the neck and paraspinal region.*

Laser Treatment Techniques

There are three basic treatment techniques commonly used when utilizing therapeutic lasers and are described as follows:

1. The first technique is tissue saturation. This, as the name implies, involves utilizing a stationary contact over the target tissue long enough to get an optimal therapeutic dose. This will initiate many of the primary and secondary effects mentioned above. Figure 2 illustrates tissue saturation of the lower cervical region. Other commonly used sites for applying laser therapy to the neck and paraspinal region are depicted in Figure 3.

2. The second technique stimulates the lymphatic system and the vascular system. This is accomplished by moving the emit-

FIGURE 4. *Photobiostimulation of the scalene lymphatic channels.*

FIGURE 5. *Laser Acupoint Stimulation of LI4.*

ter in small circular motions over the treatment site (see Figure 4). This will aid in optimizing the tertiary effects mentioned above. Lymphatic photobiostimulation is usually applied ever the scalene nodes. Treating over the thoracic and/or lymphatic ducts are also common sites of laser biostimulation.

3. The third technique is to stimulate acupoints. This has a tertiary effect on the body in that stimulating the associated meridian pathway will initiate global (systemic) responses.[27] Body, ear, or hand acupoints stimulation has been effectively used by this author to modulate many types of pain (see Figure 5).

Summary

When treating the patient with chronic pain, it is important to consider as many of the other factors that could possibly be involved in the causation of that condition along with analysis of potential pain referral patterns.

Applying laser therapy to the chronic neck pain patient—utilizing a combination of the techniques mentioned above—can provide considerable relief in many cases. The laser treatment schedule should be individualized to the patient. It usually consists of three to five applications per week. 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. ■

Acknowledgement

Images for Figures 1-5 courtesy of MedicalQuant.

Dr. Kneebone studied nursing at Cook County Hospital in Chicago graduating as an RN in 1972. He completed an anesthesia program at St. Francis Hospital in La Crosse, Wisconsin in 1974. Dr. Kneebone practiced anesthesia until he graduated from Palmer College of Chiropractic in 1978. He has been in a complimentary medicine practice in the San Francisco Bay area since 1978. He has post graduate certification in nutrition and homeopathy. He is also a Fellow of the International Academy of Medical Acupuncture and a Diplomate of the International Academy of Clinical Thermology. Dr. Kneebone has been using therapeutic lasers in his practice for over 7 years and has been teaching laser seminars for the past four years. He teaches Cutting Edge Laser Seminars™ all around the US. He can be contacted at drknee@pacbell.net.

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