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Original Articles

Chiropractic manipulation (HVLA) in temporomandibular joint disorders

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Three part question

In [adults with temporomandibular disorder (TMD)] is [chiropractic manipulation (High velocity low amplitude) of the temporomandibular joint (TMJ)] effective in [improving range of motion and decreasing pain]

Clinical scenario

A 32 year-old female attends the clinic with six months' history of pain over the right TMJ, with associated clicking on opening and closing her mouth. In addition, she finds it hard to open her mouth fully as this increases the pain over the right TMJ. On examination maximum mouth is reduced and there is local tenderness over the right TMJ. Motion palpation reveals hypomobility of the right TMJ compared to the left. There are no signs of more serious pathology. You diagnose her with chronic TMD of the right TMJ. You wonder if high velocity low amplitude (HVLA) manipulation of her TMJ is an effective treatment option.

Search strategy

Medline: "Temporomandibular joint disorders AND chiropractic" LIMITS All adults 19+ years
Index to chiropractic literature (ICL): ("TMJ" OR "TMD" OR "temporomandibular joint") LIMITS Peer Reviewed Articles.

Search outcome

Medline: 12 papers of which 3 were directly relevant.

ICL: 30 papers of which no additional citations found.
Hand search: 1 additional citation found as it was referenced in one of the articles reviewed.

No high level evidence was found. The only peer reviewed papers available were 4 case reports, of which one was a prospective case series.

Relevant papers

Author, date and country	Study group	Study type (level of evidence)	Outcomes	Key results	Study weakness
DeVocht JW et al. 2005 USA	One 30-year-old female with 7-year history of TMJ pain and decreased mouth opening. The patient treated with an Activator instrument according to activator Methods International Protocol, including full spine and shoulder adjusting over 20 months.	Case study (level 4)	Patient's subjective pain levels, measured by the Visual Analog Scale and maximum pain-fee mouth opening. In addition to the patient's report of frequency of headaches and tinnitus.	During 5 first months the patient's pain levels decreased from 60 (on a scale from 0 to 100) to 9. Maximum mouth opening without pain measurement increased from 22 to 28 mm. Headache intensity and frequency diminished.	No conclusions can be drawn on the effectiveness or safety based on this single person study. There is no comparison group. The sample size is inadequate to evaluate the effectiveness of TMJ manipulation. A larger study sample and a control group are needed to validate and evaluate the reproducibility of this intervention. Since she was treated with full spine adjusting, differentiation of which specific intervention to have improved her condition is impossible.
DeVocht JW et al. 2003 USA	Nine adult volunteers with articular TMD. The TMD symptoms had to be articular in nature. All TMD cases that were evaluated to be only myofascial in nature were excluded. Participants were treated with an Activator instrument according to Activator Methods International Protocol, including full spine adjusting and addition direct treatment of the TMJ if indicated. TMJ adjustments were given on virtually every visit of every patient.	Prospective case series (level 3b)	Visual Analog Scale for TMJ pain (change from baseline to follow-up) and maximum active mouth opening without pain.	Based on the 8 participants that completed the study, the median Visual Analogue Scale for TMJ pain decreased 45mm. The median increase of pain-free mouth-opening was 9mm; all participants showed improvement.	No conclusions can be drawn on the effectiveness or safety based on this small case series. Only 8 participants gave useable data. There were no control group and therefore no blinding. This introduces considerable bias. Lack of randomisation and a control group preclude estimates of a placebo effect or natural course of the condition. In addition, all participants were treated with full spine adjusting making it impossible to differentiate which specific intervention affected the outcome.
Saghafi D and Curl DD. 1995 USA	A 21-year-old female with a 4 year history of right-sided TMJ pain and clicking, with limited mouth-opening. The patient was treated with TMJ manipulation and cervical manipulation. The first 3 visits she was only treated with cervical manipulation.	Single-subject case study (level 4)	Patient's pain level, presence of joint clicking upon mandibular opening and the amount of mouth-opening.	After 19 visits the patient was pain-free, and had no clicking in the joint upon mandibular opening. Mouth-opening increased from 25mm on the initial examination to 42mm on the last visit. No change in mouth-opening was seen following the first three visits where cervical manipulation was administered only.	No conclusions can be drawn on the effectiveness or safety based on this single person study. As with the studies above, there is no comparison group. The sample size is inadequate to evaluate the effectiveness of TMJ manipulation, and a larger study sample and a control group are needed to validate and evaluate the reproducibility of this intervention. Since there was no change in maximum mandibular opening from the 3 initial visits, cervical manipulation alone did not improve this patient's condition.
Nykoliation JW and Cassidy JD. 1984 USA	Two adults with TMJ-pain dysfunction syndrome. The patients were treated with distractive TMJ manipulation and cervical manipulation.	Two individual case studies (level 4)	Patient's pain level and patient's subjective experience of mandibular mobility.	Patient 1. reported to have less jaw pain, and more mandibular mobility after 3 manipulations. She was virtually pain-free after several months of treatments every two weeks. Patient 2. reported to be pain-free after 1 month (12 visits).	No extrapolations can be made on single individual case-studies. There were no objective measurements, only patients' subjective experience of increased mouth-opening. As mentioned with the studies above, the sample size is inadequate and there is no control group. Since both TMJ and cervical manipulation was administered it is impossible to differentiate which specific intervention affected the outcome.

Commentary

There is no high quality research done in the treatment of TMD by chiropractic manipulation. Although the case studies reported success in reducing pain levels and improving mouth opening, no extrapolations to the general population can be made on single individual case-studies. Therefore, no clear conclusions can be drawn as to whether high velocity low amplitude manipulation of the TMJ is an effective and safe procedure to carry out on patient presenting with TMD. This review highlights the need for further research in the area, preferably high quality controlled trials.

Clinical bottom line

There is virtually no high level evidence to support or refute HVLA manipulation of the TMJ in the patient with TMD. Reports of success in individual cases supports a therapeutic trial of HVLA for adult patients who present with TMJ dysfunction.

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DeVocht, J.W., Schaeffer, W., Lawrence D.J. (2005) Chiropractic treatment of temporomandibular disorder using the activator adjusting instrument and protocol. *Alternative Therapies in Health and Medicine*. 11(6):70-73.

Devocht, J.W., Long, C.R., Zeitler, D.L., Schaeffer, W. (2003) Chiropractic treatment of temporomandibular disorders using the activator adjusting instrument: A prospective case series. *Journal of Manipulative and Physiological Therapeutics* 26:421-425.

Saghafi, D., Curl, D.D. (1995) Chiropractic manipulation of anteriorly displaced temporomandibular disc with adhesion. *Journal of Manipulative and Physiological Therapeutics.* 18(2):98-104.

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Reprints & Abstracts

Clinical Sports Medicine Update
Management of Osteochondritis Dissecans of the Knee
Current Concepts Review

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Osteochondritis dissecans of the knee is being seen with increased frequency in pediatric and young adult athletes and is thought to be, in part, owing to earlier and increasingly competitive sports participation. Despite much speculation, the cause of both juvenile and adult osteochondritis dissecans remains unclear. Early recognition is essential. Whereas adult osteochondritis dissecans lesions have a greater propensity to instability, juvenile osteochondritis dissecans lesions are typically stable, and those with an intact articular surface have a potential to heal with nonoperative treatment through cessation of repetitive impact loading. The value of adjunctive immobilization, protected weightbearing, and unloader bracing has not been established. Skeletally immature patients with stable lesions that have not healed with nonoperative treatment should have consideration given to arthroscopic drilling to promote healing before the lesion progresses and requires more involved treatment with a less optimistic prognosis. Magnetic resonance imaging may allow early prediction of lesion healing potential. The majority of adult osteochondritis dissecans cases as well as those skeletally immature patients with unstable lesions and secondary loose bodies require fixation and possible bone grafting. Many unstable

lesions will heal after stabilization, but long-term prognosis is not clear. Chronic loose fragments can be difficult to fix and have poor healing potential. Results of excision of large lesions from weightbearing zones are poor. Chondral resurfacing techniques have limited long-term data for cases of osteochondritis dissecans in skeletally immature patients.

Class IV "High Power" Laser Therapy in Physical Medicine and Rehabilitation

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Abstract-- The trend in laser therapy for the past 10 years has been to increase power density and dose, since this has been shown to improve therapeutic outcomes considerably.[1] The first therapeutic laser in the U.S. was cleared by the FDA in 2002, and had an output of 5 mW of power.[2] Now, only 4 years later, several manufacturers have entered the marketplace and the power of FDA cleared therapeutic lasers can range up to 7500 mW.[3] That represents an increase in power of 150000% (Fig. 1).

Despite more than 35 years of experience with therapeutic laser devices, concerns remain as to the effectiveness of laser therapy as a treatment modality. Controlled clinical studies have demonstrated that while laser therapy is effective for some specific applications, the most common reason for poor clinical outcomes is related to low power or dosage.[1] The expansion of the healthcare providers armamentarium to include laser therapy for pain management, inflammatory reduction, and accelerated healing has "pointed to the need for higher output levels and, similarly, led to implementation of higher wavelengths with deeper penetration in tissue."[4]

Key words: Class IV laser therapy, high power laser therapy, LLLT, low-level laser therapy

Introduction

A great deal of misunderstanding exists among practitioners relating to the selection of a therapeutic laser device that will provide the deepest penetration and the greatest amount of stimulation for conditions routinely seen in practice. Given the parallels of x-ray and infrared (laser) physics, both of which are continuums of energy within the electromagnetic spectrum, it is a wonder why many practitioners remained confused about the three important parameters of therapeutic laser devices; power, wavelength and power density. Although these are not the only parameters, they are outlined in this article because of their frequent association in the literature, due to their influence on clinical outcomes.

The Importance of Power and Penetration

Cells and tissues that are ischemic and poorly perfused as a result of inflammation, edema and injury have been shown to have a significantly higher response to laser therapy irradiation than normal healthy structures.[5] Tina Karu, PhD, of the Laser Technology Center in Russia and affiliated with the University of California at Berkley, has researched the effects of light on the cell since the 1980's. She found there are photoreceptors at the molecular level that, when triggered, activate a number of biological reactions such as DNA/RNA synthesis, increased cAMP levels, protein and collagen synthesis, and cellular proliferation. The result is rapid regeneration, normalization and healing of damaged cellular tissue. Thus, light is a trigger for the rearrangement of cellular metabolism.[6]

Bjordal places the range of laser energy absorption (joules) by the skin and subcutaneous tissue to be in the range of 50% - 90%.[7] The amount of laser energy absorption increases as the wavelength decreases (Figure 2); therefore making higher wavelengths preferable for deeper stimulation of the physiological processes

necessary for decreases in pain, inflammatory reduction and accelerated tissue healing.

Tun'er and Hode state: "There is no point in increasing the dose if the wavelength has a low penetration factor; the penetration of the particular wavelength must be taken into account." [1] The laws of laser physics have demonstrated that the higher the wavelength, the deeper the penetration. Penetration is paramount in order to stimulate deep musculoskeletal, vascular, lymphatic and neurological structures.

Given the in-depth nature of x-ray physics and utilization as taught in most school curriculums, we can draw several parallels to further our understanding of laser physics. The mAs setting governs the quantity of X-ray photons produced a given period of time. This is also referred to as the dose. Therapeutic lasers deliver their dose by the amount of photons emitted secondary to the milliWatt setting over a given period of time. The higher the setting in both instances, the higher the dose.

X-ray penetration is governed by the kVp setting. In laser therapy, penetration is governed by the wavelength which is measured in nanometers (nm).[7] Both kVp and wavelength are affected by tissue density.

The most common musculoskeletal conditions that initiate a healthcare providers intervention are neck pain and low-back pain. Leading researchers published in the world's most respected peer-reviewed journals have identified the most common generators of pain in the cervical and lumbar regions. Bogduk et al have reported that the zygapophyseal joints of the neck were implicated most frequently in acute (traumatic) and chronic neck pain conditions.[8-11] Several authors have reported the most common tissue of pain origin in the low back to be the outer layer of the annulus fibrosis and PLL.[12,13] Given the depth of these documented structures lies below multiple layers of muscle and fascia in the aforementioned spinal regions, successful clinical outcomes in chiropractic dictate that a therapeutic laser device has the ability to penetrate multiple layers of biological tissue while simultaneously providing sufficient power to stimulate photoreceptors responsible for triggering positive physiological events for the reduction of pain, inflammation and accelerated tissue healing.

Class III or "low-level" lasers have a limited power output of up to 500 mW. As mentioned previously, therapeutic laser devices are now being manufactured to meet the needs of deeply seated conditions. These devices are referred to as Class IV, or "High-Power" therapeutic lasers, and have been cleared for use by the FDA up to 7500 mW.

Recently published systematic reviews of the literature have concluded that there is a lack of adequate evidence of effectiveness of Class III "low-level" laser therapy for treatment of musculoskeletal disorders,[14] arthritis,[15-18] and pain[19-25]. Recently reviews have also concluded that low-energy laser therapy (e.g., Microlight 830, Microlight Corporation of America, Missouri City, TX) is ineffective in treating carpal tunnel syndrome.[26,27] This should be of particular concern to the physical medicine and rehabilitation professions where these conditions are commonly encountered. Tun'er and Hode, have performed an analysis of a number of frequently cited studies on the effects of Class III, "low-power" laser therapy. The authors state: "In many of these studies, analysis uncovered one or more reasons for the negative findings reported, the most common being the use of extremely low doses."[1]

How Much is Too Much?

Manufacturers and proponents of Class III "low-level" laser devices often express concerns regarding inhibition of the healing process due to "over-stimulation" from increased treatment times or higher powered devices. However, reports of therapeutic laser devices having an inhibitory effect on cells has only occurred on thin tissue cultures in petri dishes (in-vitro) and lacks validation in human studies (in-vivo), with the exception granted for inhibition and suppression of depolarization of C-fibers resulting in a reduction in pain.[28-33]

As the interest level surrounding laser therapy continues to grow in the physical medicine and rehabilitation professions, one Class IV "High-Power" manufacturer[3] now includes the use of Gold Standard outcome assessment tools with their product, including an algometer[34-36] to measure changes in tissue sensitivity pre- and post-treatment, and patient questionnaires that quantitatively assess patient improvement in a variety of areas including, pain, function and quality of life. This Class IV manufacturer promotes the utilization of core set of measures published in the journal, SPINE, to validate the efficacy of laser therapy treatment.[37] These outcome assessment instruments measure the following five domains: back specific function, generic health status, pain, work disability, and patient satisfaction.[37] Perhaps in the future more therapeutic laser manufacturers will follow suit and expose their technology to scrutiny of scientific rigor for the benefit of those who would choose laser therapy as an adjunct to chiropractic care.

Dr. Jan Tuner, President of the Swedish Laser Medical Society and renown lecturer and author on the topic states: "I can see two alternatives for myself: to speak up and start a conflict within the laser community, maybe discrediting the therapy itself in the eyes of the general public or to keep quiet and let US practitioners pay a lot of money for very low-powered lasers, leaving us with dissatisfied customers and discredit from those who are supposed to use laser therapy in medicine."[1]

A Look to the Future

Tune'r and Hodes position on Class IV "High-Power" lasers is reported as: "For the moment, we must rely on our own clinical experience. That experience, however, is so encouraging that it cannot be ignored, even with lack of scientific support. It would appear that "high-powered" therapeutic lasers will be able to further expand the scope of laser therapy."[1] Given that the number one reason for poor clinical outcomes is low power and poor penetration, most healthcare providers utilizing low powered devices agree with these pioneers in the field.

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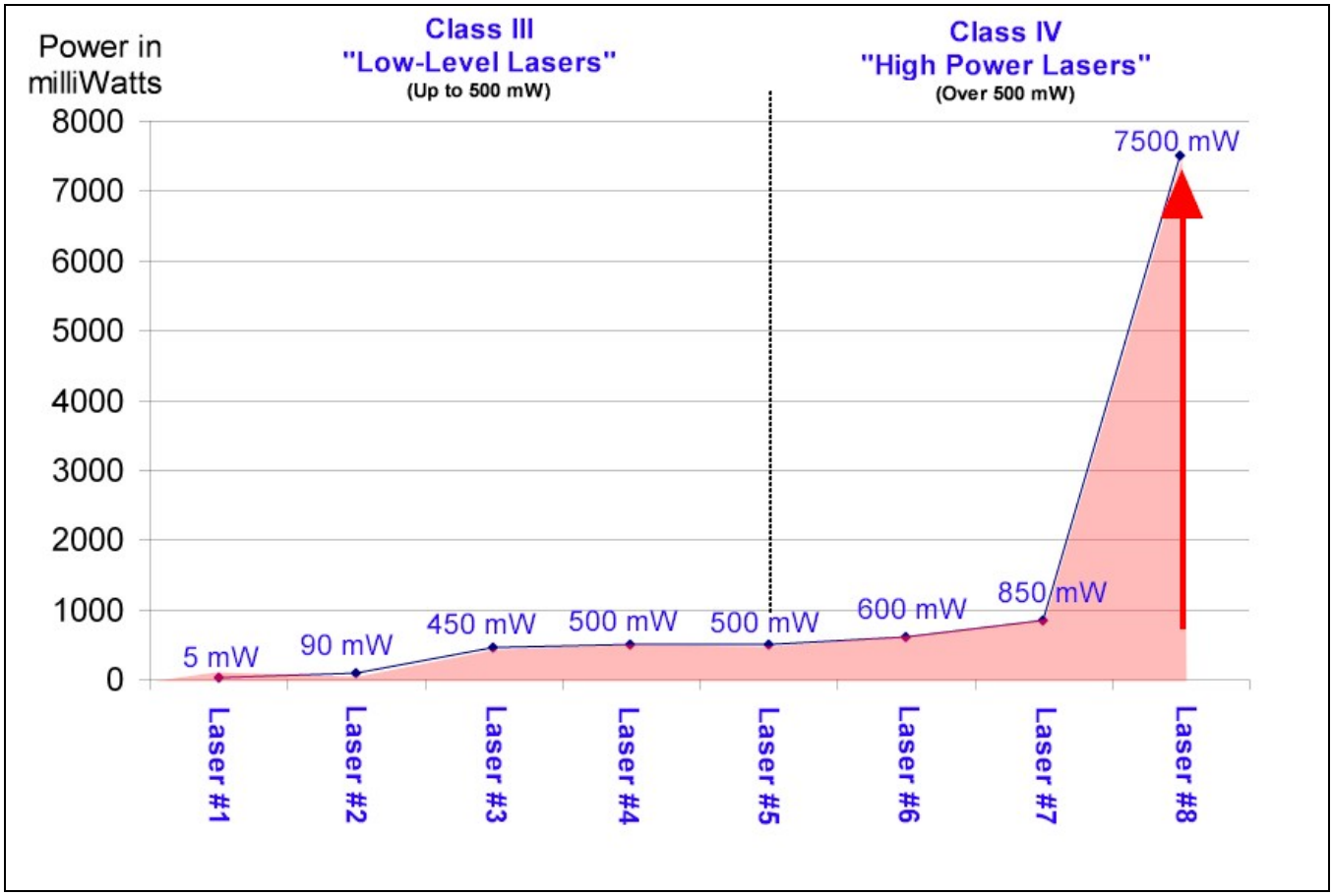

Figure 1

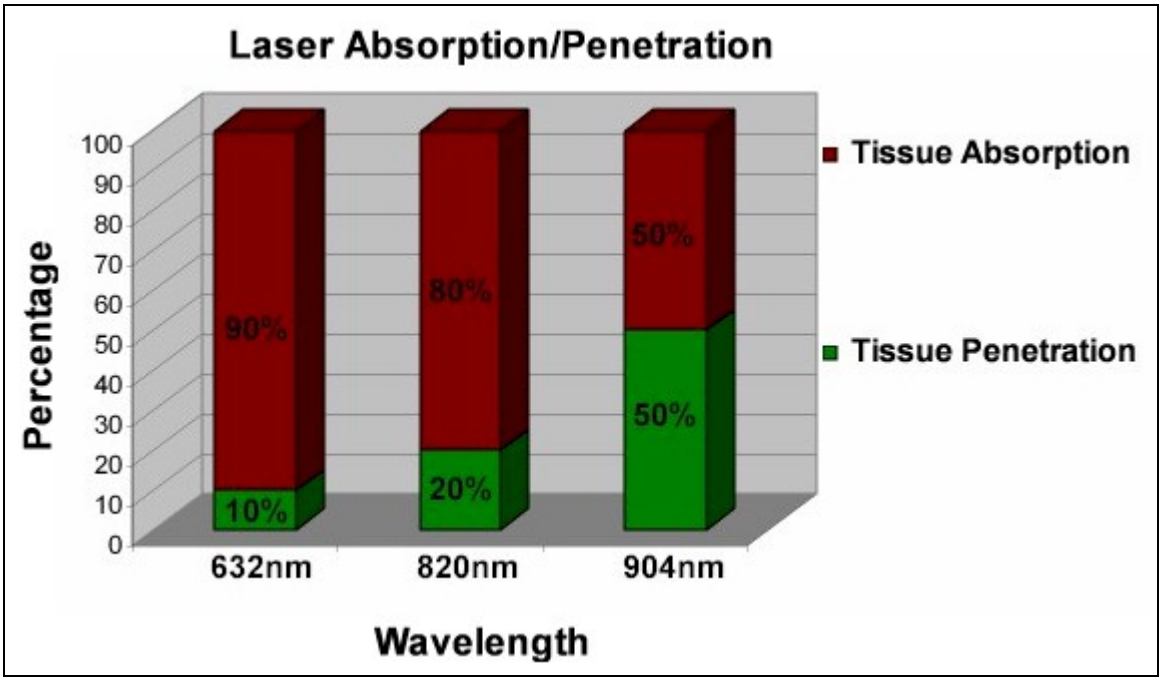

Figure 2

Case History

Clinical Pearl

By Loren Miller, DC, FACO

For knee adjustment:

I thought something in the neighborhood of the quick adjustive thrust applies an instantaneous stretch into the muscle spindles involving the knee joint complex.

This event results in an immediate activation of the Type 1a and type 2 afferent nerves serving the muscle spindle and the fusiform muscle fibers in those muscle complexes. In addition to this reflex activity, the golgi tendon organ is activated, initiating an impulse along the 1b afferent nerve, that reestablishes the tone in the knee complex. The greater the number of receptors brought to threshold the greater the effect.

Manual osseus adjusting should therefore have a has a tendency to initiate a greater number of spike trains at the receptor consequently leading to an increased spatial effect on the joint complex.

*Fizgerald and Curran. 2004,

Review of the Literature

Current Events

President's Message

American College of Chiropractic Orthopedists (ACCO Spring Convention will be held at the Wigwam Resort in Phoenix, Arizona April 27-29, 2007. This is a call for papers to be presented. Details are on the website.

Attribution

Ed Payne, FCER