FOUR LEG NEWS

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ROUND TWO… HELLO AGAIN

Here we are with even more amazing shock wave research. I'm going to start this 'introduction' off with a wee literature review (and a bit of a rant…). Enjoy this issue!

Cheers,

Laurie.

Shockwave and the Spine

As I have eluded to and demonstrated in my L-S Disc Disease video set, I love my shockwave for lumbosacral disc disease. And I first heard of using it for L-S problems when visiting Fitzpatrick Referrals in the UK back in 2013. I went home and started trying it, and I was impressed.

So here I am, over a year later, actually trying to FIND research to validate this use. And since this is rather novel… I've not found tons. In fact my search was dismal! But here is what I found.

One review paper (Seco et al) concluded that there was not enough evidence to support shock wave for treating low back pain. I guess if next to no studies have been done on it, then that statement is correct. But if we just go with 'evidence-based' medicine… then we will never learn what new therapies could be utilized! And we can't count on institutional researchers to 'guess' at what therapies to study! (Argh… I will try not to rant about how evidence-based practice has the potential to halt the progression of medicine!)

I found one paper (Marwan et al) that used shockwave on two cases of men with coccygeal pain. It worked for those fellows! I bet they're happy that their health care providers thought 'outside of the box!'

Then I found a paper that I wasn't going to mention (Lee TC et al) as I didn't think it fit with this grouping… but heck, I only found 4 papers so why not include it!!!??? So this group of researchers used shockwave on rabbits that had undergone spinal fusion! (That sounds gutsy to me!) End result? Yep… it helped to promote the spine to fuse. (Now, don't get freaked out… I don't think that this means that all shock wave therapy will result in spinal fusion… just that it helped to progress the natural healing of the region, based on what the body was trying to accomplish already.)

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Shockwave and the Spine continued …

Lastly… I found a 2014 study (Lee S et al) in a physiotherapy journal. This group used SWT to see if it would help with dynamic balancing ability of patients with chronic low back pain. (I never would have thought about studying THAT!) Bottom line the group that received SWT along with their exercise prescription (both groups did the exercises) showed significant improvements after the intervention (2x/week for 6 weeks). Ha! Good on ya, Lee S and colleagues for trying something new and reporting your findings! Prior to them having the guts to try this, make a study of it, and report their findings, we would have had to live with the evidence of 'Nah… nothing to support it's use for spinal conditions!'

So there you go!

References:

Lee S et al. Effects of Extracorporeal Shockwave Therapy on Patients with Chronic Low Back Pain and Their Dynamic Balance Ability J Phys Ther Sci. 2014, 26(1): 7 – 10.

Seco et al. The efficacy, safety, effectiveness, and cost-effectiveness of ultrasound and shock wave therapies for low back pain: a systematic review. Spine J 2011, 11(10): 966 - 97.

Marwan Y et al. Extracorporeal shock wave therapy relieved pain in patients with coccydynia: a report of two cases. Spine J 2014, 14(1): 1 - 4.

Lee TC et al. Application of extracorporeal shock wave treatment to enhance spinal fusion: a rabbit experiment. Surg Neurol 2008, 70(2): 129 - 134.

Shockwave and Osteoarthritis

The goal of treating osteoarthritis (OA) is finding ways to decrease joint pain and dysfunction and prevent and slow the cartilage degeneration.

The effects of shock wave on cartilage, joints, and functional measures relative to joint osteoarthritis have been studied in small numbers in human and animal subjects. Some highlights have been included here.

In Vitro Studies

In vitro studies have found variable effects of shock wave on cartilage. One study (Benson et al. 2007) on equine articular cartilage found that radial shock wave decreased new synthesis of glycosaminoglycan at 48h post-application using 500 impulses at 2.5 bar, however 2000 & 4000 impulses had no effect (positive or negative). Even the authors stated that what can be concluded from this in regards to clinical application is questionable. Using the same methods as above, the same research group (Byron et al. 2005) had previously found that radial shock waves increased membrane permeability of equine chondrocytes in a dose-dependent manner (greater permeability with greater number of impulses). Furthermore, treatment at higher pulse doses had a small but significant negative impact on chondrocyte viability. Radial shock waves do not appear to acutely disrupt integrity of articular cartilage at the pulse doses used in this study. These papers also noted that focused shock wave has also been found to increase cell membrane permeability.

Experimentally induced OA studies

In cases of experimentally induced osteoarthritis, rat, rabbit, and horse subjects have been utilized. Findings indicate (Zhao et al. 2012) that SWT reduced nitric oxide within the treated joints and had a significant decreased the severity of cartilage lesions (at a 4-week & 8-week follow up). (Radial SWT was applied at the time of OA-induction, and three times thereafter within 1 week. Dosage used: 1.5 bar x 600 impulses.)

Wang et al (a prolific researcher & research group in the area of SWT) has a number of studies in this category. This group has used focused shock wave and found that aiming the shock waves at the subchondral bone (i.e. medial aspect of the tibia – using 800 impulses at 0.18 mJ/mm2 in a single session 12 weeks after surgery & evaluated at 24 weeks) resulted in only very subtle OA changes compared to the non-SWT group, without deterioration in bone mineral density, bone strength, or cartilage degeneration. They additionally found an increase in chondrocyte activity compared to the control group, and significant improvements in bone remodeling. The group later researched an earlier application of SWT (1-week post-surgery) and concluded that SWT was effective in preventing OA of the knees in rats. And then yet in another in the series of papers by Wang et al., they looked at chondroprotective effects of SWT, and found that after a single session (800 impulses at 0.22mJ/mm2, same location as described above), the most beneficial effects of SWT in the OA knee occurred at 4 weeks after shockwave application. Such effects seemed to continue until 12 weeks.

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Shockwave and Osteoarthritis continued …

The researchers remarked that results after multiple treatments may differ, and that additional studies are needed to establish the therapeutic regimen of SWT in OA changes of the knee. Lastly, they also researched location of SWT administration and found that treatment to either of the distal femur, proximal tibia or both has identical results as the afore mentioned studies. *(Which leads me to say that perhaps we need to aim the SWT at the subchondral bone as compared to the joint itself for best results! - LEH)* But just to show the other side of the coin, one rat study (Mayer-Wagner S et al.) that used 1500 shocks at 0.5mJ/mm2 to the femoral heads found alterations of hyaline cartilage on a molecular and ultrastructural level, similar to changes described in the early phase of OA. They cautioned that high-energy ESWT might cause degenerative changes.

Equine research has had variable findings. Frisbie et al reported that use of focused shockwave into OA-induced carpal joints (two applications, on day 14 & 28 post-surgery, 2000 pulses at 0.14mJ/mm2 and 1500 pulses at 0.15mJ/mm2 respectively) had no impact on disease modifying markers or cartilage inspection, however there was a significant improvement in the degree of lameness in the SWT-treated horses. The same researchers (Kawcak et al.) in a follow-up study using the same parameters as above did find an increase in serum biomarkers indicative of bone remodeling.

Studies Related to Function

And lastly, good things have been found with use of SWT from a clinical & functional perspective! Dahlberg et al treated chronic OA stifles of dogs (1500 impulses at 0.15mJ/mm2 with a focused SW unit) on a weekly basis for three weeks, with rechecks (force plate, ROM, & client questionnaire) at each appointment and at day 98 of the study. They found an increase in peak vertical force and ROM in the treated dogs, although the numbers were not statistically significant. However the dogs treated with sham-SWT did not improve or worsened. The client questionnaire showed no difference between groups (*NOTE: It has been shown that subjective client feedback does not compare with veterinary evaluation or objective measures – LEH.*) Mueller et al studied canine hip OA and the application of radial shockwave (2000 shocks at 2 bar, weekly for 3 weeks). They found significant improvements in force plate measures of vertical impulse and peak vertical force at both the 4-week post treatment mark and the 3-month post-treatment mark. However, after 6-months the positive effects had ceased. One interesting study (Ochiai et al.) showed that SWT is a useful treatment for knee OA in rats, with improvement in walking ability and reduction of calcitonin gene-related peptide (CGRP) in dorsal root ganglion (DRG) neurons innervating the knee. (The study used 1000 impulses of Focused SWT using 0.08mJ/mm2 on the medial side of the knee.) This is interesting as it is an indirect method by which SWT may have a positive impact on pain and dysfunction in cases of OA joints.

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Shockwave and Osteoarthritis continued …

Conclusion

Overall, while no review papers could be found that summarize the effects or value of SWT on osteoarthritic joints, there are enough individual studies to support its use and to garner information on dosing and effects.

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Shockwave and Neurogenic Hypertonia / Spasticity

Several studies could be found to indicate a usefulness of ESWT for the improvement of spasticity. Research was conducted using both FSWT and RSWT. Conclusions were as follows:

- ESWT has a significant effect on improving spasticity in patients after brain injury.
- Shockwave therapy may be a useful tool for improving spasticity and gait pattern in children with hemiplegic cerebral palsy.
- RSWT was found to reduce pain and muscle tone in multiple sclerosis patients without adverse effects. The lack of RSWT effects on spinal excitability supports the idea that RSWT is likely to act on non-reflex hypertonia, for example reducing muscle fibrosis.
- More consistent and long lasting results were obtained in the lower limb muscles of patients affected by cerebral palsy with both FSWT and RSWT and in the distal upper limb muscle of adult stroke patients using FSWT. The most probable mechanism of action is a direct effect of shockwaves on muscle fibrosis and other non-reflex components of muscle hypertonia.

Studies looked at providing weekly ESWT session for anywhere from a month to 3-months in duration before testing, but the following was also found:

- A single session of RSWT realized a significant reduction in the spasticity of plantar flexor muscles in children with cerebral palsy, which remained at the 4-week follow-up.

References:

1. El-Shamy SM, et al. Effect of extracorporeal shock wave therapy on gait pattern in hemiplegic cerebral palsy: A randomized controlled trial. Am J Phys Med Rehabil 2014, 93(12): 1065-1072.
2. Lee JY, et al. Effects of extracorporeal shock wave therapy on spasticity in patients after brain injury: A meta-analysis. J Phys ther Sci 2014, 26(10): 1641-1647.
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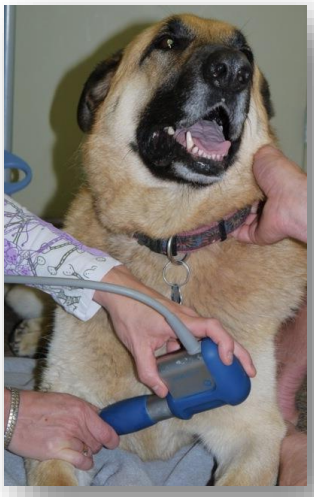

Shock Wave and Plantar Fasciitis

Plantar fasciitis is a common foot disorder, manifest by pain originating from the insertion of plantar fascia near the medial tubercle of the calcaneus. Its pathophysiology is not clear but likely a result of overuse or poor foot biomechanics,

Treatment for plantar fasciitis include night splinting, stretching exercises, and local corticosteroid injections. Recent studies find that shock wave therapy is an effective therapy for plantar fasciitis.

Pain and Function

Chang et al undertook a meta-analysis of focused shock wave therapy using different energy levels and determined that the clinical success rate of treatment (i.e. function) was not related to intensity of the shockwave application, however higher energy flux density might reduce pain scores more. Statistical analysis found that for every 0.1mJ/mm2 increase in intensity there was a small associated decrease in reported pain. They recommend treating with medium-intensity focused shock wave therapy (.25mJ/mm2), to provide the highest energy density (without the requirement of local anaesthesia).

Grecco compared radial shock wave (three applications of radial shock wave at 2000 shocks, 3 bar and 6 Hz, once weekly) to conventional physiotherapy (ultrasound, exercise and home-based stretching). At the 12-month follow-up, both treatments were found to be effective for improving pain and functional ability, although the shock wave therapy resulted in a faster response.

For patients with chronic proximal plantar fasciitis, 5 shock wave sessions of 2500 shocks per session at a pressure of 2.5 bars (radial shock wave) resulted in a statistically significant improvement in pain and function both at the end of treatment and at 1-year follow up (Ileava).

To test whether two sessions of radial shock wave therapy would be effective for treating plantar fasciitis Ibrahim et al undertook a study involving patients with chronic, unilateral plantar fasciitis. Shock wave therapy was applied in two, weekly sessions providing 2,000 impulses, 3.5 bar, at 8Hz with a calculated energy flux density of 0.16 mJ/mm2 per session. Both pain and function scores improved at 4, 12, and 24 weeks post baseline when compared to a control group.

Radial versus Focused Shock Wave

In comparing RSWT and FSWT for plantar fasciitis Chang et al determined that the probability of having the greatest success for pain relief was the highest in patients receiving radial shock wave therapy. Next successful in regards to the probability calculations was low-, then medium-, and finally higher-intensity focal shock wave therapy. The author noted the advantages of radial over focal shock wave therapy were the ability to target a broader treatment area, less precise focusing, and no need for local anesthesia.

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Shock Wave and Plantar Fasciitis continued …

In contrast an 8-week study (Lohrer et al) comparing focused shock wave therapy (2000 impulses at 0.20 mJmm2) to radial shock-wave therapy (2000 impulses, 3 bar, 10Hz with a calculated EFD of 0.17mJ/mm2), administered weekly for three weeks. They found a small superiority to focused SWT treatment over the radial SWT.

Conclusion

Quantitative evidence supports the use of shock wave therapy for plantar fasciitis. It is a safe non-invasive method of treatment and an effective treatment for chronic plantar fasciitis in patients who fail conservative treatment modalities.

Recommendations in the literature include using medium intensity for practitioners already owning focal shock wave equipment. For those intending to purchase a unit Chang et al recommend a radial shock wave unit because of its lower price and demonstrated effectiveness for plantar fasciitis specifically.

References:

1. Chang KV et al. Comparative Effectiveness of Focused Shock Wave Therapy of Different Intensity Levels and Radial Shock Wave Therapy for Treating Plantar Fasciitis: A Systematic Review and Network Meta-Analysis. Arch Phys Med Rehabil July 2012, Vol 93, 1259-1268.

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Shock Wave and Other Soft Tissue Tendinopathies

Shock wave therapy can be used to treat other tendinopathies. Examples include:

Greater Trochanteric Pain Syndrome

Greater trochanteric pain syndrome is a painful overuse syndrome and often a manifestation of underlying gluteal tendinopathy.

In one study (Furia et al) patients received either low-energy shock wave therapy without anaesthesia (2000 shocks; 0.18 mJ/mm2; total energy flux density, 360 mJ/mm2) or non-surgical therapy. Data analysis showed the percentage of patients with excellent or good hip function scores 12 months after treatment was statistically greater in the shock wave therapy than in the non-surgical therapy group.

Rompe et al compared a home exercise program to a single corticosteroid injection or repetitive low-energy radial shock wave. Outcome measures were degree of recovery and pain. At a one month assessment corticosteroid injection was found to have better results than home exercise or shock wave therapy, however by 4 months, and up to 15 months post therapy shock wave had better results than home exercise and corticosteroid injection.

Conclusions: Low energy FSWT and radial shock wave therapy are effective and safe treatments for greater trochanteric pain syndrome.

Lateral Epicondylitis

In a review of focused and radial shock wave Speed found conflicting evidence regarding the use of shock wave therapy in common extensor tendinopathy of the elbow (tennis elbow). Three of five studies indicated a lack of benefit, although, two studies found focused shock wave therapy to be superior to placebo.

Using radial shock wave, Ilieva et al performed 5 weekly procedures providing a total number of 2500 shocks at 2 bar, (1500 shocks of 5 Hz frequency followed by 500 shocks of 10 Hz frequency applied to the lateral epicondyle and 500 shocks of 5 Hz frequency applied along the muscles near their insertions.) Evaluation of pain and function and limitations found a significant decrease in pain and improvement in function from before therapy to one-year evaluation.

Conclusion: Further research is required, however radial shock wave therapy may be effective in the treatment of lateral epicondylitis that has not responded to other conservative methods of treatment.

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Shock Wave and Other Soft Tissue Tendinopathies continued …

Hamstring Tendinopathy

Proximal Hamstring Tendinopathy (PHT) is an overuse syndrome of unknown origin associated with a degenerative process of the hamstring tendons.

Cacchio et al evaluated radial shock wave against traditional conservative therapy in 40 professional athletes with chronic hamstring tendinopathy.

Shockwave therapy consisted of 2500 impulses per session, using 4 bar, (equivalent to an EFD of 0.18 mJ/mm2) without anesthesia, for 4 weeks and conservative treatment consisted of nonsteroidal anti-inflammatories, physiotherapy and hamstring exercise program.

Outcome was assessed by evaluating pain, limitations to activity, and degree of recovery. At three months there was a significant decrease in pain measured on a visual analog scale and a higher degree of recovery, and return to sport amongst patients in the shock wave group than those receiving conservative treatment. None of the athletes in the conservative treatment group had been able to return to their previous level of sports activity by the three month reevaluation.

The authors concluded that shock wave therapy is a safe and effective treatment for chronic hamstring tendinopathy.

Shoulder and Neck Pain

Did you know that musicians suffer shoulder and neck problems related to playing their instruments? In this study, the effect of radial shock wave therapy plus trigger point therapy on the symptomatic sites, quality of life, and playing habits of musicians was compared to a placebo control group of musicians. When pain and function (especially related to playing an instrument) were evaluated both shock wave and placebo groups reported temporarily decreased shoulder and neck pain, however this was only found to be significant in the treatment group.

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Shock Wave and Other Soft Tissue Tendinopathies continued …

Patellar Tendonipathy & Biceps Tenosynovitis

Van der Worp et al compared the treatment of patellar tendinopathy using radial or focused shock wave therapy. Three treatments were provided to each group, along with an eccentric training program. Both groups improved and there was no difference in effectiveness between the focused and radial shock wave therapy.

Liu et al studied the effect of radial shock wave therapy for bicipital tenosynovitis. They used 1500 shocks, at 3 bar and 8Hz for four weekly sessions. However both the RSWT group and the control group that received sham shockwave significantly improved in pain and function! These researchers could therefor not recommend radial shockwave for bicipital tenosynovitis.

Cellulite

One study (Angehrm et al) investigated the effects of low-energy shock waves on the collagen structure of skin with cellulite. Shock waves were applied to the lateral thigh twice a week for six weeks (96000 shots per person). Collagenometry indicated that low-energy shock waves may be effective in treating cellulite. Seven of the twenty one study participants reported an improvement at the end of treatment. At two month recheck six participants reported continued improvement, ten reported no change and five a recurrence. Some participants found the treatment to be painful.

However, Schlaudraff et al, found an improvement in mean cellulite grades when using radial shock wave. Treatment was conducted twice a week for four weeks using 15000 shocks per session with 3.5 – 4 bar at 15Hz. And, the outcome was not dependent upon the patient's individual cellulite grade at baseline, BMI, weight, height, or age.

(Laurie's commentary – Guess what I'll be trying over my lunch breaks!!!)

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Shock Wave and Other Soft Tissue Tendinopathies continued …

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