



Electrotherapy News



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Welcome to the (delayed) second edition of Electrotherapy News. There were some significant distribution problems with the first issue that I hope to have overcome this time round.

Web Sponsor

The web site is proving to be rather popular at the moment - which I take as a complement - but it is costing a significant amount of money to keep it going (it is not a part of my job and is not directly supported by the university - it is something that I do in my 'spare time' ho ho ho!!!

I have been in preliminary discussions with several potential sponsors, looking for somebody who would support the venture without trying to control the web site content - I am fiercely independent and hope to keep it that way. Anyway, it looks like somebody might be up for some support and apart from a banner or two, they don't appear to be looking at changing content or editorial control. If this all works out, then I guess you'll spot the modification when you go to the site next. If no joy, then there may not be a site for you to go to!

Recent Developments Electrotherapy Guidance

There have been a good number of electrotherapy related papers out recently, and I have included reviews and comments about several of them in the pages that follow. In addition, the group of 'experts' that have been looking at the Dangers and Contraindications guidance (on behalf of the Chartered Society) have almost completed their work. We have been through all the modalities looking at what actually is (and is not) a contraindication, a danger, a precaution etc based on published evidence where we have found it and on expert opinion where none other than cross referencing between the standard texts.

I am not sure of the actual publication date (I have been going on about it since writing started in 1998!) but I hope for everybodys sake that it will be soon. Will put a note up on the web site as soon as it is available. In the meantime, there is a contraindications grid on the website which summarises some of the key issues. I posted it up there in July, but modified it again this month - worth checking to see if you have the current version.

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Recent paper Muscle injury and repair

Some of you will know that my main two interests are electrotherapy and tissue repair, and I have an ever growing collection of papers from both arenas. This paper is a great read for any of you involved in soft tissue / musculoskeletal work. **Jarvinen et al (2005) Muscle Injuries: Biology & Treatment. American Journal of Sports Medicine 33(5);745-764.** It is not a short paper, but it does provide a quality review of some of the more recent work in the field, and furthermore, it combines a review of the current state of the art with clinically relevant information. The front end of the paper goes through an up to date story of injury, the local consequences, taking the reader through the repair phases. There wonderful sections on Growth Factors (p748 and again p759), angiogenesis as an essential component of repair (p752) and some fascinating review material of the role of Satellite cells, myofibre regeneration and their role in muscle repair (p749). The later sections are concerned with treatment and although one might disagree with parts of some sections (e.g. NSAID's), there is some well presented material and for any therapist or practitioner involved in soft tissue repair and treatment, it should be an essential read.

Recent paper Tendon injury

Following on from the Jarvinen et al paper, there is an interesting publication that actually came out last year, but again, throws up some sound points with regards damage and repair in tendon and synovium. **Darmani et al (2004) Expression of nitric oxide synthase and transforming growth factor-beta in crush injured tendon and synovium. Mediators of Inflammation 13(5/6);299-305.** There have been several interesting papers over the last couple of years that have challenged some of the long held concepts with regards tendinitis – especially the chronic version), but this paper looks at some particular growth factors (especially TGF Beta) and their role in the reactions after injury. The growth factors generally, although complex, are worthy of attention in that (a) they have a highly significant impact on the processes of inflammation and repair and (b) a growing number of therapeutic interventions have been shown to influence their synthesis and release. This paper does not deal with the therapeutics as such, but does demonstrate the complex behaviour of some growth factors, their relationship with nitric oxide (also receiving a deal of attention these days) and the process of recovery & repair following injury. Of particular relevance to therapists is the relationship between these elements and the development of adhesions.

Recent paper . . . Myofibroblasts

The myofibroblast is an often under rated wee beastie involved in tissue repair. Much of the early work on its role, behaviour and control related to open wounds and skin damage. It has been shown however to have a significant impact on repair in musculoskeletal tissues, and a recent paper by **Desmouliere et al (2005) Tissue repair, contraction and the myofibroblast. Wound Repair and Regeneration 13(1);7-12** illustrates their importance in these processes. It is not a long paper, but makes for an excellent read. The myofibroblast is strongly influenced by various of the growth factors and several therapies (including ultrasound for example) have also been shown to influence its behaviour.

Interferential Therapy the 2 pole / 4 pole debate . . .

There has been a deal of confusion over the years with regards several aspects of interferential therapy (IFT), and the arguments over whether 2 pole or 4 pole is the better form continue to this day. Essentially, the nerve doesn't actually care how many electrodes you use, but at the end of the day, it cares about whether it has been stimulated or not. A paper last year investigated the issue and makes for another good read ; **Ozcan et al (2004). A comparison of true and pre-**

modulated interferential currents. Archives Physical Medicine and Rehabilitation. 85(3);409-415.

The authors investigate whether there is in fact any difference between the measured effects of using 4 pole (or true interferential – where the current is modulated within the tissues) versus 2 pole (or pre modulated – where the current is modulated within the machine). The argument about 4 pole being both ‘true’ interferential and more effective versus the ‘not proper’ interferential achieved with 2 pole are pretty much blown away by the findings from this paper. The authors found no significant difference between the two application methods against numerous outcomes. In fact, the 2 pole intervention gave rise to lower levels of patient discomfort and for some outcomes, actually gave better results. Hopefully this will help to put to bed, once and for all this long lasting ‘old wives tale’ (pardon my non politically correct phrase – it being both ageist and probably sexist!).

Pulsed Shortwave Therapy and Osteoarthritis

There have been numerous papers over the last couple of years relating to pulsed shortwave therapy (PSWT), and in fact there is a series coming out from this research unit over the next year (Al Mandil and Watson) as I have a long standing interest in the therapy. This paper – **Callaghan et al (2005) An evaluation of pulsed shortwave on knee osteoarthritis using radioleucoscintigraphy: a randomised, double blind, controlled trial. Joint Bone Spine 72;150-155** is one that demonstrates no apparent beneficial effect – just in case you thought that I only ever cite papers that show electrotherapy in a positive light! In this RCT a group of patients with OA knee were exposed to either a low power (10W mean power), a high power (20W mean power) or placebo treatment regime. The outcomes used included pain, ROM, muscle strength, times walk and nuclear medicine scanning. There were no pre-post treatment differences between the groups and the scanning demonstrated no significant change in the inflammatory state. This is not, in my view, a negative outcome in that it demonstrates that using these outcomes measures, treatment with this modality at these doses appears to have no useful beneficial effect. This does not mean that PSWT itself is a ‘useless’ modality, nor even that it does no good in OA patients. In the studies that I mentioned above, we conducted a significant series of investigations in the lab with ‘normals’ and with the same machine and same test equipment on patients with OA knee. The results demonstrated quite clearly that the same applied power had measurably different effects on the two populations – something that has been hypothesised for a good while, but that has now been demonstrated. The effects of electrotherapy modalities are not simply a matter of doing treatment X to patient group Y in order to get result Z. There are dose and modality related differentials plus of course the effect of differences between individuals. This was a well conducted trial, and the outcome is important in this clinically it at least identifies what appears not to work.

Another OA . . . but this time with Ultrasound

Interesting paper earlier this year in Archives Phys Med which looked at the effect of ultrasound as a means to increase the effectiveness of isokinetic exercise for patients with OA knee (**Huang et al 2005 Use of ultrasound to increase effectiveness of isokinetic exercise for knee osteoarthritis. Archives Physical Medicine and Rehabilitation 86(8);1545-1551**). The authors compared the effects of using either continuous or pulsed ultrasound in combination with an isokinetic programme. There were a series of outcome measures and the ultrasound was delivered at either 1MHz, 1.5 w/cm² continuous or 1Mhz, 2.5W/cm² pulsed with 25% duty cycle. All groups (exercise alone, exercise with continuous US an exercise with pulsed US) improved, but the two US groups did significantly better, and of the US groups, the pulsed group did better. The treatments were 3 times weekly for 8 weeks at these fairly high intensities, but the results were clearly significant. 120 patients participated in the study, so it is not a small trial and well worth a read.

Ultrasound again . . . but this time with Ligament healing

As you may be aware, I have been talking for some time about the differential effects of various modalities based on energy absorption capacities. Ultrasound has been demonstrated to be best absorbed in dense collagenous tissue, and hence this is where it is most effective. Several studies (e.g. Wilkin et al 2004) have demonstrated little or no real beneficial effect of the modality immediately following a contusion / crush injury of muscle (in a rat model). This does not mean that US fails to work – it simply means that it works best in the tissues that absorb the energy, and freshly injured muscle does not fall into that category. A nice paper by **Sparrow et al (2005) The effects of low-intensity ultrasound on medial collateral ligament healing in the rabbit model. American Journal of Sports Medicine 33(7);1048-1056** demonstrated how effective US can be when applied to tissue that does absorb the energy. The treatment was applied on alternate days for a total of 6 treatments. Ligaments from the treated animals were larger in area, achieved a greater load before failure and had greater energy absorption capacity than untreated ligaments. The relative proportion of Type I to Type III collagen was greater, and those of you that have followed the ongoing discussions with regards collagen types in repairing tissue will recognise the potential benefits of this finding. Although it is an animal model study rather than a human/patient trial (you will see from the methodology why that is – sacrificing patients at the end of the treatment series is not popular with the ethics committees!!! – the findings are worthy of note.

Back to muscle injury . . . and Ultrasound . . .

Following on from the Sparrow et al study above, and linked to the Wilkin study (2004), **Markert et al (2005) Nonthermal ultrasound and exercise in skeletal muscle regeneration. Archives Physical Medicine and Rehabilitation 86(7);1304-1310** highlights the points made above. Following a similar procedure to Wilkin et al, the researchers generated a 'standard' contusion injury in rats and evaluated the effect of exercise and nonthermal ultrasound on the regenerative capacity of the damaged tissue. Four groups were evaluated using the obvious combinations (Ex and US; No Ex and No US; No Ex and US; Ex and No US) and the results demonstrated no significant differences between the groups. What this says about exercise, I'll leave to you – or maybe to another time – but what it says about US is that it is not effective in treating muscle immediately post injury, certainly in relation to the outcome measures evaluated – muscle mass, contractile protein concentration, fibre cross sectional area, nuclei per fibre and myonuclear density. The US in this instance was applied at 3MHz using 0.1W/cm², continuous, 5 minutes.

Interferential therapy for OA knee pain how strong does it need to be?

Almost the last paper for this issue, this one by **Defrin et al (2005) Segmental noxious versus innocuous electrical stimulation for chronic pain relief and the effect of fading sensation during treatment. Pain 115;152-160**. Interferential was applied at the painful area in 4 groups of patients with painful OA knee. 2 groups received the stimulation at a 'noxious level (lucky old them – which was 30% above the pain threshold). The other 2 groups received their stimulation at 30% below the pain threshold. Some patients increased the stimulation as it faded during the treatment and the other groups let it fade and made no current intensity compensation. A fifth group received sham stimulation and a 6th group got nothing and acted as a control. There were a good range of outcome measures, including pain, ROM and morning stiffness. Both stimulation levels significantly decreased pain levels, morning stiffness and ROM compared with the controls. The noxious stimulation levels did this significantly more effectively than the lower level stimulation. Interestingly, there were no differences in the outcomes for the groups that adjusted the stimulation levels (turn machine up when sensation starts to fade) versus those that did not. The authors conclusion was that the treatment was effective, that the stronger stimulation was the more effective of the two and that the fading sensation did not appear to make a difference (contrary to current under-

standing). I would be interested to know of any other work that has evaluated the fading sensation aspect – I'll go and have a look for some more – but if you are treating patients with OA knee, this is one to consider.

Last one for this issue Laser Therapy and Pain Relief

From the many, many papers that I could do a thing on, the last one this time comes from some laser work which is fascinating, and serves to support other findings that have been published over the last 5 years or so. Elke Vinck has produced several interesting papers over the last few years, but this latest one (**Vinck et al (2005) Evidence of changes in sural nerve conduction mediated by light emitting diode irradiation. Lasers in Medical Science 20;35-40**) provides some useful evidence with regards the effect of laser on nerve conduction capacity. How laser achieves pain relief was originally put down to its effects on the inflammatory events and stimulation of tissue repair. It was suggested several years ago (by Baxter amongst others) that the therapy could be working by having a direct effect on nerve conduction. This paper evaluates just such a phenomenon. An RCT design was used to measure antidromic conduction of the sural nerve in 64 healthy volunteers. The subjects were divided into two groups – one receiving the laser therapy (2 minutes, continuous power output at 160mW giving 1.07 J/cm²) whilst the other group were sham irradiated. The results show that the nerve conduction characteristics were changed by the therapy on an almost immediate and localised level. Both conduction latency and velocity were affected and this may have some significant implications for the therapeutic use of laser as part of a pain management regime.

OK, that will do for now. If you have any comments, issues or complaints, please do e mail. The address as before is :

electronews@electrotherapyonline.co.uk

All being well, this should have come directly to those that have signed up for the newsletter. I'll put a copy on the web site (www.electrotherapy.org) for others that might want a copy. Next edition should be out sometime in the Spring. I have enough papers for an edition before that, but time is the critical parameter.

Have a good Christmas if this reaches you prior to the festive season, and if you are already into the New Year when you read this, then have a good one of them.

Regards

Tim

**Seen any interesting papers?
Is there a paper that you have written
and think ought to be reviewed here?
E mail and let me know
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