Academy of PHYSICAL MEDICINE

Broadcast Summary

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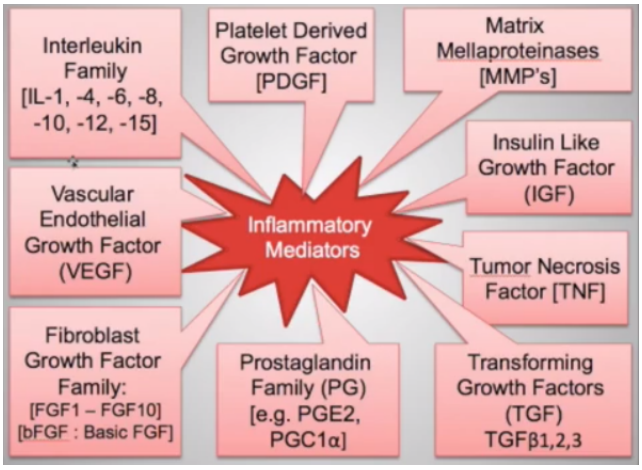
Electrotherapy: The weird and the wonderful

With Tim Watson

About Tim Watson

- Qualified as physiotherapist in 1979.
- BSc in Biomedical Sciences and PhD in Bioelectronics.
- Currently Professor of Physiotherapy at the University of Hertfordshire and is a freelance consultant.
- Researches in several fields associated primarily with electro physical agents / electrotherapy and tissue repair.
- Has published over 50 journal papers, and is editor of a core text on electrotherapy; has contributed numerous chapters in other edited texts and is on the Editorial Board of 2 physical therapy journals.
- Reviews for more than 25 journals and grant authorities and has presented more than 870 professional lectures, short courses and conference papers.
- Was awarded a Fellowship of the Chartered Society of Physiotherapy in the UK in 2013
- Has been on the Executive for the Electro Physical Agents and Diagnostic Ultrasound (EPADU) group in the UK and is the President of the ISEAPT sub group of the WCPT.
- Website: www.electrotherapy.org

The latest on tissue repair



• Possible that chemical mediators are the phenomena linking all the therapies together i.e. electrotherapy, manual therapy, massage therapy, stretching and PNF. Could be the common denominator between cause and effect.

• Inflammatory mediators are necessary, but differ in their origin, what stimulates their release, and what they do (but they all have an effect on the inflammatory healing cascade). When one does manual therapy, these chemical mediators are influenced.

• The direction of current studies on inflammatory mediators is to ascertain which of those families is most effective and which of the therapies stimulates the right one. There are several therapies with evidence of an effect on the mediator system.

• Inflammation is a driver of healing and repair. The more potent types of inflammatory mediators like prostaglandins, interleukins, and vascular endothelial growth factor help maximise the benefits to the repair sequence.

Shockwave

• Evidences shows the range of inflammatory mediators influenced by shockwave.

• Stimulating mediator release is intrinsic in the role of shockwave therapy.

Anti-inflammatories & painkillers

• The healing process is delayed when an individual takes a significant amount of non-steroidal anti-inflammatories.

• Evidence suggests that prescription-level, non-steroidal anti-inflammatory drug use, when will have an inhibitory effect on the tissue repair sequence. It will be delayed and have reduced quality.

• Over-the-counter anti-inflammatory gel does not work as advertised (only a very small amount of the active ingredient reaches the tissue). Ultrasound has been used to enhance the absorption of topically applied anti-inflammatory gel ("phonophoresis"), but evidence shows clinical effectiveness is no better than applying the gel by massage.

• Anti-inflammatory gel and oral anti-inflammatory do not potentiate or make the other redundant.

• Paracetamol, co-codamol, and codeine are better prescriptions than ibuprofen for pain from injury, because they do not inhibit inflammation.

• For joint injury, maximum fluid exchange between the synovium and the synovial membrane is encouraged. Anti-inflammatories can make the joint less painful but they do not enable the fluid exchange.

Ice treatment

Within 4 to 6 hours post-injury

• Ice is both vasoconstrictor and vasodilator. If a person has just been injured (i.e. within 2 hours) short ice treatment is advisable to achieve vasoconstriction (limit the bleeding that goes into the tissue).

• If the ice is left for more than 10 minutes (e.g. ice packs strapped on an injured leg), vasodilation is achieved – more blood goes into the tissue. The more bleeding there is, the longer it takes to recover.

• Short ice treatment should be administered within the first 4 to 6 hours post-injury.

Beyond 6 hours post-injury

• If ice is applied during the inflammatory event (i.e. after 6 hours post-injury), it should be 10 to 15 minutes to be beneficial. Recommended frequency is 15 minutes, 3 times a day.

• Do not administer ice treatment continuously, giving no time for the muscles to warm up. This will cause further damage to the tissues.

Cold pack and cold sprays

• The most efficient way of delivering cold is by using either crushed ice in a wet/damp towel or ice cube rub.

• Cold pack or crushed ice in a wet towel can penetrate 3 centimetres. Cold spray can only go a fraction of a millimetre.

• Ice has the advantage over heat in terms of outcome effectiveness or treatment benefits up to the end of the inflammatory phase (i.e. 3-week mark). Beyond this, heat has the advantage over ice.

• Cold sprays do not have the effect of ice. They numb the skin for a few seconds. Not to be used when someone is clearly injured to avoid putting them at further risk.

Used to pass a radiofrequency current to the damaged tissue. Capable of producing significant heat at depth through an electrode.

Benefits:

- Relieves pain
- Increases blood flow
- Stimulates healing in damaged tissue
- Enhances effect of exercise (if the latter is done after heating)

Cold immersion

• Ice bath or cold immersion is not the same as ice treatment. It is not pro-inflammatory. Cold immersion is good only when someone has a micro injury as it enhances recovery. It also helps remove lactic acid and other minor strains building up in the muscles.

• Clinical trials on the effectiveness of cold immersion showed no measurable difference.

Contrast bathing

• Evidence has shown that alternating hot and cold bathing has no advantage over either hot bathing or cold bathing. While contrast bathing has gained popularity among athletes and active people, there has been no established evidence that it gives better results.

• Cold bathing is done when the condition is acute, hot bathing when it is chronic. This method gives better results than contrast bathing.

Heat treatment

• Heat is effective. It reduces pain and increases tissue mobility. It also improves fluid exchange, increases blood flow and lymphatic return as well as tissue extensibility. It is very effective when sufficiently applied to the target area.

• It is not as effective as ice when applied in the acute and sub-acute stages (i.e. inflammatory stage up to 3-week mark). It can provoke too much inflammation.

• Raising the tissue temperature by about 3°-4°C gives physiological effects of sufficient magnitude to be therapeutically useful. These temperature levels can be achieved by heating a 'wheaty' bag in the microwave for 3 minutes, and putting on the target area for 20 minutes. But the heat cannot penetrate beyond one centimetre down to reach deeper inside the knee or hamstrings, etc. Research is still ongoing on ways of producing significant heat at depth.

• Methods used to get the tissues heated (i.e. heat at depth) are through pulsed shortwave and radiofrequency application. The latter has about 7 times longer effect than the former.

- Low cost (£150 - £300).
- Footplates stimulate calf muscles.
- Recommended for long-term circulation problems (ulcers, varicosities, diabetic polyneuropathy). Intended for those who cannot exercise. Can be done while sitting.
- Blood flow changes up to 600%.
- Recommended frequency is 30 minutes, once a day for increased circulation and pain relief.
- Not for pregnant women and individuals with pacemakers.

• Using the right method, getting the right amount of heat, and reaching the right amount of depth are keys to getting significant therapeutic benefits from deep heat.

• Measuring heat and blood flow deep in the tissues can be done by sticking sensors in the tissues (unpopular but accurate) or by ultrasonography (thermal camera imaging).

• Treatment wax (hot wax dipping) could definitely raise the tissue temperature but does not penetrate deeply. Evidence suggests it is effective for hands (which do not need significant heat at depth).

- This is SCENAR (Self Controlled Energetic Neuro-Adaptive Regulator) - a device that claims to aid in creating ideal conditions for self-healing in the body's bioelectric field.
- It is said to be capable of making a back and forth biofeedback dialogue with the body.
- There is no established evidence to explain how it can locate the problem or injury in the body.
- It is designed for use by therapists, not by individuals.

Electrical stimulation

• Transcutaneous electrical nerve stimulation (TENS) is a type of electric stimulation where electric impulses are delivered into the sensory nerves to get pain relief.

• Neuromuscular electric stimulation (NMES): electric impulses are sent to the motor nerves causing muscles to contract.

Incontinence

• Electrical stim started in 1960's as faradism and was used for patients with stress incontinence. Operates through electric currents sent to the pelvic floor to make muscles contract.

• Strengthening the pelvic floor through exercise helps individuals with genuine stress incontinence. The electrical stim is an adjunct or supplement to this. It delivers minimal effect without the strengthening exercises.

• For female incontinence, the muscular type of electrical stim delivers best results. It is a way of making the pelvic floor contract.

• Internal electrodes are used for faecal incontinence and genuine stress incontinence in women. External electrodes are now used more in male post-prostatectomy incontinence.

• Electrical stim procedures are done in NHS-physio departments. But cheap, portable electrical stim machines are available, which patients can use at home. These machines are as beneficial as those in the physio clinic or NHS.

In practice…

The clinicians should first be very proficient in differentiating genuine stress incontinence from an urge incontinence or a mixed incontinence. If they are not on the level of being able

to tell the difference between these conditions, it is best to refer the patients to the specialists.

Electrical acupuncture, lasers, and LED

• Electrical acupuncture involves passing a current between two acupuncture needles. Research is under way.

• Trials on transcutaneous electrical acupoint stimulation (TEAS) are currently under way. Standard TENS machine used with the electrodes placed over acupuncture points without needles.

• SCENAR is different from TENS and electro-acupuncture (see inset).

• Electro-acupuncture pen is like a little clicker with a plunger on top. Once a particular acupuncture point is located, the pen is pointed on the area and a shot of TENS-like electric pulse is delivered when you click it.

- This over-the-counter device claims to be capable of getting rid of inflammation when used for one minute a day.
- Although it produces red light (not laser), the dose is completely inadequate for any therapeutic effect.

• Laser deliver light energy into the soft tissue and is effective in treating injuries, including wounds and ulcers.

Vagal stimulation

• Severe caution must be exercised when stimulating the vagus due to its important role (not least heart and gut).

• Useful to inhibit pro-inflammatory cytokines Tumour Necrosis Factor for chronic inflammatory infections. But extra care must be taken when stimulating the vagus because it controls significant organs like the heart and the gut, among others.

Fractures

• Fractures mend more effectively and faster by incorporating a gentle loading activity to the bone (e.g. standing up and putting a bit of weight through the leg). The latter stimulates the release of chemical mediators thus enhances the bone healing.

• Ultrasound stimulates bone healing as does electrical stimulation therapy. Both processes activate the release of chemical mediators.

Delayed Onset Muscle Soreness (DOMS)

- Post-exercise pain and muscle soreness that take place 2 days (48 hours) later. There is no established explanation about mechanism.

- Research comparing 10 different treatments for DOMS and none was better than placebo.

- While DOMS is not harmful, it causes a lot of discomfort.