Academy of PHYSICAL MEDICINE

Broadcast Summary

Caution: These notes should be used in conjunction with the recorded interview. While every effort is made to ensure accuracy, APM cannot guarantee freedom from any errors. Treatment should be based on the advice given by the expert speaker during the interview. Please let us know if you find any errors in this text so that we can correct them.

Electro-Physical Agents: Contraindications

With Tim Watson

About Tim Watson

- Qualified as a Physiotherapist in 1979. Degree in Biomedical Sciences and a Ph.D. in Bioelectronics from the University of Surrey, 1994.
- Lecturer at West Middlesex Hospital, then Brunel University and now at the University of Hertfordshire. Currently, a Professor of Physiotherapy at the University of Hertfordshire and a freelance consultant.
- Conducted research in several fields primarily associated with electrophysical agents/electrotherapy and tissue repair. Published over 50 journal papers, and is editor of a core text on electrotherapy; has contributed numerous chapters to other published texts and is on the Editorial Board of two 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.
- 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 subgroup of the WCPT.

Electro-physical agents

- Electrotherapy is about the specific application of electrical energy to the body (e.g. TENS or Muscle stimulation).

- Electrophysical agents are broader in that they encompass other energy forms such as mechanical, sound, light, and thermal energies (e.g. ultrasound).

Global contraindication

Particular treatments or procedures that are complete contraindications.

Electromagnetic waves i.e. radio wave, microwave	Contraindicated for use anywhere on the body in patients with electronic implants i.e. pacemakers, internal defibrillators, cochlear implants, among others.

Note:

- Lasers are not contraindicated for use with pacemakers because they deliver light energy.
- Not all pacemakers are the same. Some are more sensitive to interference than others.
- Some patients with a pacemaker can stand less than a metre from a shortwave machine that is working without getting adverse influence from it.
- Continuous shortwave was used historically as a modality to produce significant heat. It is no longer used for therapy.
- Pulsed shortwave (radio frequency) therapy delivers low energy pulses into the tissue (e.g. Megapulse, Diapulse, Curapulse machines). Good for swelling, hematoma, muscle tears, etc.

Local contraindication

Particular treatments or procedures that are contraindicated in the area local to a condition.

Ultrasound	• Thermal ultrasound at a high dose and with a deliberate intention of producing heat is locally contraindicated where there is infection. • Therapy ultrasound is contraindicated in the immediate vicinity of cancer or tumour because it can stimulate cell activity/growth.

Note:

- An ultrasound that is applied to the knee, thoracic spine, shoulders, or lower back of a pregnant patient has a zero chance of reaching the fetus.

- An ultrasound scanner in sonography delivers a lower dose of energy than therapeutic ultrasound (i.e. a tiny pulse of energy is pumped at intervals so that the beam is deliberately scattered into the tissue to get maximum reflection). The same type of ultrasound is used to scan cancerous growths and tumours.

- Therapeutic ultrasound sends energy at higher doses compared with ultrasound scanning to achieve a physiological change. Therapeutic ultrasound should **not** be aimed directly at the foetus at any point during pregnancy.

- An ultrasound that is given at extremely high doses could induce abortion/miscarriage. N.B. this can't be delivered with a therapy machine.

- There is no evidence at the moment that links ultrasound scanning with detrimental effects on the fetus.

- The worst damage therapeutic ultrasound can cause to a foetus, if given at therapy doses and within a normal range (even if delivered close to the foetus directly over the abdominal wall or the sacroiliac joint) would be a detrimental effect on growth and development.

- The energy delivered by a therapeutic ultrasound and fetal scanning ultrasound is the same. How it is delivered and the level at which it is delivered is different.

- Therapeutic ultrasound that is done 10 minutes a day once a week does not generate positive outcomes.

- In the past, ultrasound was delivered at a higher doses and was hence listed as a problem when given after an acute injury. The heat generated was detrimental to the injury. The ultrasound scanner now delivers a lower dose such that the heat is not damaging anymore.

- There is no contraindication to using ultrasound over passive implants (e.g. hip replacement).

Precaution

Procedures or treatments that are not contraindicated i.e. there is no known risk to the patient, but should be administered carefully and appropriately chosen .

Ultrasound	• Ultrasound can be administered over a metal implant as long as you have a clinical reason for the procedure. The ultrasound will not heat the metal. • The ultrasound hitting the metal is almost guaranteed to bounce off in a different direction from its entry.

	E.g. It has been categorically proven that ultrasound over the temporomandibular joint does not heat the metal amalgam used in teeth fillings.

Note:

- With TENS, muscle stimulators, and other domiciliary ultrasounds, safe and effective ultrasound treatment can be delivered in the home and the absence of a therapist. The patient just needs to be educated on how to do this safely and correctly.
- Physical therapists in the US commonly use ultrasound with the deliberate intention of heating the tissue. This practice is not prevalent in the UK.
- Evidence has shown that ultrasound causes a heat increase in the tissue of 1 and 1.5 degrees Celsius – enough to be felt but not enough to cause a therapeutic effect. To generate the latter requires a rise of about 3-4 degrees Celsius.
- A hot water bottle wrapped in a towel can do more thermal good than ultrasound.
- Using ultrasound for 20 minutes a day to stimulate fracture healing works but the amount of energy to stimulate that healing is about 3x lower (i.e. 1.5 megahertz) than that delivered by a standard therapy ultrasound. It can take 40% off the fracture healing time.

Interferential therapy

This is one of the lowest ranking among the therapeutic modalities in terms of how much evidence backs its effectiveness compared with TENS or muscle stimulators. The lack of evidence does not mean that it does not work.

Shockwave therapy

There are two types of shockwave therapy: focussed and radial. Focussed shockwave delivers concentrated energy to a defined point in the tissue. Radial shockwave is a controlled pressure wave, not focussed (i.e. helps reduce spasticity).

Magnet and fractures

The fracture should be exposed to magnetic energy long enough to stimulate repair. Magnetic bracelets do not deliver therapy.

Electrotherapy devices

- Scenar is a device designed by Russian scientists for use in space as part of their medical practice in treating themselves in orbit. It measures areas of higher/lower resistance of tissues then delivers electrical stimulation into the area that needs it most.

- InterX is a neurostimulator device for acute and chronic pain relief and management.

- Microcurrent device operates at a level below the nerve stimulation threshold i.e. cellular level. It is not a muscle-strengthening current but it can stimulate tissue repair, wound healing, and relieve pain. Muscle strengthening can be achieved with electrical stimulators.

    - There is a theoretical model of action whereby the microcurrent could have a benefit at the spinal cord level through the upregulation of cellular activities that were stimulating the neurogliams. In metabolic terms, it does not work like nerve stimulation.

- Tecar device transfers electromagnetic energy (i.e. combination of radiofrequency and electrical stimulation) to biological tissue to stimulate the natural processes of repair. It generates heat to the tissues but it does not stimulate the nerves, with energy delivered at half a million cycles a second.

- Indiba system was tested on OA knee twice a week for four weeks and it can significantly drop the pain levels in patients. A follow-up was done after three months and the pain had not returned to its previous levels (i.e. from 7/10 before treatment to 2.5/10 after treatment).

- A standard laser therapy machine delivers laser diode to treat musculoskeletal conditions.

- An LED device can be used to get rid of skin spots. It does not produce true laser light. The laser energy from an LED source is not as concentrated and strong. LED lights can produce an effect equivalent to lasers only if they deliver the same amount of energy (i.e. what lasers can deliver in 2 minutes may take LED 50 minutes to an hour).

- For chronic back pain, set the TENS machine at a low frequency (i.e. 5 pulses per second). For acute back pain, set the TENS machine at a higher frequency (i.e. 100 pulses per second). It does not matter if the pain is neuropathic or not. It only matters whether the pain is chronic or acute.

- Shockwave can be used to smash calcific kidney stones. As gallstones are fattier, continuing studies are being done on how shockwave can be used to powderise them.

Other relevant notes:

- Clinicians/therapists are duty bound to inform their patients on the proper use of nerve stimulation or muscle stimulation machines that can be bought over the counter.

- The outcome of a systematic review can be altered by changing the inclusion-exclusion criteria. If one of the inclusion criteria is changed, articles included in the review can be changed and therefore the conclusion reached is based genuinely on the articles that were reviewed systematically. Potentially, inclusion/exclusion criteria could be adjusted after seeing what the results might have been.

- There is indicative evidence concerning the use of at low dose on soft tissue injuries – it makes the scar tissue more mobile and less adherent, thereby stimulating remodeling.