Phonophoresis
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Phonophoresis is frequently used in athletic therapy to treat soft tissue musculoskeletal injuries. What is it? Phonophoresis is the use of therapeutic ultrasound to drive topical medication transdermally.

In 1954 Fellinger and Schmid, in their book published in German, reported using ultrasound to enhance percutaneous absorption of hydrocortisone for treating polyarthritis in the hand. It wasn’t until the early 1970s that athletic therapists began to increase their use of phonophoresis.

Phonophoresis can be an alternative to intra-articular injections, which may cause athletes to miss playing time, cause them to feel pain and anxiety, raise drug testing concerns for banned substances (IM and IV corticosteroid injections are banned), or predispose to tendon rupture, especially with repeated injections.

Phonophoresis medications must be appropriate for the condition being treated. All transdermal drugs have different release mechanisms with specific targets. Four types of transdermal medication are commonly used for phonophoresis:

1. Anesthetics (e.g., lidocaine);
2. Counterirritants (e.g., menthol);
3. Nonsteroidal anti-inflammatories (e.g., salicylate or nonsteroidal anti-inflammatory creams);
4. Steroidal anti-inflammatory (e.g., hydrocortisone—short acting; dexamethasone—long acting).

For maximum treatment efficacy, the athletic therapist must localize the injured area. Application technique is identical to regular ultrasound but uses a coupling agent containing medication.

Duration of treatment, depth of penetration, application technique, and quantity of coupling agent all influence treatment effectiveness but remain the same as regular ultrasound. Treatment time is 7–10 minutes, with tissue depth dictating a sound head of either a 1-MgH, 5- to 10-cm tissue penetration or a 3 MgH, 0- to 5-cm tissue penetration sound head. Surface anatomy helps determine size of sound head, with the treatment area being no larger than twice the size of the sound head. During phonophoresis treatments, the sound head should be moved in a slow, constant, circular or linear motion of 1 to 2 cm per second. Slower motion may cause excessive heating and possible periosteal burns. The athlete should feel only a gentle warmth.

With phonophoresis, medications diffuse through the outermost layer of epidermis, the stratum corneum, then permeate the dermis and deeper layers such as ligament, tendon, and muscle. The ultrasound waves augment this natural diffusion.

The medicated coupling agent must cover the entire area being treated. In addition, it must transmit sound waves. If the coupling agent blocks ultrasound transmission, as early hydrocortisone creams did, then no increase in drug penetration beyond simple diffusion can be expected. If a premixed phonophoresis gel is not used, a topical medication can be rubbed into the skin followed by a regular ultrasound treatment.

Phonophoresis can help decrease inflammation and so help increase range of motion, decrease muscle spasm, decrease pain, increase blood flow, increase tissue temperature, increase cell metabolism, accelerate wound healing, and increase tissue mobility (decrease scarring).

Indications for phonophoresis are inflammatory conditions such as tendinitis, bursitis, capsulitis, synovitis, and some calcifications associated with fractures. Contraindications are drug hypersensitivity and those of regular ultrasound: over the spine,
thrombus or hemorrhage, tumor or active infection, abdomen of pregnant or menstruating women, eyes, open skin abrasions, gonads, pacemakers, or open epiphysis of children.

In the athletic environment the most common phonophoresis medication is hydrocortisone, generally a 10% concentration. Since hydrocortisone cream does not transmit ultrasound well, a water-based gel with hydrocortisone in solution is a better choice.

Griffin and associates, in an article published in 1967 in *Physical Therapy* (pp. 594-601), compared the effects of ultrasound with hydrocortisone and with ultrasound alone. Of 102 patients with chronic inflammatory conditions, 68% receiving phonophoresis experienced relief from pain and increased joint range of motion. Only 28% improved with ultrasound alone.

Despite the frequent use of phonophoresis in athletic therapy clinics, some researchers maintain that it is an ineffective and unpredictable method of drug penetration. Some research shows that when phonophoresing with hydrocortisone, the medication penetrates soft tissue but not the joints.

Other research suggests that medications delivered by phonophoresis have been detected as deep as 10 cm below the skin after 5 minutes of treatment. However, scientific and clinical research must continue, as there is no research consensus on the therapeutic potential of phonophoresis.

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