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Mechanical Drainage of Non-Vascular Edema Affecting Nerves

End range loading is used to increase blood supply to affected nerves (vasa nervorum). [1,16] These include the peripheral nerves, nerve roots, and the cauda equina. A lack of oxygen to these areas leads to many conditions seen in the therapist's office.

One example of lack of blood supply to the peripheral nerves would be a resulting tendinopathy. [2,3,5,7] The tendon at the site of injury undergoes neurogenesis and angiogenesis. [8,10,20] If the local proteoglycan concentration becomes too high, the hydrostatic pressure increases to the point that blood can no longer perfuse into the area and a chronic pathology develops. This low-grade pseudo inflammation can last for years. In these cases tendon degeneration often progresses as the fibrocytes die. The following is a case report.

A thirty-five year old legal secretary, previously a Highland dancer, presented with a chief complaint of bilateral Achilles' pain in April 2005[4,5]. The problem started in 1987 and has been constant since that time. My tentative diagnosis was bilateral Achilles' tendinopathy due to non-vascular edema in the area. The trial of therapy consisted of stretching the nerves innervating the affected part of the tendons. I repeated this procedure three times over a period of ten days. Her symptoms were much improved after the first treatment and after one week she was asymptomatic. I last saw this patient in October, 2009. She was thirty-nine years old at that time and she reported a total abatement of the Achilles' tendon pains. Since the first week of treatment in 2005, her Achilles' problems had disappeared.

The patient felt a warm and tingling sensation into her Achilles' area immediately after the treatment. I believe this sensation was due to the blood flowing into the affected nerves.

A possible explanation for this scenario of chronic low-grade inflammation is as follows. Healthy connective tissue, which in some cases is relatively avascular and aneural, undergoes injury. [11,15] The healing response results in both angiogenesis and neurogenesis at the site. [8,10,12,20] The injured area now has both a nerve and a blood supply. Here's the problem: far too much proteoglycan is produced by the fibroblasts. [2,3,4,5,7,14,18] The hydrophilic proteoglycan now absorbs water. This increase in fluid raises the hydrostatic pressure and a pseudo inflammation results. If the hydrostatic pressure in the local tissue exceeds the capillary blood pressure at systole then no blood perfusion takes place at the local interstitial nerves. Nerves have a vasomotor effect and if these nerves don't get oxygen then they can't function properly.

Here are a few examples of other peripheral nerve sites, ligaments, muscles, fascia, joint capsules, articular surfaces, periostia, organs, internal structures, and skin. I also include the cranial nerves here.

The normally avascular disc[15] also innervates and vascularizes after injury. [6,9,17] These new discal interstitial nerves need oxygen to function effectively as well. In discs too much proteoglycan may only be part of the problem. A misshaped disc will add to the disability.

Nerve root[11] involvement may result in lumbar and lumbosacral plexus symptoms, and or unilateral back pain. Of course the symptoms will be different for thoracic or cervical nerve root involvement. After injury both neurogenesis and angiogenesis[21] occur within the intervertebral foramen and again a pseudo inflammation sets up in the area. Surprisingly, healthy nerve roots are insensitive to mechanical stimulus.

Lack of oxygen to the cauda equina may result in neurogenic claudication. Other nerves in the cauda can be affected here as well. The primary dorsal branches will affect the muscles, skin and zygapophyseal joints of the lumbar spine. The coccygeal and pudendal plexuses may be involved affecting the genitals, pelvic floor, etc. The posterior branches of the lumbosacral plexus will involve the lateral rotators of the hip. Obviously, central stenosis can therefore affect more than just the legs. Lateral stenosis may lead to symptoms similar to other types of nerve root involvement and again getting the blood to the area is a vital key to healing.

Central stenosis of the cervical spine is occasionally seen in the therapist's office as a mild form of cervical spondylotic myelopathy and lateral stenosis is seen as foraminal encroachment. Increasing the volume in both the central and lateral canal will cause a pressure drop and therefore blood can flow into the target tissues.

End range loading decreases the hydrostatic pressure around affected nerves. It changes the hydraulics of affected discs. It increases the size of the neural canal in cases of stenosis. These changes will increase blood supply to the affected nerves to more normal levels.

End range loading can be described as that mechanical pressure applied to the target tissue after all the slack has been taken up.

End range loading is effective if the following four criteria exist. The patient has to communicate with the therapist, i.e. they have to tell the therapist where the problem is and also, how the therapist is progressing during the treatment. The target area must have flexible walls at the point of end range. [13,19] The loading has to be slow in order to give the fluid enough time to move. Finally, portals of exit and entry must exist through which this fluid can move. [13,19]

End range loading is not only used for shifting fluid. It is also effective treatment for collagen remodeling and intra discal nuclear migration. Remodeling of scar tissue takes six weeks of treatment. Reversing a migrated nucleus pulposis may only take one treatment.

The good news is that this form of therapy fits comfortably within the massage therapy scope of practice.

Outcomes and patient satisfaction will improve.

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