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Sport Injuries & Acupuncture

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Abstract

In the United States today, almost every athlete has suffered or is suffering from a sports-related injury, and the annual cost of treatment for injuries is estimated to be over \$50 billion dollars. The costs include millions of lost game days, necessary health care, and the consequences of injuries. Acupuncture can help to reduce these costs.

The action of acupuncture as an analgesic, although widely accepted, remains somewhat of an enigma. In reviewing the literature it became evident that many investigators have conflicting data; however, with regard to the use of acupuncture for sports-related injuries, quite a few positive results were found.

Many now believe that acupuncture should be considered a valuable asset in the treatment of sports-related injuries, and that it can be a value in comprehensive clinics as well. Acupuncture is certainly not a cure-all; however, researchers and experienced clinicians both attest to its benefits.

This article is a review of the literature with regard to acupuncture as a modality for the management of sports-related injuries.

Introduction

In the United States today, almost every athlete has suffered or is suffering from a sports-related injury. These injuries were estimated to cost more than \$50 billion in 2006 and are a major burden to the sports clubs as well as to the suffering athletes. According to a survey by the National Electronic Injury Surveillance System (NEISS), the estimated number of sports-related injuries had reached 2,832,570 in 2006; and the top three sports in which injuries occurred were basketball, bicycling, and football. [1] Acupuncture is one of the more popular types of treatment that athletes use to help control pain, hasten recovery, and treat injury. A recent large-scale survey of Americans' use of complementary and alternative medicine therapies indicated that acupuncture is one of the most utilized forms of complementary medicine. [2] In other studies, musculoskeletal conditions are the most common reason for seeking alternative care. [3]

Traumatic injuries are still the number one sports-related injury in contact sports such as soccer, rugby, Australian rule football, Gaelic football, and American football because of the dynamic nature of these sports and the high rate of collisions. These injuries range from bruises and muscle strains to fractures and head injuries.

This article will review the basics of Western medicine theories and treatment modalities for injuries, followed by an in-depth look at acupuncture. The article will touch upon the theory of acupuncture with a concise review of the investigations that have been undertaken to provide scientific data for its effectiveness in the management of sports-related injuries.

Mechanism of Sport Injuries

Acute injuries are injuries that happen suddenly, and correlate to direct or indirect trauma. For example, falling on an outstretched arm produces direct trauma to the wrist joint, and indirect trauma to the elbow and shoulder. These injuries include fractures, strains, sprains, dislocations, subluxations, bursitis, nerve impingements, and growth plate problems in children. [4] In general, acute injuries have the signs of sudden and severe pain, swelling, inability to place weight on a lower limb or extreme tenderness in an upper limb, inability to move a joint through its full range of motion, and even visible dislocation. The injuries usually involve partial or complete tears in the ligaments or tendons in or around a joint, stretching or strain of muscles, and even dislocation or fracture of the bones. Although bones can sometimes fracture with acute sports injuries, the most commonly injured structures are the muscles, tendons, and ligaments. Tendons attach muscles to bones, and ligaments attach one bone to another.

A bruise or contusion is damage to small blood vessels which causes bleeding within the tissues. Acute twisting or overextension of a joint can lead to tears of muscles and tendons, called "strains, " while tears of ligaments result in "sprains. " These tears range from mild to severe. In mild injuries, just a few fibers are torn or stretched. Severe injuries, where there is a tear through the full thickness of the structure, are most often considered unstable injuries and frequently require surgical intervention. The intervertebral disc, a ligament between the vertebrae of the spine that works as a shock absorber, can also be torn, resulting in a disc bulge and/or herniation. For example, ankle sprains most often involve tears of one or more of the ligaments along the outside of the ankle. Knee ligaments,

including the larger external supportive ligaments and the smaller internal stabilizing ligaments, can also be torn. The cartilage on the back of the patella (knee-cap) can also become eroded from overuse, leading to a condition termed chondromalacia patella. The body's response to these types of sports injuries is the same in the five-day period immediately following the traumatic incident -- inflammation, which is characterized by pain, localized swelling, heat, redness, and a loss of function.

All of these traumatic injuries cause damage to the cells that make up the soft tissues. The dead and damaged cells release chemicals, which initiate an inflammatory response. Small blood vessels are damaged and opened up, producing bleeding within the tissue. In the body's normal reaction, a small blood clot is formed in order to stop this bleeding and from this clot special cells (called fibroblasts) begin the healing process by laying down scar tissue.

Chronic injuries are injuries that happen over time to tissues that either are not used regularly or are overused. A common overuse injury is tendinosis, also called tendinitis. In this condition, the tendon becomes inflamed from repetitive use. In the shoulder, the rotator cuff (a complex of muscles that stabilizes and moves the shoulder) becomes inflamed, resulting in rotator cuff tendinitis. Tennis elbow is another form of tendinitis that occurs along the outside of the elbow, most commonly in tennis players. In golfer's elbow, the tendons on the inside of the elbow are affected. Some athletes may experience a stress fracture, also called a fatigue fracture. This type of fracture occurs when an abnormal amount of stress is placed on a normal bone. This might occur in a runner who rapidly increases the amount of mileage while training for a race. Stress fractures also occur in people who begin running as a form of exercise but overdo it from the start, rather than gradually progressing to longer distances. Houston Rockets basketball player Yao Ming suffers from a stress fracture in his left ankle.

One final common injury is worth mentioning, and that is shin splints. This is an overuse injury that results in microfractures on the front surface of the tibia (shin bone). Shin splints are most often seen in runners, although other athletes can also be affected. This is the area within sports medicine that tends to be forgotten, as it becomes very easy to implement treatment protocols. [4]

Western Medicine Treatment Regimens

The inflammatory stage of an injury is actually the first phase of healing. However, too much of an inflammatory response in the early stage can mean that the healing process takes longer and a return to activity is delayed. Treatments for sports-related injuries are intended to minimize the inflammatory phase of an injury, so that the overall healing process is accelerated.

The initial treatment focuses on managing the edema with RICE (rest, ice, compression, and elevation). Once this is achieved, range of motion is increased and then progressed into exercises that gradually increase strength. The idea within a clinical setting is to return the patient to normal daily activity, whereas with an athlete, the goal is to return that athlete back to his/her sport-specific activity.

The current, widely implemented treatment protocol for delayed onset muscle soreness (DOMS), validated through research, recommends non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen, specifically to manage inflammation. However, the research findings are mixed, because adverse effects have been identified with drugs associated with prostaglandin synthesis - specifically the cyclo-oxygenase pathway. Injured tissue produces prostaglandins, which are mediators released from human cells and have a variety of strong physiological effects such as regulating muscle contraction. Prostaglandins promote degradation of tissues and tissue growth during the muscle repair/regeneration and remodeling phase of the injury cycle, which create catabolic actions. [5]

Traditional Chinese Medicine and Acupuncture

In contrast to Western Medicine, Traditional Chinese Medicine (TCM) looks upon sports-related injury not as a symptom but as a disease in and of itself. In TCM, sports-related injuries are also injuries that happen suddenly. These injuries involve the Qi, Blood, Body Fluids, Channels, and Zang/Fu organs. The most common injury is Qi and Blood stagnation, which represents an excess condition. In both instances, the Qi and Blood flow become disrupted and cause stagnation to occur, meaning the Qi and Blood diminish and/or are completely obstructed. Pain is a good indicator. [4]

Chronic injuries are defined as happening over a period of time. Within TCM, the focus is on pre-existing conditions that predispose an individual to a particular condition. Most cases involve Qi and Blood, Zang/Fu organs such as Liver Qi and Blood deficiency, Liver Qi and Blood stagnation, DampPhlegm accumulation in the channels, Yin and/or Yang deficiency, all of which make the human body susceptible to external invasion. Acupuncture treatment focuses on traditional acupuncture points, local tender points (ashi points), trigger points, or motor points and addresses the muscle spindle fibers. Acupuncture improves circulation, increases the rate of healing and recovery, and has a dramatic effect on reducing inflammation.

As we know, a motor point is the point where the motor nerve enters the muscle. On entering the muscle, the nerve branches off into motor units and then onto motor end plates that enervate the many muscle fibers that cause contraction. When a muscle is torn, the electrical activity is disrupted due to trauma of the nerve fibers in the muscle. Nerve tissue regeneration, although slower, is much like muscle tissue repair in that it can be hindered by Qi and Blood stagnation and scar tissue formation, but subsequently benefited through acupuncture treatment. Needling the muscle's motor point activates the action potential and "jump starts" the muscle. A weak muscle upon manual muscle testing can be immediately strengthened once the motor point has been needled. A trigger point is a specific point or area where, if stimulated by touch, pain, or pressure, a painful response will be induced. This is helpful in diagnosing an imbalance and treating an underlying pathology. Within the Eastern theories about injuries, we can identify the pre-existing condition and counterbalance it. By being able to identify the organ(s) affected, we can be more specific and preventative in our treatments.

Sport Injuries with Pain Management

Pain is an obvious symptom in sports-related injuries. According to Chinese Medicine, pain is defined as obstruction in the circulation of Qi and blood in the channels. This obstruction of energy can be caused by many factors, either environmental such as cold, heat, dampness, etc, or arising from within the organism's body. Treatment modalities are aimed at recognizing the causative agents and directing treatment to relieve them, as well as palliating symptoms such as pain. Acupuncture is a relatively noninvasive procedure, and its benefit as an analgesic can be attested in pain management. In a study of acupuncture versus placebo for the treatment of chronic mechanical neck pain, the researchers treated with acupuncture and placebo 135 patients who had chronic mechanical neck pain. By comparison with placebo, acupuncture reduced neck pain and produced a statistically significant effect [6]. In another similar study, Roar, Jensen, et al., also found acupuncture may be an effective alternative treatment for patellofemoral pain syndrome. [7]

Acupuncture not only relieves the pain of a specific injury, but it also improves concomitant symptoms. In a randomized controlled study of improvement in fibromyalgia symptoms, the authors concluded that symptomatic improvement with acupuncture was not restricted to pain relief and was most significant for fatigue and anxiety. [8]

Acupuncture is successfully used in the treatment of degenerative osteoarthritis. The treatment of haemophilic arthropathies can require strong painkillers with severe side-effects. Wallny, et al., used acupuncture techniques to evaluate the treatment of these joint problems. They found significant improvement on the visual analogue scale (VAS) after acupuncture treatment and positive effects in pain management for haemophilic arthropathy of the lower extremities. [9] Although it has long been suspected that acupuncture causes the release of neuroendorphins and other chemical mediators, it is clear that acupuncture analgesia is induced through highly specific nervous and chemical mechanisms, and that the substances produced can be specific to body region. [10] There is mounting evidence of the effectiveness of acupuncture. Most recent randomized, controlled, clinical studies are indicating that there is definitely room for acupuncture as an analgesic modality. The challenge for future trials is to design conditions that more closely mimic the delivery of acupuncture in clinical practice, where it is administered as individualized treatment informed by its own diagnostic traditions.

Related Review of Literature and Performance Improvement with Acupuncture

Visits to complementary medicine providers, such as chiropractors, acupuncturists, homeopaths, and other more esoteric therapists now exceed patient visits to traditionally trained primary care physicians. [11] According to a study by Harvard Medical School in 1997, visits to alternative medicine providers had reached 629 million, an increase of 47% since 1990.[11] The properties of acupuncture and its validity as a modality for the treatment of sport injuries have long been examined in hopes of finding supportive scientific data. This article is a review of some of the studies of injuries conducted in the last 20 years. The National Institutes of Health's National Library of Medicine was searched for studies conducted on acupuncture since 1975 in the United States as well as in other countries. These articles were further explored for their relevance to the management of sports-related injuries. All related research studies were carefully examined with regard to their methodology and significance. Those investigations that demonstrated strong methodology with a solid scientific basis were chosen. The studies used human as well as animal subjects and were based on the scientific method. Acupuncture treatment primarily focuses on the combination of distal, local, and adjacent points, in addition to specific pattern-associated points. Distal points, used to move stagnation, can be used on affected channels or associated channels/vessels/meridians. Upper and lower extremity points may be combined, such as wrist/ankle, elbow/knee, and shoulder/hip. The adjacent and local points are identified according to the area affected. Gao, et al., used male SD rats to observe effects of acupuncture and electroacupuncture on antioxidant enzyme and Ca^{2+} ATPase activities and Ca^{2+} content in the mitochondria of skeletal muscle cells in rats during acute swimming exercise to explore the mechanism of acupuncture in increasing sports ability. They drew the conclusion that acupuncture can protect cells from injury during acute sports and maintain the functions of the mitochondria so as to delay fatigue, prolong working time of muscles, and prevent muscles from [12] being damaged. As we know, points are arrayed in channels or meridians on the body. Thus, when injuries occur in one part of the body, the channel state will be changed. Zhang, et al., concluded that an acute sports injury of the external malleolus may lead to an imbalance of the channels passing through the injured areas, as well as involving the channel dominated by the heart and the 12 Yuan-points. [13] Vice versa, stimulation of certain points can adjust the state of the channel as well as the physiological parameters of the human. Liang, et al., found in their study that transcutaneous electric acupoint stimulation at ST 36 (Zu San Li) can effectively postpone exercise-induced fatigue by reducing accumulation of blood lactate, improving anti-oxidative ability, and relieving lipid peroxidation in rats.[14]

Although some of the mechanisms of acupuncture as it applies to pain relief have been studied, little is known of the positive and/or negative effects of this procedure on the physical performance parameters of healthy people, particularly highly trained athletes. Pelham, et al., put forward this argument and expect to establish guidelines for the use of acupuncture in sports medicine. [15] In a study of whether electrical acupoint stimulation increases athletes' rapid strength, Yang, et al., found that electrical acupoint stimulation can enhance athlete's rapid strength. [16] In a similar study, Dhillon, et al., concluded from an examination of acupuncture effects on cycling performance that acupuncture can give higher RPE scores compared to other tests. [17] A recent study evaluating acupuncture effects on immune function and mood after exhaustive exercise found increased salivary IgA and salivary cortisol levels and lower ratings of "fatigue" and "confusion" on the profile of Mood States in subjects versus controls.[18] Other studies have shown complex effects on immune function, felt to be modulated by the central nervous system.[19-20]

Conclusion

Oriental Medicine is very valuable within the area of sports medicine. Acupuncture is a minimally invasive, relatively safe medical procedure that appears to have complex effects on the central and peripheral nervous system, immune system, and pain perception. Although acupuncture should not supplant the role of conventional therapies such as rehabilitation to treat these conditions, it is a very useful therapy to treat pain, which can inhibit muscular contraction, interfering with rehabilitation and athletic performance. It is also useful for treatment of chronic conditions that fail to respond to more conventional therapies. Although recent studies are of high quality, problems remain in the design and interpretation of acupuncture research. Larger, better-controlled studies are needed to determine the effectiveness of acupuncture compared with more conventional treatments.

Oriental Medicine can contribute a wealth of knowledge and result-oriented outcomes that can greatly benefit the treatment of sports-related injuries. The ultimate goal for proponents of Oriental Medicine is to gain credibility within the already existing field of sports medicine by conducting large numbers of solid clinic trials and research, establishing more open communications among the various academic professions, and, more importantly, contributing a unique perspective to the field of sports medicine.

The organs as related to sports medicine within TCM are broken down according to each Zang/Fu organ's basic function.

1. Tendons are related to the liver, according to the Five Element correspondences; and as the athlete's training intensity increases, the function of the liver, according to TCM, is impaired. One of the functions of the liver is to supply blood to all parts of the body. If blood flow decreases or becomes obstructed, then the liver's responsibility is to regulate the blood (because of its function to regulate and store blood). Thus, if the liver becomes impaired or obstructed, one will see signs and symptoms correlating with many sports injuries involving tendons.

- 2. Muscles are related to the spleen, according to the Five Element correspondences. The spleen's basic functions are transporting and transforming nutrients, and producing blood. Another aspect unique to the spleen is that it "rules" the extremities. Therefore, the spleen and stomach are extremely important to sports injuries because they nourish all the other Zang/Fu organs. Thus, if the spleen becomes impaired or obstructed, the signs and symptoms correlate with injuries associated with the extremities, and their transporting and transforming of nutrients to support the other Zang/Fu organ functions.
- 3. Bones are related to the kidney; the kidney supports the liver, and the liver directly supports the tendons. For example, if the kidney yin becomes deficient, this affects the liver yin, which affects the tendons. The kidney also stores the essence/Jing. This

information is valuable in chronic conditions. Thus, if the kidney becomes impaired or obstructed, the signs and symptoms correlate with injuries associated with lower extremity functions and low back functions. Therefore, it is very important when evaluating the quality of care of athletes to understand why we are treating and what we are treating.

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