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Osteoarthritis and Rheumatoid Arthritis: Conservative Therapeutic Management

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ABSTRACT: Hand therapists need to understand the basic science behind the therapy they carry out and the current evidence to make the best treatment decisions. The purpose of this article was to review current conservative therapeutic management of patients with rheumatoid arthritis (RA) or osteoarthritis (OA) of the hand. Treatment interventions such as orthotics, exercise, joint protection, modalities, and adaptive equipment are discussed from a basic science and evidence-based practice perspective.
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During the last decade, there has been significant progress understanding the molecular pathogenesis[1] and role of the immune system in the arthritic process, resulting in new medications that have altered the course of arthritis. The medical intervention of arthritis now includes early and aggressive treatments for greater control of inflammation and joint erosion.[2] Despite these medical advances, it is important to understand that arthritis is still a chronic condition[3] and these medical advances do not permanently change the destructive behavior of the immune system.[1] Understanding the basic science and variable course of the disease, when combined with these new medications, gives insight into the cellular responses of our hand therapy treatments.

NORMAL ARTICULAR CARTILAGE

Understanding the processes involved in osteoarthritis (OA) and rheumatoid arthritis (RA) involves an understanding of the basic science of normal joint articular cartilage. Hyaline cartilage is a specialized connective tissue that frequently lines the joints, although it can be found in other parts of the body. It makes up the majority of the body's cartilage.[4] Articular cartilage is a specialized type of hyaline cartilage and its function is to reduce friction and allow painless joint motion through load distribution.[5] Articular cartilage is made up of chondrocytes embedded in an extracellular matrix.[4] This matrix is made up of proteoglycans, type II collagen, other proteins, and water.[4] Proteoglycans provide compressive strength to the cartilage, collagen provides tensile strength and shape, and chondrocytes maintain a necessary balance between the degradation and synthesis of the extracellular matrix.[6,7] It is the unique composition of the matrix that allows articular cartilage to withstand compressive forces. Within the matrix, the collagen fibers form a network. The proteoglycans are bound within this collagen network and because they are hydrophilic, they attract water into the matrix, forming a firm gel-like matrix. The water is also essential for joint lubrication and cartilage nutrition.[4] Additionally; joint motion plays an important role in cartilage health by diffusing nutrients in and around the joint cavity. This diffusion is important as cartilage is avascular and lacks nerve supply.[5] Progressive loss of articular cartilage occurs in arthritis due to degradation of the matrix, either from a fiber or a protein perspective. This degradation creates an inability of the cartilage to effectively withstand compressive forces.[6]

OSTEOARTHRITIS

The Osteoarthritic Process

Osteoarthritis is a group of conditions associated with a defective integrity of the articular cartilage and changes in the underlying bone.[6] OA can be erosive

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or nonerosive, with erosive OA having a more abrupt onset and evidence of subchondral bone erosions on radiographs.[6] Changes in articular cartilage and subchondral bone result from the chondrocytes failing to maintain a necessary balance of the extracellular matrix. The cause of this cartilage destruction is still unknown, although there is speculation that it is from both chemical and mechanical factors.[8–10] Complex biomechanical factors appear to activate the chondrocytes to produce degradative enzymes.[4,5] Degradation then corresponds to failure of the articular cartilage to act as a shock absorber resulting in progression of the disease. Mechanical factors such as abnormal loading of the joint from trauma, heavy labor, joint instability, and obesity can increase the risk of OA.[6] Aging is also a risk factor, as aging cartilage contains less water and fewer chondrocytes, decreasing the capacity of the cells to restore and maintain the cartilage.[10] OA is usually classified as primary when there is no obvious predisposing cause and secondary when there is a predisposing cause such as a previous trauma.[8]

OA of the Hand

OA of the hand occurs more frequently in women older than 50 years and is almost mutually exclusive with osteoporosis, meaning that individuals more commonly have one or the other but less often both.[11,12] The joints of the hand most commonly affected are the distal interphalangeal (DIP) joints (35%) and the carpometacarpal (CMC) joint of the thumb (21%).[9,11,13,14] In addition, 50% of patients with DIP involvement also have proximal interphalangeal (PIP) joint involvement.[15] Nodules that occur with OA at the PIP joint are called Bouchard's nodes and at the DIP joint are called Heberden's nodes.[10] Deformities as a result of this arthritic process include a mallet finger deformity at the DIP joint and lateral deviation or boutonnière deformities at the PIP joint.[13]

RHEUMATOID ARTHRITIS

The Rheumatoid Arthritic Process

Rheumatoid arthritis is an inflammatory, systemic, autoimmune disorder.[15] The inflammatory process associated with RA manifests itself primarily in the synovial tissue.[16] The synovial hyperplasia develops from synovial outgrowths or synovial villi, which are made up of lymphocytes, macrophages, synovial lining cells, and blood vessels.[16] Joint destruction occurs when the synovial pannus expresses enzymes allowing cartilage penetration, cartilage damage, and joint erosion.[17] Despite the fact that the amount of synovial fluid increases in RA, the fluid looses viscosity reducing joint lubrication and allowing further cartilage damage.[16]

Rheumatoid Arthritis of the Hand

Rheumatoid arthritis is evident worldwide with prevalence rates at approximately 1% and varying among ethnic groups.[18,19] RA typically affects the joints symmetrically[20] and hand involvement most commonly includes the metacarpophalangeal (MP), PIP, thumb, and wrist joints.[17] Early symptoms include morning stiffness lasting more than an hour and fusiform swelling of the PIP joints.[20] Flexor tendon tenosynovitis can reduce digit motion, strength, and in some cases result in trigger finger if nodular thickening occurs.[17] Deformities of the hand include MP joint ulnar deviation with palmar subluxation and radial deviation of the metacarpals or the zigzag deformity.[17,20] Other deformities include PIP swan neck and/or boutonniere deformities,[17,20] and a variety of thumb deformities.[21] Rheumatoid nodules commonly occur over pressure areas in the elbows and digits.[17,20]

CLINICAL IMPLICATIONS AND CONSERVATIVE INTERVENTIONS

Orthoses (Splints)

Orthoses for OA and RA are frequently used to decrease pain, minimize deformities, decrease inflammation, decrease stress to the joints, provide support for increased function, and assist with joint stability.[22,23] Providing stability to weakened joint structures with an orthosis can assist in reducing joint imbalance by promoting proper joint alignment.

Link with Basic Science

Wearing an orthosis during periods of acute inflammation is designed to reduce joint friction and prevent excessive joint loading by reducing joint motion. Although critics of immobilization report that maintenance of normal tissues require movement, excessive mobilization of unstable arthritic joints can promote further instability.[24] Although immobilization with rigid surgical external fixation found decreased cartilage water content, less rigid immobilization allowing a small degree of motion (such as the type applied by a cast or an orthosis) demonstrated less cartilage damage and better joint recovery.[25] This research may provide some support for the use of orthoses in cartilage protection especially when an orthosis repositions and aligns the joint appropriately. Several studies have reported that an orthosis decreases pain and increases function during daily activities in patients with arthritis.[26–31]

Orthoses and OA

One of the most common thumb deformities in OA (which is also seen in RA) is a swan neck deformity. It

is often characterized at the CMC joint by metacarpal adduction and subluxation from the trapezium, MP joint hyperextension, and interphalangeal joint flexion.[21] Designing and fabricating a thumb orthosis for the OA CMC joint requires careful positioning during fabrication to immobilize the CMC joint appropriately. A gentle correction of a swan neck deformity places the thumb in metacarpal abduction, aligns the metacarpal on the trapezium, flexes the MP joint, and extends the IP joint.[23] Stabilizing the CMC joint with an appropriate orthosis can decrease pain and increase function[27–32] in patients that are passively correctable. Fabricating the orthotic in the patient's resting position without properly placing the passively correctable joint in metacarpal trapezial alignment may fail to meet the goal of decreasing pain with pinching activities. If the joint is not passively correctable it is important not to force it into position as this may increase symptoms.

Although there are many types of orthoses that stabilize the thumb CMC joint, orthoses preferred by patients include a hand-based thumb orthosis and a short flexible neoprene orthosis.[28,29] Night CMC orthoses were found to decrease pain and disability after 12 months of wear[30] and were also found to be effective in reducing the need or desire for surgery after seven months of wear.[33] In their systematic review, Valdes and Marik[27] found that orthosis provision had a positive impact on decreasing hand pain and increasing hand strength and function in patients with OA.

Fewer studies have been completed in regard to orthoses for the interphalangeal joints. One study demonstrated decreased DIP joint pain with thin and relatively elastic daytime orthoses.[34] PIP joint orthoses are commonly used with OA to decrease lateral PIP deviation and PIP extension lags in developing boutonniere deformities.[23] Additional research is needed to examine the efficacy of splinting for OA in the PIP and DIP joints.

Orthoses and RA

Using an orthosis to decrease pain and increase function for patients with RA is common practice in the clinic; however, more research is necessary to validate the benefits of orthoses for this patient population.[35,36] After a review of the literature, Steultjens et al.[31] reported that ''Orthosis can decrease pain and improve the strength of one's grip, but it may decrease hand movement.'' When looking at wrist orthoses another review reported insufficient evidence to make firm conclusions about the effectiveness of working wrist orthoses in decreasing pain or increasing function, although patients who wore wrist and resting hand orthoses preferred to use them.[35] Another study compared groups of RA patients wearing soft and hard night resting orthoses and found that although patients preferred the padded orthosis, both groups had decreased pain.[37] Studies that looked at orthoses for swan neck deformities at the PIP joint, reported greater acceptance and tolerance with prefabricated orthoses[38] then custom-made orthoses, and also reported that Silver Ring Splints (orthoses) improved dexterity in selected patients with RA.[39]

Properly fitting an orthosis can be challenging with RA deformities. It is important when fitting the RA hand with MP ulnar deviation to consider the position of the metacarpals, which are often in radial deviation. Aligning the MP joints in an antiulnar deviation position can aggravate the CMC joints adding to their radial deviation deformity. The orthosis should be designed to address all of the issues involved in the zigzag deformity.[23]

Joint Protection

The purpose of initiating joint protection principles early in the OA and RA disease process is to decrease joint stress and damage through altered work methods and to educate patients on proper joint alignment and the use of adaptive equipment.[40,41] Common general joint protection principles for both OA and RA are categorized by themes in Figure 1. For more complete information on specific principles and techniques as applied to specific deformities, the reader is referred to works by Cordery,[40] Cordery and Rocchi,[41] and Melvin and Ferrel.[42]

Link with Basic Science

Joint protection and energy conservation tie in with basic science by understanding the process that occurs at the joint cartilage when joints are under prolonged stress. In OA, even small traumatic forces to the joint cartilage during activities of daily living (ADLs) can lead to bone bruises and damage to the articular cartilage.[16] The cartilage in OA is weaker and has less energy dissipation than normal cartilage causing more force transfer to the adjacent bone. Use of joints with incongruous articular surfaces, misalignment, or instability, may further the degenerative joint disease.[43]

In RA, joint damage occurs when cartilage and bone are invaded by the synovial pannus.[17] Damage to the cartilage begins with inflammation and the release of metalloproteinases that are able to degrade proteins in the extracellular matrix of cartilage.[1] Overuse of the hand for ADLs can induce a flare of pain, fatigue, and inflammation.[44] Pain and fatigue should be used as a guide for specific activities, duration of activities, and activity pacing.[42]

Joint Protection and OA

There is a moderate evidence to support joint protection education and adaptive equipment for

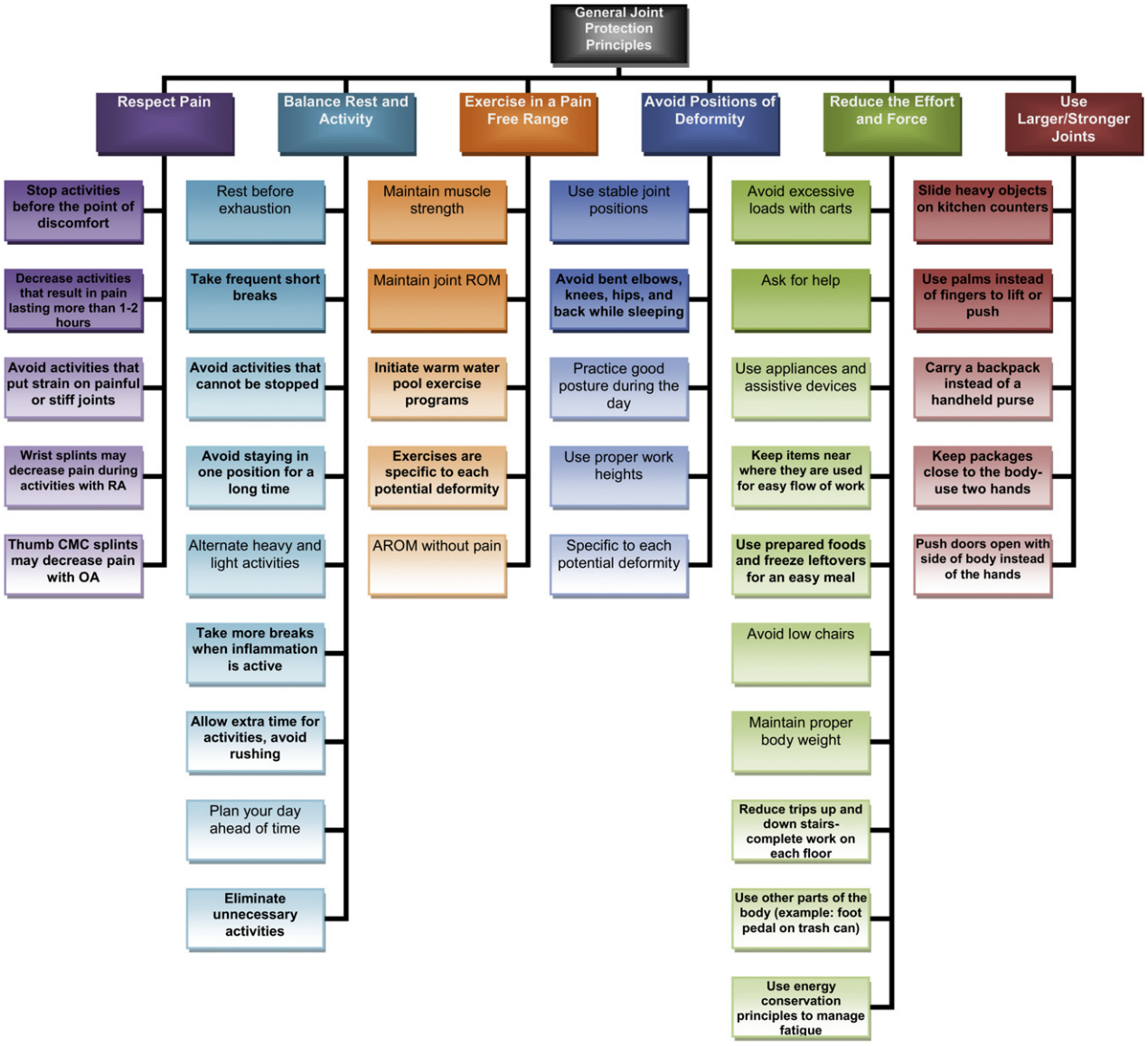

FIGURE 1. *The purpose of initiating joint protection principles early in the disease process is in the hope of decreasing joint stress and damage. The principles themselves were first developed by Cordery (1965).*[40] *This is an overview and thematic categorization of general joint protection principles for rheumatoid arthritis (RA) and osteoarthritis (OA).*[40–42,46,48] *Several studies support the effectiveness of joint protection programs in decreasing pain and increasing activity of daily living (ADL) function.*[30,40,41,45–48] *Adapted from Cordery,*[40] *Melvin (1989), Meenan et al. (1992), and Hammond et al. (2001).*

increased hand function and pain reduction in patients with OA.[27] The European League Against Rheumatism[45] in their systematic review state that education concerning joint protection with an exercise regimen is recommended for all patients with hand OA. Joint protection for OA should also take into account the specific deformity or potential deformity, which may include instability of the CMC joint and the deformities of the involved interphalangeal joints.[23] Because excessive pinching during ADLs impart large forces to the thumb CMC joint, educating patients in decreasing pressure to the thumb CMC joint is important.

Joint Protection and RA

A systematic review found joint protection education beneficial for patients with RA.[36] A randomized controlled trial of patients with early RA demonstrated that eight hours of instruction in joint protection decreased pain, morning stiffness, and doctor visits, as well as improved grip strength, self-efficacy, and maintained function.[46] Educational–behavioral joint protection programs that involve skill practice, goal setting, and home programs were more effective than short instruction and/or information booklets as demonstrated by fewer deformities, less

morning stiffness, improved ADLs scores, and joint protection adherence.[47] Additionally, a small study sample ($n = 28$) demonstrated that instruction in energy conservation with cognitive–behavioral strategies decreased pain and fatigue and increased physical activity.[48]

Joint protection principles for RA should address the specific deformity or potential deformity. For example joint protection for a patient with a tendency to develop a swan neck deformity should avoid activities that place the PIP joints in full extension such as holding a book. In contrast, if the patient has a tendency toward a boutonnière deformity, PIP flexion activities such as using a hook grasp to carry a bag should be discouraged. Patients with MP joint ulnar deviation tendencies should be aware of activities that place ulnar deviating forces on the MP joints and use alternative grasping techniques.

Exercise

Individuals with RA and OA can have decreased muscle strength, decreased range of motion (ROM), increased fatigue, and decreased endurance as a result of pain and inflammation.[49] Therapeutic exercise programs for individuals with RA and OA must take into account the arthritic process including the amount of inflammation, joint stability, and muscle atrophy.[50] A systematic review found support for aerobic and strengthening exercises three times a week for 30–60 minutes in patients with RA to improve both muscle function and fitness.[51] One study reported that general overall body conditioning was found to decrease pain.[52] Low-impact activities such as swimming, walking, and bicycling are preferred to high-impact activities that may contribute to exacerbations and joint inflammation in patients with either OA or RA.[49]

Link with Basic Science

Joint mobility bathes the avascular articular cartilage with synovial fluid providing necessary nutrients to the joint matrix.[42,53] In regard to overall health, one study found that older adults who exercised regularly demonstrated a 32% reduction in functional decline.[54] Unfortunately, the mechanisms by which exercise reduces pain and joint effusion are still unclear.[51] The hand presents special exercise challenges to ensure that the exercise does not stress or promote the progression of potential deformities. Excessive loading of the cartilage may cause further damage to the articular cartilage and subchondral bone resulting in pain.[54] Although joint motion from exercise provides lubrication and diffusion of nutrients to the articular cartilage, further research is needed regarding the benefits of specific hand exercises especially in the presence of developing deformities.

Exercise and OA

There is moderate evidence to support hand exercises in OA for increasing grip strength, improving function, improving range of motion, and pain reduction.[27] It is important to note that exercise programs should be pain free. Combining joint protection and pain-free hand home exercises were found to be an effective means to increase hand function, as measured by grip strength and self-reported global functioning in persons with hand OA.[55] Exercise programs that use active ROM as opposed to pinch strengthening[27,56] were found to be more effective and one study that used resistive pinch strengthening resulted in some of the participants leaving the study due to increased hand symptoms.[57] In their discussion, the authors reported that the hand exercises were possibly overly ambitious. In terms of overall body conditioning, it has been reported that overall body strength training (including grip strengthening) resulted in decreased pain and increased static and dynamic grip strength.[58] Low-impact general conditioning increased the aerobic capacity and decreased depression and anxiety in patients with arthritis.[59]

Exercise and RA

The evidence is mixed regarding general exercises and hand exercises for RA.[36,60,61] A systematic review reported that there was not strong research evidence for or against hand exercises in the treatment of persons with RA.[61] The reviewed studies did not specify if the hand exercises included active range of motion or strengthening. As with OA painful strengthening should be avoided following the principles of joint protection. Strenuous exercise may increase intra-articular pressures contributing to joint pain.[49] Although there is insufficient evidence to support the effectiveness of specific exercises for patients with RA,[60] generalized conditioning for the patient with RA has been found to improve stamina and muscle strength and is recommended as routine practice in patients with RA.[62] One study found that low-impact general conditioning using walking or aquatics increased endurance and aerobic capacity in patients with RA.[59] Clinically, the psychosocial benefits of group exercise in a warm pool, tai chi, and other pain-free exercise programs have been reported by patients to this author to be very beneficial.[23]

Adaptive Equipment

Adaptive equipment and adaptive techniques are often recommended by therapists to reduce the amount of force or stress to the joints through larger handles, tools that encourage joint alignment and tools that promote leverage. It is important to consider the socioeconomic needs and the client "buy in"

as the therapist makes these suggestions.[47] If the client is unable to afford the equipment or is unwilling to use the equipment, it will not be implemented. Adaptive equipment is one method that can be helpful in implementing joint protection principles.

Link with Basic Science

As the hand with OA or RA grasps or pinches an object, forces are transferred to the joints, which can contribute to joint instability.[63] However, as handle diameter increases, reduced digit force on a tool is needed. Basic science in tool design has developed in the engineering fields to accurately measure these forces. It is reported that in normal hands, the most comfortable handle is 19.7% of the user's hand length,[64] and that the ideal tool handle design is a cylinder with a 33-mm diameter.[65] It has also been determined that to decrease the maximum push pull force on a tool, a cylindrical handle must be parallel to the push/pull direction.[66] Finally, it is reported that a handle design that reduces wrist ulnar deviation requires the least amount of grip force.[67] Further studies are needed related to specific adaptive equipment used in OA and RA to determine the amount of force reduction provided by this equipment and how those specific tools protect joints.

Adaptive Equipment and OA

A systematic review found moderate evidence to support combining joint protection with adaptive device provision for increased hand function and pain reduction.[27] Adaptive equipment used in one study included enlarged writing grips, Dycem®, an angled knife, a book holder, and other equipment based on individual daily activities.[56] Improvements were noted in grip strength and global hand function. This study did not look at the effects of adaptive equipment alone without education or exercise[56] and further research is needed.

Adaptive Equipment and RA

Although adaptive equipment is widely used, there is limited evidence as to its effectiveness for individuals with RA.[36,68] One study evaluated the use of assistive devices in 53 women with RA. They found that after a 13-week course on joint protection, 91% of the assistive devices were still being used at follow-up and that 95% of the tools were in the kitchen area. Pain significantly decreased when using specific tools, a wrist orthosis, and with adaptive techniques such as using two hands instead of one.[69]

Modalities

Modalities have a long history of use in the treatment of arthritis. Many patients with RA and OA report beginning their day with a warm shower or bath as increased tissue temperatures result in temporary neuromuscular effects that decrease pain and muscle tension.[70] Research continues to add to the body of knowledge concerning heat and other modalities for RA and OA including nonthermal ultrasound, electrotherapy, cryotherapy, and low-level laser therapy.

Link with Basic Science

Modalities are used in the treatment of OA and RA to decrease inflammation, pain, and joint stiffness. The basic science behind each modality assists the hand therapist in selecting and applying the appropriate treatment. A complete review of the basic science of each modality is beyond the scope of this article but general concepts are described.

Cold modalities cause vasoconstriction, which reduces the chemical mediators associated with inflammation.[70–73] This vasoconstriction results from stimulation of the smooth muscles of the blood vessels and decreased production and release of vasodilator mediators (histamine and prostaglandin).[72,73] Cold also has an analgesic effect on nerves and nerve endings by counter irritation, and decreases nerve conduction velocities of both sensory and motor nerves.[70–73]

Heat modalities use various mechanisms to transfer heat. These mechanisms include conduction (hot pack and paraffin baths), convection (whirlpool and fluidotherapy), and conversion (continuous ultrasound). Heat has been found to increase blood flow through vasodilation, capillary permeability, muscle contraction velocity, nerve conduction, rate of cell metabolism, and collagen extensibility.[62,74,75] It has also been found to increase inflammation through the release of chemical mediators such as histamine and prostaglandin.[72,74,75] However, despite this fact, heat has been found to typically decrease pain in patients with OA and RA.[27,76]

Nonthermal ultrasound increases cellular permeability including the movement of histamine, which can facilitate the resolution of the inflammatory phase of healing.[77] Watson[78] reported that the nonthermal effects of ultrasound are more effective compared with its thermal effects. Pulsed ultrasound has been found to have a greater effect on membrane permeability than continuous ultrasound.[79] During the inflammatory phase, nonthermal ultrasound has a stimulating effect on the mast cells. This increases degranulation of the mast cells releasing arachidonic acid a precursor for the synthesis of prostaglandins and leukotreine, which act as inflammatory mediators.[80] Other nonthermal effects include increased intracellular calcium, increased macrophage responsiveness, and an increased rate of protein synthesis during fibroplasia.[71,80] These nonthermal effects have also

been attributed to acoustic streaming and cavitation that occurs during pulsed ultrasound.[72] Acoustic streaming, improved cell membrane permeability, and the other nonthermal effects provided by pulsed ultrasound may contribute to the movement of intercellular fluids, possibly resulting in the reduction of joint swelling, pain, and stiffness that is evident in arthritis.

There are a variety of electrical modalities available to the hand therapist. Bracciano[71] explains that at the cellular level electrical stimulation can excite a nerve cell increasing cell permeability. This allows an influx of sodium ions changing the cell from negative to positive resulting in an action potential. Once the action potential is reached, it propagates along the nerve membrane in both directions away from the stimulation site.[72] Nerve fibers are more excitable to action potentials than muscle fibers. Decreased pain can result when the current from transcutaneous electrical nerve stimulation (TENS) stimulates large primary sensory afferents that may block the primary nociceptive fibers or release chemical endorphins.[71,72]

Low-level laser therapy produces photochemical reactions within cells with a single wavelength light (photon) that is concentrated, monochromatic, and coherent.[81] This photochemical reaction involves cellular absorption of the photon activating enzymes at the cellular level.[71]

Modalities and OA

A systematic review by Zhang et al.[45] examined the benefits of heat and ultrasound and found predominantly only level IV evidence (expert opinion). According to the review by Valdes and Marik,[27] there is a weak-to-moderate level evidence supporting the use of heat modalities in decreasing pain and improving grip strength in patients with OA, and low-level laser therapy was no better than the placebo.

Modalities and RA

A variety of modalities have been used for the RA patient with unclear results.[76,80,82] No significant effects have been found for hot and ice pack applications, but improved ROM, improved grip and pinch strength, and reduced pain and stiffness were found with paraffin wax baths.[76] One review found that pulsed ultrasound was effective in increasing grip strength, decreasing morning stiffness, and reducing the number of swollen and painful joints.[82] TENS has been found to help decrease pain in RA.[80] Another review found ''silver''-level evidence with low-level laser therapy when used on the hand in patients with RA resulting in decreased pain and decreased morning stiffness.[83] Although a variety of modalities are currently being used for the RA patient, further research is needed to support the antidotal evidence that is reported by patients and observed by hand therapists in the clinic.

SUMMARY

The purpose of this article was to review the current conservative therapeutic management for patients with OA and RA of the hand related to basic science and evidence-based practice. Hand therapists must have an understanding of basic science, keep current on the developing research, seek out and respect expert opinion, and listen to the needs of our patients to find the best practice for our patients. Although there are many variables in designing hand therapy research studies for patients with RA and OA, we must continue to meet this challenge and contribute to the research. By recognizing what is important and meaningful to each patient, and by constantly reevaluating individualized responses to treatment, we can continue to provide the best care for patients with RA and OA of the hand.

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#1. The joints of the hand most commonly affected with osteoarthritis (OA) are
   a. the carpometacarpal (CMC) joint of the thumb and the proximal interphalangeal (PIP) joints
   b. the metacarpophalangeal (MP) joints of the hand.
   c. the distal interphalangeal (DIP) joints and the carpometacarpal (CMC) joint of the thumb
   d. the distal interphalangeal (DIP) joints and the proximal interphalangeal (PIP) joints

#2. The amount of synovial fluid in Rheumatoid arthritis (RA)
   a. increases, losing viscosity, reducing joint lubrication, and allowing further cartilage damage
   b. decreases, reducing joint lubrication and allowing further cartilage damage
   c. increases, increasing joint lubrication and allowing further cartilage damage
   d. decreases, allowing further cartilage damage

#3. Providing an orthosis for OA of the carpometacarpal (CMC) joint has been a part of several research studies. The systematic review reported in this article found that orthosis provision
   a. had a positive impact on decreasing hand pain, but decreased hand strength and function in patients with OA
   b. did not decrease hand pain in patients with OA
   c. had a positive impact on decreasing hand pain and increasing hand strength, but decreased function in patients with OA
   d. had a positive impact on decreasing hand pain and increasing hand strength and function in patients with OA

#4. Education concerning joint protection for patients
   a. has not been found to be effective
   b. with OA is recommended
   c. with RA and OA is recommended
   d. with RA is recommended

#5. A variety of modalities have been used for the RA patient but the following have been reported in the literature to decrease pain
   a. paraffin wax
   b. paraffin wax, pulsed ultrasound, TENS, and low level laser therapy
   c. paraffin wax, pulsed ultrasound, and TENS
   d. paraffin wax and pulsed ultrasound

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