
Rehabilitation in rheumatoid arthritis and ankylosing spondylitis: differences and similarities

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ABSTRACT

The aim of the paper is to summarize and compare the best available evidence concerning the effectiveness of rehabilitative interventions and provide an overview of recommendations or international guidelines on non-pharmacological treatments in rheumatoid arthritis (RA) and ankylosing spondylitis (AS).

It was found that, compared to RA, there are relatively fewer non-pharmacological intervention studies in AS. Overall, the literature on the effectiveness of non-pharmacological treatment modalities in RA and AS supports the use of exercise and educational interventions with a cognitive behavioural component. The evidence on electro-physical modalities, balneotherapy, and dietary interventions and alternative or complementary interventions for managing RA and AS is generally weak or inconclusive.

International practice guidelines on RA and AS management recommend non-pharmacological interventions as adjunctive interventions to medications. Areas for future research include non-pharmacological interventions in AS, studies on the effectiveness and costs of various health care delivery models, and the usage of alternative or complementary treatments.

Introduction

The pharmacological treatment for rheumatoid arthritis (RA) and ankylosing spondylitis (AS) has improved considerably over the past years, in particular with the introduction of anti-tumor necrosis factor (TNF) agents (1-3). Despite these advances, systematic reviews on infliximab (4) and etanercept (5) in RA have consistently demonstrated improvements in roughly 60%, 40%, and 20% of patients, under the American College of Rheumatology (ACR) 20, 50, and 70 criteria for

improvement, respectively. Recent research also found that overall about 75% of patients with RA did not achieve full remission in the first three years of the disease, with 15% of them having a sustained high or moderate disease activity (6). For AS, between 70% and 90% of patients in anti-TNF clinical trials failed to meet the ASsessment in Ankylosing Spondylitis (ASAS) 70 response criteria at 12 weeks (3).

In those patients whose disease activity is not fully controlled, RA and AS can have a significant impact on their physical, emotional and social functioning. Work disability can occur even at the early stage of the disease (7-9). For example, Lacaille *et al.* reported that 7.5% of patients with RA experienced work disability in the first year and up to 18% by the fifth year (10). Some of these patients may require additional non-pharmacological interventions for managing their health.

The complementary roles of non-pharmacological treatments, such as the ones used in physiotherapy and occupational therapy, are supported by a number of systematic reviews and umbrella reviews (*i.e.* reviews of systematic reviews), for the management of RA (11, 12) and AS (13). International guidelines, including the ones developed by the European League Against Rheumatism (EULAR) on early arthritis, (14) the ACR guidelines on RA, (14) and the ASAS/EULAR recommendations on AS (16, 17) also endorse the use of non-pharmacological interventions as an adjunct.

The purpose of this article is two-fold. First, we summarize and compare the best available evidence on the effectiveness of rehabilitative interventions in RA and AS based on findings of the available systematic reviews and key randomized controlled trials (RCTs). More emphasis will be given to the Cochrane systematic reviews, if available, because

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of the mandatory rigorous methodology employed by these reviews. Second, we provide an overview of recommendations of international guidelines on non-pharmacological treatments in RA and AS.

Evidence on rehabilitative treatment in RA and AS

Overall, the literature on rehabilitation in RA is more extensive than in AS. This observation is illustrated by the availability of systematic reviews on rehabilitative interventions for each of the two conditions (Table I). The current review will focus on the following interventions: 1) physical activity and exercise, 2) balneotherapy and spa therapy, 3) electro-physical modalities, 4) patient education interventions, 5) occupational therapy, 6) dietary supplements, and 7) complementary and alternative treatments. Only interventions that have been evaluated in both diseases are discussed. We have excluded treatments that are

specific for one of the two conditions, such as wrist splints in RA.

Physical activity and exercise

Based on Howley’s work, (18) Westby and Minor define physical activities as “any bodily movement produced by contraction of skeletal muscle that results in increased energy expenditure” (19). Physical activities, which include sports and recreational activities, occupational activities, and daily-living activities, are important for maintaining general health and modifying the risk of chronic diseases, including rheumatic conditions. The ACR recommends that, at minimum, people with arthritis should accumulate 30 minutes of moderate-intensity physical activity (e.g. brisk walking) 3 days a week or the equivalent 90 minutes per week (20). Exercise, a sub-set of physical activity, is specially designed to maintain or improve physical fitness. It consists of planned, structured and repetitive

movement of parts of or the whole body (18, 19). Exercise can be used to improve specific components of physical fitness such as strength, flexibility, range of motion, pain, vitality, and physical fitness. Exercise programs for patients with rheumatic diseases usually comprise of a combination of muscle strengthening, range of motion, flexibility and cardio-respiratory exercises.

The available literature on exercise therapy in RA focuses mainly on dynamic exercise, *i.e.* exercise with sufficient intensity, duration and frequency to improve aerobic capacity and/or muscle strength. In general, systematic reviews conclude that dynamic exercise is effective with respect to the improvement of aerobic capacity and muscle strength, without detrimental effects on disease activity, pain or radiological joint damage (21-23). In particular with respect to early RA, Häkkinen and colleagues compared a 2-year dynamic strength training program with range of

Table I. Cochrane reviews* on rehabilitative interventions in rheumatoid arthritis and ankylosing spondylitis (Cochrane database accessed: May 10, 2009).

	First author	Number of trials included	Treatment modalities
<i>Rheumatoid arthritis</i>			
Exercise therapy	Van den Ende (21)	6 RCTs	Dynamic exercise therapy (At least twice a week during at least 20 minutes exercise forms whereby the heart rate exceeded 60% of the maximal heart rate, duration of the programme at least 6 weeks)
Balneotherapy	Verhagen (35)	6 RCTs	Bathing in water which may contain minerals (added or natural)
Thermotherapy	Welch (40)	7 RCTs	Any form of heat or cold (balneotherapy excluded)
Ultrasound	Casimiro (42)	2 RCTs	Ultrasound applications using any combination of parameters (intensity, mode or size of ultrasound head)
Electrotherapy	Pelland (45) Brosseau (47)	1 RCT 3 RCTs	Electrostimulation of muscle All types of transcutaneous electrical nerve stimulation
Low level laser therapy	Brosseau (50)	5 RCTs and 1 CCT	All types of low level laser therapy (Classes I, II and III) including all wavelengths
Psycho-educational interventions	Riemsma (52)	31 RCTs	An intervention comprising formal structured instruction on RA and on ways to manage arthritis symptoms, including modern behavioural methods to promote changes in health behaviours.
Occupational therapy	Stultjens (57)	15 RCTs 6 CCTs, 16 other designs	Training of motor function, training of skills, instruction on joint protection, counseling, advice and instruction in use of assistive devices, provision of splints, and comprehensive occupational therapy
Dietary interventions	Hagen (63)	14 RCTs	Any dietary manipulation, such as elimination diets, Mediterranean or Cretan, vegetarian, acid-base balance and fasting. Dietary supplement studies were not included.
Accupuncture	Casimiro (67)	2 RCTs	Accupuncture and electro-accupuncture
<i>Ankylosing spondylitis</i>			
Physiotherapy	Dagfinrud (28)	11 RCTs	Relevant physiotherapy modalities in AS: exercises, training, manual therapy, massage, hydrotherapy, electrotherapy, acupuncture, patient information and educational programs

*References are numbered according to the order in which they are discussed in the text.

motion and stretching exercises and/or continuation of recreational activities (24-25). In this RCT, a greater improvement of muscle strength, activities of daily living and disease activity was seen in the intervention group, with no differences between the two groups for bone mineral density and radiological damage.

Evidence on the optimal mode of delivery (*e.g.* land-based or water-based, home-based or with supervision, individual or group therapy) is less clear; however, participants in some studies appeared to prefer supervised and water-based activities (26, 27). Lack of energy and fear of joint damage were factors most strongly associated with individuals' exercise behaviour (27).

Exercise therapy in AS (land-based or water-based) aims to maintain and improve mobility of the spine and peripheral joints, to strengthen the muscles of the lower extremities, back and the abdomen, to enhance relaxation of the body, and to improve fitness. The effects of exercise were examined in a recent Cochrane review of six RCTs on physiotherapy in the management of AS (28). The experimental interventions mainly consisted of exercises, although some also used additional physiotherapy treatments such as education. Overall, the evidence supports the use of exercise in patients with AS, due to its positive effect on physical function and spinal mobility. Supervised exercise programs appeared to be more effective in improving spinal mobility and patient global assessment of disease activity than home exercises. These findings are in agreement with an earlier review by van Tubergen (29), who reported beneficial effects of exercise programs, including range of motion, muscle strengthening and aerobic exercises, and sports on spinal mobility and physical functioning.

After 2006, the inclusion period of the Cochrane review (28), Widberg *et al.* published the results of a combination of individualized self- and manual mobilization and home exercises with no treatment, and observed a favourable effect of the exercise program on chest expansion, posture and spinal mobility (30). Similar to RA patients, Sundstrom

found that patients with AS favoured pool exercises for relieving symptoms and found it more enjoyable than land-based exercises (31). The authors also identified the lack of time and fatigue as the major barrier to adhere to an exercise routine (31).

Nowadays, apart from structured exercise regimens recommended by health professionals, participation in physical activity in everyday life is deemed increasingly important. The literature on the effectiveness of physical activity programs in both RA and AS is, however, relatively scarce. In an RCT including 160 sedentary patients with RA, van den Berg *et al.* (32) found that an Internet-based physical activity intervention combined with individually tailored supervision by e-mail, the use of exercise equipment, and group contacts, was superior to the Internet intervention alone for increasing the proportion of patients who reported meeting physical activity recommendations (*i.e.* ≥ 30 minutes, moderately intensive activity, most days of the week). In addition, an RCT on a 1-year coaching programme for physical activity in 228 patients with early RA demonstrated greater improvements of perceived health status, grip strength and lower extremity muscle strength in the intervention group than in the control group, although there were no differences in reaching a healthy physical activity level (defined as moderately intensive, 30 minutes/day, 4 days/week) between the groups (33). We found no RCT on physical activity interventions for managing AS.

Balneotherapy and spa therapy

Balneotherapy is commonly used in Europe, but not in North America. It implies bathing in water, particularly from natural mineral and thermal springs, at the optimal temperature ranges between 34 and 35°C and a duration of about 20 minutes. Balneotherapy is usually part of total spa therapy, including other modalities such as massage, electrotherapy, and/or exercises (34). Spa therapy, usually provided with an average duration of 2-3 weeks, is often used in a health holiday setting so that the placebo effect is considered to be substantial (34).

In patients with RA, a Cochrane review, including seven RCTs on balneotherapy, concluded that although most studies reported positive results in pain, morning stiffness and functional ability, most of them suffered from methodological flaws (35). Overall, the evidence on balneotherapy, compared to no treatment, medications or other non-pharmacological treatments, for patients with RA was deemed inconclusive.

The effectiveness of balneotherapy or spa therapy in AS has been sparsely investigated. The Cochrane review on physiotherapy for AS (28) has identified one RCT including 120 patients (36). Spa therapy plus weekly group exercises was found to improve pain and overall well-being more than weekly group exercises alone (36). More recently, Yurtkuran *et al.* conducted an RCT comparing spa therapy to non-steroidal anti-inflammatory drug (NSAID) therapy and a combination of both (37). It was found that spa therapy was more effective in relieving symptoms and improving spine mobility than NSAIDs alone, with the effect lasting up to 6 months. In a third RCT, 60 patients with AS were randomized to intensive treatment, including daily balneotherapy in spa water at 39°C plus two hours of bed rest for three weeks, followed by a 30-min home exercise program for six months, or to the exercise program alone (38). Balneotherapy was found to have a significant supplementary effect on disease activity and functional parameters directly after the treatment period; however, the effects diminished after 6 months.

Electro-physical modalities

Electro-physical modalities, involving the use of thermal, electrical, light, sound and magnetic energy, have been used to generate therapeutic physiological effects with the aim to reduce pain or restore function in people with arthritis. Thermotherapy includes the application of local cold (ice packs, ice chips, ice massage, cryo-wraps, cold air or vapocoolant sprays) and heat (superficial heat: hot packs, paraffin or wax baths and infrared; deep heat: electromagnetic wave forms and ultrasound) (39). In addition, heat and cold can be

generally applied by means of whole-body cryotherapy, infrared sauna, or thermal baths.

In a Cochrane review of thermotherapy applications in patients with RA, no significant effect was found on disease activity compared to no treatment or active therapy (40). However, in people with RA and hand involvement, four weeks of paraffin treatment was found to improve range of motion, hand function, pain and stiffness, compared to the no treatment control. In a recent RCT, Hirvonen *et al.* compared local cryotherapy with whole-body cryotherapy (-60° and -110°) in 60 patients with RA and found no significant difference in the disease activity between the groups (41).

Therapeutic ultrasound in RA was the subject of another Cochrane review that comprised two RCTs (42). No conclusion can be drawn due to considerable methodological shortcomings and conflicting results.

We did not identify any systematic reviews on thermotherapy in AS, but a few recent studies have been published in this area. In a small observational study involving 17 patients with RA and 17 with AS, infra-red sauna, a form of total-body hyperthermia, was found to improve pain, stiffness, and fatigue, without enhancing disease activity in both groups (43).

In another study, with a randomized, cross-over design, total body cryotherapy and whole spine paraffin mud packs were provided to eight patients with AS (44). No clinical changes were observed after either therapy, however, participants reported an improvement in spine function after cryotherapy and a worsening after thermotherapy (44).

Electrotherapy is the therapeutic use of different forms of electric currents, mostly applied by surface electrodes. Transcutaneous electrical nerve stimulation (TENS) is applied with the aim of pain control. Muscle stimulation by means of electrotherapy is used to improve muscle strength and function.

The evidence on the use of electrical stimulation in RA is limited. In a Cochrane review (45), only one RCT that met the methodological criteria was identified (46). The study compared two electrical stimulation protocols, a

fixed 10 Hz stimulation frequency and a patterned stimulation protocol, with a no-treatment control for managing hand RA. The results suggested that either protocol seemed to be superior to no treatment for improving pinch strength and endurance; however, due to poor reporting and methodological shortcomings, the authors found the evidence inconclusive. The authors of a Cochrane review on the effectiveness of TENS applied to the hand in patients with RA concluded that acupuncture-like TENS helps to decrease pain and joint tenderness compared to a placebo (47). On the other hand, it was also found that more people who received conventional TENS reported a decrease in disease activity than those who received acupuncture-like TENS (47).

In AS, no systematic review was identified, but we found one RCT comparing TENS with sham TENS treatment over three weeks. Pain appeared to improve in the treatment group, but the difference did not reach statistical significance (48). In another RCT, Gurcay compared a 3-week course of a combination of 15 sessions of Stanger bath therapy (a combination of electrotherapy and hydrotherapy) and exercises with a 3-week course of conventional exercises alone in an RCT involving 58 patients (49). Compared to those who received exercise alone, patients who received Stanger bath therapy plus exercise showed greater improvement in the spinal mobility, functional capacity, disease activity and quality of life immediately after the treatment period.

Low level laser therapy is a light source that generates extremely pure light, of a single wavelength. The effect is not thermal, but rather it produces photochemical reactions in the cell. A Cochrane review of five placebo-controlled studies on low level laser therapy in RA suggests that the treatment is effective in reducing pain and morning stiffness, and improving the finger tip-to-palm flexibility (50). It should be noted however that the sample sizes in these studies were small, and the treatment protocols, including dosage, wavelength and types of low level laser therapy, varied greatly.

In AS, no systematic review or RCT on low level laser therapy is available.

Educational interventions

Educational interventions are provided to support patients to cope with the consequences of the disease. The nature of educational interventions may range from the provision of information in a traditional didactic format to cognitive-behavioral therapy. Not all educational interventions are created equal (51).

In RA, two systematic reviews on educational interventions consistently conclude that only interventions that involved behavioural change techniques (*e.g.* the Arthritis Self Management Program) provided a small but significant short-term effect on pain, functional disability and psychological status, while those that offered counselling or "information only" showed no additional benefit (52, 53).

The literature on educational interventions for patients with AS is scanty. In one controlled trial, patient education was shown to have short-term benefit for function (54). The preliminary analysis of another study, with a randomised, controlled design, showed that an educational course in AS is likely to be cost-effective (55). Moreover, positive effects of an interdisciplinary patient education course consisting of 6 modules each lasting 90 minutes were reported, (56) with the most favourable effects seen in patients with early disease and considerable disease activity.

Occupational therapy

Comprehensive occupational therapy interventions may consist of a combination of instruction on joint protection and energy conservation, advice and instruction in using assistive devices and orthoses, training of motor function or skills, and counselling. Joint protection and energy conservation techniques include a wide variety of concepts, such as planning and pacing activities, regular rest, altering patterns of joint movement, and the use of assistive devices.

In RA, a systematic review on comprehensive occupational therapy, including education on joint protection (57) concluded that there is limited evidence for the effectiveness of comprehensive occupational therapy on patient outcomes such as knowledge and functional ability. Since this review was published, Ham-

mond *et al.* published an RCT comparing a joint protection programme with a behavioural education component on joint protection with standard education, in patients with early RA (58, 59). In this study a greater improvement of adherence, pain, disease status and functional ability was seen in those attending the joint protection programme than in the patients who received standard care. In another RCT on comprehensive OT in early RA, it was found that OT improved self-management, but not health status (60).

In AS, the effect of comprehensive occupational therapy was assessed in an RCT with 27 patients treated with anti-TNF-alpha drugs (61). In that study, three occupational therapy sessions, held every six weeks, were compared with no treatment. It was found that after 16 weeks, improvements of pain and function were significantly greater in the intervention group than in the control group. We found no studies that specifically evaluated the effect of joint protection and energy conservation in AS.

Dietary interventions

Diets are commonly employed by patients with arthritis, (62) and may include elimination, Mediterranean or Cretan, vegetarian, and acid-base balance diets and fasting.

In RA, one systematic review on dietary manipulation reported inconclusive results (63). The sample sizes of the majority of the 14 available RCTs were found to be small. Although on average patients in the dieting groups lost about 3 kg more than those who did not follow the diet, the dropout rates were also higher in the dieting group (63).

In patients with AS, a reduction in consumption of carbohydrate was not found to be effective (62, 64).

Complementary and alternative treatments

– Massage

Massage, a form of manual therapy, is the systematic manipulation of soft tissues of the body for pain reduction or other therapeutic purposes (65). To date, there is no controlled clinical trial

on the effectiveness of massage in patients with RA or AS, whereas a review on its safety concludes that adverse events with the use of classic massage are rare (66).

– Acupuncture

Acupuncture is a traditional Chinese treatment, wherein thin needles are inserted into specific location of body, known as acupuncture points, for pain relief and other therapeutic purposes. A Cochrane systematic review, based on two medium to low quality RCTs in patients with RA, concluded that acupuncture had no effect on the inflammatory indicators (ESR, CRP), pain, patient's global assessment, number of swollen and tender joints, general health, disease activity, or the need for analgesic medications (67). However, owing to methodological issues, including the types and location of the acupuncture interventions, and the small sample sizes of the included studies, the findings should be viewed with caution.

No systematic review was found in AS.

Table II. Recommendations on non-pharmacological management strategies in rheumatoid arthritis and ankylosing spondylitis.

	Rheumatoid arthritis		Ankylosing spondylitis
	EULAR recommendations for the management of early arthritis (14)	ACR guidelines for the management of RA (15)	ASAS/EULAR recommendations for the management of ankylosing spondylitis (16, 17)
Consultation with allied health professionals		Consultation with PTs, OTs and/or vocational rehabilitation counselors should begin earlier in order to prevent deterioration in physical activities. An inter-disciplinary approach of care is recommended.	
Psycho-educational interventions	Patient information concerning the disease and its treatment and outcome is important. Education programmes aimed at coping with pain, disability and the maintenance of work ability may be employed as adjunct interventions.	Education and cognitive-behavioural interventions, including the Arthritis Self-Management Program, are recommended.	Non-pharmacological management of AS should include patient education.
Exercises and other non-pharmacological interventions	Non-pharmacological interventions such as dynamic exercises, occupational therapy, and hydrotherapy can be applied as treatment adjunct to pharmaceutical interventions in patients with early arthritis.	Interventions including exercises, joint protection and energy conservation techniques should be provided to maintain joint function. Regular participation in dynamic and aerobic exercise can improve joint mobility, muscle strength, physical fitness, function, and psychological well being without aggravating joint symptoms or fatigue	Non-pharmacological management of AS should include regular exercise. Individual and group physical therapy should be considered.
Patient associations and self-help groups		Credible non-profit organizations such as the Arthritis Foundation can be used to provide useful resources.	Patient associations and self help groups may be useful.

Clinical practice guidelines

International practice guidelines on RA and AS management (14-17) recommend non-pharmacological interventions as adjunctive interventions to medications (Table II). The EULAR recommendations on RA management primarily center on early inflammatory arthritis, while the ACR guidelines provide recommendations on RA management in general. All three guidelines recommend exercises and patient education. In RA, occupational therapy is explicitly mentioned, whereas in AS patient associations and self-help groups are recommended.

In addition, other guidelines are available that provide more specific recommendations on the use of non-pharmacological interventions (68, 69). For example, the British Society for Rheumatology and British Health Professionals in Rheumatology guidelines support educational interventions, exercises, hydrotherapy, the use of TENS, heat and cold application, and joint protection and energy conservation techniques. Furthermore, they stress that interventions can be provided by a team of specialized health professionals (68, 69).

Discussion

Research on the effectiveness of non-pharmacological treatment in the management of RA and AS has demonstrated some benefits in patient outcomes. Our overview of the literature, which focuses on the Cochrane reviews and international guidelines, has highlighted the importance of the use of exercise and education with a cognitive behavioural component in the management of arthritis. The evidence regarding electro-physical modalities, balneotherapy, and dietary interventions was generally weak or inconclusive.

This overview focused on systematic reviews and RCTs. It should be noted that the majority of systematic reviews included only few RCTs. In addition, most of the systematic reviews have pointed out methodological shortcomings in the available RCTs, which have diminished the ability for concluding on the effectiveness of these treatments. Therefore, with the development of guidelines, expert opinion is also taken

account. Nevertheless, the currently available guidelines are in general not very specific with respect to the optimal indication, timing, intensity and frequency of non-pharmacologic interventions.

The conduct of RCTs in non-pharmacological care is hampered by a number of factors, including *e.g.* the complex nature of many interventions, the inability of blinding patients and health care providers or the availability of appropriate outcome measures (70, 71). Currently, initiatives are taken to enhance the methodologic quality of intervention studies in non-pharmacological care (72). In this respect it should be taken into account that, apart from the RCT, there are a number of other study designs that can be used, including cluster-randomized trials, large-scale pragmatic trials, preference trials, or individual patient trials (70). In addition, qualitative research designs or combinations of quantitative and qualitative methods must be considered.

Our review has also identified a few gaps in research. First, compared to RA, there are relatively few non-pharmacological intervention studies in AS. This may explain the disparity in the numbers of Cochrane systematic reviews and international guidelines in RA versus AS. Since AS affects about one in 200 people in the population, many of whom are at the most productive years of their lives, there is an urgent need for more high quality studies to understand the effectiveness and the role of non-pharmacological treatment in addition to medical treatments.

Second, little is known on the optimal model(s) for providing rehabilitative care for patients with RA and AS, taking into account the constraints of local health care resources. Rehabilitative care may be provided by single health professionals or by a multidisciplinary team co-ordinating their activities, in a primary, secondary or tertiary care setting. Based on the literature and daily practice, it appears that in the rehabilitative treatment of AS a group treatment approach is more common than in RA. With respect to access to rehabilitative services there are large differences among countries, depending on

the health care system, availability of institutions and individual health professionals and cultural aspects. These factors should be taken into account with the interpretation and design of studies on rehabilitative care in RA and AS.

Finally, although the use of complementary and alternative treatments is popular in patients with RA and AS (73-76), we found very few systematic reviews and RCTs in this area. For example, no RCTs in massage therapy in RA or AS were found, yet it is one of the most commonly used alternative treatments by patients with arthritis (76). In order to facilitate evidence-based practice in rheumatology, more research will be needed to guide clinicians' decisions in using complementary and alternative treatments for managing RA and AS.

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