Physiotherapy in ankylosing spondylitis: What is the evidence?

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ABSTRACT

Evidence on the value of some current physiotherapeutic practices and the in-effectiveness of others is accumulating. This paper addresses the best evidence available on the efficacy and effectiveness of physiotherapeutic modalities in ankylosing spondylitis. General issues in the assessment of physiotherapy in this disease are briefly discussed. Core sets for assessments are nowadays available. A recent Cochrane review on this topic supports the (at least short-term) positive effects of physiotherapy, in particular exercise, in the management of ankylosing spondylitis. Some details of the included studies are provided.

Ankylosing spondylitis, the prototype of the group of related diseases that are collectively labeled as spondylarthropathies, is one of the most frequent inflammatory rheumatic conditions. Like rheumatoid arthritis, the disease is associated with significant disability and increased socioeconomic costs. Currently available conventional therapies for ankylosing spondylitis are palliative at best, and often fail to control symptoms at the long run. Physical therapy including exercises is often considered as a necessary adjunct to drug therapy. However, the paucity of data makes it difficult to identify the best administration mode of these interventions based upon scientific evidence.

Nowadays, the question whether or not physiotherapy is effective for patients with musculoskeletal diseases in general and ankylosing spondylitis in particular receives considerable attention. Publication of randomized trials and systematic reviews in physiotherapy for the whole field of musculoskeletal conditions has increased spectacular over the past few years. More than 2700 randomized trials and systemic reviews in physiotherapy are now available of which more than 800 have been published since 1997 (1). A large web-based database of randomized trials and systematic reviews in physiotherapy has now been produced (1). The evidence confirms the value of some current physiotherapy practices and the ineffectiveness of others (2).

Dealing with evidence based medicine (EBM) in practice four stages can be delineated.

(1) The formulation of answerable questions.
This requires analytical skills, an awareness of knowledge gaps and the compelling motivation to do something about them by orderly inquiry.

(2) The search for the best evidence.
This mandates for the selection of the most appropriate source of information, their systematic investigation and the application of information technology competencies to the full range of printed and electronic data.

(3) Critical appraisal of the evidence.
This calls for rigorous, scientific testing of accuracy and diagnostic validity in the literature or data, with the help of statistical competence and logical discrimination between the costs and benefits of alternative procedures.

(4) The decision to apply the conclusion to patients' healthcare.

This demands the integration of the evidence with the practitioner's clinical expertise to produce a soundly based judgment of treatment. In fact, this point comprises an approach to decision-making, in which the clinician uses the option that suits that patient best, underlining the importance of patients in the evidence based approach.

Evidence from the literature is usually categorized into several levels of importance ranging from highest quality evidence to lowest quality evidence based upon the strength of the study design (Table I).

Clearly, these general principles are

Table I. Levels of scientific evidence (A = highest; D = lowest).

(A1)	Meta-analysis including consistent results of high quality double-blinded randomized controlled clinical trials (RCTs)
(A2)	High quality double-blinded randomized controlled clinical trials providing consistent results
(B)	Lower quality randomized controlled clinical trials and those with smaller numbers and other comparative (non-randomized) studies (cohort studies; case-control studies)
(C)	Non-comparative studies
(D)	Expert opinion

relevant not only for physiotherapy as it relates to musculoskeletal (or other) diseases in general. Their practical application to a disease such as ankylosing spondylitis,however, is no easy task. For example, what exactly do we mean if we use the word physiotherapy? Traditionally, the mainstays of physiotherapy in the management of musculoskeletal conditions have been massage, manual therapy (manipulation and joint mobilization), electrotherapy (ultrasound, short-wave diathermy, or low energy laser), and therapeutic exercises. Therefore, physiotherapy comprises a whole spectrum of – usually non-standardized – therapeutic interventions applied by non-standardized physiotherapists to different patients whose disease (ankylosing spondylitis) might differ in important aspects such as activity, severity or stage of the condition to be treated. Patients may have varying degrees of involvement of the axial skeleton ranging from radiographic changes limited to the sacroiliac joints to complete fusion of the spine. Braun *et al*. have recently proposed to stage the disease into 5 categories based upon radiological involvement of the spine (Table II). Also, features such as peripheral arthritis, enthesitis, anterior uveitis, or organ involvement may or may not be present. All these stages may be associated with different degrees of impairment, functional limitations or handicap and may require different physiotherapeutic approaches. Thereby, one should have realistic expectations if one prescribes physiotherapy to patients with ankylosing spondylitis. Probably, no one would reasonably expect that physiotherapy would affect acute phase reactants as indicators of the inflammatory process such as the erythrocyte sedimentation rate or the C-reactive protein level. Dealing with assessment of the effectiveness of physiotherapy, other important issues have to be addressed also. For example, what is the time horizon of the intended effects of physiotherapy ? Are we opting for short-term efficacy or long-term effects? Maybe we want to recommend physiotherapy aiming at *prevention* of possible future complications such as limited physical functional ability due to a fused bend spine. In fact, we are dealing with a whole array of possible interventions (Table III) and many possible outcomes (or prevention of certain outcomes) over considerable periods of time. In order to promote standardization in this field the international Ankylosing Spondylitis Assessment group (ASAS) has addressed some of these questions. A core set for the assessment physiotherapy is now available (Table IV) (3).

Table II. Radiological stages of ankylosing spondylitis (Braun *et al*. in preparation).

Stage I	≥ Grade II bilateral radiographic sacroiliitis
Stage II	Minor radiographic evidence of spinal involvement in 1 spinal segment (≤ 3 vertebrae or < 15% of the spine)
Stage III	Moderate radiographic evidence of spinal involvement in 2 spinal segments (4–12 vertebrae or 15-50% of the spine)
Stage IV	Radiographic evidence of spinal involvement in 3 or more spinal segments (13–19 vertebrae or 50-80% of the spine)
Stage V	Widespread (≥ 80%) fusion of the spine (≥ 20 vertebrae)

In this paper searching for scientific evidence for effectiveness of physiotherapy we will deal with high quality evidence (level A) only (Table I). Recently, a Cochrane review on physiotherapeutic interventions for ankylosing spondylitis has been completed with the objective to summarize the available scientific evidence on the effectiveness of physiotherapy interventions in the management of ankylosing spondylitis (4). Only randomized and quasi randomized studies on patients fulfilling the modified New York criteria for ankylosing spondylitis (5) were included in this review of the literature if at least one of the comparison groups received some kind of physiotherapy. As main outcomes the ASAS core set was used (Table IV). Altogether 21 studies were considered for inclusion in this review, but 16 of them had to be excluded due to study design or due to the objection of the

Table III. Spectrum of physiotherapeutic modalities for ankylosing spondylitis.

Supervised exercises for individual patients
Supervised exercises for groups of patients
Unsupervised exercises
Training
Manual therapy
Massage
Hydrotherapy
Spa therapy
Electrotherapy
Acupuncture
Patient information and education

Table IV. Core set of domains for assessment of efficacy of physiotherapeutic interventions in patients with ankylosing spondylitis as proposed by the international ASAS group (3).

- Physical function
- Pain
- Spinal mobility
- Stiffness
- Patient global evaluation

study leaving 5 studies (6-10). Of these remaining studies 2 are follow-up or crossover studies (8, 10) of previous studies in this group and, therefore, do not provide independent results. The results of these best evidence studies will be discussed in more detail below. Remarkably, exercising is the experimental treatment in all these trials.

Physiotherapy in ankylosing spondylitis is usually said to aim at maintaining and improving mobility of the spine and peripheral joints, strengthening the muscles of the trunk, the legs, the back, and the abdomen by exercises; stretching of the back and improving fitness by sporting activities; and by relaxation of the body and improving mobility by hydrotherapy (7,11,12). Several exercise regimens for ankylosing spondylitis can be distinguished: supervised (individuals or groups) or unsupervised (Table III). Detailed information on various forms of these physical exercises has been described in the literature, although no uniform protocol is yet available (6,11-15).

In *supervised individualized* exercises, performed at a physiotherapy center or - to a lesser extent - at home, education plays a central role. The physiotherapist advices the patient how to move, how to rest in a particular position, and which sports are appropriate (badminton, volleyball, swimming, cross-country skiing) and which is less suited or not suited at all (horse riding, cycling, boxing, football, soccer). The aim of these exercises is to teach the patient an individual exercise program that he/she can subsequently continue daily unsupervised at home (7).

The *unsupervised individualized* exercises may consist of exercises based on a predefined program, but may also include recreational exercises. These exercises should become part of daily routine in a patient's life.

In practice, many patients find it difficult to comply to a program of daily exercises individually. Therefore, *supervised group* physical therapy is offered mainly to stimulate and motivate the patients to continue exercising, and to provide social contacts with and control by fellow-patients. Also, the supervising physiotherapist closely guards the intensity of the exercises in order to achieve improvement. Group physical therapy usually consists of 1 hour of physical exercises, 1 hour of sports and 1 hour of hydrotherapy.

In-patient physiotherapy, consisting of 2-4 weeks daily exercising at a specialized clinic, in particular is frequently offered to recently diagnosed patients or to patients experiencing a flare of their disease. Treatment usually consists of exercises and pool sessions, but also other treatment modalities (for example ice or heat applications, massages) may be applied. Also, education about the disease, the role of patient societies, and information about reimbursement by insurance companies is extensively provided.

Best evidence for efficacy or effectiveness

Supervised individualized exercises

The effects of supervised individualized physical exercises have been studied in a RCT (9) with an additional follow-up period (10), and in an open study (16). Kraag *et al*. randomly allocated patients to either physiotherapy and disease education at home (n = 26), or to no therapy (n = 27) (9). After 4 months, the patients from the control group were also offered physiotherapy sessions at home (10). In comparison with the control group, the intervention group showed at 4 months (end of trial period) statistically significantly more improvement in finger-to-floor distance (mean relative between-group improvement [scores of intervention group minus those of controls]: 42%) and function (23%) (9). At 8 months (end of open follow-up period), only function had significantly changed in both study groups compared with results at 4 months (10). Interestingly, the intervention group showed significantly more improvement at 4 months in comparison with the control group at 8 months. The authors suggested that this reduced treatment effect may be due to the fact that the intervention group had received more therapy sessions in the first 4 months compared with the controls in the second period of 4 months, implying that more therapy given on a regular basis will be more effective (10).

Supervised group physical therapy

The effects of weekly-supervised group physical therapy in addition to unsupervised exercises have been investigated in a RCT (7), which was followed by a second RCT after the end of the first study period in which the effects of continuation of group physical therapy were assessed (8). In the first study, patients were randomly allocated to a group that followed weekly group physical therapy in addition to daily-unsupervised exercises at home (n = 68) or to a group that only daily exercised at home (n = 76) (7). Both groups had received 6 weeks of supervised individualized therapy before randomization (16). After 9 months, statistically significantly more improvement in favor of the intervention group was found for thoraco-lumbar flexion and extension (mean between-group improvement: 7%), physical fitness (5%), and global health (28%). In a second, consecutive study, the intervention group was randomized again into a group continuing weekly group physical therapy for another 9 months (n = 30),and a group discontinuing this (n = 34) (8). Both groups were advised to continue exercising at home. After 9 months, statistically significantly more improvement was found in the continuation group compared with the discontinuation group in global health (28%). Function did not improve much in the continuation group (4%), but deteriorated in the discontinuation group (-28%), the difference being statistically significant. During the study period, the time spent on exercises at home appeared to be significantly higher in the continuation group than in the discontinuation group. An explanation for this could be peer pressure and encouragement by the supervisor of the continuation group stimulating home exercising (8). This may consequently also have had effects on the outcomes of the study. Alongside this RCT (7), a cost-effectiveness study was performed (17). Only direct (health care) costs were included. Costs of annual weekly group physical therapy were estimated at (1993 figures) USD 531 per patient per year. In comparison with the pre-trial period, the total me-

dical costs for the intervention group decreased with a mean of USD 257 (35%) per patient per year for the individualized exercise group and USD 379 (44%) per patient per year for supervised group therapy.

In-patient physiotherapy

One RCT reported the effects of inpatient physiotherapy (6). Three groups of patients were studied: group A (n = 15) followed 3 weeks of intensive inpatient physiotherapy, group B (n = 15) followed during a 6 weeks period twice weekly hydrotherapy sessions and performed individual exercises twice daily at home, group C (n = 14) only performed individual exercises at home. All groups were advised to continue exercising at home after the treatment period. Significant differences between the three groups were found immediately after treatment in pain, stiffness, and cervical rotation, with most improvement found in the two intervention groups. At 6 months no significant differences between the groups were found in any of the outcome measures.

Spa therapy

Evidence for the effects of the therapy known as Spa therapy, also – at least in central Europe - often called "Kur Therapie" may need particular attention. It can be described as an intensive - usually up to 3 weeks lasting – combination of physiotherapeutic modalities, including hydrotherapy and exercises. It can be offered to groups of patients or to individuals. It is mostly supervised and takes place (at least partly) in-house.

A recently conducted study evaluated the efficacy of 3 weeks of combined spa-exercise therapy as an adjunct to standard treatment with drugs and weekly group physical therapy in patients with ankylosing spondylitis (18). Two groups of 40 patients each were randomly allocated to treatment at 2 different spas (one in Austria, the other one in the Netherlands) A control group (n = 40) stayed at home and received weekly group therapy for 40 weeks. The "spa" patients followed a regimen of combined spa/group physical exercises for 3 weeks, followed by weekly group physical therapy for an additional 37 weeks. The improvements in function and global well being in the spa-exercise therapy groups were greatest early in the study. At 4 weeks after the start of spa-exercise therapy, significant improvements were seen in the pooled index of change (which was an aggregate of the following primary outcomes: BASFI, patient's global well-being, pain, and duration of morning stiffness) in the "spa" group, compared to the control group ($p \leq 0.004$). Benefit was maintained over the 40-week study period in patients receiving spa-exercise therapy, although at 40 weeks, the improvement in the pooled index of change had lost statistical significance, as compared to controls.

The cost-effectiveness of combined spa-exercise therapy has also been assesses alongside this RCT. The incremental (= additional) cost-effectiveness and cost-utility ratios of the 3-week course of spa-exercise therapy as compared to standard treatment were investigated (19). Direct (health care and non-health care) as well as indirect (non-health care) costs were included. The incremental cost-effectiveness ratio per unit effect gained in functional ability a 0-10 scale (based on the Bath Ankylosing Spondylitis Functional Index) was Euro 1269 and Euro 2477 for the Austrian and Dutch group respectively. The costs per QALY (Quality Adjusted Life Year) gained (assessed by EuroQol) were Euro 7465 (spa therapy in Bad Gastein, Austria) and Euro 18575 (spa therapy in Arcen, The Netherlands) for the 2 groups respectively. No substantial changes in the cost ratios were found in sensitivity analyses for a whole range of variables.

Conclusion

In summary, the available data support (at least short term) positive effects of physiotherapy, in particular exercises, and spa therapy in the management of ankylosing spondylitis. However, further research is needed to determine the most effective physiotherapy modalities and applications and to establish the precise role of physiotherapy interventions for this potentially disabling inflammatory rheumatic condition. In the meantime, patients should consider exercising as part of their daily routine. Depending on their personal needs and preferences, disease activity and severity, patients with ankylosing spondylitis may opt for unsupervised (recreational or ankylosing spondylitis-specific) exercises alone, may additionally attend group physical therapy sessions, or if necessary follow an in-patient course of physiotherapy or engage in spa therapy. Self-management is a prerequisite to success, with the basis lying initially at the physician convinced of the need of exercising and referring the patient to a physiotherapist, and second at the physiotherapist who inspires and motivates the patient to follow a time consuming program, which however may eventually lead to a better outcome of their disease (20).

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