

The Dougados functional index with the 5-point Likert scale is sensitive to change due to intensive physiotherapy and exercise in spondyloarthropathy

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ABSTRACT

Objective
The aim of the present study was to evaluate whether the Dougados Functional Index (DFI) with 5-point Likert scale is sensitive enough to demonstrate the efficacy of intensive physiotherapy and exercise.

Methods

Eighty-one consecutive patients with spondyloarthropathy (SpA) completed self-administered questionnaires on functional analysis, the Bath Ankylosing Spondylitis Functional Index (BASFI) and the DFI with 5-point Likert scale, at the beginning and end of a 3-week in-patient course based on intensive physiotherapy and exercise. The objective effect of the course was measured with 10 ranges of movement. After a 6-month follow-up the patients completed the questionnaires by mail for analysis of the lasting impact of rehabilitation on function.

Results

The in-patient course was highly effective: all ranges of movement and both functional indices including the DFI with 5-point Likert scale improved to a highly significant degree. Six months later functional ability as measured by the DFI remained significantly better than at baseline before the in-patient course, but the BASFI had returned to the baseline level.

Conclusion

The DFI with 5-point Likert scale is sensitive enough to demonstrate the effect of intensive physiotherapy and exercise.

Introduction

The rheumatic manifestations of ankylosing spondylitis (AS) (1) and other spondyloarthropathies (SpAs) (2) include spinal symptoms, extraspinal joint disease and enthesopathic lesions. Inflammation is responsible not only for the subjective clinical symptoms of pain and stiffness, but also for reduction in spinal mobility, which can hamper daily activities. Treatment comprises both drug and nondrug approaches (3). Rehabilitation and physical therapy have beneficial effects (4, 5).

The Assessment in Ankylosing Spondylitis (ASAS) Working Group (6) has

recommended instruments for end-point core sets to be used in research projects investigating AS, and in the domain of function both the Bath Ankylosing Spondylitis Functional Index (BASFI) (7) and the Dougados Functional Index (DFI) (8) can be used in physical therapy trials. The BASFI and the DFI correlate equally well with disease activity and damage (9). In a comparison of BASFI and DFI, there is in the setting of physical therapy some advantage in favor of BASFI (10).

The use of visual analogue scales (VASs) in BASFI allows for depiction of more change than can be shown in Likert response scales using only 3 categories in the DFI. In a comparative study of the usefulness of the BASFI and DFI, a modification of the DFI using a 5-point Likert scale has been used, but the sensitivity to change in this modification could not be analysed with the cross-sectional data in question (9). Ruoff and Stucki (10) have recommended testing of the 5-point Likert response scale in the DFI for future research agenda. The aim of the present study was to test the sensitivity to change of the 5-point Likert response scale in the DFI in response to intensive physiotherapy and exercise, and to establish whether the therapeutic effect lasts as long as 6 months after the in-patient course.

Patients and methods

Eighty-one consecutive (47 male and 34 female) SpA patients with spinal involvement attended a 3-week in-patient rehabilitation course. Most patients (56) had idiopathic AS, 9 psoriatic arthritis, 4 reactive arthritis, 3 enteroarthritis due to colitis ulcerosa and 9 nonspecific SpA. Their health condition otherwise was fairly favourable: 41 had no other disease, 24 had other diseases in a stable phase (e.g. hypertension or diabetes) mellitus and 16 had other e.g. degenerative joint/spinal disease with or without other diseases. The actual symptoms were due to SpA; otherwise the patients had to be in such good health that they were able to exercise. Only 2 patients had prosthetic joints. The peripheral joint status was assessed using the so-

Table I. Demographic data of the 81 (47 male and 34 female) patients with spondyloarthritis.

	Median	(IQR)	Range
Age, years	46	(39, 54)	20-70
Diagnosis duration, years	7	(2, 15)	0-30
Symptom duration, years	17	(10, 28)	2-40
Erythrocyte sedimentation rate, mm/h	12	(5, 19)	5-19
Haemoglobin, mg/l	135	(129, 145)	115-161

called 44-joint index (11): 66 patients (82%) showed only axial involvement and 15 (18%) showed peripheral arthritis (mostly oligoarthritis) in addition to spinal involvement. The following drug treatment was used: 38 patients (47%) had only nonsteroidal anti-inflammatory drugs, 24 (30%) had sulfasalazine and 16 (20%) other disease-modifying antirheumatic drugs; in 3 patients (3%) these data were missing. The plain radiographic findings varied from uncertain or no changes in nonspecific SpA to ankylosis and bamboo spine findings in AS. The posture was usually still quite favourable, but some patients had severe kyphosis.

The rehabilitation course is based on intensive physiotherapy and exercise and the details of the programme have been described elsewhere (5). During the course it is possible to obtain obligatory local glucocorticoid injections; this was applied to 8 patients (10%). These patients were not excluded, because this could have led to bias in selection of patients with too stable a phase. Patient education is one part of SpA therapy, and the course thus included lessons, self-treatment education, discussions and group meetings guided by a psychologist and a social worker. Refreshment during free time and cessation of work duties also had their own impact. The demographic data are shown in Table I. The patients

were middle-aged, and the laboratory tests showed quite low inflammatory activity. The delay in diagnosis was about 10 years.

Spinal mobility and functional ability were analysed at the beginning and end of the in-patient rehabilitation course, and the functional indices by mail 6 months later. Patients also reported their exercising during the follow-up period.

The clinimetric properties of spinal mobility measurements coupled with validity and reliability analysis have been described in detail elsewhere (12). Briefly, they include the following: Schober (from sacral 1) test, whole thoracolumbar flexion, thoracolumbar lateral flexion, thoracolumbar rotation (Pavelka method), cervical rotation, cervical lateral flexion, cervical extension, chest expansion, occiput-to-wall distance and finger-to-floor distance.

The Finnish versions of the BASFI and DFI have been validated elsewhere (13) and have been shown to be as reliable as here in the DFI with the 5-point Likert scale. The functional indices and disease activity index were as follows:

BASFI. The BASFI comprises 8 items on daily activities and 2 assessing the patients' ability to cope with everyday life. Each item is answered on a 10-cm horizontal VAS. The total score ranges between 0 and 10, higher scores indi-

cating more severe impairment.

DFI. The DFI consists of 20 items assessing the ability to perform distinct daily activities. The questionnaire provides in this modification 5 categories of answers to the question 'Can you': 0 (yes, with no difficulty), 1 (yes, but with mild difficulty), 2 (yes, but with moderate difficulty), 3 (yes, but with severe difficulty) and 4 (no). The total score ranges from 0 to 40.

BASDAI. The Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) (14) consists of 6 questions on disease activity, including fatigue, back pain, joint pain, local tenderness, and quality and quantity of morning stiffness evaluated by VAS. The total score ranges from 0 to 10.

Excluded data. Since on ethical principles patients were free to participate in the study, there were 20 (19 %) of the 107 baseline patients who did not respond 6 months later and were excluded. Missing values in the questionnaires completed by the 107 patients at entry and at the end of the course or during follow-up were found in 14 cases (13%) in the BASFI (the most common was question number 4), in 14 (13%) in the BASDAI (the most common was question number 5) and in 11 (10%) in the DFI (the most common was question number 4). The missing value was corrected by replacing it with the mean value of the remaining item values. Usually, only one missing value was found per patient, and if more than 2 values were missing the patient was excluded. The final study sample thus consisted of 81 patients. The demographic data, range of movements and functional index values of the excluded patients at entry did not differ from the patients included except in disease duration, since symptoms were more protracted in the included than in excluded patients.

Ethics. The procedures followed were in accordance with the standards of the responsible local committee.

Statistics

The statistics were computed using SPSS (version 9). Normality assumptions were verified and proved true in

Table II. Effect of 3-week in-patient rehabilitation course on spinal movement measures in 81 patients with spondyloarthritis, measured with a tape, in millimetres (mm). Expressed as the median with the interquartile range (IQR) between parentheses.

	Entry	End	Difference	
Schober test, mm	40 (25, 50)	44 (32, 50)	1.5 (0.0, 5.0)	< 0.001
Chest expansion, mm	40 (30, 50)	50 (30, 60)	5.0 (0.0, 10)	< 0.001
Occiput-wall distance, mm	0 (0, 60)	0 (0, 43)	0.0 (-10, 0.0)	< 0.001

Table III. Differences in indices, the Bath Ankylosing Functional Index (BASFI), Dougados Functional Index (DFI) with 5-point Likert scale and Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), between the baseline and end values of the in-patient course, in 81 spondyloarthritis patients. Expressed as the median with the interquartile range (IQR) between parentheses.

	Baseline	End	Difference
BASFI (0-10)	2.6 (1.3, 4.5)	1.9 (0.8, 4.1)	-0.5 (-1.0, -0.2) < 0.001
DFI (0-40)	8.0 (5.3, 12.5)	5.5 (2.5, 9.0)	-2.0 (-4.0, -0.5) < 0.001
BASDAI (0-10)	4.1 (3.0, 5.4)	2.4 (1.3, 4.1)	-1.3 (-2.4, -0.4) < 0.001

Table IV. Differences in indices, the Bath Ankylosing Spondylitis Functional Index (BASFI), Dougados Functional Index (DFI) with 5-point Likert scale and Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), between the baseline and 6-month follow-up values in 81 spondyloarthritis patients. Expressed as the median with the interquartile range (IQR) between parentheses.

	Baseline	6-month	Difference
BASFI (0-10)	2.6 (1.3, 4.5)	2.8 (1.4, 4.2)	0.1 (-0.5, 0.8) 0.463
DFI (0-40)	8.0 (5.3, 12.5)	8.0 (3.0, 11.5)	-1.0 (-3.3, 1.3) 0.007
BASDAI (0-10)	4.1 (3.0, 5.4)	4.1 (2.3, 5.5)	0.01 (-0.9, 0.7) 0.818

only a few demographic data variables; therefore the median with lower and upper quartile (IQR = interquartile range) and range from minimum to maximum were used. The significance of improvement during the in-patient course in variables between the beginning and end was analysed with the nonparametric Wilcoxon test for 2 related samples with 2-tailed Monte Carlo significance. The differences between included and excluded data were analysed with the nonparametric Mann-Whitney U test for 2 independent samples.

Results

The results showing the impact of the rehabilitation course on the range of motions in spinal mobility are given in Table II. The effects were excellent: all values for the 10 measurements analysed improved to a highly significant degree, but only those recommended by the ASAS Working Group (6) are shown.

Table III presents the results showing the impact of the rehabilitation course on the functional indices, and again the effects were excellent. During the 6-month follow-up period, functional ability began to decline but did not worsen beyond the baseline values (Table IV). Six months after rehabilitation the functional ability as measured

by the DFI remained significantly better statistically than before the course. It is encouraging that 79% of patients (64/81) had continued at home the exercise programme learned during the in-patient course.

Excluded data (not shown). In view of dropouts in the follow-up period, we compared the improvements in functional indices during the rehabilitation course between follow-up and dropout patients. There were no differences in improvement in the indices during the course between the included and excluded data.

Discussion

The DFI with 5-point Likert scale was sensitive to change after a 3-week in-patient course, and the improvement in function to some extent lasted for at least 6 months. As expected the BASFI was also sensitive, but the improvement in this index returned to the baseline entry level. In general, rehabilitation helped to improve or maintain functional ability.

The original DFI includes a 3-point Likert scale and has been recommended for use as often as has the BASFI (6), but in physical therapy settings the BASFI was shown to be better than the DFI (10). It is commonly known that the 5-point Likert scale offers more alternatives and may be more sensitive.

Modification of the 5-point Likert scale has been shown to correlate as well as the BASFI with disease activity and damage, but the sensitivity to change could not be analysed in the study in question (9). In the present study the sensitivity to change in response to exercise and physiotherapy of these two indices was equal.

One surprising observation was that the durability of the improvement in function differed in these indices. The present study does not address this question, and the answer can only be speculated. The number of questions differed: there are 10 in the BASFI and 20 in the DFI. The questions partly overlap, and there are more questions in the DFI. Whether the durability difference is due to the scale difference or to the question contents can be analysed only by asking the same questions on both scales, Likert and VAS.

It was encouraging to note that so many patients (79%) continued the learned exercise programme at home during the follow-up period. This can also partly be due to the effect of the rehabilitation in-patient course, in that the courses are also educational and the aim is to motivate patients to continue self-treatment. Since rehabilitation involves many aspects, it is difficult to show the pure effect of physiotherapy. However the in-patient courses are based on intensive physiotherapy and exercise.

Home exercise is not sufficient to maintain the functional ability at the level attained by the end of the in-patient course. It is possible to recommend occasional in-patient courses in addition to home exercise to maintain functional ability. How long should the interval between in-patient courses be? Viitanen and co-workers (5) demonstrated that it is possible by means of intensive rehabilitation courses to prevent deterioration of spinal mobility and fitness in AS patients for more than one year. In the present study the BASFI showed that this interval may be 6 months, but the DFI with 5-point Likert scale showed that it may be longer, suggesting that the recommendation must be made individually in each case.

Simultaneous direct comparison of the DFI with both the 3- and 5-Likert scales was not undertaken in this study. In our previous study the DFI with 3-point scale was not sensitive enough to demonstrate the effect of a 3-week inpatient course based on intensive physiotherapy and exercise, while the BASFI was shown to be sensitive (15). This result accorded with others (10), and the BASFI has been shown to be superior to the DFI with regard to physical therapy. Ruof and Stucki (10) suggested that the lack of a very difficult item in the DFI and the ordinal scaling with only 3 categories of answers could explain the inferior sensitivity of the DFI. In the present study, use of the 5-point scale in the DFI obtained better results regarding sensitivity of the DFI. The current recommendation for of the equal use of both the BASFI and DFI can also be expanded to cover rehabilitation. In conclusion, both the BASFI and DFI with 5-point Likert scale are sensitive and can be used to demonstrate the effect of intensive physiotherapy and exercise.

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