Frequency of Impaired Spinal Mobility in Patients with Chronic Back Pain Compared to Patients with Early Axial Spondyloarthritis

Camilla Fongen, Hanne Dagfinrud, Inger Jorid Berg, Sofia Ramiro, Floris van Gaalen, Robert Landewé, Roberta Ramonda, Désirée van der Heijde, and Karen Minde Fagerli

ABSTRACT. ***Objective.*** To examine the frequency of impaired spinal mobility in patients with chronic back pain of short duration and to compare it with the frequency of impaired spinal mobility in patients with axial spondyloarthritis (axSpA), possible SpA, and no SpA.

Methods. The SpondyloArthritis Caught Early (SPACE) cohort includes patients with chronic back pain (≥ 3 mos, ≤ 2 yrs, onset < 45 yrs). Spinal mobility was assessed with lateral spinal flexion, chest expansion, cervical rotation, occiput-to-wall distance, and lumbar flexion. Hip mobility was assessed with intermalleolar distance. Mobility measures were defined as impaired if below the 5th percentile reference curve from general population, adjusted for age and height when appropriate. Proportions of patients categorized with impaired mobility were examined with chi square.

Results. In total, 393 patients with chronic back pain were included: 142 axSpA, 140 possible SpA, and 111 no SpA. Impairment in ≥ 1 mobility measure was present in 66% of all patients. The most frequently impaired mobility measure was lateral spinal flexion (40%), followed by chest expansion (22%), cervical rotation (18%), intermalleolar distance (17%), lumbar flexion (15%), and occiput-to-wall distance (11%). No statistically significant differences in proportion of patients with impaired spinal mobility were found between patients with axSpA and the other subgroups in any of the tests.

Conclusion. Two out of 3 patients with chronic back pain of short duration had impaired spinal mobility compared to the general population. Impaired spinal mobility occurs as often in patients with early axSpA as in other forms of chronic back pain. (First Release July 1 2018; J Rheumatol 2018;45:1643–50; doi:10.3899/jrheum.170786)

Key Indexing Terms:
BACK PAIN
SPINAL MOBILITY
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Back pain is one of the most common musculoskeletal disorders, affecting up to 80% of the population at some point in life[1] and representing large individual and societal costs[1,2]. Most patients with back pain experience a natural recovery within some weeks. However, symptoms and functional limitations remain over time in about 10%[1], and some of these patients have an inflammatory rheumatic disease such as axial spondyloarthritis (axSpA)[3,4,5,6]. AxSpA is characterized by inflammatory back pain and progressive restriction in spinal mobility[7], with available treatments allowing us to improve health-related quality of life through control of symptoms and inflammation as the primary treatment goal[8].

Early initiation of treatment is considered favorable in the disease course of patients with axSpA, and the response to tumor necrosis factor inhibitor (TNFi) therapy may be better when initiated early in the disease course[9,10]. Further, regular exercise is included in the management recommendation throughout the disease course[8] and is shown to reduce disease activity and improve spinal mobility[11] even in patients receiving stable TNFi therapy[12]. Because effective treatment is available, it is important to recognize patients with inflam-

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matory rheumatic disease among the large group of patients with chronic back pain.

Reduced spinal mobility is regarded as an important clinical feature of axSpA, emphasized by its inclusion in the core set of clinical assessment defined by the Assessment of SpondyloArthritis international Society (ASAS)[13]. Both structural damage and inflammation may contribute to spinal mobility impairment[14,15]. In early disease, impairment in spinal mobility is shown to be more influenced by inflammation, whereas in later disease, structural damage is also important[14]. Lateral spinal flexion and the frequently used index of spinal mobility, the Bath Ankylosing Spondylitis Metrology Index (BASMI), have the best ability to discriminate between patients with and without structural damage in ankylosing spondylitis (AS)[15]. However, according to the current ASAS classification criteria, patients with axSpA can be classified before structural, radiographic changes have occurred, and the role of impaired spinal mobility as a disease-specific clinical feature in the early phase of the disease is not clear[16]. Age-adjusted normal values have recently been defined for the spinal mobility measures, which enables comparing spinal mobility of patients with the general population[17]. The objectives of our study were therefore to examine the frequency of impaired spinal mobility in patients with chronic back pain of short duration; and further, to compare the frequency of impaired spinal mobility between patients with axSpA and those with other forms of chronic back pain with similar symptom duration.

MATERIALS AND METHODS

Patients. Data from the SpondyloArthritis Caught Early (SPACE) cohort are used for this analysis. The SPACE cohort is a European ongoing observational inception cohort established in 2009[18] and includes patients with chronic back pain for at least 3 months, not exceeding 2 years of duration, with an onset before the age of 45 years. All patients included in SPACE between January 2009 and December 2014 from the 5 rheumatology outpatients' clinics are included in the current analysis: Leiden University Medical Center, Amsterdam Medical Center and Groene Hart Ziekenhuis, the Netherlands; University of Padua, Italy; and Diakonhjemmet Hospital, Norway. In the Netherlands, the SPACE protocol was approved by a medical ethics committee at Leiden University Medical Center (P08.105), in Norway by the regional committee for medical and health research ethics in South East Norway (2010/426), and in Italy by the Azienda Ospedaliera di Padova (2438P). The study was performed in compliance with the Helsinki Agreement. All patients provided their written informed consent before participation.

Assessments. Data used in the current study refer to the baseline visit, in which all patients underwent a diagnostic assessment for potential axSpA and were classified according to the ASAS axSpA criteria[16]. Laboratory assessment consisted of HLA-B27 typing, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP). The presence or history of SpA features including inflammatory back pain, arthritis, enthesitis, uveitis, dactylitis, psoriasis, inflammatory bowel disease, response to nonsteroidal antiinflammatory drugs (NSAID), and family history of SpA were recorded[18]. Imaging was obtained with plain radiographs of the pelvis with anteroposterior view and magnetic resonance imaging (MRI) of the sacroiliac joints with a semicoronal plane. All imaging was scored independently by 2 experienced readers in a central reading. The pelvic radiographs were scored according to the modified New York criteria[19] and the MRI were scored according to the ASAS definition of active sacroiliitis[20].

For the purpose of our study, patients were classified as having axSpA if they fulfilled the ASAS criteria for imaging and/or clinical axSpA[16]. Patients who did not fulfill the ASAS criteria were classified as possible SpA if they (1) presented with sacroiliitis on imaging with no other SpA feature, (2) were HLA-B27–positive with 1 other SPA feature, (3) had ≥ 1 of the following SpA features: peripheral arthritis, uveitis, dactylitis, heel enthesitis, psoriasis, inflammatory bowel disease, elevated ESR/CRP, or (4) had these 3 SpA features: inflammatory back pain, positive family history, and good response to NSAID. Patients were classified as no SpA if they had low possibility of having axSpA (e.g., either being HLA-B27–positive with no other SpA feature or having ≤ 2 of the following SpA features: inflammatory back pain, positive family history, or good response to NSAID). A detailed description of the categorization of patients in the possible SpA and no SpA groups has been published previously[21].

Information was collected about the patients' age, sex, age at onset of back pain and duration of back pain, location of back pain, and current use of medication. Body height and weight were measured and body mass index (BMI) was calculated (kg/m^2); ≥ 25.0 was categorized as overweight. In addition, intensity of back pain during the last week was assessed by the patients on an 11-point numeric rating scale, anchored by 0 "no pain" and 10 "unbearable pain."

Five measurements of spinal mobility and 1 measure of hip mobility were collected following the recommendations from ASAS[13]. Spinal mobility was assessed with lateral spinal flexion, chest expansion, cervical rotation, lumbar flexion measured according to the 10-cm Schober test and occiput-to-wall. Hip mobility was assessed with intermalleolar distance. All spinal mobility measurements were recorded in cm with 1 decimal, except for cervical rotation, which was recorded in degrees. Intermalleolar distance was recorded in cm and rounded to integer unit. The better of 2 tries for each measurement was recorded. More details on the measurement are in Supplementary Table 1 (available with the online version of this article).

The composite index BASMI includes lateral spinal flexion, cervical rotation, lumbar flexion, intermalleolar distance, and tragus-to-wall distance[22]. To calculate BASMI, the values of tragus-to-wall were derived from the occiput-to-wall results by adding 8 cm[18]. By doing so, the value of zero in the occiput-to-wall corresponds to 8 in tragus-to-wall used in the calculation of BASMI linear, both equivalent to no increased kyphosis[23,24]. Further, measures of tragus-to-wall and occiput-to-wall are known to be comparable across the entire scale[24]. The formula for BASMI linear was used to compute the total score, ranging from 0–10, in which the highest score represents the most impairment[23].

Reference data from the general population for lateral spinal flexion, chest expansion, cervical rotation, intermalleolar distance, lumbar flexion, and BASMI were obtained from the MOBILITY study[17]. The mobility measures, except BASMI, were defined as impaired if they fell below the reference values for the fifth percentile curve from the general population, adjusted for age for all measures, and for chest expansion and intermalleolar distance also for height[17]. The BASMI has inverse scoring; therefore, reference values above the 95th percentile curve were defined as impaired. For occiput-to-wall, percentile curves could not be derived, and a cutoff of > 0 was considered impaired. To analyze the sensitivity, we also performed the analyses with the 2.5th percentile curve as the cutoff for impairment.

Statistical analyses. Patient characteristics are presented as mean with SD for continuous variables and as frequency (percentage) for categorical variables. Mobility measures and the BASMI are presented with mean (SD) for continuous variables with normal distribution or median with interquartile range for continuous variables with skewed distribution. Proportions of patients categorized with impaired spinal mobility are presented as frequency (percentage). Overall group differences (definite, possible, and no SpA) were examined with chi-square test for categorical variables, 1-way ANOVA for continuous normally distributed variables, and by Kruskal-Wallis test for continuous variables with skewed distributions. If statistically significant differences were detected in the overall group

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analyses, appropriate posthoc analyses (chi-square test with Yates continuity correction, Fisher LSD test, or Mann-Whitney U test) were applied. Statistical analyses were performed using SPSS version 21.0 (SPSS Inc.) and the figures were made in GraphPad Prism version 7.0 (GraphPad Software).

RESULTS

In total, 395 patients with chronic back pain were eligible, but 2 patients had insufficient information, so 393 were included in our present study. Of the included 393 patients, 142 (36%) fulfilled the ASAS axSpA criteria, 140 (36%) were classified as possible SpA, and 111 (28%) as no SpA. In the axSpA group, 58 (41%) fulfilled the imaging arm (28 with radiographic sacroiliitis and 30 with active inflammation on MRI) and 84 (59%) the clinical arm only of the ASAS axSpA criteria. In the possible SpA group, 108 (77%) who had normal imaging were HLA-B27–negative and had ≥ 1 of the following SpA features: peripheral arthritis, uveitis, dactylitis, heel enthesitis, psoriasis, inflammatory bowel disease, or elevated ESR/CRP. There were 20 HLA-B27–positive patients (14%) with normal imaging and 1 SpA feature. Eight (6%) who had normal imaging were HLA-B27–negative, with the following 3 SpA features: inflammatory back pain, positive family history, and good response to NSAID. Four patients (3%) had positive imaging and no SpA features.

The patients' characteristics are shown in Table 1. Patients classified with axSpA were more frequently male ($p < 0.001$) and HLA-B27–positive ($p < 0.001$). They reported less back pain (intensity; $p < 0.001$) but more commonly buttock pain ($p = 0.03$), and less frequently lumbar pain ($p = 0.01$). There were no differences in age at onset or duration of back pain between the subgroups.

Mobility measures are presented in Table 2. Comparisons between the subgroups showed that the axSpA group

Table 1. Characteristics of the patients according to subgroups. Values are n (%) unless otherwise specified.

Characteristics	N	All Patients, n = 393	AxSpA, n = 142	Possible SpA, n = 140	No SpA, n = 111	p
Male	393	138 (35)	69 (49)	39 (28)	30 (27)	$< 0.001^{\alpha,\beta}$
Age, yrs, mean (SD)	393	31.1 (8.3)	29.7 (8.0)	32.0 (8.3)	31.7 (8.4)	0.04^{α}
Height, cm, mean (SD)	373	175 (9)	177 (10)	172 (9)	175 (9)	0.01^{α}
Overweight (BMI ≥ 25.0)	372	147 (40)	43 (33)	63 (48)	41 (38)	0.04^{α}
Age at onset of back pain, yrs, mean (SD)	391	29.4 (8.2)	28.1 (7.9)	30.4 (8.3)	30.0 (8.4)	0.05
Duration of back pain, mos, mean (SD)	392	13.1 (7.2)	13.2 (7.4)	12.4 (6.8)	13.7 (7.4)	0.39
Back pain intensity, NRS 0–10, mean (SD)	352	5.0 (2.3)	4.2 (2.3)	5.3 (2.3)	5.6 (2.2)	$< 0.001^{\alpha,\beta}$
Location of back pain						
Buttock	389	212 (55)	88 (63)	70 (50)	54 (49)	$0.03^{\alpha,\beta}$
Lumbar	393	333 (85)	108 (76)	124 (89)	101 (91)	$0.01^{\alpha,\beta}$
Thoracic	393	137 (35)	48 (34)	42 (30)	47 (42)	0.12
SpA features						
IBP	393	246 (63)	114 (80)	74 (53)	58 (52)	$< 0.001^{\alpha,\beta}$
Positive family history	393	150 (38)	72 (51)	55 (39)	23 (21)	$0.01^{\beta,\gamma}$
HLA-B27+	387	147 (38)	123 (89)	20 (15)	4 (4)	$< 0.001^{\alpha,\beta,\gamma}$
Good response to NSAID	386	136 (35)	62 (45)	46 (34)	28 (25)	0.01^{β}
Elevated CRP/ESR	383	86 (23)	38 (28)	48 (35)	0	$< 0.001^{\beta,\gamma}$
Heel enthesitis	393	64 (16)	31 (22)	33 (24)	0	$< 0.001^{\beta,\gamma}$
Peripheral arthritis	388	54 (14)	27 (19)	27 (20)	0	$< 0.001^{\beta,\gamma}$
Psoriasis	392	38 (10)	18 (13)	20 (14)	0	$< 0.001^{\beta,\gamma}$
IBD	393	33 (8)	9 (6)	24 (17)	0	$< 0.001^{\alpha,\beta,\gamma}$
Uveitis	393	31 (8)	23 (16)	8 (6)	0	$< 0.001^{\alpha,\beta,\gamma}$
Dactylitis	393	21 (5)	11 (8)	10 (7)	0	$0.01^{\beta,\gamma}$
Sacroiliitis present on imaging	354	62 (17)	58 (45)	4 (3)	0	$< 0.001^{\alpha,\beta}$
Radiograph		19 (5)	17 (13)	2 (2)	0	
MRI		31 (9)	30 (23)	1 (1)	0	
Radiograph and MRI		12 (3)	11 (8)	1 (1)	0	
Current use of medication						
NSAID	393	273 (70)	105 (74)	90 (64)	78 (70)	0.21
DMARD	378	24 (9)	11 (8)	13 (10)	0	$0.01^{\beta,\gamma}$

Statistically significant subgroup difference between $^{\alpha}$ axSpA and possible SpA, $^{\beta}$ axSpA and no SpA, $^{\gamma}$ possible SpA and no SpA. BMI: body mass index; axSpA: axial spondyloarthritis; CRP: C-reactive protein; DMARD: disease-modifying antirheumatic drug; ESR: erythrocyte sedimentation rate; IBD: inflammatory bowel disease; IBP: inflammatory back pain; MRI: magnetic resonance imaging; NRS: numerical rating scale; NSAID: nonsteroidal antiinflammatory drug; SpA: spondyloarthritis.

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Table 2. Spinal mobility measures according to subgroups. Values are mean (SD) except where indicated.

Measure	All Patients, n = 393	AxSpA, n = 142	Possible SpA, n = 140	No SpA, n = 111	p
Lateral spinal flexion, cm, n = 393	17.3 (4.4)	17.8 (4.3)	17.2 (4.6)	16.8 (4.2)	0.25
Chest expansion, cm, n = 393	5.5 (2.0)	5.8 (2.1)	5.3 (2.2)	5.3 (1.6)	0.07
Cervical rotation, degrees, n = 389	72 (12)	74 (11)	70 (13)	71 (10)	0.01 $^{\alpha}$
Intermalleolar distance, cm, n = 390	114 (20)	118 (19)	110 (21)	112 (18)	0.01 $^{\alpha,\beta}$
Lumbar flexion, 10 cm Schober's, cm, n = 393	4.7 (1.2)	4.9 (1.2)	4.7 (1.1)	4.7 (1.1)	0.12
Occiput-to-wall distance, cm, median (IQR), n = 393	0 (0.0–0.0)	0 (0.0–0.0)	0 (0.0–0.0)	0 (0.0–0.0)	0.12
BASMI (0–10), n = 386	1.9 (0.9)	1.7 (0.8)	2.0 (0.9)	2.0 (0.8)	0.01 $^{\alpha,\beta}$

Statistically significant subgroup difference between $^{\alpha}$ axSpA and possible SpA, $^{\beta}$ axSpA, and no SpA. BASMI: Bath Ankylosing Spondylitis Metrology Index; axSpA: axial spondyloarthritis; IQR: interquartile range.

compared to possible SpA and no SpA groups had statistically significant better intermalleolar distance (p = 0.01) and better cervical rotation than the possible SpA group (p = 0.01). There were no differences between the subgroups in the other mobility measures. In the BASMI, the axSpA group had a lower score (better mobility) compared to the possible SpA and no SpA groups (p = 0.01).

The proportions of patients categorized with impaired spinal mobility are shown in Table 3. In all patients with chronic back pain, impairment in at least 1 mobility measure was present in 66% among those with complete assessment. The most frequently impaired mobility measure was lateral spinal flexion (40% of the patients), followed by chest expansion (22%), cervical rotation (18%), intermalleolar distance (17%), lumbar flexion (15%), and occiput-to-wall distance (11%). Twenty-nine percent of the patients were categorized with impaired spinal mobility according to the composite score BASMI.

There were no statistically significant differences in the proportions of patients categorized with impaired mobility according to the single instruments among the chronic back pain subgroups in any of the mobility measures (Table 3). However, for the BASMI, in accordance with the scores, a statistically significant lower proportion of patients with axSpA (21%) had impaired mobility compared to possible SpA (33%) and no SpA (33%; p = 0.03). There were no statistically significant differences in the proportion of patients with impairment according to sex in any of the measures (data not shown). The distributions of lateral spinal flexion and BASMI in the subgroups are shown in Figure 1, with percentile curves illustrating the age-specific spinal mobility cutoff as defined from the general population. Details of other mobility measures are outlined in Supplementary Figures 1-5 (available with the online version of this article).

In the subgroup of patients with axSpA, impaired mobility in at least 1 measure was present in 58% among those with

Table 3. Proportion of patients categorized with impaired spinal mobility according to subgroups. Values are n (%).

Variables	N	All Patients, n = 393	AxSpA, n = 142	Possible SpA, n = 140	No SpA, n = 111	p
Measure						
Lateral spinal flexion	393	158 (40)	50 (35)	57 (41)	51 (46)	0.22
Chest expansion$^{\gamma}$	373	81 (22)	27 (20)	31 (24)	23 (21)	0.81
Cervical rotation	389	69 (18)	21 (15)	31 (23)	17 (15)	0.18
Intermalleolar distance$^{\gamma}$	370	63 (17)	16 (12)	28 (21)	19 (18)	0.13
Lumbar flexion, 10 cm Schober's	393	57 (15)	17 (12)	20 (14)	20 (18)	0.40
Occiput-to-wall distance	393	42 (11)	18 (13)	18 (13)	6 (5)	0.10
BASMI	386	111 (29)	29 (21)	45 (33)	37 (33)	0.03 $^{\alpha,\beta}$
Impaired mobility measures $^{\delta}$						
N		367	131	128	108	
No. impaired mobility measures						
1		118 (32)	38 (29)	40 (31)	40 (37)	
2		68 (19)	18 (14)	23 (18)	27 (25)	
3		37 (10)	15 (11)	15 (12)	7 (6)	
≥ 4		19 (5)	5 (4)	9 (7)	5 (5)	
No. with at least 1 impaired mobility measure		242 (66)	76 (58)	87 (68)	79 (73)	

Statistically significant subgroup difference between $^{\alpha}$ axSpA and possible SpA, $^{\beta}$ axSpA and no SpA. $^{\gamma}$ Derivation of reference percentile included height. $^{\delta}$ Patients with complete set of mobility measures. AxSpA: axial spondyloarthritis; BASMI: Bath Ankylosing Spondylitis Metrology Index.

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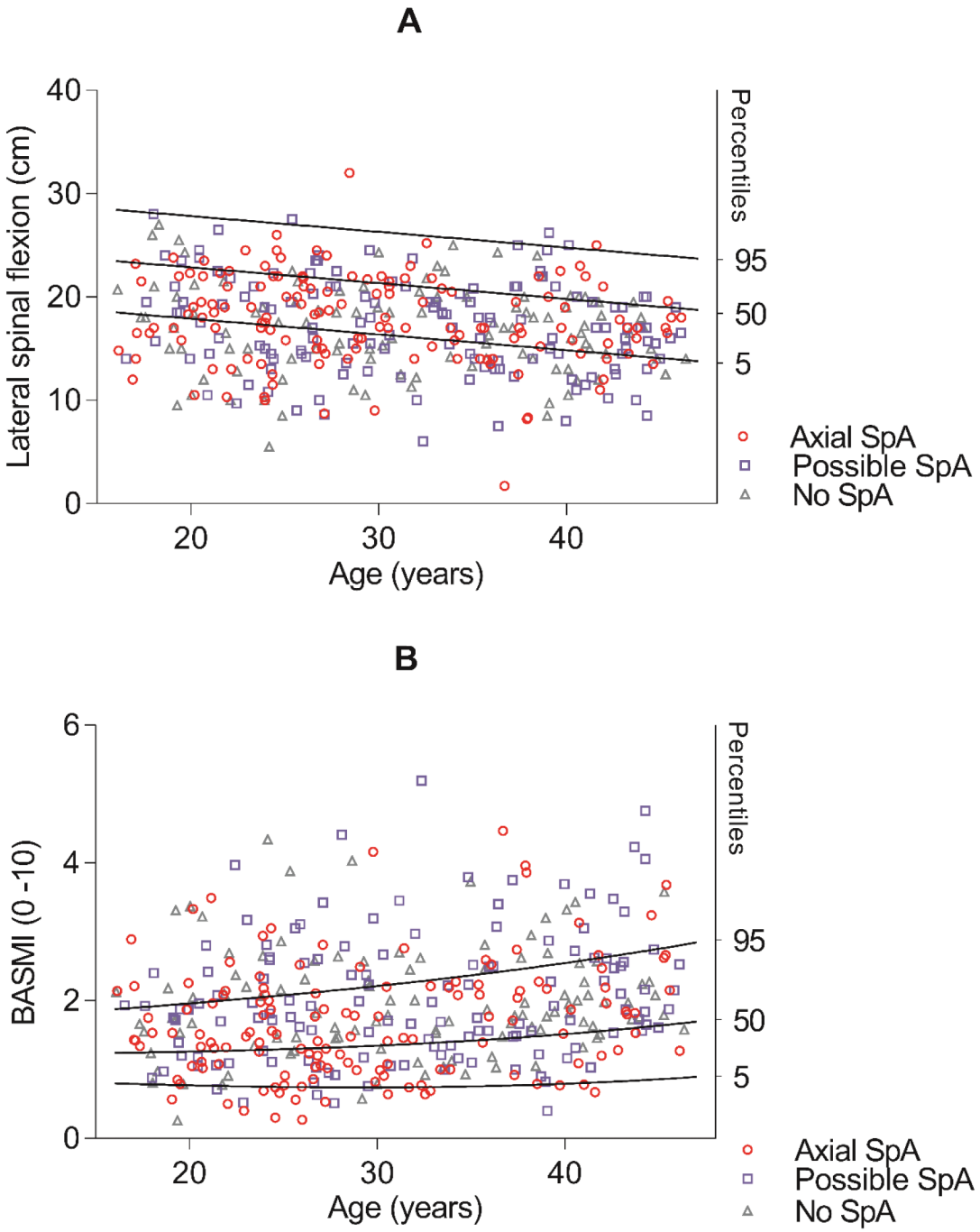

Figure 1. Distribution of measurements for lateral spine flexion (A) and BASMI (B) in function of age and with percentile curves derived from measurements in the general population. Patients below the fifth (A) and above the 95th (B) percentiles are categorized as having impaired spinal mobility. BASMI: Bath Ankylosing Spondylitis Metrology Index; SpA: spondyloarthritis.

complete assessment of mobility measures (Table 3). Among those with at least 1 impaired measure, lateral spinal flexion was most frequently impaired in 47 out of 76 (62%). Among the remaining 29 patients (38%), chest expansion was most frequently impaired in 14 (48%), followed by cervical rotation in 9 (31%), occiput-to-wall distance in 8 (28%), intermalleolar distance in 7 (24%), and lumbar flexion in 7 (24%; data not shown).

The proportions categorized with impaired mobility were compared between patients fulfilling the ASAS criteria for axSpA according to radiographic sacroiliitis, active sacroiliitis on MRI, and clinical arm, and no statistically

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significant differences were seen in any of the mobility measures. Sensitivity analyses with the 2.5th percentile curve as cutoff showed similar results (data not shown).

DISCUSSION

In this study of patients with chronic back pain of short duration, we have shown that spinal mobility was impaired in 1 or more mobility measures in 66% of patients and that the most frequently impaired mobility measure was lateral spinal flexion. However, mobility measures recommended for axSpA are as frequently impaired in patients with early axSpA as in those with other causes of chronic back pain.

To our knowledge, this is the first study comparing spinal mobility in patients with chronic back pain with age-adjusted percentile curves from the general population. Large variations in spinal mobility are demonstrated in the general population[17,25,26]. Even so, in our current study, 2 out of 3 patients with chronic back pain had impaired mobility in 1 or more measures, defined as below the fifth percentile of the general population. In a previous study, a similar comparison was made for patients with established AS[27], with an even stricter cutoff between normal and impaired mobility (2.5th percentile). This study showed that 79% of the patients with AS had impaired spinal mobility compared to the general population[27], reflecting that restricted spinal mobility is more prevalent in patients with established AS.

In the current study, the most frequently impaired mobility measure in the axSpA group was lateral spinal flexion (35%), followed by chest expansion (20%), while the other mobility measures had lower proportions of impairment (12–15%). Lateral spinal flexion has also been reported to be the most frequently impaired mobility measure in established AS[27], but unlike in our early cohort, the second most frequently impaired measures were found to be lumbar flexion and tragus-to-wall/occiput-to-wall distance[27]. This finding may indicate that there is a different pattern of mobility impairment in early disease compared to late disease. It has been suggested that screening for impairment in mobility in AS can be done by assessing lateral spinal flexion and lumbar flexion[27]. However, our results do not support screening with only these measures, because 28% (21 out of 76) of patients with early axSpA with normal lateral spinal flexion and normal lumbar flexion had impairment in another mobility measure.

Because of the natural disease course of progressive restriction in spinal mobility in patients with axSpA[28], it could be expected that impaired spinal mobility would occur more often among patients with early axSpA than in patients with other causes of chronic back pain. However, no differences in proportions of impairment of spinal mobility were found between patients with axSpA and patients with chronic back pain from other causes in any of the measures. Therefore, our results indicate that mobility measures recommended for monitoring axSpA are of limited diagnostic value. Correlations between levels of back pain and reduced spinal mobility have previously been demonstrated in patients with chronic back pain[29,30,31], and because patients with axSpA reported less back pain than the other subgroups in our study, this may at least partly explain the lack of between-group differences. Further, we found differences in the location of back pain; a larger proportion of patients with axSpA have buttock pain and a lower proportion have lumbar pain. It is plausible that the location of back pain could influence spinal mobility measures. Further research is needed to explore which factors are associated with reduced spinal mobility in early axSpA.

Even though the proportion of patients with impaired spinal mobility was similar in the subgroups, patients with axSpA showed better cervical rotation and intermalleolar distance than patients with other causes of chronic back pain. The intermalleolar distance is a measure of hip abduction and is therefore not included in the spinal mobility measures recommended by ASAS[13]. However, intermalleolar distance is included in the BASMI[22] and is therefore often reported as an outcome measure in studies with axSpA. Spinal mobility is known to be influenced by age[17,25,26], height[17,26], sex[25,26], and BMI[26] in the general population as well as in patients with axSpA[32,33,34,35]. In our population, patients with axSpA were younger, taller, more often men, and had lower BMI than patients with other causes of chronic back pain, which may have influenced the results. However, the categorization of patients with impairment was adjusted for age (and height) and we did not find any differences between the sexes. On the other hand, we were unable to do subgroup analyses by BMI, because the extreme groups according to BMI were too small, which is a limitation of our study.

Strengths of our study are the use of wide inclusion criteria (chronic back pain ≥ 3 mos ≤ 2 yrs, onset < 45 yrs), the inclusion of patients from several countries in Europe, and having followed a thorough examination with assessment recommended by the ASAS. However, being a multicenter study, several assessors have collected data, which is a limitation.

Because the cohort consists of patients with short symptom duration, it is possible that some patients not fulfilling the ASAS axSpA criteria at baseline might develop axSpA later. In this and previous publications from this cohort, we therefore grouped patients not fulfilling the criteria but with a higher likelihood of developing axSpA based on baseline features as having possible SpA. Included patients may not fully represent the chronic back pain population of young age in a community setting, and findings are therefore most applicable to rheumatologist outpatients' clinics.

To be specific enough to identify all patients with definitely impaired spinal mobility, and sensitive enough to identify those with potentially impaired spinal mobility, we chose to report the fifth percentile as a cutoff. To our

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knowledge, a unified definition of impaired mobility has not been established, but this cutoff is in line with articles assessing normative values in the general population[17,25,26]. Moreover, data using the 2.5th percentile were very similar.

Spinal mobility is impaired in 2 out of 3 patients with chronic back pain who are young and have short symptom duration, but the frequency of impairment is similar in patients with early axSpA and those with chronic back pain from other causes.

Although spinal mobility may play an important role in clinical decision making and treatment evaluation in patients with axSpA, our results indicate that mobility measures are of no diagnostic value.

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ONLINE SUPPLEMENT

Supplementary material accompanies the online version of this article.

REFERENCES

1. Manchikanti L, Singh V, Datta S, Cohen SP, Hirsch JA. Comprehensive review of epidemiology, scope, and impact of spinal pain. Pain Physician 2009;12:E35-70.
2. Hoy D, March L, Brooks P, Blyth F, Woolf A, Bain C, et al. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis 2014;73:968-74.
3. Underwood MR, Dawes P. Inflammatory back pain in primary care. Br J Rheumatol 1995;34:1074-7.
4. O'Shea FD, Boyle E, Salonen DC, Ammendolia C, Peterson C, Hsu W, et al. Inflammatory and degenerative sacroiliac joint disease in a primary back pain cohort. Arthritis Care Res 2010;62:447-54.
5. Bakland G, Alsing R, Singh K, Nossent JC. Assessment of SpondyloArthritis International Society criteria for axial spondyloarthritis in chronic back pain patients with a high prevalence of HLA-B27. Arthritis Care Res 2013;65:448-53.
6. van Hoeven L, Luime J, Han H, Vergouwe Y, Weel A. Identifying axial spondyloarthritis in Dutch primary care patients, ages 20-45 years, with chronic low back pain. Arthritis Care Res 2014; 66:446-53.
7. Dougados M, Baeten D. Spondyloarthritis. Lancet 2011;377:2127-37.
8. van der Heijde D, Ramiro S, Landewe R, Baraliakos X, Van den Bosch F, Sepriano A, et al. 2016 update of the ASAS-EULAR management recommendations for axial spondyloarthritis. Ann Rheum Dis 2017;76:978-91.
9. Sieper J, Braun J. How important is early therapy in axial spondyloarthritis? Rheum Dis Clin North Am. 2012;38:635-42.
10. Wendling D, Claudepierre P, Prati C. Early diagnosis and management are crucial in spondyloarthritis. Joint Bone Spine 2013;80:582-5.
11. van den Berg R, Baraliakos X, Braun J, van der Heijde D. First update of the current evidence for the management of ankylosing spondylitis with non-pharmacological treatment and non-biologic drugs: a systematic literature review for the ASAS/EULAR management recommendations in ankylosing spondylitis. Rheumatology 2012;51:1388-96.
12. Masiero S, Bonaldo L, Pigatto M, Lo Nigro A, Ramonda R, Punzi L. Rehabilitation treatment in patients with ankylosing spondylitis stabilized with tumor necrosis factor inhibitor therapy: a randomized controlled trial. J Rheumatol 2011;38:1335-42.
13. Sieper J, Rudwaleit M, Baraliakos X, Brandt J, Braun J, Burgos-Vargas R, et al. The Assessment of SpondyloArthritis international Society (ASAS) handbook: a guide to assess spondyloarthritis. Ann Rheum Dis 2009;68 Suppl 2:ii1-44.
14. Machado P, Landewe R, Braun J, Hermann KG, Baker D, van der Heijde D. Both structural damage and inflammation of the spine contribute to impairment of spinal mobility in patients with ankylosing spondylitis. Ann Rheum Dis 2010;69:1465-70.
15. Wanders A, Landewe R, Dougados M, Mielants H, van der Linden S, van der Heijde D. Association between radiographic damage of the spine and spinal mobility for individual patients with ankylosing spondylitis: can assessment of spinal mobility be a proxy for radiographic evaluation? Ann Rheum Dis 2005;64:988-94.
16. Rudwaleit M, van der Heijde D, Landewe R, Listing J, Akkoc N, Brandt J, et al. The development of Assessment of SpondyloArthritis international Society classification criteria for axial spondyloarthritis (part II): validation and final selection. Ann Rheum Dis 2009;68:777-83.
17. Ramiro S, van Tubergen A, Stolwijk C, van der Heijde D, Royston P, Landewe R. Reference intervals of spinal mobility measures in normal individuals: the MOBILITY study. Ann Rheum Dis 2015;74:1218-24.
18. van den Berg R, de Hooge M, van Gaalen F, Reijnierse M, Huizinga T, van der Heijde D. Percentage of patients with spondyloarthritis in patients referred because of chronic back pain and performance of classification criteria: experience from the Spondyloarthritis Caught Early (SPACE) cohort. Rheumatology 2013;52:1492-9.
19. van der Linden S, Valkenburg HA, Cats A. Evaluation of diagnostic criteria for ankylosing spondylitis. A proposal for modification of the New York criteria. Arthritis Rheum 1984;27:361-8.
20. Rudwaleit M, Jurik AG, Hermann KG, Landewe R, van der Heijde D, Baraliakos X, et al. Defining active sacroiliitis on magnetic resonance imaging (MRI) for classification of axial spondyloarthritis: a consensual approach by the ASAS/OMERACT MRI group. Ann Rheum Dis 2009;68:1520-7.
21. de Hooge M, van den Berg R, Navarro-Compan V, Reijniers M, van Gaalen F, Fagerli K, et al. Patients with chronic back pain of short duration from the SPACE cohort: which MRI structural lesion in the sacroiliac joints and inflammatory and structural lesions in the spine are most specific for axial spondyloarthritis? Ann Rheum Dis 2016;75:1308-14.
22. Jenkinson TR, Mallorie PA, Whitelock HC, Kennedy LG, Garrett SL, Calin A. Defining spinal mobility in ankylosing spondylitis (AS). The Bath AS Metrology Index. J Rheumatol 1994;21:1694-8.
23. van der Heijde D, Landewe R, Feldtkeller E. Proposal of a linear definition of the Bath Ankylosing Spondylitis Metrology Index (BASMI) and comparison with the 2-step and 10-step definitions. Ann Rheum Dis 2008;67:489-93.
24. Heuft-Dorenbosch L, Vosse D, Landewe R, Spoorenberg A, Dougados M, Mielants H, et al. Measurement of spinal mobility in ankylosing spondylitis: comparison of occiput-to-wall and tragus-to-wall distance. J Rheumatol 2004;31:1779-84.
25. Chilton-Mitchell L, Martindale J, Hart A, Goodacre L. Normative values for the Bath Ankylosing Spondylitis Metrology Index in a UK population. Rheumatology 2013;52:2086-90.
26. Assassi S, Weisman MH, Lee M, Savage L, Diekman L, Graham TA, et al. New population-based reference values for spinal mobility measures based on the 2009-2010 National Health and Nutrition Examination Survey. Arthritis Rheumatol 2014;66:2628-37.
27. Ramiro S, Landewe RB, van der Heijde D, Stolwijk C, Dougados M, van den Bosch F, et al. Hierarchy of impairment of spinal mobility measures in ankylosing spondylitis: twelve-year data. Arthritis Care Res 2015;67:1571-7.
28. Carette S, Graham D, Little H, Rubenstein J, Rosen P. The natural disease course of ankylosing spondylitis. Arthritis Rheum 1983;26:186-90.

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29. Kang SW, Lee WN, Moon JH, Chun SI. Correlation of spinal mobility with the severity of chronic lower back pain. Yonsei Med J 1995;36:37-44.
30. Mellin G. Correlations of hip mobility with degree of back pain and lumbar spinal mobility in chronic low-back pain patients. Spine 1988;13:668-70.
31. Mellin G. Correlations of spinal mobility with degree of chronic low back pain after correction for age and anthropometric factors. Spine 1987;12:464-8.
32. Viitanen JV, Kautiainen H, Kokko ML, Ala-Peijari S. Age and spinal mobility in ankylosing spondylitis. Scand J Rheum 1995;24:314-5.
33. Maksymowych WP, Mallon C, Richardson R, Conner-Spady B, Chung C, Russell AS. Does height influence the assessment of spinal and hip mobility measures used in ankylosing spondylitis? J Rheumatol 2006;33:2035-40.
34. Calvo-Gutierrez J, Garrido-Castro JL, Gil-Cabezas J, Gonzalez-Navas C, Ugalde PF, Carmona L, et al. Is spinal mobility in patients with spondylitis determined by age, structural damage, and inflammation? Arthritis Care Res 2015;67:74-9.
35. Mogard E, Lindqvist E, Bergman S, Bremander A. Spinal mobility in axial spondyloarthritis: a cross-sectional clinical study. Musculoskeletal Care 2017;15:36-48.

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