Relationship Between Spinal Mobility and Radiographic Damage in Ankylosing Spondylitis and Psoriatic Spondylitis: A Comparative Analysis

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ABSTRACT. ***Objective.*** To correlate measures of spinal mobility used in the assessment of spondyloarthritis with radiographic severity, and to compare ankylosing spondylitis (AS) and psoriatic spondylitis (Ps-Sp) in this clinical-radiographic correlation.

Methods. As part of the International SPondyloarthritis Interobserver Reliability Exercise (INSPIRE) study, 20 spondyloarthropathy (SpA) experts met for an examination exercise assessing 19 patients with SpA — 10 with Ps-Sp (9 men, mean age 52 yrs, mean disease duration 17 yrs) and 9 with AS (7 men, mean age 38 yrs, mean disease duration 16 yrs). Spearman correlation with bias correction was used to correlate median values of the spinal measurements obtained in the INSPIRE study with modified Stoke AS spinal score (mSASSS) and Bath AS Radiology Index-spine (BASRI-s) scores calculated by consensus of 2 assessors.

Results. The 2 radiographic measures performed comparably in relation to clinimetrics in the SpA group as a whole. There was very good correlation between mSASSS and the occiput-to-wall distance, tragus-to-wall distance, modified Schober, and lateral spinal flexion in the entire group ($r_s > -0.64$, $p < 0.05$ for each measure). There was also good correlation between mSASSS and cervical rotation and chest expansion ($r_s = -0.58$ and -0.54, $p < 0.05$, respectively). The clinical-radiographic correlations were comparable in the AS and Ps-Sp, except for cervical rotation, which correlated better with mSASSS in Ps-Sp than in AS.

Conclusion. Our study documents the structure-function correlations in axial SpA and provides evidence supporting application of radiographic and clinical measures used in AS to studies of Ps-Sp.
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Key Indexing Terms:
SPONDYLOARTHROPATHY RADIOGRAPHY PSORIATIC ARTHRITIS

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Inflammatory back pain and restricted spinal mobility are hallmarks of ankylosing spondylitis (AS)[1]. Radiographic damage to the spine is associated with impaired spinal mobility in AS. This association has been demonstrated at both group and individual levels[2-6]. Radiographic damage to the spine has been assessed using the Bath AS Radiology Index-spine (BASRI-s) score[7] and the modified Stoke AS Spinal Score (mSASSS)[8]. Radiographic involvement of the axial joints is seen in 30%–50% of patients with psoriatic arthritis (PsA)[9]. There are important differences in axial involvement between AS and PsA[10,11]. Asymmetric sacroiliitis, nonmarginal asymmetric syndesmophytes, paravertebral ossification, and more frequent involvement of cervical spine are features more often seen in psoriatic spondylitis (Ps-Sp)[11]. The relationship between spinal mobility and radiographic damage to the spine in Ps-Sp has not been studied. We therefore studied the correlation between measures of spinal mobility with radiographic severity, and compared AS and Ps-Sp using data obtained from the INSPIRE study[12].

MATERIALS AND METHODS

The INSPIRE study was a physical examination exercise to determine whether the measures used to assess axial mobility in primary AS were reproducible for both AS and Ps-Sp[12]. The assessors were 20 SpA experts, who assessed 19 patients, 9 with AS (7 men, mean age 38 yrs, disease duration 16 yrs) and 10 with Ps-Sp (9 men, mean age 52 yrs, disease duration 17 yrs). The selected patients had varying range of spinal mobility. Occiput-to-wall distance, tragus-to-wall distance, cervical rotation (goniometer), chest expansion (at the xiphisternum), modified Schober, and lateral lumbar flexion (Domjan and INSPIRE) were measured on each patient by 10 assessors and the measures were found to be reliable[12]. The median values of each of the spinal mobility measures were obtained from the INSPIRE study database. All patients had radiographs of the pelvis and lumbar and cervical spine within 6 months of the study. These radiographs were scored for mSASSS and BASRI-s by consensus read by 2 assessors. To score mSASSS, anterior corners of the vertebrae on lateral radiographs of the cervical and lumbar spines are scored from 0 to 3: 0 for normal; 1 for sclerosis, erosions, or squaring; 2 for syndesmophytes; and 3 for bridging syndesmophytes (total score range 0–72)[8]. To score BASRI-s, anteroposterior and lateral radiographs of the cervical and lumbar spine and sacroiliac joints are scored from 0 to 4 for normal, suspicious, mild, moderate, and severe, respectively (total score range 0–12)[7]. Spearman correlation with bias correction was used to correlate the median value of individual spinal mobility measures and radiographic scores, in the entire group of 19 patients, and subsequently in AS and Ps-Sp separately, to determine whether there is a differential correlation between the 2 diseases.

RESULTS

The spinal mobility measures and the radiographic scores of the 19 patients are shown in Table 1. The patients had a wide range of mobility and radiographic severity. The Spearman correlations between the mSASSS and spinal mobility measures are given in Table 2. Since mSASSS is the most appropriate method to score radiographic progression[13], correlations of spinal mobility measures with mSASSS were examined. There was excellent correlation between mSASSS and occiput-to-wall distance and tragus-to-wall distance ($r_s \geq 0.79$, $p < 0.0001$). There was also very good correlation between mSASSS and modified Schober, lateral spinal flexion ($r_s \geq -0.64$, $p < 0.01$), and moderate correlation with chest expansion and cervical rotation ($r_s \geq -0.54$, $p < 0.05$). The correlations were then examined separately in both diseases (Table 2). There was excellent correlation between mSASSS and lateral spinal flexion INSPIRE, occiput-to-wall distance, and modified Schober in AS ($r_s \geq -0.82$, $p < 0.05$), and with occiput-to-wall distance, tragus-to-wall distance, and cervical rotation in Ps-Sp ($r_s \geq -0.83$, $p < 0.01$). When the correlations were compared between the 2 diseases, the only measure that showed a differential correlation was cervical rotation, which correlated with mSASSS in Ps-Sp but not in AS.

DISCUSSION

Correlation between radiographic damage and spinal mobility in AS has been demonstrated[2-6]. However, there are important differences between AS and Ps-Sp[10,11]. The relationship between radiographic damage to the spine and spinal mobility in Ps-Sp has not yet been investigated. We therefore investigated this relationship in AS and Ps-Sp using data obtained from the INSPIRE study[12], and aimed to analyze any possible differential relationships between the 2 diseases. The results of our study show that radiographic measures correlate with clinimetrics in SpA. In AS, occiput-to-wall distance, modified Schober, and lateral spinal flexion correlate very well with mSASSS scores. In Ps-Sp, occiput-to-wall distance and cervical rotation correlate with mSASSS. Cervical rotation demonstrated a differential correlation, correlating better with mSASSS in Ps-Sp than in AS.

The strength of our study is that the clinical assessments of the patients were done by 10 different expert assessors. We used the median values of the 10 different values obtained for each spinal mobility measure and believe that this represents the "true" value of the spinal mobility measure. We used 2 validated radiographic measures (mSASSS and BASRI-s) to assess radiographic damage to the spine[7,8,13]. The radiographs were read by consensus read of 2 assessors blinded to the clinical status of the patients. Excellent correlations were demonstrated with some of the mobility measures, in spite of the small number of patients.

We recognize that our study examined a relatively small number of patients and used radiographic measures that have not been validated in Ps-Sp. The differential correlations

Table 1. Spinal mobility and radiographic scores [median (minimum, maximum)] in the SpA group as a whole, and separately in AS and Ps-Sp.

Measurement	SpA, n = 19	AS, n = 9	Ps-Sp, n = 10
Occiput-to-wall distance, cm	6.5 (0, 17)	7 (0, 16.5)	5.5 (0, 17)
Tragus-to-wall distance, cm	16.75 (10.85, 26.5)	16.8 (10.9, 26.5)	15.6 (11.6, 26.5)
Cervical rotation, degrees	49 (7.5, 82)	49 (33.8, 76)	56 (7.5, 82)
Chest expansion, cm	3.15 (1.5, 7.65)	3.1 (1.8, 4)	3.6 (1.5, 7.7)
Modified Schober, cm	3.35 (0.5, 6.35)	3 (0.5, 5.9)	4.3 (1.1, 6.4)
Lateral spinal flexion-Domjan, cm	14 (3.45, 22.35)	11.8 (3.5, 17.3)	14.6 (5.3, 22.4)
Lateral spinal flexion-INSPIRE, cm	26.25 (7.5, 42.25)	25.3 (7.5, 35)	30.1 (9.9, 42.3)
mSASSS score	16.6 (0, 72)	16.6 (1, 72)	13 (0, 46)
BASRI-s score	7 (1, 12)	7 (5, 12)	7 (1, 10.5)

SpA: spondyloarthropathy; AS: ankylosing spondylitis; Ps-Sp: psoriatic spondylitis; INSPIRE: International Spondyloarthritis Inter-observer Reliability Exercise; mSASSS: modified Stoke AS Spinal Score; BASRI-s: Bath AS Radiology Index-spine.

Table 2. Spearman correlation (95% confidence interval) between spinal mobility measures and mSASSS in AS and Ps-Sp.

Measurement	SpA, n = 19	AS, n = 9	Ps-Sp, n = 10
Occiput-to-wall	0.83†† (0.61, 0.93)	0.84** (0.40, 0.97)	0.86** (0.50, 0.97)
Tragus-to-wall	0.79†† (0.52, 0.92)	0.75* (0.17, 0.94)	0.83** (0.41, 0.96)
Cervical rotation†	–0.58** (–0.82, –0.17)	–0.11 (–0.72, 0.60)	–0.83** (–0.96, –0.41)
Chest expansion	–0.54* (–0.80, –0.12)	–0.46 (–0.86, –0.30)	–0.61 (–0.90, 0.03)
Modified Schober	–0.64** (–0.85, –0.27)	–0.82* (–0.96, –0.35)	–0.59 (–0.89, 0.06)
Lateral spinal flexion–Domjan	–0.70*** (–0.88, –0.36)	–0.77** (–0.95, –0.22)	–0.66** (–0.91, –0.05)
Lateral spinal flexion – INSPIRE	–0.72*** (–0.88, –0.40)	–0.87*** (–0.97, –0.47)	–0.60 (–0.89, 0.05)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, †† $p < 0.0001$, † $p < 0.01$ between AS and Ps-Sp. For abbreviations, see Table 1.

obtained with respect to cervical rotation raise important questions about cervical spinal involvement in AS and Ps-Sp, since in Ps-Sp cervical spine is the most severely affected area and the morphology of the syndesmophytes differs in the 2 diseases[11]. This observation will, however, have to be confirmed in studies involving a larger number of unselected patients. The use of mSASSS in scoring radiographic damage in Ps-Sp needs to be investigated further with larger sample size.

Our study shows that radiographic damage to spine correlates with spinal mobility in both AS and Ps-Sp. Further studies are needed to address the differential correlations between AS and Ps-Sp, especially in relation to cervical spine.

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