Original Article

Spectrum of Radiographic Involvement in Axial Spondyloarthropathy Using the Modified Stokes Ankylosing Spondylitis Spine Score (MSASSS) and Modified Newyork Classification

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Abstract

Background: Ankylosing spondylitis is a chronic debilitating inflammatory disease of the spine and it can lead to significant disability and morbidity in patients which can affect their quality of life.

Objective: Modified Stokes Ankylosing Spondylitis Spinal Score (mSASSS) is a four-point (0-3) scoring system for lateral radiographs of the lumbar and cervical spine. The purpose of this study was to find out the mSASSS and the grade of sacroiliitis according to radiological criteria of MNYC in axial spondyloarthropathy patients.

Methods: This descriptive cross-sectional study wasdone in the Rheumatologyoutpatient department at the Federal Government Polyclinic Hospital Islamabad from January 2023 till July 2023. The data was recorded onto a proforma after informed consent. Patients underwent x-rays of the cervical, lumbar spine for finding the mSASSS and the sacroiliac joints in standard positions for sacroiliitis based on the modified NewYork classification. BASDAI and ASDAS-CRP scores were assessed.

Results: There were 40(86.9%) males and 6(13.1%) females. Of these, 27(58.7%) had a BASDAI score of ≥ 4 while 31 (67.3%) hadASDAS-CRP≥2.1 suggestive of active disease. The mean duration of disease was 6.51±4.43 years. The mean mSASSS of the patients was 9.69±17.99. Grade II and III sacroiliitis were the most frequent at 30.4% and 28.3% respectively as per the modified Newyork classification. The duration of disease, mSASSS(p=0.03) and the grade of sacroiliitis (p=0.015) showed a positive correlation.

Conclusion: The modified stokes ankylosing spondylitis spine score and the grade of sacroiliitis suggest the severity of the disease. The mean MSASS score in our patients was 9.69±17.99, while grade II and III were the most prevalent grades of sacroiliitis based on the MNYC.The modified Stokes Ankylosing spondylitis spine score and the grade of sacroiliitis correlated with the duration of the disease. Grade of sacroiliitis also correlated with the mSASS score.

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Introduction

Axial spondyloarthropathy is a common rheumatologic disease with a broad spectrum of clinical features and carries a high chance of disability. Ankylosing spondylitis is the commonest

among the axial spondyloarthropathies. The axial spondyloarthropathy has been classified into two entities based on the radiographic involvement as per the Modified New York criteria i.e radiographic axial spondyloarthropathy (ankylosingspondylitis) and non-radiographic axial spondyoarthropathy.[1]

In Pakistan, a COPCORD study done in the suburbs of Lahore, found that 3% of the patients presenting to Rheumatology clinics have inflammatory backache, of which 1% are found to have radiographic axial Spondyloarthropathy.[2]

Because of the chronicity of the inflammatory process, those with radiographic axial spondyloarthropathy are prone to structural damage in the form of erosions, sclerosis and later on formation of syndesmophytes and vertebral column's ankylosis.[3] Conventional radiographs have been employed in assessing the disease damage and thus assessing the disease activity and its functional limitation.[4] Hence several radiographic scores have been developed to assess the progression of disease but the most commonly used include the Bath Ankylosing Spondylitis Radiology Index(BASRI), Stokes Ankylosing Spondylitis Spine Score(SASSS) and the Modified Stokes Ankylosing Spondylitis Spine Score (mSASSS).[5]

SASSS, used to assess the corners of the lumbar spine for presence of sclerosis, erosions , squaring of the vertebrae, syndesmophytes formation and total bony bridging, has been replaced by the modified Stokes Ankylosing spondylitis spine score (mSASSS) and is regarded as the most efficient tool for assessment of progression in terms of radiological damage in patients with ankylosing spondylitis.[6]

Several notable studies by van der Heijde et al,[7] J Braun et al,[8] and Anna Deminge et al,[9] have used this tool as a measure to assess the radiographic progression in ankylosing spondylitis patients over a minimum period of 2 years. To our knowledge, no such study has been conducted in Pakistan so far and hence, the rationale behind this study was to use it as a tool to assess the spectrum of the radiographic involvement in our local axial spondyloarthropathy patients. The primary objective was to find out the radiographic score in axial spondyloarthropathy patients using the mSASSS score at baseline and the grade of sacroiliitis based on the radiological criteria of MNYC and secondary objective was to find out the correlation of the radiographic score with the activity of disease utilising the ASDAS-CRP.

Methods

The study design was descriptive cross sectional and was carried out on patients with ankylosing spondylitis who presented to the Rheumatology Unit of Federal Government Polyclinic Hospital Islamabad. The study was completed over six months after approval in January 2023 till July 2023.A sample size of 46, was calculated using the WHO calculator keeping the prevalence of spondyloarthropathies at 1%. The Confidence interval was 95%with a margin of error of 0.05. The sampling technique used was non probability consecutive sampling and all diagnosed cases of Axial spondyloarthropathies were included. Exclusion Criteria: Patients suffering from axial variety of psoriatic arthritis, other spinal disorders like diffuse idiopathic skeletal hyperostosis, spinal degenerative disorders, traumatic or atraumatic vertebral fractures, kyphosis, and kyphoscoliosis spinal tuberculosis, were excluded from the study

ASDAS-CRP is a measure of disease activity for axial spondyloarthropathies.

Disease is said to be inactive if the score is <1.3, low disease activity if 1.3-2.1, high disease activity if >2.1-3.5 and very high if the score is >3.5.

BASDAI score is ≤4 inactive disease ,>4 is active disease.

Modified stokes ankylosing spondylitis spine score

In this scoring system the lateral radiographs are done for the cervical and lumbar spine. Scoring is done for the anterior corners of the upper and lower vertebral edges starting from the 2nd cervical vertebra through the upper border of the 1st thoracic vertebra and the lower border of the 12th thoracic vertebra through the fifth lumbar vertebra and the upper border of the sacrum. The scoring is done from 0 to 3 according to the presence or absence of radiologic features. No abnormality is scored as zero while features like erosions, sclerosis and squaring = 1, syndesmophyte formation=2 while total bridging=3. The total score ranges from 0-72.

Radiographic progression is defined as an increase of <2 points score is labelled as slow, 2-5 points as moderate and >5 points increase on mSASSS is labelled as fast radiographic progression.[6]

The Modified Newyork classification criteria has got clinical and radiological criteria. The radiological criteria includes the presence of grade II bilateral sacroiliitis or grade III or IV sacroiliitis unilaterally to classify the patient as having axial spondyloarthropathy.[1]

The ethical permission (IRB) was taken from the ethical committee in the 93rd meeting held on 26th January 2023 reference # FGPC.1/12/2020/Ethical committee. Data was collected after obtaining informed consent from the patient and then filled on the questionnaires. Alongside the demographic data the disease duration, treatment patients were taking, the ASDAS-CRP was calculated and lateral radiographic views of the cervical and the lumbar vertebrae were obtained. The radiologist assessed the films and calculated the mSASSS for each patient at baseline and also the grade of sacroiliitis as per the radiological criteria of the MNYC. In the second part of the study,the mSASS score will be calculated again for all participants after 2 years to assess their disease progression. Data was analysed on 23rd version of Statistical package for social sciences(SPSS). The mean, mode and median were calculated for the quantitative variables and statistical tests for significance were applied to the degree of radiographic progression in correlation to activity and disease duration and what treatment the patients are taking.

Results

The study included patients from the outpatient and inpatients of the rheumatology department at federal government polyclinic hospital. There were 46 patients in total, male were 40(86.9%) and female were 6(13.1%). The majority of the study participants i.e. 35(76.1%) belonged to the age group 15-40 years, 10 (22.1%) were 41-80 years and only 1 patient was less than 15 years. Half of the patients i.e (23/46) were those whose duration was less than 5 years, 13(28.3%) 6-10 years and 10(21.7%) had a duration of disease>10 years. 44(91.3%) patients had a diagnosis of Ankylosing spondylitis and two had ER-JIA. The mean duration of disease was 6.51±4.43 years. The mean mSASSS of the patients was 9.69±19.79. Table 1 shows the baseline demographic characteristics of the different variables of the study.

Table 1: *Main Variables of the Study*

	Minimum	Maximum	Mean	Std. Deviation
Age	19	55	30.87	8.22
Duration of disease	1	22	6.51	4.43
BASDAI SCORE	0.6	6.5	3.57	1.42
ASDAS SCORE	1.1	5.28	2.91	1.193
CRP	1	98	18.41	24.95
mSASSS TOTAL 72	0	72	9.69	17.99
CERVICAL SPINE SCORE 36	0	36	4.98	8.91
LUMBAR SPINE SCORE 36	0	36	4.72	9.45

Out of these, 27(58.7%) patients had active disease based on BASDAI while 19 (41.3%) had inactive disease. The different categories based on the ASDAS-CRP score are given in the figure.1

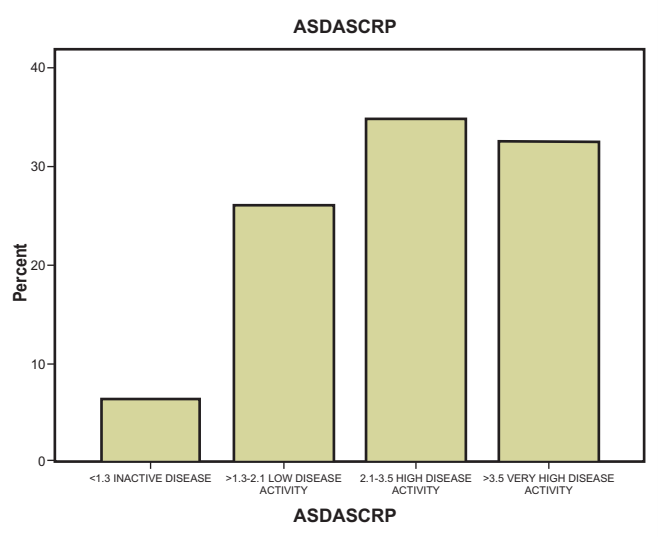

Figure 1: *Percentage of Patients in each ASDAS-CRP disease activity category*

The structural involvement of the spine was assessed

by taking the x-rays of the sacroiliac joints, the lumbar and cervical spine x-rays in anteroposterior and lateral views. Based on the X-rays of the pelvis out of 46 patients, 7 (15.2%) had Grade I, 14(30.4%) had Grade II, 13(28.3%) had Grade III and 12(26.1%) had Grade IV sacroiliitis.

Our study also showed that the mean mSASSS was greater for those with high disease activity i.e. 10±19.0 as compared to those with very high disease activity 5.3±5.1 and low disease activity 5.6±10.1, however, it was non-significant on one way ANOVA.

Table 2: *Spearman's correlation between the disease duration and the grade of sacroiliitis and modified stokes ankylosing spondylitis spine score.*

Factors		Spearman's Rho Correlation Co-efficient (r) and p-value
Grade of sacroiliitis on MNYC	Correlation Co-efficient on spearman's rho	0.357
	p-value	0.015*
Modified stokes ankylosing spondylitis spine score	Correlation Co-efficient on spearman's rho	0.321
	p-value	0.03*

P <0.05.

The spearman's correlation analysis showed a positive significant correlation between the duration of disease, MSASS score (p=0.03) and the grade of sacroiliitis (p=0.015) respectively. Both mSASSS and modified NewYork classification criteria also showed a positive correlation (p=0.036) as shown in Table 2.

Discussion

Ankylosing spondylitis is one of the chronic inflammatory arthritidesthat can lead to severe structural damage leading to functional limitation and disability in the long run and affecting the quality of life.[10] It is, therefore, very important to control the disease process at the outset to prevent future damage. The reason behind conducting this study was to find out the baseline radiographic involvement at presentation and get an idea about the damage the disease has caused so that the diagnosis of this group of arthritides is not delayed. Aim is to initiate the treatment at the earliest to slow down the progress of the disease and thus reduce the disability associated with it.

A landmark study on the progression of disease in ankylosing spondylitis by the name of Outcome in AS international study (OASIS) cohort showed that out of the total 184 patients, the mean age of the patients was 43±12, mean disease duration was 11±9 years, mean ASDAS-CRP score of 2.6±1, mean BASDAI score of 3.4± 2 and mean mSASSS of 10.8± 15.2.[11] The findings of 46 patients from our study at baseline presentation showed a lowermean age of our patients 30.8±8.2, a lesser duration of disease 6.5±4.4, almost similar ASDAS-CRP score (2.91±1.1), BASDAI score of 3.57±1.42 and mean mSASSS of 9.6±17.9. However, findings from the Ankylosing Spondylitis Study for the Evaluation of Recombinant Infliximab Therapy (ASSERT) trial in 2015 carried out in Netherlands by Vander Heidiet al showed a higher baseline mSASSS of 17.8±17.3 and higher BASDAI of 6.4 ±1.5 while EASIC study (European Ankylosing Spondylitis Infliximab Cohort) by Jurgen Braun et al showed a higher baseline duration of disease i.e 13.0±8 years and higher age 43.9±10.5 years at presentation.[12]

In our study, we found that 67.4% had either high or very high activity of disease and the mean mSASSS was greater in the group with high activity of disease i.e. 10±19, but, the overall difference was insignificant on ANOVA. The Follow Up Research Cohort in Ankylosing Spondylitis Treatment (FORCAST) from the University of Alberta, Canadashowed 16% with inactive disease(ASDAS CRP<1.3), 21% with low activity of disease (ASDAS-CRP ≥1.3 to <2.1) 33% had high activity of disease (≥2.1 to ≤3.5) and 30% with very high activity of disease (> 3.5).The majority (63%) of the patients who showed a high mean mSASSSS (mean± SD= 14±19) had either high or very high activity score on ASDAS- CRP.[13]

With regards to the grade of sacroiliitis on x-ray according to modified New York criteria, we found that out of the 46 patients, 14(30.4%) had Grade II, 25 (54.34%) had combined Grade III (28.3%) and Grade IV (26.1%) sacroiliitis which were almost similar to the findings from one of the largest cohort on imaging in axial spondyloarthropathy by Ciurea A et al, which showed that out of the 2080 patients 21.2% had grade

II while 1152 (55.3%) had grade III+ Grade IV sacroiliitis.[14]

Ismail Sari et al in 2021 had a meanmSASSSof9.3 ± 15.8 at baseline nearly comparable to ours i.e. 9.6±17.9.[15] However, a German study by MairaLiop et al in 2019 showed a very low baseline mSASS score 5.9 ± 10.3.1 the variability in these findings suggest that the scores might be affected by the time the patient usually would take to reach a rheumatologist for their first evaluation.However, evidence from the ASSERT[12] and OASIS11 trials show that the higher the duration of the disease the higher the baseline mSASSS, similar observations between grade of sacroiliitis and mSASSS were found in our study(p=0.015) and (p=0.03) respectively.

As for the impact of different treatment groups on the progression or regression of radiological scores, a lot of work is being carried out on NSAIDs, conventional disease-modifying agents biological and targeted synthetic agents. Of note were the hallmark studies by Karmacharya P et al,[16] Lee TH et al,[17] and San Koo B et al[18] which showed that biological agents had a better outcome in halting the progression of the radiographic damage. This is further supported in a meta-analysis by Xenofon Baraliakos et al[19] in 2020 compared the baseline mSASSS among the very renowned axial spondylitis cohorts like MEASURE-1 by Braun et al[20], RAPID Ax-Sp A by Van der Heijde et al[21],Pederson et al[22]and Park et al[23], and he found out that Secukinumab had the greatest impact on slowing the disease progression in axial spondyloarthritis as compared to TNF inhibitors and NSAIDs alone as observed in the ENRADAS cohort.[24]

It is important to mention here that our study has certain limitations.First and foremost, in our study, we just measured the baseline mSASSS for our patients and their radiographic grade of sacroiliitis at first presentation to our rheumatology clinic. There were a few patients who were already on biological agents before being enrolled in our study so, it could have been a confounder in some patients. We hereby intend to take the study further and reassess the study cohort to assess their radiographic progression of the disease, taking into account factors like age, gender, disease duration and treatment they are taking. It would thus be a prospective study based on the PSOAS (Prospective study of outcome of ankylosing spondylitis) model.[25]

Conclusion

The modified stokes ankylosing spondylitis spine score and the grade of sacroiliitis suggest the severity of the disease. The mean MSASS score in our patients was 9.69±17.99, while grade II, III and IV were the most prevalent grades of sacroiliitis based on the MNYC. The modified Stokes Ankylosing spondylitis spine score and the grade of sacroiliitis correlated with the duration of the disease. Grade of sacroiliitis also correlated with the mSASS score.

Ethical Approval: The Ethical Committee of Federal Government Polyclinic Hospital, Islamabad approved this study vide No. letter No. FGPC.1/12/2020/ Ethical Committee.

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Author's Contribution:

TK: Conception & design, acquisition of data, critically revised it for important intellectual content

SS: Acquisition of data, drafting of article

SAS: Acquisition of data, drafting of article, analysis & interpretation of data, final approval

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