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Original Research Article

Correlation of Radiographic Findings of Sacroiliac Joint with Inflammatory Low Back Pain Profile in Patients

Dr. Sudheer Kumar Kalyankar[1], Dr. Raghavendra Chigullapally[2*]
[1]Associate Professor, Department of Radiology, Meenakshi Medical College and Hospital, Kanchipuram.
[2]Associate Professor, Department of Radiology, Narayan Medical College and Hospital, Dehri.

***Corresponding author**
Dr. Raghavendra Chigullapally

Abstract: ***Introduction:*** The clinical need to diagnose sacroiliitis at an earlier stage has led to the sacroiliac joints being more frequently imaged, particularly with magnetic resonance imaging (MRI). This review outlines the imaging approach to sacroiliitis, emphasizing the imaging protocols, diagnostic criteria, limitations and potential mimics of MRI examination. The value of imaging-guided intervention in sacroiliac joint disease is also briefly outlined. ***Materials and Methods****:* This is a prospective, observational and descriptive study conducted in the Department of Radiology at a Tertiary care teaching hospital over a period of 6 months. Treatment naive patients with low back pain and subsequently diagnosed with Inflammatory Low Back Pain (LBP) as per Calin criteria were identified. The clinical and laboratory parameters of these patients were recorded. Sacroiliac Joint Dysfunction (SIJ) radiographs of these patients were analyzed. ***Results:*** Seventy patients were registered with 35 of subjects being female and 35 males. No significant difference was noted in the age of onset or duration of illness in males and females. There was no significant difference in the positivity of this gene in male (5.7%) and female (3.8%) groups. Borderline HLA-B27 status was commoner in males (19.2%) than females (7.6%). About 31.4% of cases demonstrated active inflammation (raised CRP levels) at presentation. A maximum number of cases were seen in Grade 2 followed by Grade 3. ***Conclusions****:* In the present scenario, where the majority of cases are presenting in the chronic stage of the disease, radiography may be advocated in resource poor areas to decrease burden and cost related to the use of MRI.
Keywords: Sacroiliitis, Inflammatory low back pain, Magnetic resonance imaging.

INTRODUCTION

Sacroiliitis is one of the causes of inflammatory-type low back pain [1]. The recognition of inflammatory-type low back pain helps segregate patients with axial spondyloarthritis (SpA) from those with more common mechanical low back pain [2]. About 20% of patients with low back pain have inflammatory-type pain, while about 20% of these patients with inflammatory-type pain will have axial SpA [3]. The prevalence of axial SpA is about 1%, though this prevalence does vary according to ethnicity and HLA-B27 population prevalence. For example, in German, American and Chinese populations, the population prevalence of HLA-B27 is 9%, 6% and 5%, respectively [4-6].

Early recognition and treatment of SpA can ameliorate symptoms, improve quality of life and reduce the likelihood of developing seriously impaired spinal mobility [6]. One-third of these diagnoses are made by rheumatologists, and the remainder made by primary care practitioners, chiropractors, physiotherapists, orthopedic surgeons, pain physicians, and emergency care physicians [7]. SpA is diagnosed using a combination of clinical, serological and imaging criteria. Clinical criteria include the presence of inflammatory-type low back pain and other features of SpA such as anterior uveitis. Serological criteria relate to HLA B27 positivity, and imaging criteria relate to imaging evidence of sacroiliitis and spondyloarthritis [8].

About half of the patients diagnosed initially with axial SpA have radiographic evidence of SpA while the remainder have non-radiographic SpA with no radiographic features of SpA [8]. Although a small percentage of non-radiographic SpA patients will progress to radiographic SpA on followup, many will never develop any radiographic features of SpA. As disease activity and functional impairment is similar for

patients with radiographic and non-radiographic SpA [9], the distinction does not affect prognosis or treatment, though one should nevertheless be aware that about 50% of SpA patients will not have radiographic features of the disease at presentation. In patients with radiographic SpA, sacroiliitis may take many years to become radiographically apparent [10]. Radiographic recognition of mild, or even moderate, sacroiliitis is not always clear cut. As a result, magnetic resonance imaging (MRI) is increasingly utilized to enable recognition of sacroiliitis at a much earlier stage than which is possible radiographically.

Even if the radiographs are normal and axial SpA is strongly suspected clinically, MRI examination is still usually performed to detect sacroiliitis. MRI is the most sensitive imaging technique to detect sacroiliitis. It is the only imaging modality that can reliably reveal bone marrow oedema and inflammation around the sacroiliac joints and is comparable to low dose CT for demonstrating erosions and ankyloses [11]. Even so, about one-third of patients with confirmed SpA on clinical grounds will still have a normal MRI examination with no evidence of either sacroiliitis or spinal enthesopathy. Patients with significant bone marrow oedema on MRI of the sacroiliac joints generally have a good clinical response to anti-tumour necrosis factor (TNF) therapy [12]. While conversely SpA patients who do not have MRI evidence of sacroiliitis or elevated C - reactive protein levels do not respond well to anti-TNF treatment [13].

Imaging, and in particular MRI, has greatly helped in the diagnosis and understanding of early SpA. It is important to remember that reactive abnormalities on MRI similar to those seen with sacroiliitis, but not due to sacroiliitis, are quite common, especially in patients with non-SpA inflammatory back pain and in athletes. There are also several other diseases that can mimic sacroiliitis on MR imaging. This review, based on our own institutional experience, illustrates the imaging appearances of common sacroiliac joint pathologies. We also discuss diagnostic or therapeutic percutaneous intervention of the sacroiliac joints.

MATERIALS AND METHODS

This is a prospective, observational and descriptive study conducted after getting approval from the institutional ethics committee. Study conducted in the Department of Radiology at a Tertiary care teaching hospital over a period of 6 months.

Inclusion Criteria

Treatment naive patients attending general medicine outpatient clinics/ rheumatology clinics with low back pain and subsequently diagnosed with LBP as per Calin criteria were identified and included in this study after obtaining informed written consent.

Exclusion Criteria

Subjects having low-back pain which was preceded by an event of trauma in lower back region, subjects who were known case of congenital/acquired lower spinal deformity or prolapsed inter-vertebral disc and subjects who were known case of malignancy/infective etiology which can potentially involve bones/spine were excluded from this study.

The clinical parameters of these patients were recorded, which included age and sex of the patient and duration of LBP. Human leukocyte antigen-B27 (HLA-B27) status and C-reactive protein (CRP) levels were recorded.

Detection of HLA-B27 was done using flow cytometry and CRP levels were assessed using immunonephelometry. These patients underwent conventional radiography of their bilateral SIJs (anteroposterior [AP] and oblique views).

STATISTICAL ANALYSIS

The data were collected on a pre-designed schedule and entered into Microsoft Excel. The data collected were tabulated. The tabulated data were analysed using descriptive statistics, i.e by using percentages. Two tailed probability (P) was calculated to test the statistical significance at the 5% level of significance.

RESULTS

Table-1: Demographic characteristics of subjects and duration of inflammatory back pain

Parameter	Frequency	Percentage
Gender		
Male	35	50
Female	35	50
Presenting age (year) (mean and range)		
Male	29.73 (18-60)	t-value 0.431 p-value 0.634
Female	27.43 (18-55)	
Disease duration (months) (mean and standard deviation)		
Total	40.96 ± 37.80 (3−120)	t-value −0.014 P-value 0.9889
Male	41.05± 40.07 (3−120)	
Female	40.90± 36.75 (3−120)	

In table 1, over a period of one year, a total of 70 patients were registered in this study with 35 of

subjects being female and 35 males. The mean age of the patient at symptoms onset was 29.7 years for males and 27.4 years for females. The mean duration of LBP was 40.9 months. No significant difference was noted in the age of onset or duration of illness in males and females.

Table-2: Laboratory characteristics of subjects.

Parameters	HLA-B27 (n=52)			CRP (n=70)
	Positive n (%)	Borderline** n (%)	Negative n (%)	Positive n (%)
Total	5 (9.6)	14(26.9)	33(63.4)	22(31.4)
Male	3(5.7)	10(19.2)	11(21.1)	8(11.4)
Female	2(3.8)	4(7.6)	22(42.3)	14(20.0)

Table-3: Radiological characteristics of subjects.

Parameter	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
Male	1	4	16	4	3
Female	4	11	15	12	0
Total	5	15	31	16	3

In table 3, a maximum number of cases were seen in Grade 2, followed by Grade 3.

Table-4: Radiological characteristics of subjects.

Parameters	Sacroiliaitis	
	Definite (n=35)	Suspicious (n=21)
Symmetric	19	11
Asymmetric	11	8
Unilateral	5	2

In table 4, cases with symmetrical sacroiliitis were more (42.8%) as compared to asymmetrical/unilateral sacroiliitis.

DISCUSSION

To our knowledge, this is the first study to evaluate the effect of mechanical stress on MRI-SIJ. Overall, there was a high prevalence of MRI lesions in healthy active individuals without any symptoms of back pain, both at baseline and after 6 weeks of follow-up. However, MRI lesions do not seem to increase significantly after 6 weeks of intensive physical training.

SpA characteristically involves sacroiliac joints is a complex joint. It has two well-differentiated parts – a lower ventral synovial part and an upper dorsal interosseous part. The hyaline cartilage in SIJ is thinner along the iliac aspect of the joint [14]. During the imaging of SIJ, consideration of their complex anatomy is required. SIJs course obliquely from lateral to medial position due to which there is a substantial overlap of ilium with sacrum on standard AP projection of pelvis in the supine position. To avoid misdiagnosis,

In table 2, out of 52 patients could undergo testing for HLA-B27. HLA-B27 positivity was noted in only 9.6% subjects whereas 63.4% of subjects had negative HLA-B27 status. The rest of the subjects showed borderline HLA-B27 status. There was no significant difference in the positivity of this gene in male (5.7%) and female (3.8%) groups. Borderline HLA-B27 status was commoner in males (19.2%) than females (7.6%). About 31.4% of cases demonstrated active inflammation (raised CRP levels) at presentation. Rest, though presenting for treatment for the first time, did not show raised CRP levels.

additional oblique views of bilateral SIJs are taken along with standard AP projections. Alternatively, PA projection techniques can be used in which the patient lies in prone position and X-ray tube is angled by 25-30 degrees [15]. SIJs are essentially involved in the pathogenesis of SpA [16]. SIJ involvement in SpA leads to LBP of varying intensity. Radiographs cannot assess active inflammation in SIJs and usually appear normal in the early phase of LBP. Chronic changes in SIJ are well appreciated on conventional radiographs in the form of erosions, sclerosis, pseudo- widening of joint space, and joint space narrowing ultimately leading to bony ankylosis [17].

Modified New York criteria have been proposed for grading of sacroiliitis on conventional radiography. According to modified New York criteria, five grades of sacroiliitis from Grade 0 (normal SIJ) to Grade 4 (ankylosis) can be differentiated [18]. Our study group had same number of male and female cases that were unlike the observation of Alexis Lacout who reported that males are affected slightly more than females [19]. Furthermore, our observation is not consistent with that of Geijer M who reported a higher incidence of LBP in males [20]. Although the mean age of onset of symptoms was slightly higher in females and mean duration of symptoms was higher in males, there was no significant difference between the two genders statistically ($P < 0.05$). This result may be attributed to relatively small sample size in our study.

HLA-B27 positivity was noted in only 9.6% of the total study population, whereas 26.9% had borderline values. Borderline HLA-B27 status was commoner in males than females. This difference is statistically significant ($P < 0.05$). Our observation is consistent with Angel A. *et al*. who reported a higher incidence of HLA-B27 positivity in males [21]. However, overall HLA-B27 positivity reported in our cases is 9.6% which is low in contrast to Yusuhn Kang who reported higher HLA-B27 positivity in cases with LBP [22]. Our observation is as per the statement that the strength of association between HLA-B27

status and LBP is weak in Middle-East, South-East Asian, and sub-Saharan countries as compared to the Western population [23]. HLA-B27 positivity in Ankylosing Spondylitis (AS) group (symmetric sacroiliitis group) was relatively lower (10.9%) than in the non-AS (asymmetric sacroiliitis) group. This observation shows that HLA-B27 positivity in our AS group is much lower than that observed in the Western world where HLA-B27 positivity in AS group is approximately 90% [24].

In our study, only 31.4% of study subjects presented with raised CRP levels. The majority of patients despite being treatment naïve, presented with normal CRP levels indicating the fact that in our population majority of patients with LBP present in chronic stages of sacroiliitis. Our observation is in accordance with Antonio L. *et al*. who reported that patients with clinically assessed active disease had higher mean CRP and ESR levels [25].

Radiographic sacroiliitis was noted in a significantly high number of cases (94.2%). The percentage of patients with radiographic sacroiliitis is much higher in this study as compared to Seunghun Lee *et al*. who reported radiographic sacroiliitis in 14% of cases [26]. Changes in SIJ in cases of LBP pass through different stages from the early stages of edema/synovitis to the late stage of ankylosis. X-ray changes are observed in late stages of the disease and the aim of our intervention should be not to reach a stage where X-ray changes are visible as that is an irreversible stage and the damage causes chronic morbidity, especially in an active population. This observation is unlike observation reported by Roberto B. *et al*. where most of the cases presented early [27].

In our study, females presented with higher grades of sacroiliitis as compared to males this observation is contrary to Western data, which reports the presence of higher grades of sacroiliitis in males [28]. Our observation indicates that female's patients in our study group had chronic forms of sacroiliitis and they presented late as compared to their male counterparts likely due to neglect and lack of awareness. Symmetric (AS type) sacroiliitis was noted in 57% of patients (66.7% males and 33.3% females). This observation is in accordance with Althoff CE *et al*. who reported higher incidence and prevalence of AS in male population [29].

CONCLUSIONS

Although literature advocate MRI as the gold standard for evaluation of sacroiliitis, present data show a high proportion of cases in chronic phase. Hence, after a proper clinical screening especially when acute phase reactants are not high, radiography may be advocated in resource poor areas to decrease the burden and cost of MRI. In Indian scenario, there is often delay in diagnosis of active sacroiliitis partly due to limited resources and partly due to ignorance of patients and most patients with LBP end up into chronic sacroiliitis. Appropriate measures need to be taken in the health-care sector to increase awareness among people and treating physician and sensitize them to LBP and its associated morbidities.

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