

# Spondyloarthropathy - Is sacroiliac joint imaging sufficient? A study of 431 patients

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## Abstract

**Background:** Sacroiliac (SI) joint involvement (sacroiliitis) is considered as major criteria for diagnosing Spondyloarthropathy (SpA), although involvement of spine and hip can also occur. The aim of our study was to assess the utility of including sagittal short-tau inversion recovery (STIR) sequence of dorsolumbar spine and coronal STIR/proton density (PD) fat saturated sequence through both hips, to routine SI joint magnetic resonance (MR) imaging protocol, in patients clinically suspected to have SpA. **Material and Methods:** A retrospective observational study was conducted between February 2013 and February 2018 on clinically suspected SpA patients referred to our department for imaging. The images obtained using this new SI joint protocol were evaluated for findings suggesting SpA diagnosis as per the Assessment of SpondyloArthritis international Society criteria. Other differentials for similar symptoms were also looked for. **Results:** Of the 431 patients (313 M and 118 F), 255 had features confirming the diagnosis of SpA and 176 had no radiological manifestations of SpA (56 were normal and 120 had other findings to suggest clinical symptoms; e.g., degenerative SpA, Pott's spine, skeletal metastases, early AVN of hip, cysticercus, iliofemoral impingement). 19/255 patients had normal SI joints but other findings to suggest diagnosis of SpA, e.g. romanus lesions, costovertebritis/costotransversitis, pubic symphysisitis, inflammatory hip arthropathy, enthesitis, iliofemoral/trochanteric bursitis. 33/61 patients with chronic sacroiliitis had disease activity in spine or hip. **Conclusion:** Inclusion of sections through dorsolumbar spine and both hips to routine SI joint protocol, helped in identifying: (a) early disease in 19 patients, who had normal SI joints and may have otherwise been missed with routine only SI joint imaging, (b) additional findings in SpA-related sacroiliitis, (c) disease activity in chronic sacroiliitis, and (d) other causes of low back pain and thus helped in further patient management.

**Key words:** MRI; sacroiliitis; spondyloarthropathy

## Introduction

Sacroiliac (SI) joint involvement (sacroiliitis), being hallmark in SpA, makes SI joint imaging an important tool in diagnosing SpA<sup>[1]</sup> and is considered as major criteria for diagnosing SpA in Assessment of SpondyloArthritis international Society (ASAS) criteria.<sup>[2-5]</sup>

ASAS also includes other skeletal manifestations like arthritis, dactylitis, and enthesitis as minor criterion for diagnosing SpA in patients with inflammatory back pain along with other clinical and biochemical features like family history, HLA B27 positive patients, and raised CRP in

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patients. For these additional imaging criteria, evaluation of spinal and appendicular skeletal manifestations is required but magnetic resonance (MR) imaging of spine or hip is not included in any of the diagnostic criteria, as the lesions in spine and hip are not common.<sup>[6]</sup> Many authors have mentioned about role of spine imaging in SpA patients.<sup>[7-11]</sup> About 17 to 35% of patients with ankylosing spondylitis are known to have hip disease.<sup>[12]</sup> However, we could not find any MR study that has assessed utility of screening both hip joints and dorsolumbar spine, in addition to the SI joint imaging, as a unified scan-protocol.

We assessed the utility of including specific sequences through dorsolumbar spine and both hip joints, to routine SI joint MR imaging protocol, in patients clinically suspected to have SpA.

## Material and Methods

The institutional review board at our hospital reviewed the study for issues of patient safety and confidentiality and approved the same. We conducted a retrospective analysis of the data and images from February 2013 to February 2018 of patients who were referred by rheumatologists to radiology department for MR imaging of SI joints with clinical suspicion of inflammatory back pain (IBP). In these patients, screening of dorsolumbar spine and both hip joints was done by incorporating short-tau inversion recovery (STIR) sagittal sequence for dorsolumbar spine (below D10 level) and STIR/proton density (PD) fat saturated coronal sequence for both hip joints into the routine SI joint imaging protocol. The relevant imaging parameters including approximate scan time are tabulated in Table 1.

The imaging was carried out on 1.5 or 3T Siemens MR Scanners and was reviewed by two certified radiologists, one with additional qualification in musculoskeletal radiology having 15 years of experience and the other having 5 years experience. Images were evaluated for SI joint involvement and for presence of enthesitis in spine and hip, the additional skeletal findings supporting SpA diagnosis besides sacroiliitis and consensus was achieved in case of difference of opinion. Other causes of back pain and stiffness in patients without radiologic evidence of SpA

were also looked for in the images. We also calculated the increase in total scan time as a result of inclusion of above two sequences to routine SI joint protocol.

## Results

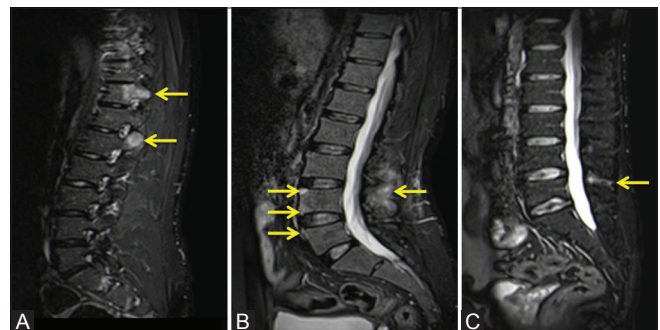
A total of 431 patients (313 M and 118 F) were imaged with the new protocol in the mentioned time period, out of which 255 (59.2%) had features supporting the diagnosis of SpA as per ASAS criteria and 176 (40.8%) did not have any radiological manifestation to support diagnosis of SpA.

Most of the patients with SpA had imaging findings consistent with sacroiliitis (acute or chronic). Imaging findings supporting the diagnosis of SpA, other than sacroiliitis, were Romanus corner lesions, costovertebritis or costotransversitis, pubic symphysitis, inflammatory hip arthropathy, spinal and extraspinal enthesitis, and iliofemoral and trochanteric bursitis [Figures 1 and 2].

Of the 255 patients, with imaging supporting diagnosis of SpA:

- 175 (68.6%) had findings consistent with acute or acute on chronic sacroiliitis
- 19 (7.4%) – [Hip 15, Spine 2, and Both 2 case] did not have SI joint involvement but had some other associated finding to suggest diagnosis of SpA [Figures 3 and 4] and clinical and laboratory parameters confirming the diagnosis
- 61 had features suggesting chronic sacroiliitis, of which 33 (54.1%) had active disease elsewhere in spine (15) or hip (9) or both (9) [Figures 5 and 6].

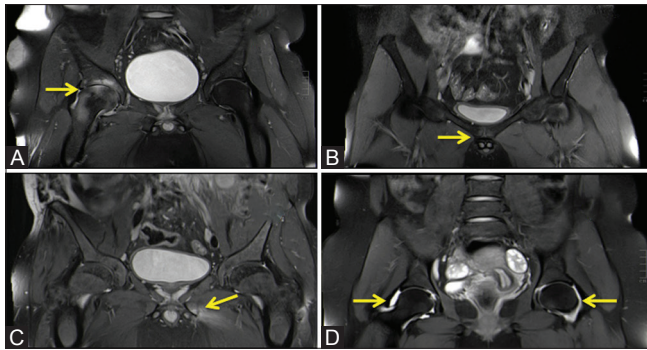
Of the 176 patients who had no imaging finding to support diagnosis of SpA, 56 (31.8%) patients had normal imaging and rest 120 (68.2%) had other findings to suggest the clinical symptoms, e.g., degenerative spondyloarthropathy (SpA), Pott's spine, skeletal metastases, early AVN of hip, gluteal cysticercus, and iliofemoral impingement [Figures 7 and 8], which were identified on spine and hip sequences.



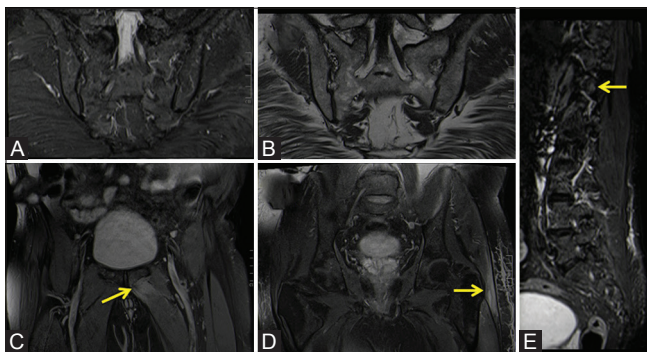
**Figure 1 (A-C):** STIR sagittal sequence through dorsolumbar spine (different patients) shows SpA-associated findings (arrows): (A) Costotransversitis and Costovertebritis, (B) Romanus shiny corner lesions with interspinous ligament enthesitis, and (C) Interspinous ligament enthesitis

**Table 1: MR sequence parameters and scan times**

| Sequence                        | Plane    | FOV | TR   | TE  | Distance factor | No. of slices | Scan time |
|---------------------------------|----------|-----|------|-----|-----------------|---------------|-----------|
| STIR SI joint                   | Coronal  | 200 | 3000 | 30  | 10              | 20            | 4:10      |
| T1-W SI joint                   | Coronal  | 200 | 590  | 8   | 10              | 20            | 3:00      |
| STIR SI joint                   | Axial    | 200 | 3000 | 26  | 10              | 20            | 4:00      |
| T1-W SI joint                   | Axial    | 200 | 700  | 8.5 | 10              | 20            | 3:40      |
| STIR DL spine (below D10 level) | Sagittal | 340 | 2000 | 56  | 30              | 15            | 2:30      |
| PD fat saturated hip joint      | Coronal  | 350 | 4000 | 32  | 10              | 30-40         | 3:30      |



**Figure 2 (A-D):** Coronal PD-FS sequence through both hip joints (different patients) shows SpA-associated findings (arrow): (A) Right hip inflammatory arthropathy, (B) Pubic symphysitis, (C) Left adductor enthesitis, and (d) Bilateral hip effusion



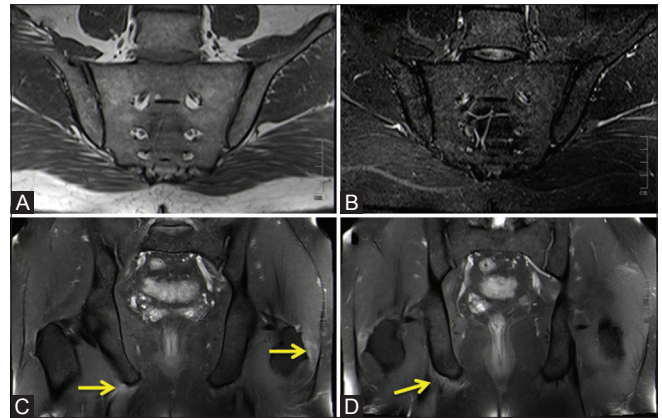
**Figure 4 (A-E):** Coronal (A) PD-FS and (B) T1W sequence through both SI joints (same patient) shows normal SI joints in signal intensity and morphology with (C and D). Coronal PD FS sequence through the hip joints and (E) Sagittal STIR sequence through the dorsolumbar spine in the same patient show features of enthesitis (arrows): along the left adductor attachments and along the greater trochanter on left side with left trochanteric bursitis and costotransversitis in spine

There was only slight increase in scan time as the two screening sequences took only about 5-6 minutes more than the imaging for SI joint alone.

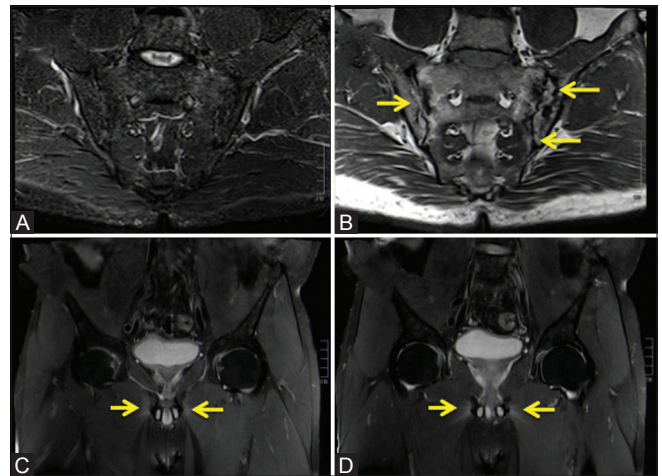
## Discussion

SpA refers to a group of seronegative interrelated, but distinctive disorders that cause chronic inflammation of the axial skeleton and peripheral joints and have clinical, laboratory, and genetic features in common; most important of these being association with human leukocyte antigen HLA-B27.<sup>[13]</sup>

The traditional SpA classification divided the group into six separate disease types: Ankylosing SpA (AS), Psoriatic SpA (PSPA), Reactive SpA, Enteritis-associated SpA, Juvenile SpA, and Undifferentiated SpA; but the newer classification system recognizes two broader categories encompasses the full range of SpA: the axial SpA and the peripheral SpA. AS is considered as prototype disease having predominant axial skeletal manifestations. Other diseases according to the traditional classification usually



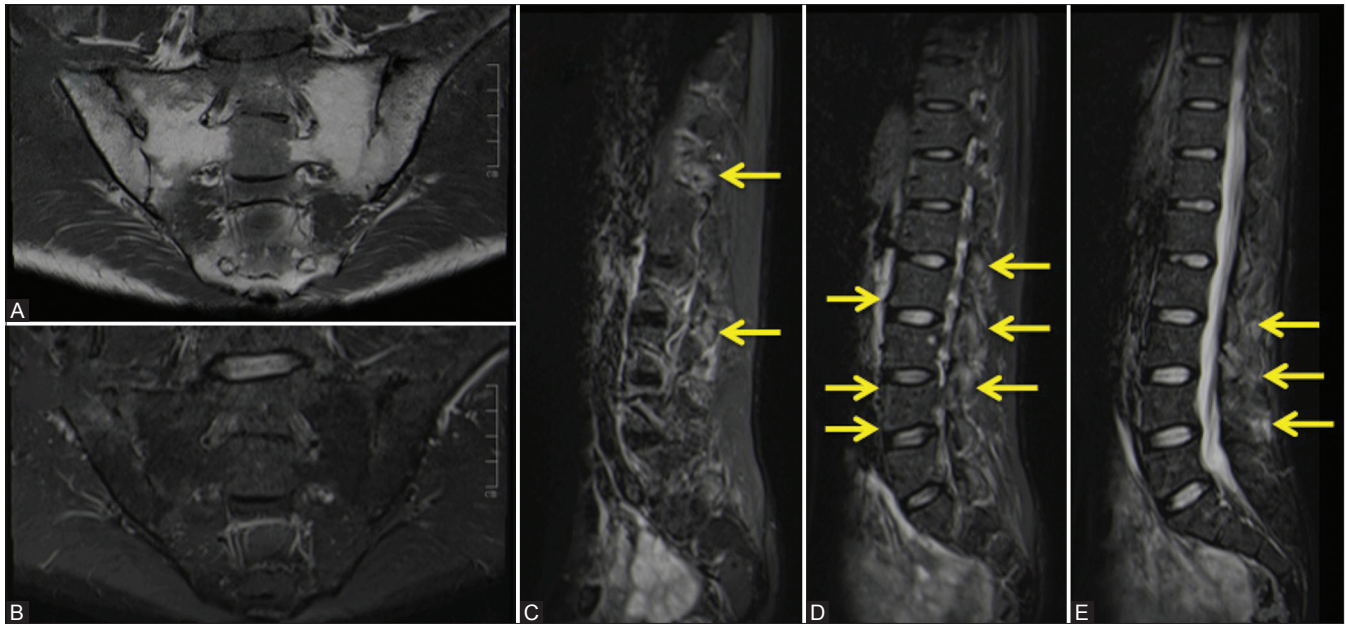
**Figure 3 (A-D):** Coronal (A) T1W and (B) PD-FS sequence through both SI joints (same patient) shows normal SI joints in signal intensity and morphology with (C and D). Coronal PD FS sequence through the hip joints in same patient show features of enthesitis (arrows) along the hamstring attachment on right side and along the greater trochanter on left side



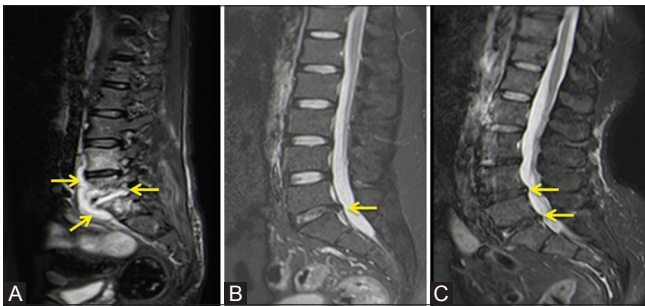
**Figure 5 (A-D):** Coronal (A) PD-FS and (B) T1W sequence through both SI joints and (C and D) PD-FS sequence through both hip joints (same patient) show features of chronic sacroiliitis (arrows) but evidence of active disease in form of adductor enthesitis (arrows) is seen in PD FS sequence through the hip joints

have peripheral articular involvement, but axial skeleton manifestations are also frequently seen.<sup>[14]</sup> The disease presentation is often on a spectrum that is dynamic and progressive, rather than static and unchanging.

Diagnostic criteria for SpA have evolved over time and the present consensus is on using the one that has role of MR imaging in the diagnosis as it plays an important role in evaluation of the skeletal changes in SpA over conventional radiography. Eshed *et al.* in their study showed MRI to be sensitive for detection of early enthesitis in the appendicular skeleton, providing information that is useful to the rheumatologist for evaluation and monitoring the disease.<sup>[15]</sup> Not only does it help in early diagnosis of the subtle skeletal changes but also in evaluating the treatment response more effectively,



**Figure 6 (A-E):** Coronal (A) T1W and (B) PD-FS sequence through both SI joints show features of chronic sacroiliitis with evidence of bony ankylosis, and (C-E) Sagittal STIR sequence through dorsolumbar spine (same patient) shows evidence of active disease in spine in the form of enthesitis (arrows) along the facet joints and subtle corner marrow edema at few levels



**Figure 7 (A-C):** STIR sagittal sequence through dorsolumbar spine (different patients) shows Non-SpA findings (arrows): (A) Infective Spondylodiscitis with subligamentous collection, (B) Annular tear with PIVD and (C) Annular tear and PIVD

especially with the advent of newer line of therapies for SpA.

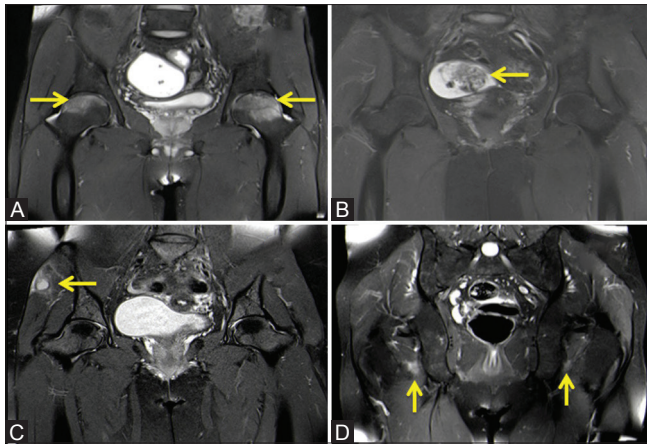
Recently, the ASAS group has proposed separate criteria to classify patients with axial SpA (with or without sacroiliitis) and peripheral SpA.<sup>[4]</sup> These criteria take into consideration sacroiliitis and many other SpA features in patients without sacroiliitis for diagnosis of SpA [Figures 9 and 10].

Braun *et al.* in their study found 27% patients of their study group to have normal SI joints with inflammatory lesions in spine.<sup>[16]</sup> Michet *et al.* in their study of 504 patients with psoriatic arthropathy found 32 patients with hip involvement, of which 4 patients did not have SI joint or spine involvement.<sup>[17]</sup> Lee *et al.* also suggested that that recognition of facet joint inflammation has the potential to contribute to understanding of clinical outcomes in AS.<sup>[18]</sup>

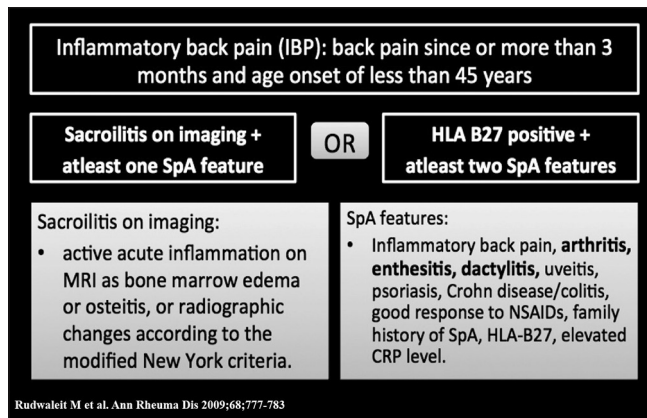
However in contradiction to our data, Zaitouni *et al.* in their study in the SpondyloArthritis Caught Early (SPACE) cohort and the DEvenir des Spondylarthropathies Indifférenciées Récentes (DESIR) cohort reported that MR spine had a low diagnostic yield in newly classified axial SpA and therefore do not recommend inclusion of MR spine as a criteria.<sup>[19]</sup> The differences in their and our study are: (i) we included only screening of dorsolumbar spine than whole MR spine sequence protocol, thus not increasing much of the scan time, (ii) we also support the fact that early findings in spine or hip may represent as a part of peripheral SpA or nonradiographic axial-SpA which are being debated to be same spectrum of disease as axial SpA/AS and are known to have equally prevalent peripheral manifestations as AS<sup>[20]</sup> and (iii) our study also evaluated role of screening in chronic SpA cases in which nearly 54% patients in our study with chronic sacroiliitis showed disease activity in spine or hip or both.

We advocate incorporating these screening sequences into the SpA protocol as it saves the cost of three different examinations, which is borne by the patient. The scan time is increased by only 5-6 minutes as compared to dedicated imaging for spine and hip separately, which is at times requested by clinicians, and takes about 20-25 minutes. Also it provides more information to the clinician, thus benefitting patients with a single examination for the same cost which is a big issue in the current Indian scenario.

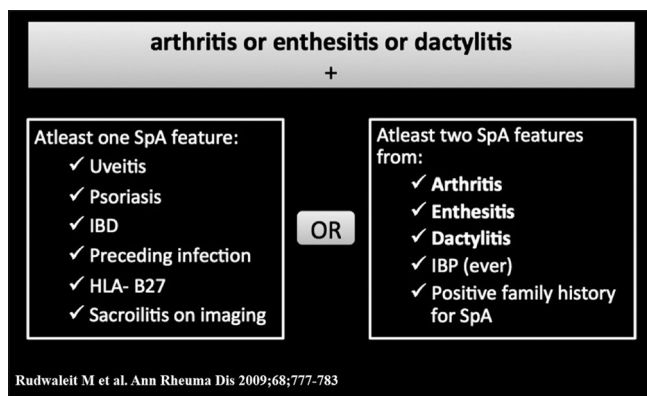
A limitation in our study was that in patients who were diagnosed with SpA and had normal SI joint imaging with



**Figure 8 (A-D):** Coronal PD-FS sequence through both hip joints (different patients) shows Non-SpA associated findings (arrows): (A) Bilateral early avascular necrosis of femoral heads, (B) Complex right adnexal cystic lesion, (C) Right Gluteus Maximus Cysticercus, and (D) Bilateral Ischiofemoral impingement



**Figure 9:** ASAS criteria for axial SpA



**Figure 10:** ASAS criteria for peripheral SpA

other evidences of disease activity, a follow-up imaging had not been done to assess whether they subsequently developed sacroiliitis. However our data warrant use of screening sequences in patients of SpA for SI joint imaging and the same may be evaluated further with randomized control trials to access its utility.

## Conclusion

In our study, inclusion of additional sections through dorsolumbar spine and both hips to routine SI joint protocol, helped in identifying: (a) early disease in 19 patients with normal SI joints, who may have otherwise been missed with routine only SI joint imaging, (b) additional findings in SpA-related sacroiliitis that are considered as SpA features but not seen with only SI joint imaging, (c) disease activity in spine or hip or both, in patients with imaging features of chronic SI joint disease, and (d) other causes of low back pain that help explain the symptoms.

It thus ensures timely and adequate patient management especially in patients who have normal SI joints on imaging with disease activity elsewhere, assessment of disease load and decision on treatment modality in patients who have chronic sacroiliitis with no disease activity in SI joints but active disease in hip or spine. The single examination protocol proves to be time and cost-effective with a higher yield of diagnostic result and shows great promise in our clinical setup.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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