Sciatica Indirectly Caused by Sacroiliitis Due to Involvement of Piriformis Muscle: Deduced from Images of Skeletal Scintigraphy

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DOI: https://doi.org/10.51584/IJRIAS.2024.910027

Received: 03 October 2024; Accepted: 12 October 2024; Published: 14 November 2024

ABSTRACT

This case report expresses a 47-year-old lady diagnosed with sacroiliitis that led to the develop ment of piriformis muscle syndrome. The interconnected nature of these conditions underscores the importance of comprehensive assessment and treatment. The patient presented with lower back pain and left sciatica. Conservative treatment and rehabilitation were employed, resulting in improved patient outcomes. This report highlights the need for a multidisciplinary approach, including skeletal scintigraphy to manage sacroiliitis and piriformis muscle syndrome in order to achieve optimal patient care and minimize the need for invasive procedures.

Key words: Piriformis muscle syndrome; Sciatica; Sacroiliitis; Whole body bone scan; Quantitative sacroiliac scintigraphy; Scintigraphic rehabilitation

INTRODUCTION

Sacroiliitis, a situation of inflammation of the sacroiliac (SI) joints, can cause lower back pain and radiate to the leg(s) [1]. The SI joint plays a fundamental role in connecting the bilateral iliac bones to the midline sacral spine, providing stability and distributing the load from the lower extremities. This joint is classified as a synovial diarthrosis-amphiarthrosis joint, characterized by sacral hyaline cartilage and iliac fibrocartilage [2,3]. With a surface area of measured 17.5 cm^2, SI joint is the largest one of human axial joints [2].

The anatomical structure of the SI joint allows conditions like pyogenic sacroiliitis to spread anteriorly to the psoas major muscle and occasionally to other nearby muscles. This can lead to a wider distribution of SI pain and irritation of major nerve structures, including the lumbosacral plexus (comprising fibers from L4-L5) and the dorsal sacral plexus. These nerves, responsible for innervating the SI joint, may cause intense and sometimes excruciating pain when affected [4]. Diagnosis of Sacroiliiitis can be made by quantitative sacroiliac scintigraphy (or scan) (QSS), if SI ratio bigger than 1.5 [5,6]. Conservative treatment for SI joint pain, including the use of analgesics, NSAIDs, physical therapy, chiropractic manipulation, pelvic belts, shoe inserts, and injections, should be attempted before considering surgery [1]. Sacroiliitis can co-exist with facet joint [7,8], and reflect bottom-up the foot periostitis [9].

The piriformis muscle, a flat, pear-shaped muscle, located in the pelvis and originates from some anatomical points, including the anterior aspect of the sacrum, the spinal portion of the gluteal musculactures, the superior

gluteal aspect of the ilium near the greater sciatic notch, the capsule of the adjacent SI joint, and occasionally the sacrotuberous ligament [10,11]. Piriformis muscle syndrome (PMS) also referred to as deep gluteal syndrome [12], and can be triggered by various factors, including injury at the hip or buttock, hypertrophy of the piriformis muscle (common in scoliosis, athletes while intense weightlifting), and prolonged sitting (common in occupations like taxi driving, office work, and cycling) [13-16]. However, PMS was never mentioned derived from sacroiliitis.

PMS is usually a diagnosis of exclusion, necessitating excluding more common pathologies [17]. Sciatica can be caused by PMS due to sciatic nerve emerged from the inferior [10,11,18-21], We herein report a patient with sciatica caused by sacroiliitis due to involvement of piriformis syndrome, in whom bone scintigraphy imaging was used to confirm the diagnosis with increased uptake of the bilateral SI joints consistent with sacroiliitis.

Case presentation

A 47-year-old lady, with a height of 154 cm and weight of 46 kg, presented to the rehabilitation department seeking medical attention. She reported experiencing lower back pain over the past two weeks, which subsequently developed into left lower limb sciatica. Upon examination, Stork test negative and local tenderness was noted in both the lumbar and sacroiliac regions. The patient has no known history of allergies or recent travelling.

Her medical history includes herniated intervertebral disc of cervical spine and hypothyroidism attributed to a benign thyroid nodule, for which she is currently receiving T3/4 replacement therapy. Additionally, she has been experiencing bilateral tinnitus persistently since a vertigo episode in 2016.

In this case, EMG finding of the lower limbs was negative, and the pelvis X-ray reveals osteophytes, narrowing joint space, and sclerosis of subchondral tissue in both sides of SI joints and hip joints (Figure 1). Whole body bone scan reveals increased uptake over the lower C-spine, lower T-spine, and bilateral SI joints (Figure 2), and the QSS suggests obvious arthritis in both sides of SI joint with SI/S ratio as 1.66 in left upper third, 2.16 in the middle third, 1.65 in the lower third, and 1.76 in the right upper third, 2.00 in the middle third, and 1.46 in the lower third. All the ratios are bigger than 1.3 (Table 1).

The patient expressed concern about the left lower limb sciatica possibly being caused by a herniated disc, but this information did not show how the severity of disc protrusion was. We advised that it could be due to inflammation of the sacroiliac joints, leading to piriformis syndrome. The patient was referred to a nearby rehabilitation clinic, and her condition has improved through rehabilitation.

DISCUSSION

Our case involves sciatica potentially caused by piriformis syndrome, later confirmed to be sacroiliitis as demonstrated by whole-body scan and QSS. This is the first case to present sciatica indirectly caused by sacroiliitis due to involvement of piriformis muscle, which has not been widely documented. The use of skeletal scintigraphy, QSS, and detailed imaging effectively supports the diagnosis of sacroiliitis and its secondary effects, reinforcing the clinical relevance of these diagnostic tools.

The sciatic nerve is the largest nerve in the human being, arising from the L4-S3 ventral rami and innervates the thigh, leg, and foot, which exits the pelvis via the greater sciatic foramen, situated directly below the piriformis muscle. Several other nerves and blood vessels also pass through this foramen [14,15,19].

The anatomical relationship between these structures is clinically significant. The insertion of the piriformis muscle near the SI joint contributes to the stability and function of this joint. We infer that inflammation of SI joint shoud cause inflammation of pirformis muscle. Notably, the proximity of the piriformis muscle to the sciatic nerve is of particular interest, as the sciatic nerve exits the pelvis just beneath the piriformis muscle (Figure 3). We also speculate that sciatica can be caused by inflammed piriformis muscle due to sciatic nerve emerged from its inferior [15,16,20]

QSS, which measures the SI joint-to-sacrum ratio, is useful for evaluating inflammation in sacroiliitis. QSS is a

reliable method for identifying sacroiliitis and related conditions, offering valuable insights for early intervention and management. QSS plays a significant role in the early diagnosis of ankylosing spondylitis, helps differentiate stages of the disease, and detects SI joint stress in osteitis condensansilii before and after treatment [22,23]. Moreover, it correlates with elevated ASLO titers in post-streptococcal reactive arthritis and is effective in monitoring and treating SI joint stress caused by periostitis [9].

From a pathophysiological perspective, the close anatomical relationship between sacroiliitis and piriformis syndrome can explain the observed symptoms and complications. Sacroiliitis may cause inflammation and tissue damage in the pelvic bone joints, affecting adjacent soft tissues such as the piriformis muscle. This inflammation could trigger muscle tension and exacerbate pain and discomfort in the pelvic area. Additionally, inflammation and tissue damage in the pelvic region might place pressure on nearby nerve structures. For instance, swelling or increased pressure around the sacroiliac joint could compress the sciatic nerve, leading to sciatic nerve pain and related lower limb discomfort (Figure 4).

Although both CT and MRI can provide detailed imaging of bone and soft tissue structures, bone scintigraphy offers more direct information regarding bone metabolic activity, especially in the early stages of inflammation or bone destruction. In some cases, these imaging modalities may be less sensitive than bone scintigraphy in detecting early inflammatory processes [24]. Additionally, the non-use of MRI in this context can be attributed to its higher cost, while bone scintigraphy is relatively economical and allows for rapid, whole-body assessment.

A limitation of this case report is the absence of MRI data. Although this case provided valuable scintigraphy results, it acknowledges the absence of MRI data, which could have offered more precise imaging of soft tissues, and might have strengthened the findings. Being a single case study, the conclusions drawn may not be widely generalizable, so larger studies would be needed to confirm the observations made in this report. The third limitation is the lack of information regarding the duration of sacroiliitis from its onset to symptom development, as well as the timeline of sacroiliitis progressing to piriformis muscle inflammation, and the subsequent development of sciatica, making it harder for clinicians to understand how quickly sacroiliitis progressed to piriformis syndrome and sciatica. Even improvement with rehabilitation, there was a lack of detailed follow-up data to assess the long-term effectiveness of the treatment.

CONCLUSIONS

There exists a mutual influence and exacerbation between sacroiliitis and PMS, emphasizing the importance of comprehensive assessment and treatment for both conditions. Understanding these causal relationships aids healthcare providers in better comprehending and managing related clinical situations. A comprehensive approach to SI joint pain management that prioritizes conservative treatments and multidisciplinary strategies can lead to better patient outcomes and reduce the need for invasive procedures. A more in-depth discussion on the challenges of diagnosing piriformis syndrome as a secondary condition to sacroiliitis would be valuable for clinical practitioners. Skeletal scintigraphy is very useful in scintigraphic rehabilitation.

AUTHOR CONTRIBUTIONS

Concept and design: SHIN-TSU CHANG

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Drafting of the manuscript: YU-CHIAO KUO

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Table Legend (Table1) Quantitative sacroiliac scintigraphy of our patient.

Table 1. Quantitative sacroiliac scintigraphy of our patient.

	left	right
upper：	1.66	1.76
middle：	2.16	2.00
lower：	1.65	1.46

Figure Legend

Figure 1. X-ray film of pelvis. The minimal osteophytes, joint space narrowing and subchondral sclerosis are shown in bilateral sacroiliac joints and hip joints.

Figure 2. Whole body bone scan with. The scintigraphic findings reveal increased uptake of the lower C-spine, lower T-spine, and bilateral SI joints, indicating traumatic/degenerative joint disease (DJD) changes. Sacroiliitis is confirmed as high SI/S ratio quantitative sacroiliac scintigraphy

Figure 3. Posterior view of right-sided pelvis to show anatomical relationship between sacroiliac joint, piriformis muscle and sciatic nerve. All the three adjacent structures are so close.

Figure 4. Skematic pathophysiology for sacroiliitis complicating with sciatica due to involvement of piriformis syndrome

Figure 1

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume IX Issue X October 2024

Figure 2

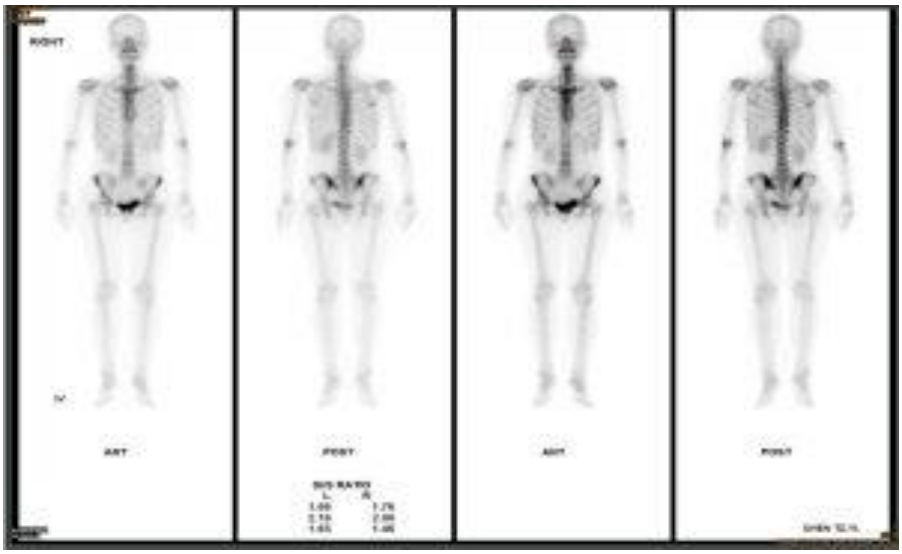

Figure 3

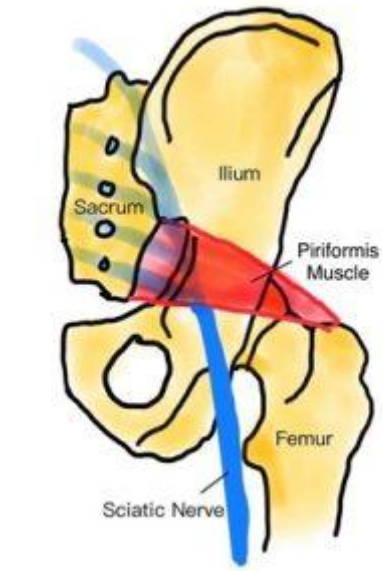

Figure 4