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Clinical Characteristics of Block-Confirmed Sacroiliac Joint Arthropathy: Referral Pain Distribution, Triggering Positions, and Provocative Maneuvers

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Abstract:

Background: The sacroiliac joint (SIJ) plays a crucial role in transmitting axial loads and maintaining pelvic stability. Sacroiliac joint arthropathy (SIJA) accounts for 10%–30% of low back pain cases but remains underrecognized due to overlapping pain referral patterns and nonspecific imaging findings. Diagnosis relies primarily on characteristic pain distribution and provocative maneuvers, with image-guided intra-articular block serving as the diagnostic gold standard. This study aimed to characterize the clinical profile of block-confirmed SIJA, emphasizing referral pain distribution, triggering position, and provocative test responses**. Methods:** A cross-sectional study was conducted on 98 patients with diagnostic block–confirmed SIJA at Siloam Hospital Lippo Village, Indonesia. Demographic data, referral pain sites, sitting duration, and results of FABER, compression, and distraction tests were analyzed descriptively. **Results:** The mean age was 52.07 ± 14.17 years, with 72.4% females. Referral pain most frequently involved the lower back (28.6%) and thigh (28.6%), with occasional extension to the groin (8.2%) or calf (4.1%). Over half of patients (55.1%) reported sitting more than six hours daily. Pain was predominantly triggered during sit-to-stand transitions (85.7%) and while sitting (74.5%). SIJ tenderness (98.0%) and FABER positivity (75.5%) were most consistent. **Conclusion:** The dominant referral pain in SIJA involves the lower back and posterior thigh. Sit-to-stand transition is the most frequent triggering position, while FABER testing demonstrates the highest diagnostic yield among provocative maneuvers. These consistent patterns may serve as practical clinical indicators to improve diagnostic accuracy in suspected SIJ-related pain.

Keywords: Sacroiliac Joint Arthropathy; Diagnostic Block; Referral Pain; Provocative Test; Triggering Position; Sitting Duration

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1. Introduction

The sacroiliac joint (SIJ) plays a critical role in connecting the spine and the lower extremities, facilitating load transfer and maintaining pelvic stability during both static and dynamic movements [1]. Sacroiliac joint arthropathy (SIJA) can result in substantial pain and functional impairment; however, it remains frequently underdiagnosed in clinical practice. Current estimates indicate that SIJ pathology accounts for approximately 10%–30% of cases among patients presenting with low back pain [2]. Despite this notable prevalence, the diagnosis of SIJA remains challenging due to the joint's anatomical complexity and overlapping referral pain patterns.

Several factors contribute to this diagnostic difficulty. First, the innervation of the SIJ is complex and variable, resulting in pain referral patterns that are not limited to the lumbar and buttock regions but may also extend to the groin and lower extremities,

thereby mimicking pain arising from lumbar, hip, or myofascial sources, as reported by Slipman et al. [3]. Second, conventional imaging modalities such as radiography, computed tomography, and magnetic resonance imaging exhibit limited sensitivity in identifying pain-generating pathology of the SIJ, particularly in the absence of overt inflammation or structural abnormalities. As highlighted by Simopoulos et al., evidence supporting the diagnostic accuracy of imaging for SIJ pain remains limited compared to the stronger evidence available for diagnostic blocks [4].

In clinical practice, the diagnosis of SIJA is primarily guided by patient history, characteristic pain patterns, and the results of various provocative maneuvers. Clinically, SIJ arthropathy should be suspected in patients with persistent low back pain accompanied by referral symptoms to the buttock, thigh, or groin, position such as prolonged sitting or sit-to-stand transitions, and positive provocative maneuvers (e.g., thigh thrust, compression, distraction, or FABER tests) [5,6]. However, no single clinical test provides both high sensitivity and specificity [7]. The diagnostic intra-articular block remains the gold standard for confirming SIJA, [2] however its application is often limited by procedural invasiveness, technical complexity, and the need for image-guided precision, which requires specialized equipment and operator expertise. Consequently, recognizing consistent clinical features among patients with block-confirmed SIJA is essential to enhance diagnostic precision and optimize the selection of candidates for confirmatory procedures. Despite these established diagnostic principles, few studies have comprehensively examined the distribution of referral pain, triggering position characteristics, and provocative test responses in block-confirmed cases of SIJA [3,8-10]. Detailed clinical profiling of these cases is essential to enhance diagnostic accuracy and guide appropriate management.

Accordingly, the present study aims to provide a comprehensive clinical characterization of patients with diagnostic block–confirmed SIJA. Specifically, we examined (1) referral pain distribution (low back, thigh, groin, calf, or none); (2) triggering position characteristics, including pain related to sitting, sit-to-stand movement, standing, and walking; and (3) responses to key provocative tests (SI joint tenderness, FABER/Patrick, compression, and distraction). Through systematic analysis of these features in a consecutive cohort of block-confirmed cases, this study seeks to identify consistent clinical patterns that may facilitate more accurate and confident diagnosis of SIJA in routine clinical practice.

2. Materials and Methods

This cross-sectional observational study was conducted at the Neurology Outpatient Clinic of Siloam Hospital Lippo Village, Tangerang, Indonesia, from February to May 2025. The study enrolled 98 cooperative outpatients clinically diagnosed with SIJA, all of whom underwent image-guided diagnostic intra-articular injection for confirmation. Patients were included if they were adults aged 18 years or older, capable of following examination instructions, and willing to provide written informed consent.

Patients were excluded from the study if they had autoimmune diseases such as ankylosing spondylitis, rheumatoid arthritis, or systemic lupus erythematosus; a history of pelvic or lumbar fractures; spinal or pelvic infections; malignancies; pregnancy; or structural deformities such as scoliosis or leg length discrepancy. Participants were recruited consecutively using a nonprobability consecutive sampling technique from the neurology outpatient clinic during the study period.

A structured questionnaire was administered to collect demographic and clinical data, including age, gender, occupation, pain onset, duration, location, and aggravating factors such as prolonged sitting, standing, walking, or transitioning from sitting to standing. Anthropometric measurements, including height and weight, were taken using

a calibrated digital scale, and Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m²).

3. Procedures

3.1. Physical Examination

All participants underwent a standardized neurological and musculoskeletal examination performed by a neurologist. The physical assessment included four bilateral SIJ provocation evaluations including SIJ tenderness, FABER, compression, and distraction, to assess pain reproduction consistent with SIJ pathology.

SIJ tenderness was evaluated through posterior palpation of the sacral sulcus. With the patient in a relaxed standing or prone posture, the examiner applied firm digital pressure inferomedial to the posterior superior iliac spine (PSIS) to assess reproduction of characteristic pain, using a palpation technique similar to that described by Dreyfuss et al [11].

In the Patrick's or FABER (Flexion, Abduction, External Rotation) test, the patient was positioned supine with the ankle of the tested leg resting on the contralateral knee. The examiner gently applied downward pressure on the flexed knee while stabilizing the opposite anterior superior iliac spine (ASIS). Pain elicited in the tested SIJ region indicated a positive result [5,11,12].

The Compression test was performed with the patient lying in a lateral decubitus position, the symptomatic side facing upward. The examiner applied vertical downward pressure over the uppermost iliac crest, compressing the SIJ. The test was considered positive if pain was reproduced at the tested joint [11,12].

For the Distraction (Grapping) test, the patient was positioned supine while the examiner crossed their arms and applied a posterolateral force on both ASIS, distracting the SIJ. A positive test was recorded if pain was reproduced over the affected sacroiliac area. Each maneuver was repeated up to three times and a test was recorded as positive only when it reproduced the patient's typical pain pattern [11,12].

3.2. Diagnostic Confirmation

Diagnosis was confirmed using image-guided diagnostic block, performed by an experienced neurologist trained in interventional pain procedures. Under aseptic conditions, the patient was placed in a prone position. The skin over the PSIS was sterilized with povidone-iodine, and local anesthesia with lidocaine 2% (2 mL) was administered subcutaneously. A 22-gauge spinal needle was advanced toward the inferior portion of the SIJ, under ultrasound or C-arm fluoroscopic guidance to ensure precise intra-articular placement.

Once correct positioning was confirmed, 2 mL of 2% lidocaine was injected into the joint space. A successful diagnostic block was defined as ≥75% pain relief within 15–30 minutes post-injection. Patients who met these criteria were included as confirmed cases of SIJA.

3.3. Research Ethics

This study was reviewed and approved by the Ethics Committee of the Faculty of Medicine, Pelita Harapan University, with full consideration of the protection of human rights, confidentiality, and participant welfare in medical research (Approval No. 124/K-LKJ/ETIK/II/2025). All participants received verbal and written information regarding study procedures, risks, and benefits, and provided written informed consent prior to enrollment. The study was conducted in accordance with the Declaration of Helsinki and applicable institutional research guidelines.

4. Results

This study included a total of 98 patients with diagnostic block-confirmed SIJA. The baseline demographic and clinical characteristics of the study population are summarized in Table 1. The mean age of participants was 52.07 ± 14.17 years, with a predominance of females (72.4%) over males (27.6%). The mean body mass index was 26.05 ± 4.70 kg/m². Most patients presented with unilateral involvement, affecting the left side in 52.0% and the right side in 39.8% of cases, while bilateral involvement was observed in 8.2%. Lower back and thigh regions were the most frequent referral pain sites (each 28.6%), whereas 30.6% of patients did not report any distinct referral pain. More than half of the patients (55.1%) reported sitting for more than six hours daily in the past three months, and 24.5% had a history of falls onto the buttocks. Pain was most commonly triggered during sit-to-stand movements (85.7%) and while sitting (74.5%). On physical examination, SIJ tenderness was present in nearly all cases (98.0%), followed by positive Patrick/FABER (75.5%), compression (56.1%), and distraction (42.9%) tests.

Table 1. Demographic and Clinical Characteristics of Patients with Block-Confirmed Sacroiliac Joint Arthropathy (SIJA)

Subject characteristics	N (98 patients)
Age	52.07±14.17
Weight (kg)	66.53 ± 13.58
Height (cm)	159.62 ± 8.04
Body mass index	26.05 ± 4.70
Onset duration (weeks)	8.89 ± 18.03
Gender	
Male	27 (27.6 %)
Female	71 (72.4%)
Affected Side	
Right	39 (39.8%)
Left	51 (52.0%)
Bilateral	8 (8.2%)
Referral pain	
Lower back	28 (28.6%)
Thigh	28 (28.6%)
Groin	8 (8.2 %)
Calf	4 (4.1%)
None	30 (30.6 %)
Duration of sitting within 24 hours over the past 3 months	
< 3 hours	14 (14.3 %)
3–6 hours	30 (30.6 %)
> 6 hours	54 (55.1 %)
History of falls onto the buttocks	24 (24.5%)
Triggering Position	
During sit-to-stand movement	84 (85.7%)
While sitting	73 (74.5%)
While standing	29 (29.6%)
While walking	31(31.6%)
Provocative test	
SIJ tenderness	96(98.0%)
Patrick or FABER	74(75.5%)
Compression test	55(56.1%)
Distraction (Grapping) test	42(42.9%)

4. Discussion

The present study provides a comprehensive clinical profiling of patients with diagnostic block–confirmed SIJA, a condition that remains one of the most underrecognized yet clinically significant sources of low back pain. While numerous studies have attempted to delineate the clinical profile of SIJ-related pain, many have relied solely on clinical criteria without confirmatory diagnostic blocks, resulting in heterogeneous findings. By restricting inclusion to block-confirmed cases, the current study offers a more precise representation of the true clinical spectrum of SIJA.

SIJ injections can be performed using various techniques, including blind injections (palpation- or landmark-guided) and image-guided approaches such as those employing fluoroscopy, ultrasound, or computed tomography (CT). However Blind SIJ injections have demonstrated limited accuracy, as reported by Rosenberg et al., who achieved successful intra-articular placement in only 22% of cases [13], and by Hansen et al., who found accurate needle placement without fluoroscopic guidance in merely 12% of patients, even when performed by an experienced pain interventionist [14]. Additionally, Todorov et al. reported that ultrasound-guided SIJ injections produced significantly better outcomes than landmark-guided injections across multiple clinical parameters [15].

To overcome these limitations, the use of image-guided techniques has become increasingly advocated to enhance procedural accuracy and therapeutic outcomes. Fluoroscopic guidance has long been regarded as the standard approach, as it allows confirmation of intra-articular needle positioning through real-time contrast injection and exclusion of inadvertent vascular placement [16]. Meanwhile, ultrasound guidance has emerged as an appealing alternative due to its lack of radiation exposure, portability, and feasibility for bedside application. The use of fluoroscopy and ultrasound guidance has proven effective, with Jee et al. reporting successful intra-articular needle placement rates of 98% for fluoroscopy-guided and 87% for ultrasound-guided SIJ injections [17], confirming the high reliability of image-guided techniques. Therefore, this study utilized image-guided (ultrasound or C-arm fluoroscopy) intra-articular diagnostic blocks to confirm the SIJ as the primary source of pain. By incorporating imaging guidance, we enhanced diagnostic specificity and minimized false-positive identification of SIJ-related pain, thereby enabling a more credible analysis of associated clinical patterns, including referral pain zones, positional aggravating factors, and the diagnostic utility of provocation tests.

Our study found a predominance of middle-aged patients (mean 52.1 ± 14.2 years) and a strong female preponderance (72.4%). These findings align with previous studies. Siahaan et al. reported that most patients with SIJ pain were in the 40-to-49-year age range, and Irwin et al. also noted that patients commonly presented in their mid-50s [18,19]. Age-related structural changes in the SIJ, including gradual cartilage wear and progressive capsular stiffness, may increase joint vulnerability and contribute to the higher prevalence of SIJ pain in this age group. The predominance of female patients in our study is also consistent with prior observations. Siahaan et al. identified female sex as one of the factors associated with SIJ pain, and this trend is supported by biomechanical considerations [18]. Anatomical differences in pelvic morphology, greater ligamentous laxity, and physiological changes related to pregnancy are believed to increase the mechanical load and strain placed on the SIJ, thereby elevating the risk of pain in women.

Our study demonstrated the most frequent referral sites were the lower back and thigh (each 28.6%), with smaller proportions reporting groin (8.2%) or calf (4.1%) referral. Our findings align with those of Slipman et al., who reported that SIJ pain most commonly refers to the buttock and lower lumbar region, while lower-extremity symptoms are also frequent, occurring in nearly half of patients and extending to the lower leg (28%) and even the foot (12%) [3]. Kurosawa et al. further demonstrated that referral patterns vary according to the specific SIJ segment stimulated: upper sections typically referred pain to

the upper buttock, whereas lower sections produced lower-buttock pain, and only a minority reported distal radiation, including occasional groin, lateral thigh, lower leg, calf, or toe pain. Their work, using precise periarticular stimulation and anesthetic injection, showed that reproducing and relieving each patient's characteristic pain was possible by targeting the ligamentous region, supporting the role of hypersensitive nociceptors within the SIJ ligaments [20]. The diverse pain referral patterns associated with SIJ pathology can be attributed to several anatomical and neurophysiological factors. The SIJ has a highly variable and complex innervation, with contributions from multiple lumbar and sacral roots, as well as potential inputs from the obturator, superior gluteal, and lumbosacral trunk nerves. This variability likely contributes to the broad range of referral distributions [3,21,22]. In addition, pain may follow a sclerotomal pattern, allowing nociception from SIJ ligaments or joint surfaces to radiate into the lower back or lower extremity. Adjacent structures, including the piriformis muscle and other periarticular tissues, may also become secondary pain generators when affected by SIJ dysfunction [3,20].

Our study demonstrated pain provocation most frequently with sit-to-stand transitions (85.7%) and prolonged sitting (74.5%); 55.1% reported sitting >6 hours/day and while walking 31(31.6%). These activity-related triggers are consistent with prior clinical descriptions and reviews reporting that SIJ pain classically worsens with transitional and load-bearing tasks such as rising from sitting, prolonged sitting/standing, stair climbing, and ambulation [22-24]. Hermans et al. similarly observed that patients with SIJ dysfunction exhibit slower gait speed, longer double-support time, impaired balance, and prolonged sit-to-stand transitions, highlighting the functional impact of altered load transfer and pelvic instability [23]. In our study, sit-to-stand was the most frequent aggravating activity (85.7%). Biomechanically, the SIJ functions as the principal load-transfer structure between the spine and lower limbs, and the sit-to-stand transition produces rapid changes in pelvic orientation along with a sharp rise in compressive and shear forces across the joint. These demands require coordinated activation of lumbopelvic stabilizers to maintain force closure. When this stability is compromised, the increased shear during ascent from sitting can readily provoke symptoms. This mechanism is supported by Capobianco et al. which demonstrated that individuals with SIJ dysfunction adopt compensatory strategies during sit-to-stand, including preferential loading of the unaffected leg, reduced hip motion on the affected side, greater peak hip moment on the contralateral side, and disrupted activation timing in muscles responsible for force closure. These asymmetrical and maladaptive motor patterns increase joint stress and reduce pelvic stability, providing a clear biomechanical explanation for why sit-to-stand is highly provocative in patients with SIJ dysfunction [25]. Prolonged sitting and standing provoke SIJ pain through related biomechanical pathways. Sustained postures impose continuous compressive loading and contribute to local muscle fatigue. During sitting, posterior pelvic tilt alters load distribution across the SIJ, increasing focal stress [26]. Walking impose repetitive cyclical loading and shear; when SIJ mobility is abnormal, repeated gait cycles amplify microtrauma and nociceptive input from the joint and associated ligaments and muscles [27].

Our study showed that 24.5% of patients reported a history of falls onto the buttocks, supporting the contribution of low-energy trauma as a clinically relevant predisposing factor for SIJ pain. This aligns with findings summarized by Holmes et al., who reported that 44–58% of SIJ pain patients had prior traumatic exposure, including falls, sports trauma, and traffic accidents, although their data did not detail specific percentages for individual mechanisms [28]. Siahaan et al. similarly observed that 54.5% of patients reported fall-related trauma 1–5 years before SIJ symptom onset, reinforcing the role of delayed post-traumatic manifestations [18]. A fall can transmit axial and shear forces through the pelvis, injuring key stabilizing ligaments and disrupting load transfer across the joint; this ligamentous damage may create micro-instability that evolves into chronic SIJ pain.

In our study, SIJ tenderness was the most frequently observed clinical finding (98.0%), followed by FABER/Patrick positivity (75.5%), whereas compression (56.1%), and distraction (42.9%) demonstrated lower positivity rates. Our findings indicate that palpation-based tenderness over the sacral sulcus and the FABER maneuver remain the most sensitive bedside indicators of SIJ arthropathy in patients later confirmed by diagnostic blocks. The predominance of SIJ tenderness in our study aligns with previous studies describing Fortin area tenderness or sacral sulcus tenderness as one of the most consistent clinical findings in SIJ-mediated pain [29,30]. Dreyfuss et al. similarly demonstrated that sacral sulcus tenderness had the highest diagnostic sensitivity among provocation tests reaching 95%, surpassing other maneuvers such as FABER [11]. The high frequency of FABER positivity in our study likewise parallels prior reports. Several studies, including those summarized by Sami Salman et al, have demonstrated that the FABER test is among the most sensitive provocation maneuvers for detecting SIJ pathology [31,32]. Conversely, the lower rates of compression and distraction positivity in our sample differ from the systematic review by Cattley et al., which found greater reliability for tests such as the Thigh Thrust, Gaenslen, and Fortin Finger mapping, while FABER and sacral thrust/compression were judged less reliable as standalone assessments [33]. These discrepancies likely reflect methodological heterogeneity among studies and highlight that no single provocation test provides adequate diagnostic certainty. Our findings demonstrated the presence of multiple provocative signs, particularly SIJ tenderness and FABER positivity, which were most consistently observed in our block-confirmed SIJA. This approach is consistent with existing recommendations, including those reported by Laslett et al. and Saueressig et al., which demonstrated that clusters of positive provocation tests offer greater diagnostic confidence [7,34], while definitive confirmation should still be obtained through image-guided intra-articular anesthetic block [35].

The findings of this study highlight several clinically relevant patterns that may aid clinicians in the early recognition of SIJA. The predominance of lower back and posterior thigh referral pain, combined with the strong association of symptoms with sit-to-stand transitions and prolonged sitting, provides practical diagnostic cues that can be readily identified during routine history taking. High rates of SIJ tenderness and FABER positivity further support the value of incorporating specific targeted provocation tests into structured physical examination, especially in settings where imaging or interventional procedures are not immediately accessible. Moreover, identifying commonly encountered aggravating factors, such as prolonged sitting and subtle traumatic exposures, may assist clinicians in tailoring early management through ergonomic adjustments, exercises, or modification of daily load-bearing behaviors.

This study has several important limitations. First, the assessment of referral pain patterns, positional triggers, and history of falls relied heavily on patient self-report, introducing potential recall bias, particularly for events occurring months to years prior and for estimating total daily sitting duration over the past three months. Second, all physical examinations, including provocative maneuvers, were performed by a single neurologist; therefore, inter-examiner reliability could not be evaluated, and the reproducibility of these findings across different examiners remains uncertain. Third, although all diagnoses were confirmed using image-guided blocks, the study did not compare the relative accuracy of ultrasound versus fluoroscopy guidance, limiting conclusions regarding the optimal imaging modality for diagnostic injections. Such limitations should be acknowledged when generalizing these results to clinical practice and when informing the direction of future investigations.

5. Conclusions

This study provides a comprehensive clinical profile of patients with diagnostic block confirmed SIJA. The findings show a predominance of middle-aged women, frequent pain referral to the lower back and posterior thigh, and consistent symptom worsening during sit to stand movements and prolonged sitting. Posterior sacroiliac joint tenderness and FABER positivity were the most common examination findings, supporting their usefulness in clinical screening. However, image guided intra articular anesthetic injection remains necessary to establish diagnostic certainty. These results highlight the value of structured history taking, focused physical examination, and appropriate imaging guidance to improve early recognition and management of sacroiliac joint arthropathy in clinical practice.

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