

*Research Article***Ultrasound Versus Fluoroscopic Guided Sacroiliac Joint Injection In Patient With Chronic Sacroiliac Joint Pain****Hany K. Mickhael, Abdelreheem M. Mohamed, Al-Shimaa I. Roushdy and Asaad E. Shaher Labib**

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**Abstract**

**Introduction:** Sacroiliac joint (SIJ) pathology is a common cause of low back pain (LBP), accounting for 10–27% of cases of mechanical LBP below L5 level. If there is no definite clinical or radiological diagnostic criteria for SIJ pain, intra-articular injection of SIJ have become the choice assessment method for making the diagnosis of SIJ pain.

**Aim of the work:** This randomized clinical trial was designed to investigate and compare both accuracy and efficacy of the ultrasound and fluoroscopy guidance for sacroiliac joint injections with local anesthetic and steroids as a treatment modality for pain relief in patients with moderate to severe sacroiliitis. **Patients and Methods:** After Minia University ethical committee approval (14/10/2019) and written informed consents obtained from all patients, this prospective randomized clinical trial was carried out on 40 adult patients of both sex in the period from October 2019 to March 2020 at the pain management unit of Assuit University Hospital. The study had been registered at the clinical trial registry. ClinicalTrials.gov (ID: 14102019). **Results:** This prospective randomized clinical trial included 40 adult patients of both sex, who had moderate to severe sacroiliitis and were candidates for sacroiliac joint injection with local anesthetic and steroids. They were randomly allocated into two equal groups (20 patients each) by using a computer generated table. The US group was treated by sacroiliac joint injection using the ultrasound, while the FL group was treated by sacroiliac joint injection using the fluoroscopy.

**Introduction**

Sacroiliac joint (SIJ) pathology is a common cause of low back pain (LBP), accounting for 10–27% of cases of mechanical LBP below L5 level. If there is no definite clinical or radiological diagnostic criteria for SIJ pain, intra-articular injection of SIJ have become the choice assessment method for making the diagnosis of SIJ pain. There is good results for diagnostic SIJ injections by using local anesthetic or placebo blocks and 75 – 100% pain relief as the diagnostic for sacroiliitis<sup>(1)</sup>.

Also, radiographs are still used as the first-line imaging of the sacroiliac joints<sup>(2)</sup>. There is difficulty for the full assessment of SIJ radiographically due to the irregular outline and obliquity of sacroiliac joints. This limitation has been overcome by more sensitive imaging techniques such as

computed tomography (CT) or magnetic resonance imaging (MRI). Ultrasound is not as useful in assessing the sacroiliac joints as only the anterior and posterior margins are seen. CT is excellent for detecting erosions, bone sclerosis and ankyloses and for interventional procedures although MRI is superior in detecting bone marrow oedema as a measure of sacroiliac joint inflammation. MRI is of choice for detecting sacroiliac joint disease and assessing disease severity and activity<sup>(3)</sup>.

Sacroiliac (SI) joint pain definition is a pain localized in the region of the SI joint, stimulated by special tests of the SI joint, and improved by selective infiltration of the SI joint by a local anesthetic. Patients with pain originating from the sacroiliac joint may describe symptoms aggravated by getting out of a chair, prolonged standing or sitting, with climbing stairs or morning

stiffness. Pain can transfer to other areas as the buttocks, hip, groin, and leg. Numbness and tingling in the leg may also be present. Risk factors include leg length discrepancy, age, arthritis, history of spine surgery, pregnancy, and trauma <sup>(4)</sup>.

Depending on the diagnostic criteria for diagnosis of SIJ pain (clinical examination, intra articular blocks, radiological investigation), the reported prevalence of SI pain through the patients with axial LBP accounting for 16 - 30% <sup>(5)</sup>.

The SI joint is a diarthrodial synovial joint. The anterior part is a true synovial joint. The posterior part is a syndesmosis consisting of the sacroiliac ligaments, the gluteus muscle (medius and minimus), and the piriformis muscle. The SI joint cannot function independently because all of these muscles are shared with the hip joint <sup>(6)</sup>.

The ligamentous structures and the muscles support the stability of the SI joint. The SI joint is innervated mainly by the sacral rami dorsales <sup>(7)</sup>

The anatomical structure, innervations, presence of sinusoids around the joint, and inter-individual variations in structure make SIJ injections difficult to accomplish without any guidance (e.g., fluoroscopy, CT, ultrasound). Clinically-guided SIJ injections without radiographic guidance have been reported to result in low rates of intra-articular injections, spread into sacral foramina, extension into the epidural space, and vascular uptake <sup>(8)</sup>

Sacroiliitis is an inflammatory process of the sacroiliac (SI) joints involving one or both sides. It is one of the major clinical features of spondyloarthropathies <sup>(9)</sup>.

Management for sacroiliitis include nonsteroidal anti-inflammatory drugs and the application of physical modalities. However, in severe painful cases, local treatment of the SI joint through intra-articular corticosteroid injection can

provide fast and considerable clinical improvements<sup>(10)</sup>. From this concept, this study was designed to compare the impact of ultrasound (US) and fluoroscopy (FL) guidance for SIJ injections on accuracy and efficacy in patients with chronic LBP secondary to SIJ arthritis.

### **Aim of the work**

This randomized clinical trial was designed to investigate and compare both accuracy and efficacy of the ultrasound and fluoroscopy guidance for sacroiliac joint injections with local anesthetic and steroids as a treatment modality for pain relief in patients with moderate to severe sacroiliitis.

The ultrasound was used for sacroiliac joint injections in an attempt to decrease the radiation exposure of the fluoroscopy and the ultrasound has emerged as a favorable alternative to fluoroscopy to guide sacroiliac joint injections as it is more affordable, available, and it avoids radiation exposure. It also allows “real-time” visualization of needle tip and spread of injectate during injection.

### **Primary outcome:**

- 1- Mean changes in pain intensity from pretreatment as a response to the procedure measured via visual analogue score (VAS) pre-procedure, during the procedure and 24 hrs. , 72 hrs. , 1week, 1 month and 3 months post-procedure.
- 2- Physical function via oswestry disability index (ODI) pre-procedure and 1 month post-procedure.

### **Secondary outcome:**

- 1- Analgesic requirement 1 month post-procedure.
- 2- Patient satisfaction post- procedure.
- 3- Procedure time (seconds).
- 4- Procedure discomfort via visual analogue score (VAS).
- 5- Global evaluation of therapy.
- 6- Incidence of any complication related to the procedure.

### **Patients and Methods**

After Minia University ethical committee approval (14/10/2019) and written informed

consents obtained from all patients, this prospective randomized clinical trial was carried out on 40 adult patients of both sex in the period from October 2019 to March 2020 at the pain management unit of Assuit University Hospital. The study had been registered at the clinical trial registry. ClinicalTrials.gov (ID: 14102019).

All participants were diagnosed as sacroiliitis according to the Assessment of Spondyloarthritis International Society (ASAS) <sup>(10)</sup> by a consultant of rheumatology, and were investigated radiologically to determine the stage of sacroiliitis according to Modified New York criteria <sup>(11)</sup>.

**Inclusion criteria:**

1. At least 3 positive physical examination maneuvers [FABER (flexion, abduction, and external rotation), POSH (posterior shear), REAB (resisted abduction), Fortin’s finger test],
2. Moderate to severe pain (VAS pain score  $\geq$  3/10) refractory to oral anti-inflammatory drugs.
3. Age from 18-60 ys.

**Exclusion Criteria:**

1. Body Mass Index (BMI) above 35 kg/m<sup>2</sup>.

2. Patients with severe anxiety or depression and other psychological disorders.
3. Allergy to local anesthetics or steroids.
4. Pregnancy.
5. Multiple comorbidities (renal, hepatic, cardiac).
6. Coagulation disorder as bleeding tendency and platelet dysfunction.
7. Contraindication for prone position or radiological exposure.
8. Patient refuse.
9. Pain suggestive of bilateral sacroiliac joint involvement (it would have been difficult to assess pain and disability secondary to each SIJ).

**Results**

This prospective randomized clinical trial included 40 adult patients of both sex, who had moderate to severe sacroiliitis and were candidates for sacroiliac joint injection with local anesthetic and steroids. They were randomly allocated into two equal groups (20 patients each) by using a computer generated table. The US group was treated by sacroiliac joint injection using the ultrasound. while the FL group was treated by sacroiliac joint injection using the fluoroscopy.

**Table (1): Characteristics of the studied groups (n=40)**

	<b>Group A (US) N=20</b>	<b>Group B (fl.) N=20</b>	<b>P value</b>
<b>Age</b>			
<b>Mean <math>\pm</math> SD</b>	42.1 $\pm$ 9.6	44 $\pm$ 8.9	0.5
<b>Range</b>	30-60	30-60	
<b>BMI</b>			
<b>Mean <math>\pm</math> SD</b>	25.5 $\pm$ 3.7	27 $\pm$ 2.3	0.1
<b>Range</b>	19.6-32.9	23.6-31.6	
<b>Sex</b>			
<b>Male</b>	8 (40%)	10 (50%)	0.5
<b>Female</b>	12 (60%)	10 (50%)	
<b>Occupation</b>			
<b>Farmer</b>	5 (25%)	6 (30%)	0.5
<b>Free business</b>	2 (10%)	4 (20%)	
<b>Teacher</b>	5 (25%)	2 (10%)	
<b>No occupation</b>	8 (40%)	8 (40%)	

P value calculated by independent samples t-test for quantitative variables and by Chi-square test for qualitative variables (<0.05 is considered significant)

## Discussion

The sacroiliac joint is the largest joint in the body and a significant source of mechanical low back pain. Sacroiliac joint pain can affect between 15% and 30% of individuals who present with chronic, non-radicular pain. It has a unique diarthrodial shape created by a syndesmosis between the sacrum the ilium<sup>(13)</sup>. The anterior third is a true synovial joint and the posterior two thirds are connected by multiple sacroiliac ligaments, the gluteus medius/minimus, and the piriformis muscle<sup>(14)</sup>. The SIJ is vascularized by the branches of sacral arteries. As with other joints, the SIJ can be damaged, degenerate, become inflamed, or the supporting soft tissue may be injured<sup>(15)</sup>. Given its unique architecture, dysfunction can occur from many causes, include excessive loading/rotation, trauma, fracture, inflammatory arthropathies, degenerative changes, pregnancy, and after lumbar fusion surgery, especially fusion, which includes the sacrum<sup>(16)</sup>.

Sacroiliac joint pain can be difficult to recognize from other causes of low back pain because there is no pathognomonic pain pattern. Sacroiliac joint pain may present at the buttock and radiate to the ipsilateral groin, lower lumbar spine, or posterior thigh. There is no single criterion standard clinical examination maneuver, but specificity and sensitivity are greatly increased when SIJ provocative tests are combined together such as FABER/Patrick's (flexion, abduction, and external rotation), Gaenslen, thigh thrust/femoral shear test, anterior superior iliac spine (ASIS) distraction (supine), and sacral compression (side lying)<sup>(17)</sup>.

When conservative methods such as oral medications and exercise by a physical therapist fail, many of these patients are treated successfully with intra-articular corticosteroid injections into the SIJ<sup>(18)</sup>.

Some patients may benefit from repeated injections if pain is only partially relieved, when the beneficial effect of the medication dissipates or when symptoms recur<sup>(19)</sup>.

Because of the complexity of SIJ, blind injection based of palpation of anatomic landmarks often results in low accuracy. So, SIJ intra-articular injections are usually performed under fluoroscopy or computerized tomography guidance<sup>(20)</sup>.

Although there are some clinical practice settings such as military medicine and private/concierge practices that may be routinely using ultrasound for needle placement<sup>(21)</sup>.

Fluoroscopy has been used as a validated control in assessing accuracy of ultrasound-guided procedures in other settings. However, there are several limitations with fluoroscopy that are particularly evident with repeated injections, such as two-dimensional imaging, exposure to ionizing radiation, the need for a contrast agent, and the direct and indirect costs associated with each procedure including the use of the fluoroscopy suite and the radiology technologist<sup>(22)</sup>. The evidence for the diagnostic accuracy of SIJ imaging is limited and more high-quality studies are needed<sup>(23)</sup>

## Recommendations

Further large scale clinical trials with longer follow up periods are recommended to demonstrate long term efficacy and adverse effects of the SIJ injection of local anesthetic and corticosteroid using ultrasound or fluoroscopy in patients with chronic sacroiliac joint pain.

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