

Original article

doi: 10.35366/113617

Sacroiliac joint dysfunction and lumbar pain. Evaluation in a Brazilian population

Disfunción de la articulación sacroilíaca y dolor lumbar. Evaluación en una población brasileña

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ABSTRACT. The study intended to evaluate the incidence and evolution of sacroiliac joint dysfunction (SIJD). To reach 50 patients with SIJD diagnosis, 192 patients with low back pain and failure in conservative approach were consecutively examined (26% incidence). Initially patients underwent intra-articular (IA) corticosteroid sacroiliac joint (SIJ) block followed, if necessary, by cooled SIJ radiofrequency or referred to surgical intervention, in order of complexity. From the 50 patients submitted to IA SI block, 41 (82%) referred pain and quality of life improvement and lesser rescue analgesics consumption for 25 weeks. The block induced a prompt onset of pain relief and there was a drop in mean pain score from 8 to 2 cm ($p < 0.001$) maintained up to 25 weeks. Rescue analgesic consumption also significantly dropped ($p < 0.05$). However, nine patients (18%) did not refer long lasting improvement in the third week evaluation and underwent cooled radiofrequency. From this population of nine, seven were successful (78%) while two were recommended surgery. In view of the 50 patients, 82% were comfortable after IA block, 18% were submitted to radiofrequency, with a success rate of 78%. The final incidence of surgery suggestion was 4%.

Keywords: low back pain, sacroiliac joint dysfunction, intraarticular sacroiliac joint block, radiofrequency, surgery.

RESUMEN. El estudio pretende evaluar la incidencia y evolución de la disfunción de la articulación sacroilíaca (DASI). Para llegar a 50 pacientes con diagnóstico de DASI, se examinaron consecutivamente 192 pacientes con dolor lumbar y fracaso en el abordaje conservador (26% de incidencia). Inicialmente, los pacientes se sometieron a un bloqueo de la articulación sacroilíaca (ASI) con corticosteroides intraarticulares (IA) seguido, si era necesario, de radiofrecuencia ASI enfriada o remitidos a una intervención quirúrgica, en orden de complejidad. De los 50 pacientes sometidos al bloqueo IA SI, 41 (82%) refirieron mejoría del dolor y de la calidad de vida y menor consumo de analgésicos de rescate durante 25 semanas. El bloqueo indujo un rápido inicio del alivio del dolor y hubo una caída en la puntuación media del dolor de 8 a 2 cm ($p < 0.001$) mantenida hasta 25 semanas. El consumo de analgésicos de rescate también disminuyó significativamente ($p < 0.05$). Sin embargo, nueve pacientes (18%) no refirieron una mejoría duradera en la evaluación de la tercera semana y se sometieron a radiofrecuencia fría. De esta población de nueve, siete tuvieron éxito (78%), mientras que a dos se les recomendó cirugía. De los 50 pacientes, 82% se sintió cómodo después del bloqueo IA, 18% fue sometido a radiofrecuencia, con una tasa de éxito de 78%. La incidencia final de sugerencia de cirugía fue de 4%.

Palabras clave: dolor lumbar, disfunción de la articulación sacroilíaca, bloqueo intraarticular de la articulación sacroilíaca, frecuencia de radio, cirugía.

Level of evidence: II

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Received: 06-22-2023. Accepted: 08-23-2023.

How to cite: Lopes BCP, Rocha-Lauretti G, Defino HLA, Oliveira CS, Serra TS, Ogata KK, et al. Sacroiliac joint dysfunction and lumbar pain. Evaluation in a Brazilian population. Acta Ortop Mex. 2023; 37(4): 227-232. <https://dx.doi.org/10.35366/113617>



Introduction

Criteria for sacroiliac pain diagnosis have been recently reviewed. The best definition is reproduced by at least three maneuvers and pain decrease with local infiltration of anesthetics into the articulation.^{1,2,3,4} Following diagnostic, treatment includes Intra-articular (IA) sacroiliac joint infiltrations with local anesthetic and corticosteroids, which holds the highest evidence rating (1 B+). If the latter fails or produce only short-term effects, cooled radiofrequency (RF) approach of the lateral sacral branches is recommended (2 B+).^{3,5,6,7} Finally, if it fails, surgery or minimally invasive sacroiliac joint fusion has been suggested for chronic sacroiliac joint dysfunction (SIJD).^{8,9}

Because of the increasing suggestion of surgical sacroiliac fusion,^{8,9} the goal of this study was to evaluate the incidence and evolution of SIJD in a Brazilian population referred to a Public University Teaching Hospital.

Material and methods

The Local Ethics Committee approved the prospective study and patients gave written informed consent. Patients with low back pain and complain of conservative treatment failure referred to the place of the study named Pain Clinic at the Teaching Hospital of the School of Medicine of Ribeirão Preto-University of São Paulo were consecutively evaluated and checked for SIJD diagnostic following the IASP criteria and exclusion of red flags (fractures, infections, radiculopathy, tumors, axial spondyloarthritis, as well as extravertebral causes).¹⁰ During seven consecutive months, patients with low back pain complain, however prior attended by the rheumatology and orthopedics for exclusion criteria of any rheumatologic or neuropathic diseases were further evaluated for the inclusion criteria of sacroiliac pain. Patients who had at least three positive compressive tests such as compression test, Gaensler's test, distraction test, and Patrick's sign,^{3,11} were subsequently submitted

to IA sacroiliac block under conscious sedation using IV 2 mg midazolam plus 250 µg alfentanil, accomplished of continuous O₂ 2 l/min. Because three or more positive pain provocation SIJ tests have sensitivity and specificity of 91 and 78%, respectively,¹² we performed three tests, and the technique of IA sacroiliac injection was carried out was previously described: IA puncture was performed followed by periarticular injection.¹³

Monitorization included continuous electrocardiography and O₂ saturation plus non-invasive blood pressure at 3-min intervals. In a sterile operating room, patients were prone on the surgical table with a cushion under the lower abdomen to reduce lumbar lordosis and the needle entry point was driven by C-arm fluoroscopy. The corrected entry point was conducted by 0.5 ml of 300 mg/ml non-iodate iohexol contrast injected into the needle (*Figure 1*). Thereafter, a combination of 5 mg dexamethasone plus 20 mg lidocaine (3 ml) was dispensed IA, combined to periarticular SIJ administration of the same amount (10 mg dexamethasone + 20 mg lidocaine, final 3 ml).

Time of analgesia assessed from IA block until pain visual numerical scale (VNS) equals 4 cm (0-10 cm), being zero equal to «no pain at all» and 10 cm equals to «the worst possible pain» was noted.¹⁴ Rescue analgesic (1 g metamizole) was available at minimum 6-hour interval during the study period. No other analgesic rescue drugs were included to avoid any bias. Quality of life was measured by the 10 cm VNS, being zero equal to «best improved quality of life» and 10 cm equals «the worst possible quality of life».

When IA block was not valuable even under 4 g oral metamizole daily intake (pain VNS equals or higher to 4 cm), cooled radiofrequency (RF) was considered. As a consensus statement lateral sacral branch radiofrequency neurotomy may be used for the treatment of posterior sacral ligament and joint pain following positive response to appropriately placed diagnostic blocks. grade II-1 B.¹⁵ Cooled RF causes denervation of nerves supplying SI joints

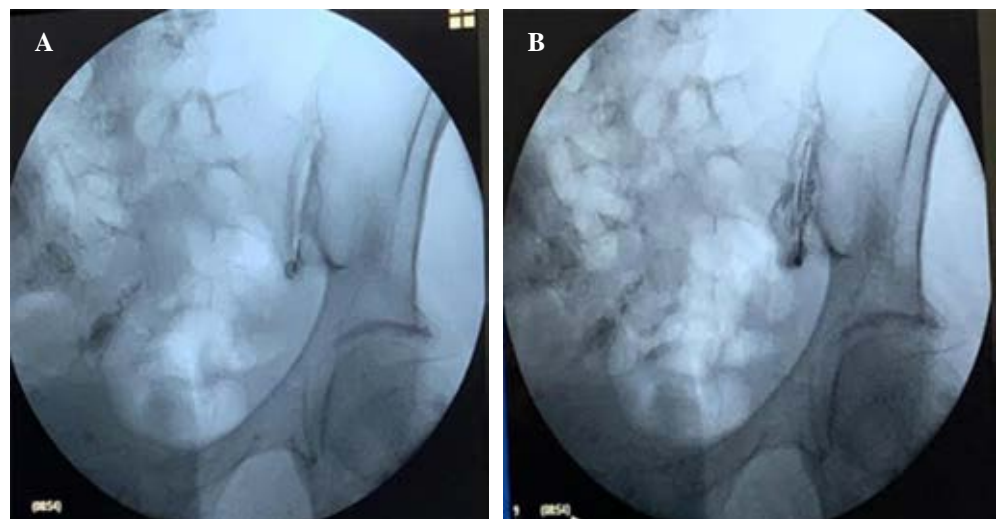


Figure 1:

Intra-articular sacroiliac joint puncture. **A)** The correct needle entry point of the sacroiliac joint. **B)** Injection of 0.5 ml of 300 mg/ml non-iodate iohexol contrast and sacroiliac joint demarcation.

Table 1: Demographic data.

Age (years)	Weight (kg)	Height (cm)	Gender	Post-laminectomy	No prior surgery
49.1 ± 10.9	69.5 ± 13.1	164.47 ± 7.79	F: 30 M: 20	F: 7 M: 5	F: 23 M: 15

F = female. M = male.

Table 2: Description of number of intra-articular sacroiliac punctures in each patient (unilateral or bilateral).

Bilateral N = 17	Unilateral N = 33	Unilateral	
		Male patients N = 11	Female patients N = 22
M: 9 F: 8	M: 11 F: 22	8-right 3-left	9-right 13-left

M = male. F = female.

with the aid of Pain Management Synergy® system (Baylis Medical Company, Montreal, Canada) to complete the intervention procedure. Patients were submitted to RF under conscious sedation using IV 2 mg midazolam plus 500 µg alfentanil, accomplished of continuous O₂ 2 l/min.

Monitorization included continuous electrocardiography and O₂ saturation plus non-invasive blood pressure at 3-min intervals. In the prone position, the skin overlying each SI joint area was infiltrated with 1% lidocaine after sterile preparation of the site. C-arm fluoroscopy visualized areas adjoining each SI joint and sacral foramina. Three 25-gauge 3.5-inch Quincke needles were stationed into S1 through S3 posterior sacral foramen (PSFA) to set up internal reference points for RF probe placement. Distance between the place for probe introducer and the aperture of PSFA was figured out with the aid of the epsilon ruler which aligned with the medial border of each sacral foramen. The procedure began at S1 level, an RF probe introducer with stylet was inserted over the bone of posterior sacrum, lying at a safe distance from sacral foramina as guided by internal reference points and epsilon marker. Synergy® RF probe was inserted through the introducer and correct probe placement checked in the lateral view. Tissue impedance set up below 500 Ω. Motor and sensory testing ensured avoidance of somatic nerve injury, while focused on the correct probe placement. Following instillation of 2% lidocaine 1 ml + 2 mg dexamethasone for each lesion area, WC-RF energy delivered 150 s at 60 °C at the target electrodes. Two lesions around S3 and three lesions around S1 and S2 created a strip of lesioned tissue lateral to each sacral foramen. The total dose administered during RF was 15 mg dexamethasone plus 160 mg lidocaine,

All patients tailed up to 12 months or until pain VNS equaled or exceeded 4 cm, which meant that follow up

would end at the time the patient started rescue analgesic (definition of time of analgesia) with free access to rescue analgesic. When radiofrequency was not successful, surgery was proposed.

Statistical analysis

The number of patients was based on earlier data. We projected that following IA sacroiliac block there would be 90% improvement in analgesia, leading to minimal suggestion of surgery. Considering $\alpha = 5\%$ and $\beta = 80\%$, it was suggested that 50 patients with SIJD would be enough to evaluate the order of treatment complexity.^{1,9,16}

Because the power test defined 50 patients, and the incidence of sacroiliac pain was defined around 15-30% of all low back pain,^{1,2,3} we were alert that around 200 subsequent patients with complaints of low back pain would be necessary to reach 50 patients suffering from SIJD.

Shapiro-Wilk test was the method used to address normality of the sample sizes.¹⁷ Continuous variables are expressed as the mean ± standard deviation (SD), and categorical variables are presented as absolute numbers and percentage. Data was assessed for and fulfilled assumptions for parametric calculations (Shapiro-Wilk test). Demographic data was described. The VNS values, the consumption of analgesics and the analgesic time defined as time from block until VNS equaled 4 cm were evaluated by Man-Whitney test between groups and by Wilcoxon signed-rank test within the same group. Categorical variables were evaluated using either the χ^2 test or Fisher's exact test. The incidence of adverse effects and adjuvant drugs were compared by the χ^2 test corrected for multiple tests. $p < 0.5$ was taken to show a significant difference, otherwise specified.

Results

192 patients with complaints of low back pain were consecutively examined to reach 50 patients with SIJD diagnosis (final 26% incidence). Patient's demographics are described in *Table 1*. *Table 2* describes the number of IA sacroiliac puncture in each patient.

Of the 50 patients submitted to IA dexamethasone plus lidocaine SIJ block; 41 patients (82%) referred pain and quality of life improvement; and lesser rescue analgesics consumption (*Table 3 and Figure 2*). The block induced a prompt onset of pain relief and there was a drop in mean

pain score from 8 to 2 cm at third week supported up to 25 weeks evaluation for the 41 patients (Table 3, $p < 0.001$). Rescue analgesic consumption was also significantly reduced when comparing prior to block to 3-week ($p < 0.05$) and finally, at 25-week, the daily consumption of metamizole slowly increased and equaled to prior-block ($p > 0.05$) (Table 3).

However, nine patients (18%) did not refer long lasting improvement in the third week of evaluation and underwent cooled RF ablation. From this population of nine patients, seven were successful (78%) while two were recommended to surgery (Tables 4 and 5, Figure 2). When one evaluates the two unsuccessful patients who underwent RF, both had bilateral puncture. One was a professional martial arts fighter who did not stop training, and the other was previously submitted to laminectomy and was unhappy with all proposed procedures.

Discussion

The sacroiliac joint accounts for approximately 16 to 30% of cases of chronic mechanical low back pain.^{1,2,3,4} In our study, 192 of the patients referred to the Pain Clinic during seven consecutive months with low back pain, were successively evaluated. When three of the six maneuvers are positive, the sensitivity of diagnosis is 85 to 94%, and specificity is approximately 78%,^{18,19} 50 patients were positively selected for the IA sacroiliac joint block (26%) in accordance with others.^{1,2,4,16} Individually, they have weak predictive value, but combined batteries of tests can help clarify the diagnosis. A meta-analysis showed that the high thrust test, the compression test, and 3 or more positive stressing tests have discriminative power for diagnosing SI joint pain.¹⁶ Also, from this population of 50 patients, 43 were successful for IA dexamethasone + lidocaine into

Table 3: Time of analgesia for 41 patients that classified improved analgesia.

Time to mention VAS = 4 cm (weeks) N = 41	Gender N = 41	VNS before the block (cm)	VNS after the block (cm)	Metamizole consumption (g) prior block	Metamizole daily consumption (g) after block
25 ± 6	M: 16 F: 25	8.5 ± 1.4	3-week: 2.44 ± 0.93 25-week: 5.96 ± 2.03	3.1 ± 0.78	3-week: 1.03 ± 0.76 25-week: 1.81 ± 0.88

M = male. F = female.
VNS (visual numeric pain scale) (0-10 cm): $p < 0.001$ (prior versus 3-week); $p > 0.05$ (prior versus 25-week); VNS among the group (3-week = 25-week) $p > 0.05$.
Metamizole daily consumption (g): $p < 0.05$ (prior versus 3-week); $p > 0.05$ (prior versus 25-week); VNS among the group (3-week = 25-week) $p > 0.05$.

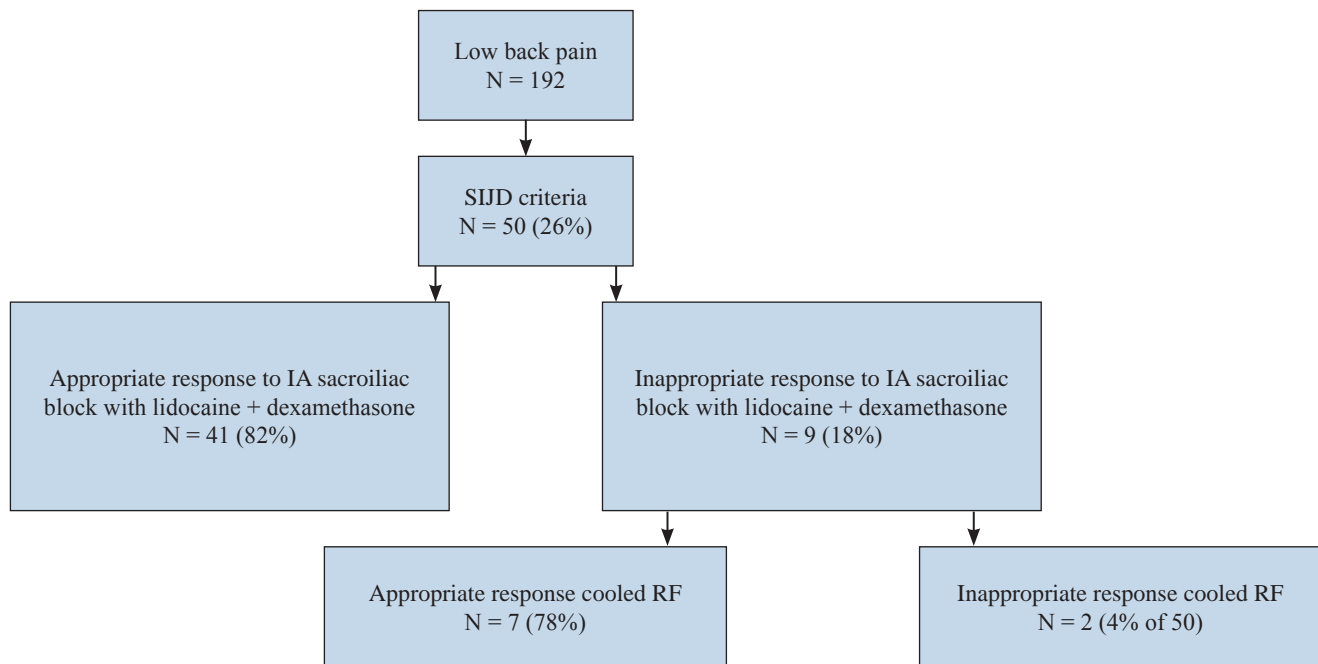


Figure 2: Results organogram.

SIJD = sacroiliac joint dysfunction. IA = intra-articular. RF = radiofrequency.

Table 4: Evaluation of patients that did not refer proper analgesia after intra-articular sacroiliac block for the 9 patients.

Time to refer VNS = 4 cm (weeks) N = 9	Gender N = 9	VNS prior block (cm)	VNS 3-week block	Metamizole daily consumption prior block (g)	Metamizole daily consumption 3-week block (g)
2.2 ± 0.83	M: 4 F: 5	8.55 ± 1.94	7.77 ± 1.48	3.33 ± 0.71	3.11 ± 0.78

M = male. F = female.
VNS (visual numeric pain scale) (0-10 cm): p > 0.05 (prior versus 3-week).
Metamizole daily consumption (g): p > 0.05 (prior versus 3-week).

Table 5: Evaluation of analgesia after cooled radiofrequency of sacroiliac joint.

Time to analgesia VNS ≥ 4 cm	Gender	VNS prior RF (cm)	VNS after RF	Metamizole daily consumption prior RF (g)	Metamizole daily consumption after RF (g)
7 patients: 36-40 weeks	M: 3 F: 4	8.29 ± 1.11	3-week: 3.14 ± 0.69 12-month: 3.57 ± 0.97	3.28 ± 0.75	3-week: 1 ± 0.82 12-month: 1.14 ± 0.89
2 patients	M: 1 F: 1	8.5 ± 0.71	3-week: 8 ± 1.41	3.5 ± 0.7	3-week: 3 ± 0

M = male. F = female. RF = cooled radiofrequency. VNS = visual numeric pain scale (0-10 cm).
VNS prior RF between groups (8.46 ± 1.7 versus 9.24 ± 0.6) p > 0.05.
VNS prior RF compared at 3 weeks and at 12 months post-RF among groups: 7 patients: prior compared to 3-week and 12-month after RF (prior versus 3-week, p < 0.01); (prior versus 12-month, p < 0.01); (3-week = 12-month, p > 0.05).
Metamizole daily consumption (g) prior RF and at 3-week: 7 patients: prior compared to 3-week and 12-month after RF (prior versus 3-week, p < 0.05); (prior versus 12-month, p < 0.05); (3-week = VNS 12-month, p > 0.05).

the sacroiliac joint combined to periarticular injection. All patients in this study correlated improved pain relief with improved quality of life, as both were measured by VNS. Unfortunately, we did not include the Oswestry Disability Index or other scales related to health quality, which would be more precious for the study. Pain originating in the sacroiliac joint is predominantly perceived in the gluteal region, although could be referred into the lower and upper lumbar region, groin, abdomen, and/ or lower limb(s).³ Because sacroiliac joint pain is difficult to distinguish from other forms of low back pain based on history, different provocative maneuvers have been advocated. Radiological imaging is important to exclude «red flags» but contributes little in the diagnosis. Diagnostic blocks are the diagnostic gold standard but must be interpreted with caution.^{3,5,6,7,10}

In agreement to our methodology, previous studies indicated that SIJD pain could originate from the joint capsule and the posterior ligamentous. The periarticular SIJ injection was described as more effective compared to IA injection for this type of pain,¹³ while combining periarticular and IA injections has been demonstrated to be superior to IA injection alone.²⁰

In accordance with others, we used fluoroscopy to localize the SIJ. Fluoroscopy was compared to ultrasound-guided steroid injections with contrast in 120 subjects with noninflammatory sacroiliac arthritis and found fluoroscopic guidance to be more accurate than ultrasound guidance

(98.2% vs 87.3%).²¹ The follow up was up to 12-months for the study, but individually addresses, as proposed in methods. The final evaluation time ended individually when patients complained of pain equal or more than 3 cm (VNS pain scale) and therefore started rescue metamizole. From the 50 patients submitted to IA dexamethasone plus lidocaine SIJ block; 41 patients (82%) referred pain and quality of life improvement; and lesser rescue analgesics consumption during 25 consecutive weeks. However, nine patients (18%) did not refer long lasting improvement in the third week evaluation and underwent cooled RF ablation of sacral joint. Nevertheless, from this group of nine patients, seven were successful (78%) while two of them were recommended to surgery (4% of total 50 patients, *Figure 2*).

Using cooled RF in managing SIJ pain was firstly described by Kapural et. al. in 2008.²² It is a minimally invasive treatment option targeting nerves that are causing pain, and internally cooled RF probes can yield larger tissue lesions than those created by the conventional ones, achieving better outcomes.^{11,23,24} The procedure has been proven to significantly relieve pain and disability with no severe complications, and majority of patients with chronic SIJ pain are satisfied with this technique.⁶

When one evaluates the two unsuccessful patients who underwent RF, one was a professional martial arts fighter who did not stop training, although the first step for SIJ pain treatment in the athlete are activity modification.²⁵

Posteriorly he gave up martial activities and became political. SIJ pain should be considered for athletes who present with complaints of low back pain because of the significant overlap in symptoms.²⁶

The second unsuccessful patient had an earlier history of laminectomy and was unhappy with all procedures. There is certain controversy about the lumbar spine surgery as a predisposing factor for sacroiliac pain. It has been attributed to the weakening of muscles and trauma to the joint cavity during surgery, besides post-surgery hypermotility.²⁷ In spite of that, there are not enough tests to show a direct relation between the latter and sacroiliac pain. The unsuccessful patient could benefit from burst or high-frequency spinal cord stimulation for axial pain,²⁸ which is not available in Brazil up to date.

In conclusion, the incidence of SIJD was 26% in the population studied. Of the full population, 82% of success rate treatment with IA dexamethasone SIJ block. The remaining 18% of patients were given to radiofrequency treatment, with a success rate of 78%. The final incidence of surgery recommendation was 4%.

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Disclaimers: the views expressed in the submitted article are from the authors and not from the institution or funder. There is no conflict of interest from any author.

Research funding: sources were from the Brazilian government.