Original Research
Medical Journal of the Islamic Republic of Iran. Vol. 23, No. 1, May, 2009. pp. 23-30

Prevalence of concomitant sacroiliac joint dysfunction in patients with image proven herniated lumbar discs

Seyed Pezhman Madani[1], MD., Mohammad Dadian[2], PT., Keykavous Firouznia[3], MD., Salah Alalawi[4], MD., Ali akbar Jafarian[5], MD.

Department of Physical Medicine and Rehabilitation, Shafayahyaian Rehabilitation Hospital, Tehran, Iran.

Abstract

Background: Sacroiliac joint (SIJ) dysfunction is a widely known but poorly defined cause of low back pain. To our knowledge, few published studies have been conducted to evaluate systematically the prevalence and significance of concomitant sacroiliac joint dysfunction in patients with herniated lumbar discs. As concomitant SIJ dysfunction in low back pain patients is likely to respond to particular noninvasive interventions such as manipulation, improved understanding of the relationship between these two diagnoses would improve clinical decision making and research.

Methods: This study was designated to estimate the prevalence of concomitant sacroiliac joint dysfunction in sub acute low back pain patients with image proven discopathy and evaluate the theory that sacroiliac joint dysfunction can be a source of pain and functional disability in discopathy. A total of 202 patients with sub acute radicular back pain and MRI proven herniated lumbar discs underwent standardized physiatrist history and physical examination, specified for detection of concomitant sacroiliac joint dysfunction.

Results: Sacroiliac joint dysfunction is a concomitant finding in 72.3% of evaluated patients. There was significantly higher SIJ dysfunction prevalence in female patients ($p < 0.001$), patients with recurrent pain ($p < 0.005$) and in patients with positive straight leg raising provocative test ($p < 0.0001$).

Conclusion: SIJ dysfunction is a significant pathogenic factor with high possibility of occurrence in low back pain. Thus, in the presence of radicular and sacroiliac joint symptoms, SIJ dysfunction, regardless of intervertebral disc pathology, must be considered in clinical decision making.

Keywords: sacroiliac joint, sacroiliac joint dysfunction, radiculopathy, low back pain

Introduction

Low back pain (LBP) with a point prevalence of 15-30% and a lifetime prevalence of 60-80 %, is one of the most common health problems, and second only to headache as a cause of pain [1,2]. Nearly 33% of total indemnity costs are related to it [1]. All strategies for incidence reduction and cost management are handicapped

1. **Corresponding author,** Assistant Professor of Physical Medicine and Rehabilitation, Department of Physical Medicine and Rehabilitation, Shafayahyaian Rehabilitation Hospital, Baharestan Sq. Tehran, Iran. TeleFax:+9821 88021781, email: pejman599@yahoo.com
2. Department of Physical Therapy, Welfare and Rehabilitation University, Tehran, Iran.
3. Assistant Professor of Radiology, Department of Radiology Tehran University of Medical Science, Tehran, Iran.
4. CCT in Rehabilitation Medicine, Royal National Hospital for Rheumatic diseases-Bath, UK.
5. Assistant Professor of Anesthesia and Critical Care, Department of Anesthesia and critical care, Iran University of Medical Sciences, Tehran, Iran.
* The study was supported financially by the Iran University of Medical Sciences.

by limited scientific data regarding diagnosis of exact pathology and effective management [3-5]. Disc herniation is only one of various possible causes of radicular symptoms. Herniations have been detected on CT and MR Scans in a high percentage of asymptomatic people [6, 7]. Additionally there is no direct correlation between size of herniations and clinical symptoms [6,7].

Sacroiliac joint is a widely known but poorly defined as a subset of several recognized low back pain generators. Deep location, limited movement and irregular anatomy are major contributory factors in SIJ evaluation.

Although the sacroiliac joint is often considered in low back pain, its importance remains controversial. Norman and May [6] identified the sacroiliac joint (SIJ) as one of the possible starting points of such complaints via injection of local anesthetic. The mechanism(s) of pain production or the specific tissues involved remain equivocal. One hypothesis is that low back pain may arise from tissues in the pelvis or low back area that are subjected to stress by pelvic asymmetry [3]. Pelvic asymmetry (also know as pelvic torsion) is characterized by the anterior or posterior rotation around a coronal axis of one innominate in relation to the sacrum and opposite innominate creating a positional change within one or both sacroiliac joints [3]. Reversible motion restrictions in spinal segments or peripheral articulation, each presenting with hypomobility, are defined as dysfunctions according to manual medicine terminology [6]. SIJ dysfunctions as the cause of pseudoraiculadr pain were identified in 10-23% of patients following nucleotomy [8]. There was significant improvement in 87.5% [6] and 90% [8] of these patients following manual therapy and even complete relief in some.

There is no scientific data on the presence and clinical significance of SIJ dysfunction in patients with lumbar disc disease. The aim of our study was to detect the prevalence of SIJ dysfunction in low back pain patients with image proven lumbar disc herniation.

We hypothesized that SIJ dysfunction could be a frequent pathology, with a potentially significant effect on pain and functional disability in patients with sub acute radicular back pain and discopathy.

Method

Patients

The study group consisted of 202 patients who were referred to our rehabilitation clinic (Shafayahyaian Orthopedic and Rehabilitation Hospital, Tehran, Iran) with physical findings suggestive of lumbosacral root irritation. Patients referred for an MRI study, were between 19-70 years of age (mean: 42.1±12.1) and weighed between 42-105 Kg (mean: 71± 11.4) with a height of 148-190 cm (mean: 166.2± 9). Physical findings are summarized in Table 1.

Exclusion criteria were current pregnancy, prior lumbar spine surgery, a history of osteoporosis, spinal or hip fracture, severe hip degenerative joint disease, polyneuropathy and diabetes.

Patients were evaluated by MRI 1.5 T, Signa, GE, USA, and all demonstrated paracenteral or intraforaminal disc herniation. Herniation in our terminology denotes a posterior focal extension of the disc with the sagittal image showing a narrow and distinguishable pedicle of the nucleus. In 54 (26.7%) cases the disc herniations was located at level of L5/S1, 73(36.1%) cases at L4/L5 level and 8 (4%) cases at segment of L3/L4.In 67 (33.2%) cases two segments were affected, namely L4/L5 and L5/S1.

All patients were then evaluated for presence of sacroiliac joint dysfunction by a rehabilitation specialist. We used the cluster method, which is the combination of anatomical and provocative tests, for detection of sacroiliac joint dysfunction [9, 10].

Anatomical tests included

1. The Sitting posterior superior iliac spine (PSIS) palpation test (Forward bending of the

trunk): For determining the side of dysfunction of moving sacrum moving on innominate bone, the inferior slope of bilateral posterior superior iliac spines was palpated on a sitting subject by an evaluator who was seated behind him. As the subject was bent forward, he/she crossed his/her arms across his/her chest and passed the elbows between knees as if to touch the floor, or resting on a stool if seated on the edge of an examination table. The evaluator's thumbs followed the cranial motion of the posterior superior iliac spines, examining for a change in the relative relationship of the PSISs in the fully flexed position. If one side moved first or more than 1 cm cranially in relation to other side, then it was considered abnormal. The dysfunction was recorded as symmetric, left, or right [11].

2. The Standing flexion test (Forward bending of the trunk): This test evaluated the iliosacral motion and accomplished by localization of PSISs, considering their relative position. The testing procedure was the same as test one, but performed whilst standing [11].

3. The FABER (Patrick) test: The test is designed for evaluating range of movement and differentiating between hip and sacroiliac as the origin of pain, by aggravating back, buttock or groin pain. Pain in the sacroiliac joint is indicative of sacroiliac involvement. The patient was placed in the test position by flexing, abducting and externally rotating the hip of the tested leg, placing the lateral malleolus on the knee of the opposite leg. ASIS is stabilized and extra pressure was applied to the medial aspect of the knee. The amount of motion available in the tested extremity was compared with the opposite side and any difference considered as positive [4]. Aggravated pain perception on buttock, low back, or groin area was also considered [4]. Buttock or groin Pain could be brought on by resisted hip abduction when it was abducted to 30° and the examiner pushed it medially to cause an isometric contraction of abductors [4].

4. The Supine Long sitting test: The long sitting test indicated an abnormal mechanical relationship of the innominates moving on the sacrum (iliosacral motion) and helped determining the presence of either an anterior innominate or a posterior innominate by a change in the relative length of the legs during test. Levelness of the malleoli was assessed. The patient was then asked to sit-up, keeping his/her legs straight. The clinician observed the change, if any, between the malleoli. The presence of a posterior innominate made the leg in question (the side of the positive standing flexion test) appeared to get longer from a position of relative shortness (short to long or equal to long). This was due to superior acetabular movement which carried the leg along with it, secondary to posterior rotation of the innominate. When the long sitting test was performed, the leg in question appeared to move from short to long or from equal to long. Reverse phenomena occurred in patients with anterior innominate [12].

5. The Gillet's Test (Sacral Fixation Test): With the patient standing, the examiner placed one thumb under the PSIS on the side being tested and with the other thumb over the S2 spinous process. The patient was instructed to stand on one leg and flex the other hip and knee, bringing the leg toward the chest. The same test was done for the other side. The PSIS on unblocked side was moved further inferiorly, and the blocked side failed to move posteriorly and inferiorly with respect to S2, or moved very little [4].

6. The Sphinx test (Press-up or backward bending): The patient was asked to come up from prone position onto the elbows and resting the chin on the hands and clinician palpated sacral sulci and inferior lateral angles [12].

Physical examination	
Pinprick[1]	17(8.4%)
Reflex[1]	93 (47.2%)
MMT[2]	59(29.2%) †
SLR[3]	149(73.8%) ‡

[1]-Diminished or absent
[2]- MMT: Manual Muscle Test, 5/5 considered normal.
[3]- SLR: Straight Leg Raising.
†Diminished power of ankle dorsi or plantar flexion
‡Considered Positive if be between 30°- 80°.

Table 1. Abnormal physical findings in 202 patients.

Provocative tests included:

1. A-P pressure on sacral base which encouraged sacral flexion.
2. A-P pressure on sacral apex which encouraged sacral extension.
3. Cephalic pressure on sacrum, near the apex, for detecting pain or movement abnormality.
4. Cephalic pressure on sacraum near the base for detecting pain or movement abnormalities.
5. Pressure on the contralateral ilia of the deep sulcus for detecting torsional movement around an oblique axis [12].

A slow, steady pressure was applied in order to stress the long dorsal sacroiliac ligament, the anterior ligaments, the sacroiliac joint capsules and the lumbosacral junction [13].

Each test was considered positive if ipsilateral pain provoked in the gluteal region or below the level of L5. Pain caused by pressure from the examiners hands or an uncomfortable position was considered negative.

In cluster method, each patient with four positive anatomical tests (including FABER) and two positive provocative tests was considered as positive for sacroiliac joint dysfunction.

The institution of ethics for the Iran University of Medical Sciences (Tehran, Iran), approved the procedure for this study in accordance with the ethical standards of human experimentation.

All data were collected and analyzed statistically by SPSS software, version 11.5. Chi square test was used for comparison of qualitative variables. Odds ratios and 95% of confidence intervals were calculated for evaluation of the effect of each contributing factor. Multivariable analysis was performed using logistic regression model to estimate the adjusted effect of several risk factors on SIJ dysfunction.

Results

Among 202 patients, 146 (72.3%) displayed dysfunction of the sacroiliac joint.

Of the positive patients 113 (55.9%) were female, with the mean age of 41.3 ± 11 years (range 19-70 years).

Physical findings and the type of SIJ dysfunction in positive patients are shown in tables 2 and 3.

Anatomical Tests	% of positivity
-Sitting Flexion Test	147 (72.8%)
-Standing Flexion Test	185 (91.6%)
-Faber Test	172 (85.1%)
-Long Sitting Test	184 (91.1%)
-Gillet's Test	166 (82.2%)
-Sphinx Test	185 (91.6%)
Provocative Tests	
- A-P pressure on sacral base	173 (85.6%)
- A-P pressure on sacral apex	62 (30.7%)
- Cephalic pressure on sacrum near apex	36 (17.8%)
- Cephalic pressure on sacrum near the base	130 (64.4%)
- Pressure on the contralateral ilia of the deep sulcus	100 (49.5%)

Table 2. Prevalence of Anatomical and provocative indices of the SIJ dysfunction in 202 patients.

SIJ dysfunction Type	Frequency	Percent
LOL(left on left)	139	95.2
ROL(right on left)	3	2.1
ROR(right on right)	4	2.7
Total	146	100.0

Table 3. Types of the sacroiliac joint dysfunction.

The prevalence of sacroiliac joint dysfunction was significantly higher in female patients (p= 0.001) with Crude OR: 2.84 - 95% confidence interval of 1.5-5.37, and Adjusted OR: 2.46-95%CI: 1.00-6.03.

The Sacroiliac joint dysfunction was more prevalent in patients with a positive straight leg raise test (SLR) than patients with normal SLR (P<0.0001) and Crude OR: 3.82 -95%CI: 1.95 - 7.47, and Adjusted OR: 5.07-95% CI: 2.37-10.85.

Patients with history of recurrent back pain during the last year, had increased possibility of SIJ dysfunction by 2.4 folds (p=0.005 Crude OR: 2.4 - 95%CI: 1.26-4.58, and Adjusted OR: 2.33 95%CI: 1.10-4.89).

Subjective opinion about having heavy work was significantly correlated with presence of the SIJ dysfunction (p=0.01 Crude OR: 2.27-95%CI: 1.18 - 4.38), but in multivariable analysis with consideration of other variables, lost its effect (Adjusted OR: 1.46-95% CI: 0.58-3.68).

However, there was no significant difference in relation to working hours, duration of low back pain, or their body mass index (p>0.05).

Discussion

The present study was conducted to detect the SIJ dysfunction as an existing pathology in patients with discopathy and estimate its prevalence in such population of patients. The SIJ dysfunction has been considered as a cause of localized or pseudo radicular pain [6]. Functional disorders in general and dysfunction of the SIJ specifically, cannot be detected by imaging studies. Since such pathologies are not detectable by imaging procedures, they are recurrently neglected. Imaging evaluation of the SIJ is important to rule out infection, metabolic changes, fracture, or tumor but most commonly will be normal in patients with SIJ pain [14].

Infiltration of inflammatory mediators from disrupted capsule accompanied by multilevel innervation from anterior and posterior ramie of L2 to S3 is other explanation for referal pain of the SIJ dysfunction [15]. Such innervation explains variable pain distribution which may remain localized to the buttocks near PSIS or refere centrally over the lumbosacral junction, sacral body, buttock, posterior thigh, and groin and even distally into the lower leg. Gluteal pain near or surrounding the posterior superior iliac spine is the most common region of the SIJ pain as described by Fortin and Colleagues [14,16].

Controversy has surrounded the diagnosis of the SIJ pain for several reasons: limited SIJ mobility with age induced decrement; absence of a specific historical point or clinical examination technique solidifying the diagnosis; and absence of gold standard treatment. In addition, prioritizing the SIJ dysfunction or discopathy in the pathogenesis of the disease is highly controversial.

Historical controversy over this joint as a pain generator has been soothed through studies using diagnostic and therapeutic injections [3,16]. SIJ block seems to be the most valid means of diagnosing SIJ syndrome [1,3,16] as described by Bernard and Cassidy [1]. Although providing an effective means of diagnosing pathologic features within the SIJ, SIJ blocks are aimed at isolating the SIJ [1,12], neglecting extra-articular structures surrounding the joint, as described in the definition of SIJ dysfunction by Beal [17].

A multitest regimen of the sacroiliac joint pain provocation tests is a reliable method to evaluate sacroiliac joint dysfunction [1,4,18]. A study evaluating such regimens noted substantial reliability (k=0.7) for diagnosis [19]. Several studies shown the sensitivity of 85-94% and specificity of 79-87% for such cluster methods

with positive likelihood ratio of 3.2 (95%CI; 2.3-4.4) and negative likelihood ratio of 0.29 (95%CI; 0.12-0.35) [20-22]. In general, pain provocation tests have proven to have better reliability than palpation tests [1,16]. However disagreement regarding the reliability of particular pain provocation tests still exists [1].

In our method a regimen of clustering consisted of four positive anatomical indicators out of six, plus two positive provocative indicators out of five was used. Such clustering decreased the possibility of clinical decision by chance or excluding a patient with SIJ dysfunction [1,4,11]. Alternatively, it was not enough to simply determine the presence of SIJ dysfunction when treating patients using a direct manual treatment program. Instead such regimen required for detecting the sacral and especially innominate bone positions [11].

Two dysfunctions were possible in patients with sacroiliac joint dysfunction. One where the left innominate bone tilted anteriorly while the right tilted posteriorly, or the second where the left innominate bone tilted posteriorly while the right anteriorly [18]. In the population of this study the second type was more prevalent (95.2%).

The epidemiology of the SIJ lesions is poorly described. The controlled diagnostic blocks utilizing the international association for the study of pain (IASP) criteria demonstrated the prevalence of pain of sacroiliac origin in 19% to 30% of the patients suspected to have sacroiliac joint pain [1,3,15]. The prevalence of the sacroiliac joint as a source of low back pain is reported to be between 13% and 48% in different studies [14,23], depending on the population being studied. Bernard and colleagues [24] reported that, of 1293 patients with low back pain, the SIJ dysfunction was thought to be a pain source in 22.5% based on history and physical examination.

In our study the prevalence of SIJ dysfunction was significantly higher than previous studies (72.3%), which could be explained by the importance of extraarticular factors which were not detected by diagnostic blocks. However, body stress induced by heavy work and poor ergonomic standards at work place could be considered as secondary interacting factors, affecting the studied population. The other influencing factor was the examined population. This study was conducted on patients with definite MRI findings of discopathy.

We found that females were more prone to the SIJ dysfunction by 184% (Crude OR: 2.84 - CI: 1.5 - 5.37) and its effect was stable when multivariable analysis was performed using logistic regression model to estimate the adjusted effect of several risk factors (Adjusted OR: 2.46-CI: 1.00-6.03). Higher frequency of the SIJ dysfunction in female patients ($p=0.001$) could be due to childbearing effects on the sacroiliac joint or other factors such as lifestyle or exercise activities, which must be evaluated more precisely in other studies.

Past history of recurrence of same back pain during previous year increases the possibility of SIJ dysfunction by 140% ($p=0.005$ Crude OR: 2.4 - CI: 1.26-4.58). Its effect remained stable in logistic regression model (Adjusted OR: 2.33 CI: 1.10-4.89).This could mean that the recurrent back pain was due to biomechanical abnormalities which had subsided by adaptation.

Positive straight leg raising test increased the possibility of the SIJ dysfunction by 282% (Crude OR: 3.82 -CI: 1.95 -7.47, and Adjusted OR: 5.07-CI: 2.37-10.85).

The symptoms of a sacroiliac lesion must be differentiated from those associated with primary disc and posterior element disease, especially because of concordance of these two pathologies in a considerable number of patients. Straight leg raising test as a routine physical finding of root irritation could not completely be differentiated between two pathologies, in fact presence of concomitant SIJ dysfunction significantly increased the rate of positive SLR ($p<0.0001$). Other physical findings were not significantly different between the

two groups.

It is worth discussing whether a herniated disc and the SIJ dysfunction develop independently from each other, or whether they are related. Pathogenesis is associated with complex and asymmetrical motions under external loads. Having a successful gentle manual therapy to correct biomechanical defects of sacroiliac joint and surrounding structures without any significant effect on concomitant discopathy, can be considered as a basis for future research of clinical trials to determine the main pathology.

Conclusion

This study found the sacroiliac joint dysfunction to be a prevalent concomitant pathology in patients with herniated lumbar discs. Thus it recommends that SIJ dysfunction must be considered during examination and planning of each conservative management protocol in low back pain patients.

Acknowledgement

We thank the men and women who consented to participate in the study.

References

1. Kokmeyer DJ, Wurff PV, Aufdemkampe G, Fickenscher T. The reliability of multitest regimens with sacroiliac pain provocation tests. J of manipulative and physiological therapeutics 2002; 25(1): 42-48.

2. Jazayeri SM, Madani SP, Alavi S. Correlation between cortical somatosensory evoked potentials and MRI in patients with lumbosacral radiculopathy. Iranian J of Medical Sciences 2000; 25(1,2):62-66.

3. Levangie PK. The association between static pelvic asymmetry and low back pain. Spine 1999; 24(12):1234-44.

4. Flynn T, Fritz J, Whitman J. A clinical prediction rule for classifying patients with low back pain who demonstrate short term improvement with spinal manipulation. Spine 2002; 27(24); 2835-43.

5. Leboeuf-Yde C, Lauritsen JM, Lauritzen T. Why has the search for causes of low back pain largely been nonconclusive? Spine 1997; 22:877-81.

6. Galm R, Fr?hling M, Rittmeister M, Schmitt E. Sacroiliac joint dysfunction in patients with imaging-proven lumbar disc herniation. Eur Spine J 1998; 7:450-453.

7. Boos N, Rieder R, Schade V, Spratt KF, Semmer N, Aebi M. The diagnostic accuracy of magnetic resonance imaging: work perception, and psychosocial factors in identifying symptomatic disc herniations. Spine 1995; 20:2613-2625.

8. McGregor M, Cassidy JD. Post surgical sacroiliac joint syndrome. J Manipulative Physiol Ther 1983; 6 :1-11.

9. Freburger JK, Riddle DL. Using published evidence to guide the examination of the sacroiliac joint region. Phys Ther 2001; 81: 1135-1143.

10. Leibenson C, Fonda S, Deily S: Integrated approach to the lumbar spine. In: Liebenson C, Rehabilitation of the spine. 2nd ed. Lippincott Williams & Wilkins,pp. 2007 798-851.

11. Greenman PE, Pelvic girdle dysfunction. In: Principles of Manual Medicine. 2nd ed. Baltimor, Md: Williams & Wilkins, 1996; pp. 305-367.

12. Woerman AL: Evaluation and treatment of dysfunction in the lumbar - pelvic - hip complex. In: Donatelli RA, Orthopedic physical therapy. 3rd ed. Churchill Livingstone, pp. 2001; 378-436.

13. Levin U, Nilsson-Wilkmar L, Harms-Ringdahl Karin et al. Variability of forces applied by experienced physiotherapists during provocation of the sacroiliac joint. Clinical Biomechanics 2001; 16: 300-306.

14. Prather H, Hunt D. Sacroiliac joint pain. Dis Mon 2004; 50:670-683.

15. Forst SL, Wheeler MT, Fortin JD, Vilensky JA. The sacroiliac joint: Anatomy, physiology and clinical significance. Pain Physician 2006; 9:61-68.

16. Triano JJ, McGregor M, Skogsbergh DR. Use of chiropractic manipulation in lumbar rehabilitation. Journal of Rehabilitation Research and Development 1997; 34(4):394-404.

17. Beal MC. The sacroiliac problem; review of anatomy, mechanics, and diagnosis. J Am Osteopath Assoc 1982; 81:667-79.

18. Cibulka MT, Understanding sacroiliac joint movement as a guide to the management of a patient with unilateral low back pain. Manual Therapy 2002; 7(4):215-221.

19. Tong HC, Hayman OG, Lado DA, Isser MM. Interexaminer reliability of three methods of combining test results to determine side of sacral restriction, sacral base position, and innominate bone position. JAOA 2006; 106(8):464-468.

20. Van der Wurff P, Buijs EJ, Groen GJ. A multitest regimen of pain provocation tests as an aid to reduce unnecessary minimally invasive sacroiliac joint proce-

dures. Arch Phys Med Rehabil 2006 87:10-14.

21. Laslett M, Aprill CN, mCdONALD b, Young SB. Diagnosis of sacroiliac joint pain: Validity of individual provocation tests and composites of tests. Manual Therapy 2005; 10: 207-218.

22. Hankok MJ, Maher CG, Latimer j, et al. Systematic review of tests to identify the disc, SIJ or facet joint as the source of low back pain. Eur Spine J 2007; 16: 1539-1550.

23. Holmgren U, Waling K. Interexaminer reliability of four static palpation tests used for assessing pelvic dysfunction. Manual Therapy 2008; (13)1: 50-6.

24. Bernard TN, Kirkaldy-Willis WH. Recognizing specific characteristics of nonspecific low back pain. Orthopedics 1987; 217: 266-80.