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Management of Sacroiliac Joint Dysfunction after Transpedicular Lumbo-Sacral Fusion

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ABSTRACT

Background: Lumbar and lumbosacral spine fusion is a popular surgical treatment performed to treat spinal instability. According to clinical research, 5.2 percent to 49 percent of patients receiving lumbar fusion experience neighbouring segmental disease.

Aim of the work: To assess the prevalence of SIJ dysfunction following lumbar or lumbosacral fusion surgery and to identify relevant risk factors.

Patients and Methods: The study involved 105 patients who operated upon by lumbar or lumbosacral fusion with screws and rods without preoperative sacroiliac joint dysfunction in Al-Azhar university Hospitals between July 2018 and January 2019.

Result: 48.98% of patients who developed SIJ dysfunction were obese, 67.35% of them were operated upon by multiple segments fixation,69.39% of them were operated upon by S1 fixation. As regard the management 59.2%of the patients who developed SIJ dysfunction was improved on conservative management according to ODI, while 40.8% of them needed Sacroiliac joint injection 75% improved and 25% patients continued to suffer from sacroiliac joint pain, one of them refused the procedure and four patients were had radiofrequency denervation for Sacroiliac joint 1 month after Sacroiliac joint injection, 75% of them had significant more than 50% clinical pain relief and 25% of them had less than 50% clinical pain relief.

Conclusion: SIJ dysfunction may be the source of ongoing or new pain following lumbar or lumbosacral fusion. A diagnosis requires physical tests, radiographic scans, and diagnostic injection.

Keywords: *Lumbar instability, Lumbosacral fusion, Sacroiliac joint dysfunction, Sacroiliac joint injection.*

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INTRODUCTION

The fusing of the lumbar and lumbosacral spines is a frequent surgical operation performed to treat spinal instability. According to clinical research, 5.2 percent to 49 percent of patients receiving lumbar fusion have neighbouring segmental disease. [1] It is expected that increased stiffness of the lower lumbar spine caused by fusion at one or more levels will result in increased stress on the sacroiliac joint, causing aberrant movements and strains on the ligaments and the joint itself. Some patients continue to complain of persistent or new low back pain following surgery, and some publications have proposed that the sacroiliac joint may be the source of the discomfort. [2]

Lumbar fusion increases angular motion and tension across the SIJ. It has been shown that the incidence of SIJ degeneration is higher in patients with S1 fusion than in those with L5 fusion. [1]

Bone scanning is an ineffective screening test for SIJ discomfort. [3] It has been found that single-photon emission computed tomography (SPECT) is more sensitive than conventional scintigraphy in detecting and localising lesions.[4], and that SPECT is effective postoperatively in evaluating patients because it is not impacted by metallic fixation devices.[5] SPECT shows higher SIJ uptake following lumbar fusion and/or laminectomy. [6]

The primary goals of treatment are to reduce inflammation in the SI-joint and increase flexibility in the lumbosacral spine and SI areas. Only patients with SIJ pain demonstrated by controlled diagnostic anaesthetic blocks and no pain sources in the lumbar spines should be evaluated for surgical surgery. It should also be reserved for patients who continue to experience disabling symptoms despite strong conservative therapy. [7]

The purpose of this study was to establish the prevalence of SIJ dysfunction after lumbar or lumbosacral fusion surgery, identify relevant risk

factors, and assess the efficacy of conservative therapy and SIJ injection.

PATIENTS AND METHODS

This is a prospective observational study for 105 cases subjected for surgical lumbar fusion to detect the prevalence of SIJ dysfunction in these patients post-operation and analyze the different ways of management and possible complications.

Patient subjected for lumbar or lumbosacral fusion surgery without sacroiliac dysfunction pre-operation. While patients who had suspected osteoporotic, suspicion of infection, recurrent lumbar fusion surgeries, local disease of either the sacrum or the ilium, or pre-operative clinical diagnose of Sacroiliac joint pain were excluded from the study.

All cases were operated upon in Al-Azhar University Hospitals between July 2018 and January 2019.

The following methods were applied for studied patients pre-operatively: history taking, general examination, neurological examination as assessment of sacroiliac joint before operation to ensure it is pain free using sacroiliac joint provocation tests (Fortin Finger test, Patrick's test, Sacral thrust test, Gillett's test, Compression test). Routine investigations before lumbar fusion surgeries were also done. While routine postoperative management of patients with lumbar spine fusion surgery was done, also clinical follow up and radiological follow up immediate postoperative, one month, three months and six months were done.

Management:
Conservative management:
Non-steroidal anti-inflammatory drugs.
Pelvic belt.
Bed rest tile pain improved
Physical therapy for 3 weeks.
Patients who did not improve with conservative treatment were given intra-articular injections of methylprednisolone and local anaesthetics.
Radiofrequency denervation for the affected side of the Sacroiliac joint image guided for patients who have been feeling pain one month after Sacroiliac joint injection.

Clinical evaluation:
The Oswestry Disability Index (also known as the Oswestry Low Back Pain Handicap Questionnaire) is a vital tool used by researchers and disability evaluators to determine a patient's permanent functional disability. The exam is regarded as the "gold standard" of functional outcome tools for the low back. The Oswestry Disability Index was calculated before surgery, immediately after surgery, when sacroiliac joint discomfort appeared, after conservative care, and after intra-articular injections of steroid and local anaesthetics[8].
Scoring instructions

The total possible score for each part is 5: if the first sentence is noted, the section score is 0; if the last statement is marked, the section score is 5. If all ten portions are completed, the following score is calculated:
Example:
16 (total scored) ÷50 (total possible score) x 100 = 32%
If one section is missed or not applicable the score is calculated:
16 (total scored) ÷45 (total possible score) x 100 = 35.5%

Minimum observable change (with 90% confidence): 10% points (change of less than this may be attributable to error in the measurement).

0%-20%: minimal disability:	Most daily activities are manageable for the patient. Aside from guidance on lifting, sitting, and exercising, no therapy is usually necessary.
21%-40%: moderate disability:	Sitting, lifting, and standing cause the patient extra discomfort and trouble. Travel and social activities are more difficult for them, and they may be unable to work. Personal hygiene, sexual activity, and sleeping are unaffected, and the patient can usually be handled conservatively.
41%-60%: severe disability:	The primary issue in this group is pain, although daily activities are also impacted. These patients necessitate a thorough examination.
61%-80%: crippled:	Back pain affects every part of the patient's life. Positive action is essential.
81%-100%:	Those who are either exaggerating their symptoms or bed-bound.

Table 1: The Oswestry Disability Index interpretation score.[8]

Results after management were assessed according to the rate of improvement and were classified in to a five- grade according to interpretation of scores in table (1)

Each participant in the study gave their written agreement after it had been authorised by Al Azhar University's ethical committee.

Statistical methods:
Data were statistically described in terms of mean ± standard deviation (±SD), and range or frequencies and percentages when appropriate. Then a suitable statistical analysis was used.

RESULTS

The data collected from 105 cases operated upon by lumbar fixation were analyzed prospectively. In our study, 49 patients (46.67%) developed sacroiliac dysfunction while 56 patients (53.33%) didn't experience sacroiliac joint pain. The following are the results collected from patients developed sacroiliac joint dysfunction (n=49)

Age and sex:

	Sacroiliac joint dysfunction		P value
	+ve (n=49	-ve n=(56)	
Sex, no. (%)	14(28.57%)	24(42.86%)	
Male	35(71.43%)	32(57.14%)	**0.033****
Female			

*P-value < 0.05

Table 2: Sex incidence

Sacroiliac joint dysfunction occurred in 49 patients, 14 male (28.57%) and 35 female (71.43%).

In our study, the mean age for patients that had sacroiliac joint dysfunction after lumbar fusion surgeries was (48.12) years old.

	N	Minimum	Maximum	Mean	Std. Deviation	P value
Age	49	27	64	48.12	10.226	0.034**

*P-value < 0.05

Table 3: Mean age of SIJ dysfunction post-operative

In our study, 55.1% of patients who developed sacroiliac joint dysfunction was ≥50 years old and 44.9% of patients who developed sacroiliac joint dysfunction was < 50 years old.

	Frequency	Percent	Valid Percent	P value
Valid				
≥ 50 years old	27	55.1%	55.1%	**0.034****
< 50 years old	22	44.9%	44.9%	
Total	49	100%	100%	

*P-value < 0.05
Table 4: Age incidence

Body Mass Index:
According to body mass index (BMI) classification:
Average 18.5 – 24.9 Overweight 25.0 – 29.9
Obese 30.0 and above
In our study, 49% of patients who developed sacroiliac joint dysfunction were obese, 34.7% were overweight and 16.3% were in average BMI.

	Number	Percent	Valid Percent	P-value
Valid	8	16.3%	16.3%	0.034**
Average	17	34.7%	34.7%	
	24	49.0%	49.0%	
Overweight	49	100.0%	100.0%	
Obese				
Total				

*P-value < 0.05
Table 5: Relation between BMI and sacroiliac joint dysfunction

Level of fixation:
In our study, 62 patients were operated upon by fixation of S1, and 34(54.8%) of them developed sacroiliac joint dysfunction post-operative. While 43 patients were operated upon fixation with no S1 fixation, and 15(34.9%) of them developed sacroiliac joint dysfunction post-operative.

		Number	Percent	Valid Percent	P-value
Valid	S1 Fixation	34	69.4%	69.4%	
	Non S1 Fixation	15	30.6%	30.6%	0.033**
	Total	49	100.0%	100.0%	

*P-value < 0.05
Table 6: Relation between S1 fixation and sacroiliac joint dysfunction

Number of levels of fixation:
In our study, 46 patients were operated upon by fixation of one level, and 16 (34.8%) of them developed sacroiliac joint dysfunction post-operative. While 59 patients were operated upon by fixation of more than one level, and 33 (55.9%) of them developed sacroiliac joint dysfunction post-operative.

		Number	Percent	Valid Percent	P-value
Valid	one level	16	32.7%	32.7%	
	more than one level	33	67.3%	67.3%	0.032**
	Total	49	100.0%	100.0%	

*P-value < 0.05
Table 7: Relation between number of levels of fixation and sacroiliac joint dysfunction

Clinical findings:
The most common referral pattern of sacroiliac joint pain in patients who developed sacroiliac joint dysfunction was pain radiating to buttocks and was present in 85 % of patients who developed sacroiliac joint dysfunction after lumbar or lumbosacral fixation, lower lumbar pain in 42%, upper lumbar pain in 8%, pain in the thigh 4% and pain below knee in 2%.

Type of Pain	Sacroiliac Joint Dysfunction (n= 49)	P-value
Left SIJ radiating to buttocks	9 (18.36%)	
Right SIJ radiating to buttocks	11(22.44%)	
Bilateral SIJs radiating to buttocks	6(12.24%)	0.036**
Left SIJ & Lower lumbar referred to buttocks	8(16.32%)	
Right SIJ & lower lumbar referred to buttocks	6(12.24%)	
Bilateral SIJs & lower lumbar region	3(6.12%)	
Left SIJ , lower lumbar and upper lumbar	2(4.08%)	
Right SIJ, lower lumbar and upper lumbar	2(4.08%)	
Left SIJ radiating to buttocks and thigh	1(2.04%)	
Right SIJ radiating to buttocks and thigh	1(2.04%)	
Right SIJ and pain below knee	1(2.04%)	

*P-value < 0.05

Table 8: Comparison between site and different types of pain in patients who developed sacroiliac joint dysfunction after lumbar fusion.

Interval between fixation and sacroiliac joint dysfunction:

In our study, mean interval between lumbar or lumbosacral fixation and sacroiliac joint dysfunction was 6.75 weeks.

	Range	Minimum	Maximum	Mean	Std. Deviation	P-value
Starting	8.00	4.00	12.00	6.7551	2.30516	0.032**

*P-value < 0.05

Table 9: Interval of appearance of sacroiliac dysfunction after lumbar fusion surgery.

Clinical provocation tests:

In our study, to assess sacroiliac joint dysfunction, we used five provocation tests (Fortin Finger test, Patrick's test, Sacral thrust test, Gillett's test, Compression test).

Clinical tests	Sacroiliac Joint Dysfunction (n= 49)	P-value
NO, no. (%)	0(0%)	
+ve Sacral thrust, Patrick, Compression, Fortin Finger, Gillet, no. (%)	4(8.16 %)	
+ve Sacral thrust, compression, Patrick, Fortin finger, no. (%)	14(28.57 %)	**0.033****
+ve Sacral thrust, Patrick, Compression, Gillet, no. (%)	2(4.08 %)	
+ve Sacral thrust, compression, Fortin Finger, no. (%)	18(36.73 %)	
+ve Sacral thrust, Patrick, Compression, no. (%)	1 (2.04 %)	
+ve Patrick, compression, Gillet, no. (%)	1 (2.04 %)	
Bilateral SIJ +ve Sacral thrust, Patrick, fortin finger, no. (%)	5 (10.20 %)	
Bilateral SIJ +ve Sacral thrust, Patrick, no. (%)	4 (8.16 %)	

*P-value < 0.05

Table 10: Clinical provocation testing in patients who had lumbar or lumbosacral fixation after experiencing SIJ dysfunction

Management:

Conservative management:

In our study, 49 patients who developed sacroiliac joint pain were started to receive conservative management (medication, bed rest then physical therapy), 29 (59.2%) patients were improved on conservative management according to ODI, while 20(40.8%) patients needed Sacroiliac joint injection.

		Number	Percent	Valid Percent	P-value
Valid	succeeded	29	59.2%	59.2%	
	failed	20	40.8%	40.8%	0.022**
	Total	49	100.0%	100.0%	

*P-value < 0.05

Table 11: Conservative management on patients who developed SIJ dysfunction

Management	Patient with Sacroiliac Joint Dysfunction (n= 49)	Score	ODI Pre	ODI Post
Conservative Management	49 (100%)	0% to 20%	0 (0%)	**29(59.2%)**
		21% to 40%	3(6.1%)	**4(8.2 %)**
		41% to 60%	20(40.8%)	**9(18.4%)**
		61% to 80%	17(34.7%)	**7(14.2%)**
		81% to 100%	9 (18.4%)	**0(0%)**

Table 12: Relation between conservative management and ODI

Sacroiliac joint injection:

In our study, 20 (40.8%) patients didn't improve with conservative management and needed Sacroiliac joint injection, 15(75%) patients of them improved according to ODI, and 5(25%) patients continued to suffer from SIJ pain.

Management	Patient with Sacroiliac Joint Dysfunction (n= 49)	Score	ODI Pre	ODI Post
Sacroiliac Joint Injection	20 (40.82%)	0% to 20%	0 (0%)	**15 (75%)**
		21% to 40%	4(20%)	**2 (10 %)**
		41% to 60%	9 (45%)	**3 (15%)**
		61% to 80%	7 (35%)	**0(0%)**
		81% to 100%	0 (0%)	**0(0%)**

Table 13: Relation between Sacroiliac Joint Injection and ODI

Radiofrequency denervation for Sacroiliac joint:

In our study, there were 5 (10.2%) patients have been feeling Sacroiliac joint pain after Sacroiliac joint injection and they have been prepared for radiofrequency denervation for the Sacroiliac joint image guided 1 month after joint injection. One patient refused the procedure and four patients had RF denervation for Sacroiliac joint, three of them had significant more than 50 % clinical pain relief.

Management	Patient	Score	ODI

	with Sacroiliac Joint Dysfunction (n= 49)		Pre	Post
Radiofrequency denervation for SIJ	4 (8.2%)	0% to 20%	0 (0%)	**3 (75%)**
		21% to 40%	1(25%)	**1 (25 %)**
		41% to 60%	3 (75%)	**0(0%)**
		61% to 80%	0 (0%)	**0(0%)**
		81% to 100%	0 (0%)	**0(0%)**

Table 14: Relation between RF denervation for Sacroiliac joint and ODI

DISCUSSION

The purpose of this study was to ascertain the prevalence of SIJ dysfunction following lumbar or lumbosacral fusion surgery, to pinpoint potential risk factors for it, and to evaluate the effectiveness of SIJ dysfunction therapy.

In our investigation, patients with sacroiliac joint dysfunction following lumbar fusion surgery had a mean age of 48.3 years, which was somewhat higher than the 48 years described by Maigne et al. [9] and lower than the 70.7 years reported by.[10]

In our study, 40 patients under 50 years old had SIJ dysfunction in 27 (67.5%) of them, whereas in 65 patients under 50 years old, SIJ dysfunction occurred in 22 (33.8%) of them.

In our study, we operated 105 patients, 67 of whom were female and 38 of whom were male. Of these, 49 patients (46.6 percent) experienced SIJ discomfort, which is greater than the range of prior studies, which varied from 10 to 40.4 percent (48,49).

14 patients (28.6%) were male, compared to 35 female patients (71.4 percent).

Obesity was discovered to be a significant risk factor for SIJ dysfunction following lumbar or lumbosacral fusion surgery. In our study, 23 patients with BMI between 18.5-24.9 (average) had 8 patients (34.7%) develop SIJ dysfunction, whereas 39 patients with BMI 30 and above had 24 patients (61.5%) develop SIJ dysfunction. This result is similar to that of DePalma et al.[11] who reported that when BMI was between 30-35, SIJP was most likely to develop (46-64 percent).

According to earlier research, fusion of the spine, particularly the sacrum, causes the SIJ to become considerably more mobile and speeds up the degeneration of the SIJ. [10-13] According to Ha et al., SIJ degeneration more commonly manifested in cases of lumbar fusion to the sacrum.[1] in our study, 62 patients operated upon by fusion to sacrum, and 34 patients (54.8%) of them developed SIJ dysfunction while 43 patients were operated upon by lumbar fusion with no sacrum fusion, and 15 patients (34.9%) of them developed SIJ dysfunction.

According to Ha et al. [1] there is no correlation between the number of fused segments and degeneration of the Sacroiliac joint.[1] Although, In our study, 59 patients were operated upon by fixation more than one level of fixation and 33 patients (55.9%) of them developed SIJ dysfunction post-operation, while 46 patients operated upon by fixation of one level and 16 patients (34.8%) of them developed SIJ dysfunction post-operation. According to some researchers, having more fixation levels causes nearby segments to experience greater stress pressures, which increases the chance of joint degenerative changes.[14,15]

In our study, we found the most common referral pattern of SIJ pain was pain radiating to buttocks and was present in 85% of patients who developed sacroiliac joint dysfunction after lumbar fixation, pain in lower lumbar region in 42% of patients, upper lumbar region pain in 8%, pain in the thigh in 4% and pain below knee in 2% of patients, this results compared with Slipman et al. [16] who confirmed that the most common referral pattern of SIJ pain were pain radiating into buttocks (94%), lower lumbar region (72%), and (28%) pain radiating below knee.

In our study, we used pain provocation tests to assess SIJ pain like: Fortin finger test, Sacral thrust test, Compression test, Patrick's test, Gillet's test.

Liliang et al[17] and Depalma et al.[11] also used pain provocation test and SIJ blocks for diagnostic evaluation of SIJ dysfunction.

In our study, we used ODI to detect severity of pain and to measure a patient's functional disability and to follow up improvement after conservative and injection treatment.

Maigne et al.[9] confirmed pain free interval 3 months post-lumbar fusion surgery [9], in our study, mean interval between fixation and starting complaint from SIJ pain 6.75 weeks.

Schutz and Crob confirmed that the preferred treatment of low back pain due to degenerative SIJ disease remains conservative.[18] In our study, among 49 patients developed SIJ dysfunction after lumbar or lumbosacral fusion surgery, 29 patients (59.2%) of them improved on conservative management and 20 patients (40.8%) of all patients developed SIJ dysfunction needed SIJ injection with local corticosteroids and local anesthetic drug. After SIJ injection to these 20 patients, 15 patients (75%) of them improved; while 5 patients (25%) of them remained have SIJ pain. According to Ktez et al., of the 34 patients who received SIJ injections, 11 (32 percent) had definite SIJ pain and at least 10 days of continued pain relief after the local anaesthetic; 10 (29 percent) had possible SIJ dysfunction; 9 had >75 percent relief with the local anaesthetic but no longer had relief; and 1 had relief between 20 and 75 percent after the local anaesthetic plus.[19]

In our study, one patient refused Radiofrequency denervation for sacroiliac joint and four patients had RF denervation for Sacroiliac joint image guided with significant more than 50% relief of pain for 75% of them the same as Vinay et al. who reported 75 % of the patients demonstrated at least a three-point drop in pain scores. [20]

CONCLUSION

With a 46.67 percent incidence of post-operative SIJ dysfunction, this observational prospective study confirms the idea that sacroiliac joint discomfort should be more carefully examined as a potential cause of low back pain following lumbar fusion surgery.

Furthermore, our work shows that obesity, old age, fusion to sacrum and multiple segments fusion are risk factors that contribute to increase prevalence of postoperative SIJ dysfunction. Lastly, conservative management is the preferred treatment of SIJ dysfunction and it is effective in 59 % of patients developed SIJ pain after lumbar fusion surgery. Seventy five percent of patients who underwent SIJ injections reported pain reduction due to this crucial line of treatment. 75 percent of patients who had radiofrequency denervation for the sacroiliac joint experienced considerable (>50 percent) clinical pain relief.

Conflict of interest : none

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