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Prevalence and Management of Postoperative Lumbar Fixation Sacro-Iliitis

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Abstract

Background: Sacroiliac joint (SIJ) pain is a common morbidity which occurs post lumbar fixation surgery. In our study, 90 patients were studied to determine the incidence and management of sacroiliac pain post lumbar fixation. Age, sex, body mass index (BMI) was found to be factors affecting the incidence of pain, BMI was found to be the main factor affecting the incidence of pain. We concluded that most cases developed sacroiliac pain post-operative. Conservative management is the first line of treatment which included bed rest, analgesics and physiotherapy. Patients who did not improve by conservative management required sacroiliac injection with analgesics and corticosteroids, and for those who didn't improve by injection radiofrequency ablation was used.

This study was done to determine the prevalence of the SIJ degenerative changes after lumbar spinal fusion surgery and to identify the potential risk factors contributing to it and to assess efficacy of conservative management and SIJ injection with steroids and anesthetics, and radiofrequency.

Aim of Study:

1- Detection of the incidence of SIJ degeneration post lumbar fixation and determining the risk factors for development of this condition

2- Diagnosis of post-operative SIJ pain.

3- Proposing a protocol to manage cases of sacroiliac joint dysfunction after lumbar spine fixation.

Patients and Methods: The study involved 90 patients who were operated upon by lumbar and lumbosacral fixation regardless cause of operation in Kasr El-Aini Hospitals, Cairo University. Sacroiliac joint dysfunction was assessed by pain provocation tests, VAS and radiological assessment by plain X-ray post-operative.

Results: The study involved 90 patients. We detected sacroiliac joint dysfunction in 53 cases (85.9%) with mean age 47 years old. 66% of patients developed sacroiliac joint dysfunction were obese, 73.5% of them were operated upon by multi-level fixation, 75.5% of the patients operated upon by s1 fixation developed sacroiliac joint dysfunction. As regard the management 35.14% were improved on conservative treatment according to VAS, while 64.86% of patients underwent Sacroiliac joint injection of them 92.5% improved and 7.5% failed to improve. Those who didn't improve after injection underwent radiofrequency which showed satisfactory improvement.

Conclusion: The SIJ is a possible source of persistent pain or new pain with failed back surgery syndrome after fixation of lower lumbar vertebrae. Conservative treatment is the first choice then sacroiliac joint injection with corticosteroid and local anesthetics provides temporary line of treatment, then radiofrequency techniques could be tried with satisfactory results. Surgical treatment may be an option for retractable cases.

Key Words: *Sacroiliac joint – Lumbar fixation – Pain management – Sacroiliitis.*

Introduction

THE past years has been noticed a surge in the number of lumbar/lumbosacral fusion surgeries **[1].** Some patients complain of persistence or new post-operative low back pain. Several studies suggested that the sacroiliac joint (SIJ) dysfunction may be a possible cause of persistent low back pain **[2].**

Pathophysiology of sacroiliac joint dysfunction:

Intra-articular causes of SIJ dysfunction include osteoarthritis; extra-articular sources include enthesis/ligamentous sprain and primary enthesopathy. Ligamentous, tendinous, or fascial attachment and other cumulative soft tissue injuries that may occur posterior to the dorsal aspect of the SIJ may be a cause of pain.

There are three possible causes of SIJ dysfunction: (1) A progressive mechanical load reroutes onto the SIJ after fusion; (2) Bone graft harvesting in the iliac crest close to the joint; and (3) Undiagnosed SIJ dysfunction before lumbar fusion **[3].**

Numerous clinical studies of adjacent segment failure after lumbar fusion surgeries have dshowed

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increased mobility in the adjacent upper and lower segments and increased stressful forces on the facet and/or intervertebral disc of adjacent motion segments **[4]**. In the case of lumbosacral fusion, the SIJ is the joint adjacent to the fused segment, and similar biomechanical stress responses could be applied to the SIJ Ivanov et al., **[5]**. Ha et al. **[6]** reported that the incidence of SIJ degeneration is higher in patients underwent lumbosacral fusion than in patients in whom fusion is down to L5.

The presence of a misdiagnosed preoperative sacroiliac dysfunction of low back pain is a possibility. Weksler et al. **[7]** found that patients with low back pain and disc herniation who were positive to pain provocation tests for SIJ dysfunction showed marked improvement in visual analogue scale (VAS) pain scores after SIJ injection. Therefore, possible cause of SIJ pain is errors made during the preoperative management of patients.

This cause of SIJ dysfunction can be differentiated from SIJ dysfunction caused by an increased mechanical load when patients are not pain free for a short postoperative period after lumbosacral fusion surgery.

Patients and Methods

The study involved 90 patients who were operated upon by lumbar and lumbosacral fixation regardless cause of operation.

All cases were operated upon in Kasr El-Aini Hospitals, Cairo University from March 2023 – May 2024.

Sacroiliac joint dysfunction was assessed by pain provocation tests, VAS and radiological assessment by plain X ray post-operative.

Ethical approval and consent to participate:

All procedures performed in the study involving human participants were in accordance with the ethical standards of the institution and approved by the Ethics Committee of Cairo University.

Methodology in details:

Patient population:

This is a study for 90 cases subjected to surgical lumbar or lumbosacral spinal fixation by randomized trial.

Inclusion criteria:

Patients who underwent lumbar fixation from March 2023 to May 2024 with no preoperative sacroiliac pain were followed-up for 6 months and patients who developed sacroiliac pain were included in the study.

Exclusion criteria:

Patients who develop sacroiliac pain after lumbar surgeries other than fixation.

All cases were operated upon in Kasr El-Aini Hospitals.

The following methods were applied for the studied cases:

(A) *History taking:*

Full personal history including name, age, and sex. History of present illness including back pain, lower limb pain, sacroiliac joint pain, history of operation and time of painfree interval.

(B) *Examination:*

The patients are examined for:

1- General examination.

2- Full neurological examination.

3- Local examination which include:

Analysis of pain including site, radiation and affecting factors.

(C) *Management:*

Clinical evaluation:

The sacroiliac joint pain is assessed using the visual analogue score (VAS) evaluation system to measure the outcome of subjective symptoms and clinical signs.

Radiological investigations:

Radiology is done after confirmation of sacroiliitis clinically.

Imaging done includes:

Plain X-ray antero-posterior & lateral on the lumbosacral spine and sacroiliac joint.

The postoperative images are compared with those done preoperatively.

All the data that are collected postoperatively are compared with those that were collected preoperatively patients who developed sacroiliac pain are divided according to the development of sacroiliac joint dysfunction.

For the patients who developed sacroiliac joint dysfunction:

Management:

1- Conservative management: Non-steroidal anti-inflammatory drugs (NSAIDs), Bed rest, Lumbar brace and Physiotherapy for 2 weeks.

2- Intra articular injection: If symptoms didn't improve after 2 weeks of conservative management (which means vas score more than 3), intra-articular injections with methylprednisolone and local anesthetics are used in 53 patients.

We used methyl prednisolone 40mg ampoule added to Lidocaine in a 10ml needle and maximum amount accepted by the joint was injected.

3- Radio frequency ablation: We use thermal radiofrequency ablation in cases who didn't show improvement after one week of intraarticular injection

Statistical analysis:

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Shapiro-Wilks test and histograms were used to evaluate the normality of the distribution of data.

Quantitative parametric variables were presented as mean and standard deviation (SD) and compared between the two groups utilizing unpaired Student's t-test. Quantitative nonparametric data were presented as median and interquartile range (IQR) and were compared by Wilcoxon test. Qualitative variables were presented as frequency and percentage (%) and were analyzed utilizing the Chi-square test. A two tailed *p*-value <0.05 was considered statistically significant.

Results

Our study involved 90 patients who were operated up on by lumbar or lumbosacral fixation, in our study; 53 (59%) patients developed sacroiliitis post lumbar fixation surgery.

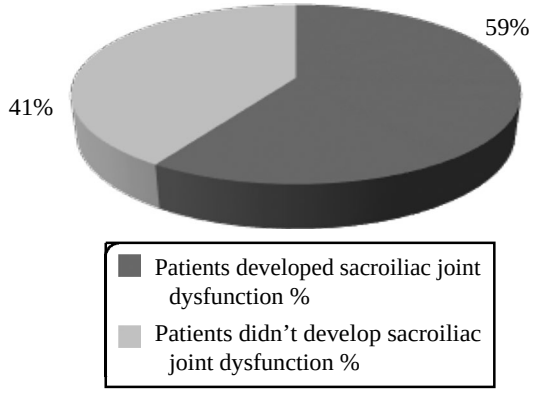

Fig. (1): Incidence of sacroiliitis.

In our study, 49 (54%) were males, 41 (45%) were females of which, 33 (62%) males developed sacroiliitis, 20 (37.7%) females developed sacroiliitis.

Table (1): Demographic data of the studied groups.

	Sacroiliittis (n=53)	Non-Sacroiliittis (n=37)	*p*-value
Age (years):			
Mean ± SD	47.42±9.1	44.78±11.77	0.235
Range	32-62	28-64	
Sex:			
Male	33 (62.26%)	16 (43.24%)	0.075
Female	20 (37.74%)	21 (56.76%)	
Weight (kg):			
Mean ± SD	87.64±11.61	78.43±9.27	<0.001*
Range	68-108	62-95	
Height (cm):			
Mean ± SD	165.43±6.28	166.11±5.34	0.596
Range	155-179	153-176	
BMI (kg/m^2):			
Mean ± SD	32.13±4.67	28.48±3.62	<0.001*
Range	22.5-41.5	21.6-38.4	

BMI: Body mass index.

Age, sex and height were statistically insignificant between two groups. Weight and BMI were statistically significant in Sacroiliitis than non-sacroiliitis (*p*-value <0.001). our study, we found the mean age for patients affected by sacroiliitis 47.4±9.1, the mean age for patients who didn't develop sacroiliitis 44.7±11.77.

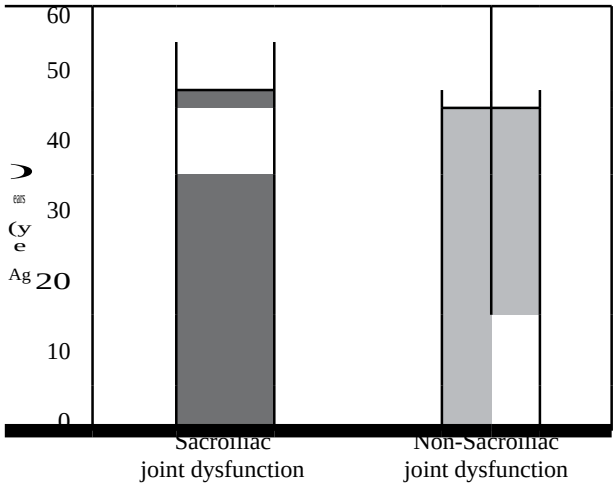

Fig. (2): Age of the studied groups.

Of the patients who developed sacroiliitis n=53, 33 (62%) were males, 20 were females (38%).

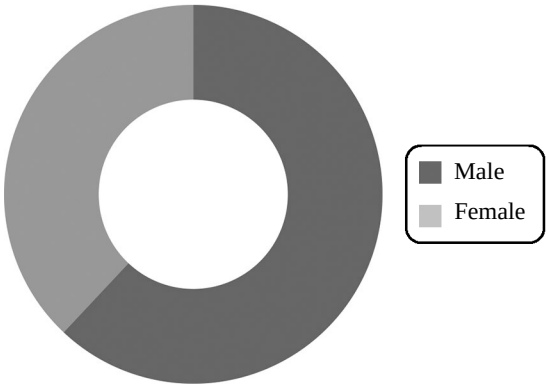

Fig. (3): Percentage of male to female in patients developing sacroiliitis.

In our study we found that the mean height for patients who developed postoperative sacroiliitis was 165.43, which was statistically insignificant (*p*-value = 0.59).

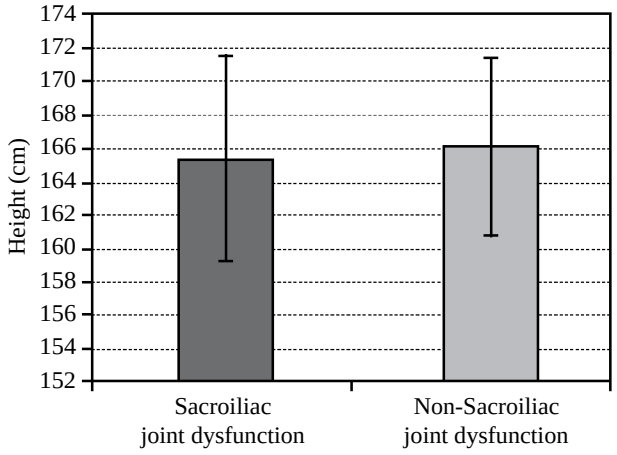

Fig. (4): Height of the studied groups.

We found statistically significant difference in BMI between the group who developed sacoiliitis postoperatively mean 32.13 compared to 28.48 in patients who didn't develop sacroiliitis postoperatively.

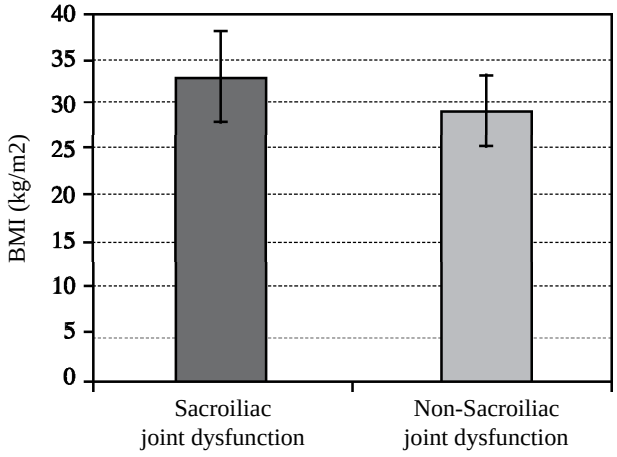

Fig. (5): BMI of the studied groups.

Table (2): Relation between level of fixation and sacroiliitis.

	Sacroiliittis (n=53)	Non-Sacroiliittis (n=37)	*p*-value
Level of fixation:			
S1 involved	40 (75.47%)	8 (21.62%)	<0.001*
No S1 involvement	13 (24.53%)	29 (78.38%)	

In our study, we found that 75.47% of those who developed sacroiliitis had S1 involvement in their fusion surgery, while 24.53% of those developed sacroiliitis had no S1 involvement. thus, sacroiliitis was higher when S1 was involved in fusion surgeries (*p*-value <0.001).

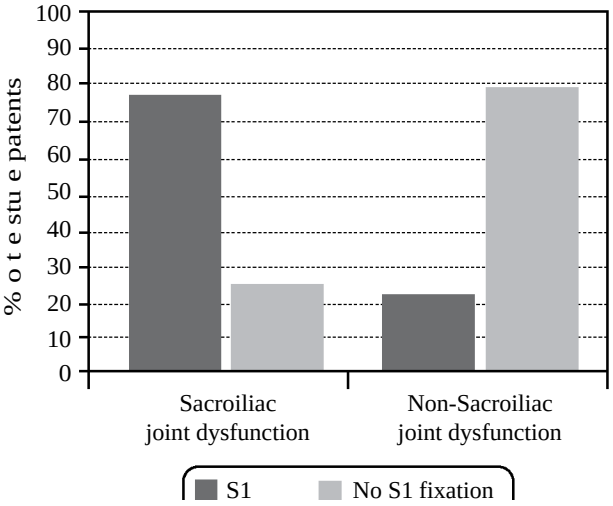

Fig. (6): Relation between evel of fixation and sacroiliitis.

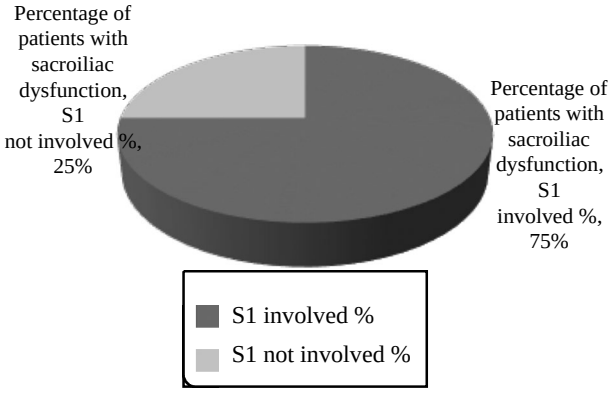

Fig. (7): Percentage of patients with sacroiliitis and S1 involvement.

Table (3): Number of levels of fixation of the sacroiliitis.

	Sacroiliittis (n=53)	
Number of levels of fixation	Singe level 14 (26.42%)	*p*-value 0.001
	Multi-level 39 (73.58%)	*p*-value 0.002

The number of levels of fixation was single level fixation in 14 (26.42%) patients and multilevel fixation in 39 (73.58%) patients. it shows statistical significance between the two groups.

Table (4): Management of the sacroiliitis.

	Sacroiliittis (n=53)
Management Conservative treatment	53 (100%)
Improvement after conservative management	13 (24.5%)

All (53) patients received initial conservative treatment, 13 (24.5%) of them were improved and 40 of them received Sacroiliac joint injection.

Table (5): Management of the sacroiliitis.

	Sacroiliittis (n=53)
Management Sacroiliac joint injection N=40	40
Improvement of sacroiliac joint injection	37 (92%)
Radiofrequency N=3	3 (8%)
Improvement of radiofrequency	3 (100%)

40 patients received Sacroiliac joint injection, 37 (92%) of them were improved and 3 (8%) of them received radiofrequency Management after failure of injection (VAS score >3 1 week after injection) and showed improvement, which means vas score less than 3.

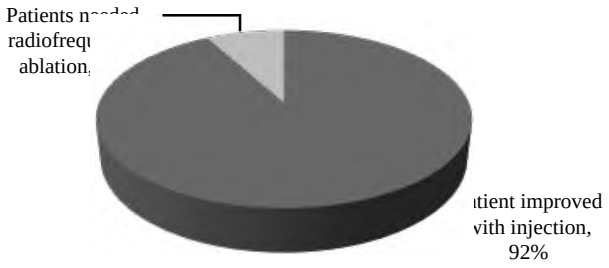

Fig. (8): Total number of patients who needed Sacroiliac joint injection.

Table (6): Visual analog scale of sacroiliitis.

	Before management (n=53)	After management (n=53)	*p*-value
VAS:			
Median	7	3	<0.001*
IQR	6-8	2-4	

*Significantly different as *p*-value ≤0.05.

Visual analog scale was significantly lower after management than before management as (*p*-value <0.001).

Discussion

As regards the prevalence of developing SIJ degeneration post lumbar fusion surgeries there was a big discrepancy of the results received from other studies; in our study 58.9% of the cases developed post-operative SIJ degeneration, where in the study done by Lee YC showed incidence of only 12% of the cases developed post-operative SIJ degeneration, while in the study by Unoki E reported 64% incidence of developing post-operative SIJ degeneration ***[8,9]***.

A study by Colò which reviewed the literature, reviewed 13 articles which showed incidence of 37±28.5% who developed Sacroiliitis out of a total of 1498 cases who did lumbar fusion surgeries ***[10]***.

As regard the age incidence; in our study, the mean age for patients that had Sacroiliitis after lumbar fixation surgeries was (47.4) years old.

The study done by Liliang it was reported that the mean age was 63 years old, the study of Lee YC reported mean age of 56 years old in a study done on 317 patients over the period of 5 years. Both are higher means of age compared to our study.

On the other hand, in the study by Maigne which showed the same mean age as our study 47 years ***[3,8,11]***.

As regard sex distribution, in our study we operated 90 cases 49 were males and 41 were females, of them Sacroiliitis occurred in 53 patients, 62.3% were males (33 patients) and 37.7% were females (20 patients). there was no statistical significance regarding the risk of developing sacroiliitis between male and females (*p*>0.5).

The study by Lee YC reported that out of the 38 patients who developed SIJ degeneration, 27 were females (71%) and 11 were males (29%) which shows a significant higher prevalence in females ***[8]***.

In our study, of the patients who developed sacroiliitis 66% were obese (22.5-41.5) and this result is like that shown in the study by Depalma who reported when BMI was 30 or 35kg/m^2, SIJP was most likely (46–64%) ***[12]***.

A study done by Bakirci S which collected data from 5 observational studies all done from 2012-2018 regarding the effect of BMI on developing ankylosing spondylitis, concluded that the prevalence of SIJ degeneration is much higher among obese

patients than those who are normal weight. BMI was an independent risk factor for the presence of sacroiliitis [OR=1.085, 95% CI (1.031–1.143)] *[13]*.

So, BMI is an important risk factor that may lead to sacroiliac joint pain.

As regards involvement of the sacrum in the lumbar fixation; in our study, 48 patients were operated upon by S1 fixation and 83% of them developed sacroiliitis (*p*-value <0.001) which is statistically significant.

While 42 patients were operated upon by lumbar fixation which did not involve S1 vertebra only 30% developed sacroiliitis post-operative.

The study done by Ha *[6]* reported an almost doubled prevalence of degenerative changes of the SIJ after fusion when compared with controls (75 vs 38.2%), while the study by Depalma *[12]* reported sacroiliitis in 58.8% of patients with sacral fusion and 18.2% of patients with no sacral fusion and the study by Lee YC reported that 57% of the patients who developed SIJ degeneration post fusion had the S1 vertebra involved in the fusion *[6,812]*.

In our study patients were followed up for 6 months, however in a study done by Maigne followed-up patients for 3 years after lumbar fusion surgeries and showed recurrence of sacroiliac pain after six months in 25% of the injected patients, however after second injection only 10% of the patients showed recurrence of symptoms *[3]*.

In our study for the 53 patients who developed sacroiliitis after lumbar spine fixation, it was found that 73.6% of them were operated upon by more than one level of fixation and 26.4% were operated upon by fixation of one level and it was statistically significant in both groups (*p*-value 0.001).

Ha *[6]* did not find any association between the number of fused vertebrae in the lumbar spine and osteoarthritis of the SIJ. Lee YC reported that 40% of the cases which developed SIJ degeneration had only one segment involved in the fixation *[6,8]*.

Some authors suggest that the higher number of vertebrae involved results in higher stress forces at the adjacent segment, leading to greater risk of joint degenerative changes

However, other authors did not confirm these findings.

In our study, we used VAS to detect severity of pain and to follow-up pain relief after management.

In our study, 53 patients out of 90 patients (58,9%) developed sacroiliitis following lumbosacral fixation surgery, 24.5% (13 patients) was improved on conservative treatment according to VAS (3 or below) while 69.8% of patients (37 patients) needed Sacroiliac joint injection.

While the remaining 5.7% of patients (3 patients) who didn't show improvement after conservative management and SIJ injection, showed satisfactory improvement after using radiofrequency ablation VAS score below 3.

A study by Liliang reported that 66.7% (26/39) of patients experienced greater than 50% pain reduction for more than 6 weeks by SIJ blocks, Katz reported that 59% of pts had 75% pain relief 15-45 minutes after injections and were thus diagnosed with SI joint pain. 11 of the 20 experienced 75% relief lasting 2 weeks, while 6 had moderate pain relief *[14,15]*.

In the meta-analysis done by Chia-Hsien Chen, which compared 15 studies done on radiofrequency neurotomy for treatment of sacroiliac joint pain done on a total of 528 patients over the course of 2 years showed significantly greater improvement in pain and functional outcomes compared with those who received conservative treatment or injection therapy *[15]*.

This shows that radiofrequency ablation could be added as a treatment line in the management of patients who did not improve after SIJ injection.

Limitations of the study:

1- Short follow-up period compared to other similar studies.
2- Limited resources and foundation.

Conclusion:

The lumbar fixation surgery disrupts the biomechanics of the lumbar spine making the sacroiliac joint bearing the downward gravitational force of the body weight and hence increasing the incidence of joint dysfunction and producing back pain.

Further assessment for the relation between inter-body fusion and development of postoperative sacroiliac joint degenerative changes is recommended.

Conservative treatment is the first choice of treatment, and it is effective in some cases.

Sacroiliac joint injection with methylprednisolone and local anesthetics is an important line of treatment that gives excellent temporary relief of pain.

And for those who don't show proper improvement after injection, radiofrequency ablation can be tried with satisfactory results.

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انتشار وعلاج التهاب المفصل العجزى الحرقفى بعد عملية تثبيت الفقرات القطنية

المقدمة: الاختلال الوظيفى للمفصل العجزى الحرقفى يعتبر من اشهر المشاكل التى تحدث بعد تثبيت الفقرات القطنية جراحياً.

الأهداف: التعرف على أسباب الاختلال الوظيفى للمفصل العجزى الحرقفى بعد تثبيت الفقرات القطنية جراحياً مع وضع منهج لكيفية العلاج والتعامل مع هذه الأسباب.

الوسائل: تم التعامل مع الاختلال الوظيفى للمفصل العجزى الحرقفى التى ظهرت بعد تثبيت الفقرات القطنية جراحياً عن طريق العلاج التحفظى وحقن المفصل للحالات التى لم تستجيب للعلاج التحفظى واستخدام التردد الحرارى للحالات التى لم تستجب للعلاج بالحقن.

النتائج: وجدنا أن مؤشر كتلة الجسم وتثبيت الفقرة العجزية مع الفقرات القطنية احد العوامل التى ادت للاختلال الوظيفى للمفصل العجزى الحرقفى وان العلاج التحفظى وحقن المفصل يعتبر من وسائل العلاج المناسبة بالاضافه إلى العلاج بواسطه التردد الحرارى.