SURGICAL TREATMENT OF SACROILIAC JOINT DYSFUNCTION

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PURPOSE

The purpose of this study was to determine the long-term outcomes of sacroiliac stabilization surgery.

INTRODUCTION

Low back pain that has defied conventional diagnostic means frequently emanates from the sacroiliac joint. Extra-articular sacroiliac joint dysfunction is a tearing or stretching of the Posterior Sacroiliac ligament complex with subsequent hypermobility. This creates a dynamic and functional derangement in which there is recurrent subluxation of the joint. Since the stable sacroiliac joint is critical for the normal force transfer mechanism, disruptions lead to dysfunction of the mechanics of the musculoskeletal system. Sacroiliac joint dysfunction can be divided into two categories. True intra-articular pathology includes fractures, infection, tumor, inflammation, spondylopathies, degenerative joint diseases, and metabolic joint disease. Extra-articular sacroiliac joint dysfunction is the disorder of abnormal joint movement and alignment, all leading to disruptions of the posterior ligamentous support system. This leads to joint hypermobility and, in more severe cases, instability and recurrent subluxation.

Vleeming (1) has demonstrated that the stability of the sacroiliac joint is dependent on two systems, force closure and form closure (also called “the self-locking mechanism”). Force closure refers to the compressive forces that resist shear. They include body weight, muscle balance and the normal integrity of the posterior sacroiliac joint ligament complex. Form closure refers to the sacroiliac joint stability due to the anatomy of the sacroiliac joint articular surfaces, which contain complimentary ridges and grooves. This creates increased friction and partially resists shear forces.

PATHOGENESIS

Disruption of the posterior ligamentous complex is the primary cause of failure of the self-locking mechanism. The articular portion of the joint is usually unaffected. It is a dynamic functional derangement in which there is joint instability often with an anatomically normal joint. Thus, it cannot be demonstrated with radiographic studies. Trauma or hormonal changes such as those occurring during pregnancy will allow the sacroiliac joint ligaments to become lax and the joint to move beyond it’s normal range, passing beyond it’s normal congruity into an area of incongruity. This results in locking between the opposing surfaces of the ilium and sacrum in a subluxed position. Ligamentous laxity leads to recurrent subluxation and, with time, degenerative changes in the articular surfaces. Traumatic causes of ligamentous disruption include: a fall on the buttock, a dashboard injury that imparts a horizontal force to the sacroiliac joint, a motor vehicle accident in which the affected extremity is extended and the force is transmitted upward to the sacroiliac joint (for example, the foot on the brake with the knee extended at impact), Lifting in a forward flexed side-bending position (the sacroiliac joint is particularly vulnerable to injury when the trunk is bent forward with superimposed lateral flexion or side-bending), Inadvertent stress on the posterior ligamentous complex during childbirth. Iontogenic causes include: Instability due to weakess of the joint and ligaments from overzealous bone grafting, Increased stress across the joint created secondary to a hip or spine fusion. (2) (3)

DIAGNOSIS

Symptoms are usually nonspecific, although the patient often complains of lateralized hip and buttock pain and difficulty sitting. Physical examination can lead one to suspect sacroiliac joint dysfunction, but does not, per se, allow one to make the diagnosis. Screening test have been described elsewhere. The three most consistent findings on physical examination are positive Fortin finger sign, tenderness at Baer's point and a positive yo-yo sign.

1. Fortin Finger Sign: Ask the patient to point to the site of pain. A positive test is when he or she points to the posterior superior iliac spine. (4)
2. Baer's Point Tenderness: Tenderness just medial to the anterior sacroiliac spine is highly suggestive of a sacroiliac joint dysfunction. (5)
3. Yo-Yo Sign: With the patient supine, check the leg lengths. Ask the patient to assume a seated position, keeping the hips and knees extended. Positive test is when the leg lengths change as measured by the position of the medial malleoli. (6)

The diagnosis of sacroiliac joint dysfunction is based on a pattern of findings, none of which in and of itself is sufficient. Sacroiliac joint dysfunction is a functional and dynamic condition and, therefore, our standard diagnostic tool cannot be used, as they only determine static anatomic conditions. There are no lab tests for diagnosing sacroiliac joint dysfunction. Injection of lidocaine into the articular portion of the sacroiliac joint under fluoroscopic control is considered the gold standard. Pain relief is considered a positive sign that the sacroiliac joint is a pain generator. (7)

CRITERIA FOR SACROILIAC JOINT STABILIZATION

The pain must be intractable, disabling, and documented as a recurrent subluxation of the joint not controlled with conservative treatment. All patients studied patients had a positive response to a fluoroscopically controlled sacroiliac block. The treatment should be performed by a manual therapist that is skilled in the evaluation and treatment of sacroiliac subluxation. Other causes such as herniated disc, facet arthropathy, trapped nerve root, spinal stenosis, piriformis problem, or hip disorders must be excluded. A relative criteria is decrease of pain with fluoroscopically controlled sacroiliac block.

It is critical that the joint be reduced into an anatomic position prior to stabilization. This requires a thorough knowledge of manual medicine. If the surgeon is not familiar with manual medicine, then it is recommended that he/she have someone in the operating room that is.

MATERIALS AND METHODS

The technique has been previously described by J.M. Matta. (8) The patient is placed prone on a radiolucent table to allow the use of an image intensifier. The aim of the operation is to insert two cannulated screws through the ilium into the sacrum. Once the position is determined, two Steinmann pins are inserted across the joint under EMG monitoring and under image intensification guidance. Once it is determined that the Steinmann pins are in an appropriate position, incisions are made, the depth of penetration measured and appropriate-sized 6.5 cannualted screws are placed across the joint. If the patient's problem is purely extra-articular, this completes the operation. It the patient who has joint problems, a posterior skin incision can be made parallel and slightly lateral to the posterior sacroiliac spine extending cephalad and parallel to the iliac crest. The lumbodorsal fascia, as it inserts onto the inner table of the ilium is identified and stripped from its attachment, exposing the inner table of the ilium. Using osteotome mallets, gouges and curettes, a bone graft is harvested from the inner table. This not only allows for better visualization of the ligaments and joint, but also gives us bone graft for future grafting. Using gouges, curettes and tissue rongeurs, the ligamentous and cartilaginous portion of the joint are removed. Once the bone is decorticated, the bone graft is inserted. The lumbodorsal fascia is reapproximated and the subcutaneous tissues and skin closed.

Post-op

Post-op immobilization is not necessary, although the patient should return to physical therapy at 3 weeks post-op for rehabilitation.

Study Design

Subjects receiving surgical stabilization were asked to complete the SF-36 at 4 different sessions. Session 1 was the day before surgery, Session 2 was 6-weeks post-op, Session 3 was 6 months post-op, and Session 4 was 1 year post-op.

All subjects with a previous history of sacroiliac and lumbar spine surgery were excluded. Twenty-eight subjects completed the survey at session 1 and 2. Twenty-six subjects completed the survey at session 3 with 2 subjects dropping out. Twenty subjects completed the survey at session 4, with 8 patients dropping out. Subjects were not contacted regarding study drop out.

Results

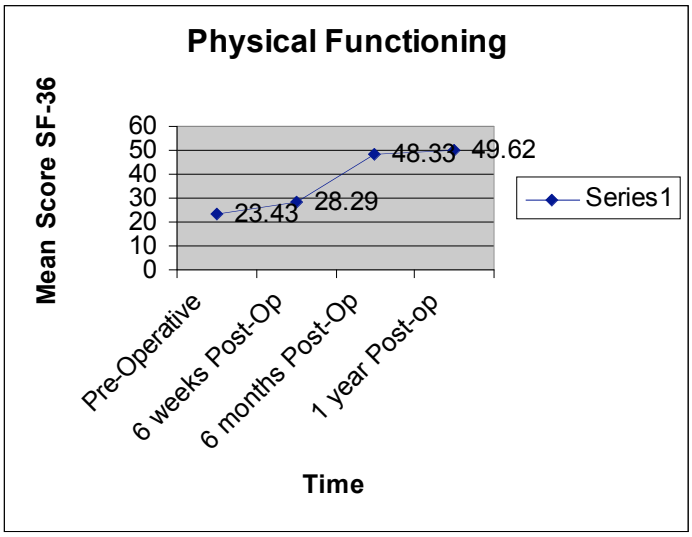
Each subject acted as his own control. The SF-36 was used to determine significant changes in mental, physical, and general health function over the stated intervals. Components that showed significant changes were graphed (Figures 1-5) showing a summary of their actual means at the stated intervals. Remaining domains measured on the SF-36 showed either marginal significance or no significance. Measures of vitality showed a significance of .118 in the between groups ANOVA. Of note, there was a significant difference in the scores on this measure between baseline and 6 months signfiicance=.017. Items corresponding to this measure included:

Did you feel full of pep?
Did you have a lot of energy?
Did you feel worn out?
Did you feel tired?

While not clearly statistically significant there was a clear positive linear trend in the data. The means were 32.29, 41.57, 45.76 and 41.35 respectively for the following time points: pre-surgical, 6-weeks, 6-months, and 12-month follow-up. The decrease in sample size at the 12-month follow-up likely contributed to the decline in the 12-month follow-up cohort.

Mental Health, Mental Component Summary, Role Limitations because of Emotional Problems, and General Health Perceptions domains showed the following significances in the between groups ANOVA respectively: .258, .346, .927, and .908. While not significant relative to the analysis of all items, two domains showed statistically significant changes between baseline line and 6-month follow-up time points. Mental Health significance = .051 and Mental Component Summary significance=.071.
A summary of all components were charted with their respective mean trends in Figure 6.

Figure 1. Physical Functioning Component



For Physical Functioning a Between Groups ANOVA for each variable was performed. Physical Functioning significance=.005 An Univariate analyses was done with correction for multiple comparisons. Specifically the least Squared Differences Method was used to correct for differences.

Comparison of Pre-Operative scores with each subsequent time point yielded significance at .002 at 6 months and .014 at 1 year.

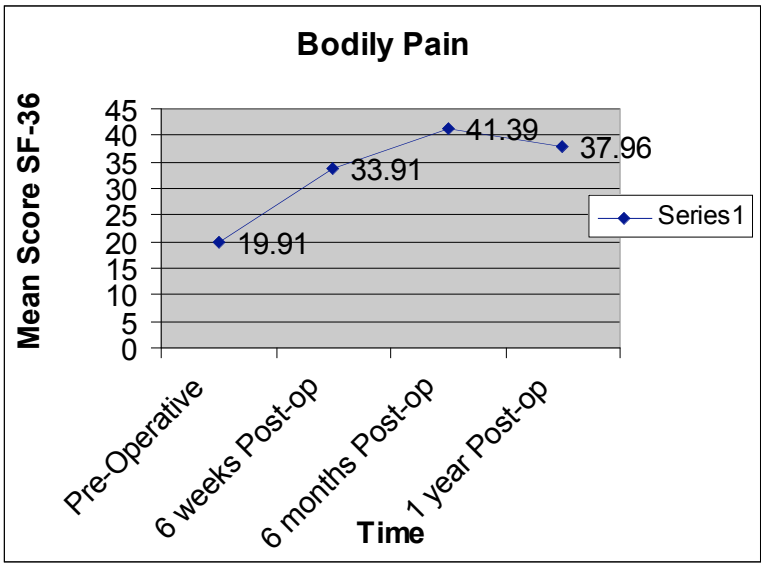
Items scored for this variable were in response to the question:
The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

Vigorous activities such as running, lifting heavy objects, participating in strenous sports

Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf

Bending, kneeling, or stooping, Walking more than a mile, Walking several blocks, Walking one block, Bathing or dressing yourself

Figure 2. Bodily Pain Component



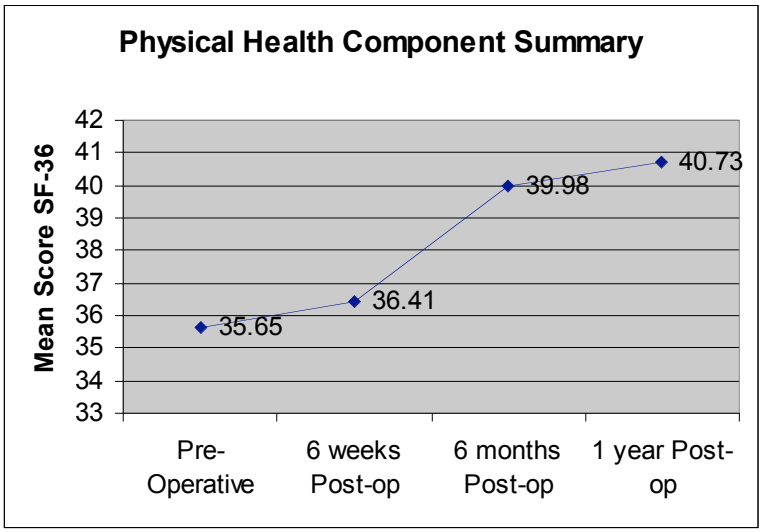
For Bodily pain a Between Groups ANOVA for each variable was performed. Bodily Pain significance=.011.
An Univariate analyses was done with correction for multiple comparisons. Specifically the least Squared Differences Method was used to correct for differences.

Comparison of Pre-Operative scores with each subsequent time point yielded significance at .036 at 6 weeks,.002 at 6 months, and .019 at 1 year.

The following questions comprised this variable:

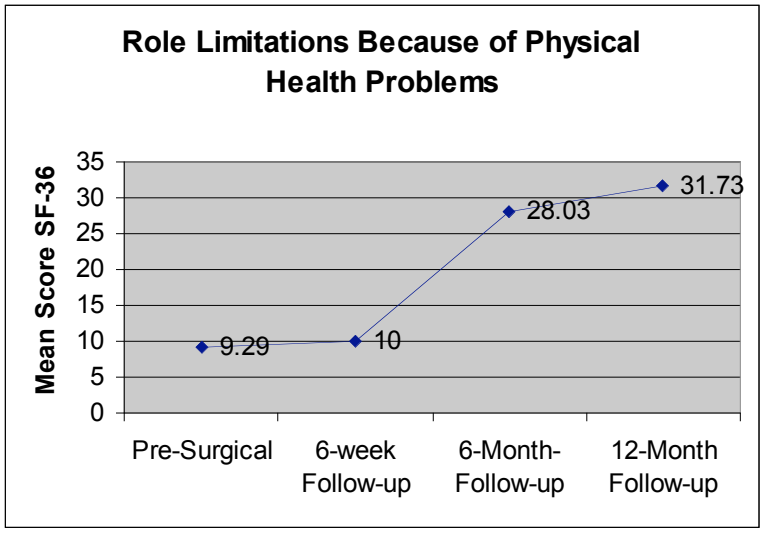
How much bodily pain have you had during the past 4 weeks?
During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework?

Figure 3. Physical Health Component Summary



A between groups ANOVA for each variable was performed. Physical Health Component Summary significance=.040
An Univariate analyses was done with correction for multiple comparisons. Specifically the least Squared Differences Method was used to correct for differences.
Comparison of Pre-Operative scores with each subsequent time point yielded significance at .034 at 6 months, and .017 at 1 year.

Figure 4. Role Limitations Because of Physical Health Problems



A between groups ANOVA for each variable was performed. Role Limitations Because Of Physical Health Problems significance=.019

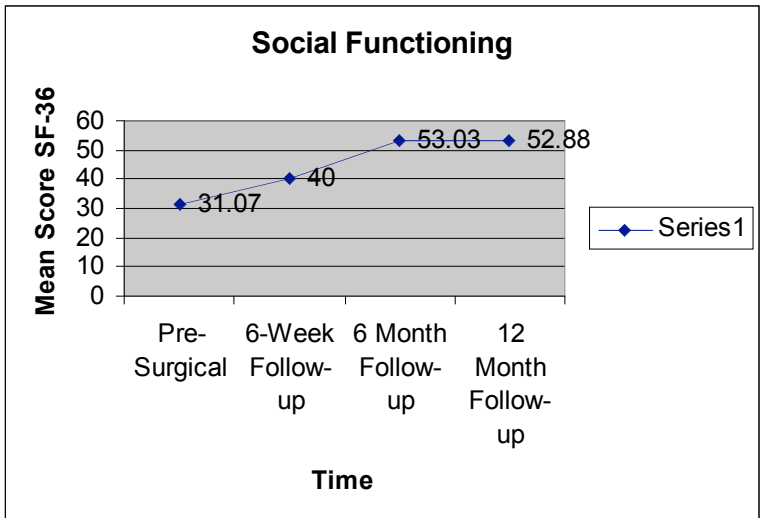
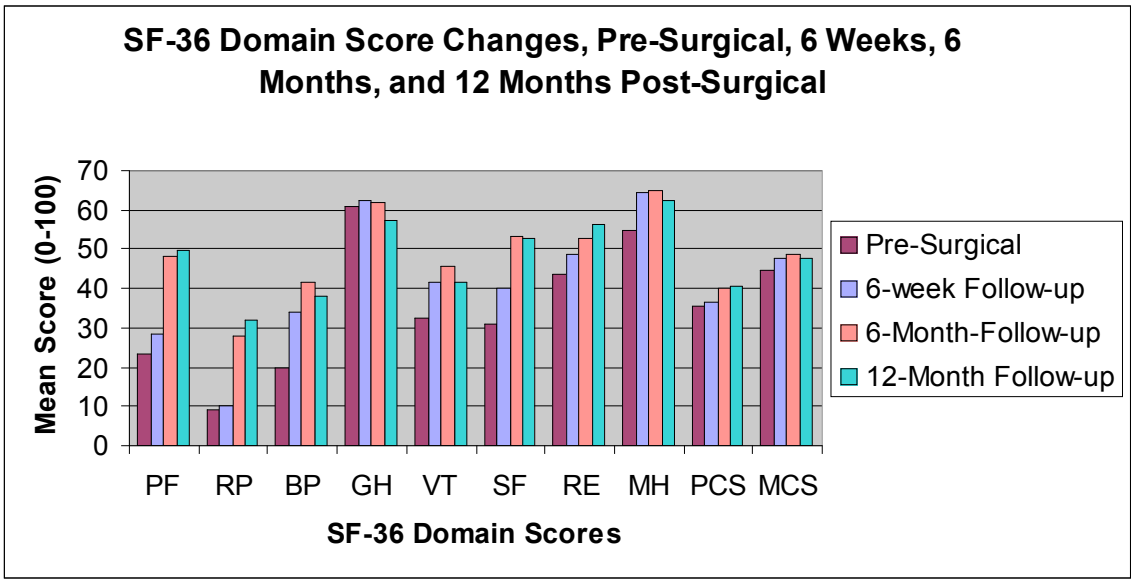


Figure 6. Domain Score Changes sessions 1-4 for Physical Functioning, Bodily Pain, Physical Health Component, Social Functioning, Role Limitations Because of Physical Health Problems.



	PF	RP	BP	GH	VT	SF	RE	MH
Pre-Surgical	23.43	9.29	19.91	60.74	32.29	31.07	43.81	54.63
6-week Follow-up	28.29	10	33.91	62.34	41.57	40	48.57	64.34
6-Month-Follow-up	48.33	28.03	41.39	62.12	45.76	53.03	52.52	64.97
12-Month Follow-up	49.62	31.73	37.96	57.5	41.35	52.88	56.41	62.62

	PCS	MCS
Pre-Surgical	35.65	44.71
6-week Follow-up	36.41	47.6
6-Month-Follow-up	39.98	48.57
12-Month Follow-up	40.73	47.85

Discussion

Score changes on the SF-36 for each follow-up interval for Physical Functioning, Social Functioning, Bodily Pain, Physical Health Component, and Role of limitations because of Physical health Problems showed a statistically significant improvement. This was mostly notable at 6 months post-operatively. Other components tested on the SF-36(Figure 6) showed positive trends although no statistical significance. Patient drop out was considered non-compliance with returning the follow-up questionnaire.

Conclusion

Sacroiliac joint stabilization surgery is a viable procedure that improves functioning and decreased bodily pain among subjects tested with the SF-36. Long-term follow-up studies may reveal significance in components that showed positive trends but no statistical significance. Surgical stabilization of the sacroiliac joint appears to be a valid treatment option for those patients with sacroiliac dysfunction, who have failed conservative treatments.

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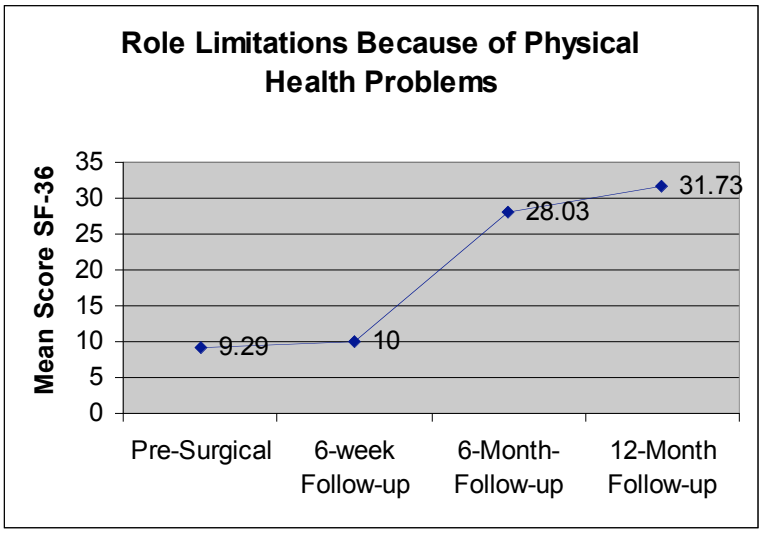
Figure 4. Role Limitations Because of Physical Health Problems



A between groups ANOVA for each variable was performed. Role Limitations Because Of Physical Health Problems significance=.019
An Univariate analyses was done with correction for multiple comparisons. Specifically the least Squared Differences Method was used to correct for differences.

Comparison of Pre-Operative scores with each subsequent time point yielded significance at .055 at 6 months, and .023 at 1 year.

The following questions comprised this variable:

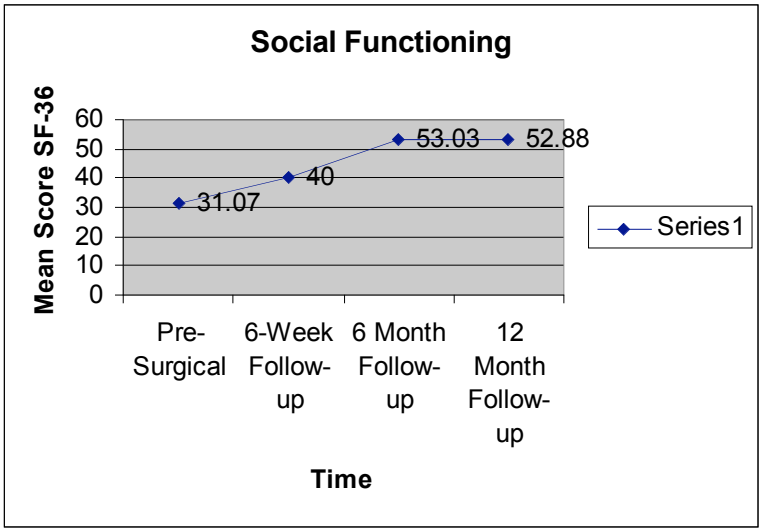
During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities

As a result of your physical health?, Cut down on the amount of time you spent on work or other activities?, Accomplished less than you would like?

Were limited in the kind of work or other activities?

Had difficulty performing the work or other activities (for example, it took extra effort)?

Figure 5. Social Functioning component



A between Groups ANOVA for each variable was performed. Social Functioning significance=.012
An Univariate analyses was done with correction for multiple comparisons. Specifically the least Squared Differences Method was used to correct for differences.

Comparison of Pre-Operative scores with each subsequent time point yielded significance at .002 at 6 months, and .018 at 1 year.

The following questions comprised this variable:

During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?