



Outcomes of bilateral sacroiliac joint fusions and the importance of understanding potential coexisting lumbosacral pathology that might also require surgical treatment

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Only one study in the literature describes performing a bilateral sacroiliac joint fusion, and the results were poor. Many patients needing a bilateral sacroiliac joint fusion frequently have had previous lumbosacral surgeries and present with lumbosacral pain as well. This study reviews our results in consecutive patients having had a bilateral sacroiliac joint fusion over a five-year period. Fifteen patients had bilateral sacroiliac joint fusions with 13 having concurrent lumbosacral fusions. The modified posterior midline fascial splitting approach, first described by Belanger was utilized. Patients were followed for an average of 30.3 months. There were no infections, neurovascular injuries, lasting morbidity or deaths. One non-union of a sacroiliac joint (7%) occurred, which after revision was satisfactory. There was a statistically significant drop in pain ($p = 0.01488$) using the VAS, and patient satisfaction rates were 86%. With all those patients saying they would have the surgery again for the same result. There was no significant increase in functionality. Patients needing bilateral sacroiliac joint fusions frequently fall into the “failed back” category, and it is important to evaluate both the sacroiliac joints and the lumbosacral spine for potential pain generators. This study shows that by treating all the pain generators in both areas there were significant decreases in pain, low complications, low re-operation rates, and high patient satisfaction scores. Overall functionality, however, was not positively affected.

Keywords : sacroiliac ; joint ; fusion ; surgery, outcomes ; bilateral ; lumbosacral ; algorithm ; treatment.

INTRODUCTION

Surgery for the painful dysfunctional sacroiliac joint has been in the scientific literature for almost a century (19). Studies published in peer review journals include results on both unilateral as well as bilateral sacroiliac joint fusions (1,3,8,9,11-17,20). At this time only one study discusses performing only bilateral sacroiliac joint fusion procedures and the very poor outcomes of those procedures (17). It was documented in that study that when the need for bilateral sacroiliac joint fusions has been decided there also exists in that patient population a signifi-

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cant number of previous “failed back” surgeries. Although pathology in the lumbosacral spine was identified in those patients, it was not further investigated or treated as part of the bilateral sacroiliac joint fusion surgery. Currently there is no study in the literature that discusses surgically treating valid pain generators in both the sacroiliac joints and the lumbar spine at the same setting in an attempt to completely treat the patient’s pain.

The purpose of this study is to present long-term results of patients having had a bilateral sacroiliac joint fusion at our institution. What differs in this study from the previous published study is that all patients with valid bilateral sacroiliac joint dysfunction, that were deemed surgical candidates using a published algorithm to make that decision (4), also had their lumbosacral pain fully investigated as well prior to surgery. If it was determined that the lumbosacral spine also had pain generators that qualified for fusion surgery (many of these were previous “failed back” fusion surgery patients) both the sacroiliac joints and the lumbosacral fusions were done at the same setting. The logic as to consideration for investigating both the sacroiliac joints and the lumbosacral spine for potential pain generators when the chronic pain patient presents with pain in areas both above and below the L5-S1 disc level is discussed.

MATERIALS AND METHODS

Ninety-nine consecutive patients having had sacroiliac joint fusion procedures performed between April 1, 2005 and March 31, 2010 were retrospectively reviewed. All patients were referred to our institution for evaluation of sacroiliac joint pain and were progressed through the published algorithm for the diagnosis and treatment of the painful dysfunctional sacroiliac joint (5,10). The first step in the algorithm is to fully evaluate the lumbosacral spine for potential pain generators, which was done in every case. This retrospective review was presented to and accepted by our institutions Investigational Review Board (IRB) as a valid study and followed for the entire review process to assure proper patient assessment and safeguards. Of these patients twenty-one had a bilateral sacroiliac joint fusion performed. The procedure used was the modified posterior midline fascial splitting approach with instrumentation (2,6) (Figs. 1, 2).

X-Rays were performed at six weeks, 18 weeks, six months, and one year post-operatively. A CT scan was performed three months post-operatively and repeated thereafter only if there was a concern which required it. Bracing consisted of using a sacral belt for twelve weeks while up. Showers were allowed out of the brace. If a lumbosacral fusion was also performed, a TLSO was used with a pantaloan attachment. If the patient was morbidly obese only a walker was used for twelve weeks. All patients were allowed to be full weight bearing as tolerated immediately after surgery. Restrictions for the first twelve weeks consisted of no lifting more than #15, limited bending at the waist, and walking with a shorter stride. Patients were allowed to resume full activities 18 weeks post surgery unless symptoms required restrictions. If a lumbosacral fusion was also performed, the restrictions would default to that procedure. Fusions were considered solid if visible bone graft crossed the vital areas that were fused on CT scan and there were no signs of hardware loosening, halo effect, or failure on either CT scan or X-Ray. Follow-up, performed by an independent contractor, consisted of a questionnaire, telephone contact, and in some cases personal follow-up. Independent radiologists at our institution, not involved with this research study, independently read the CT scans and the radiographs. Changes in Visual Analog Scale (VAS) were obtained both preoperatively and at final follow-up and evaluated for significant changes using the paired t-test performed by an independent statistician.

RESULTS

Fifteen of 21 patients (71%) having had a bilateral sacroiliac joint fusion responded. The average follow-up was 30.3 mos. (24-59). There were 12 females and 3 males with an average age of 57 (40-66). The average VAS was 7 preoperatively. The average BMI at the time of surgery was 28.2 (16.3-39.1). Ten patients (67%) initially presented with previous lumbosacral fusion surgery with one of these having a previous failed sacroiliac joint fusion as well. Of the 10 patients having previous lumbosacral fusion surgery, 9 of them had had multiple lumbar fusions with 9 having had recent hardware removals. Thirteen (77%) of the patients had severe pain symptoms on initial presentation both above and below the L5-S1 disc space level. All patients at presentation had been in conservative treatment (physical therapy, chiropractory, injection therapy,

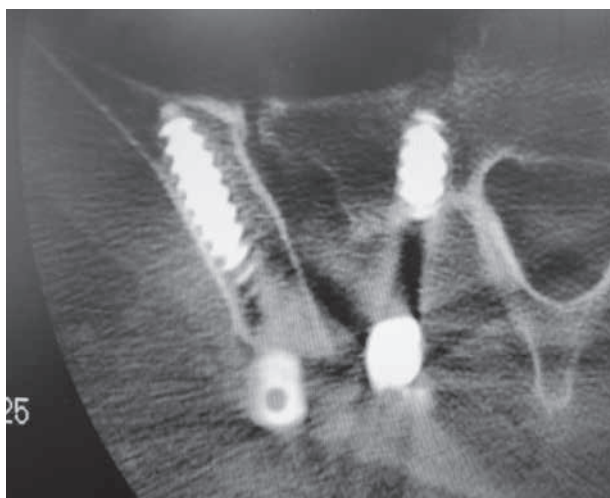


Fig. 1. — Axial CT scan showing placement of the Iliac and S1 screws via the posterior midline technique.

etc) for an average of four years. Ten patients (67%) at presentation were considered to be “failed back” patients with 9 of these being in chronic pain clinics. All patients were using chronic narcotics to some degree. Four patients were working in some restricted capacity and the rest were either disabled or retired. The steps in the algorithm for the diagnosis and treatment of the dysfunctional sacroiliac joint (5,10) were satisfied in all patients for their sacroiliac joint symptoms. During the workup for the sacroiliac joint pain generators all 15 patients had one or more valid intra-sacroiliac joint diagnostic injections, by clinicians trained and experienced with these procedures, using image, dye and a long acting anesthetic solution with greater than 2 hours of greater than 90% pain relief. The lumbosacral spine was evaluated clinically and radiographically in all patients using plain Flexion/Extension X-Rays, MRI and CT scanning. When appropriate, injections were performed to identify pain generators in the lumbosacral spine. Keeping in mind that this study set out to evaluate the results of all the consecutive bilateral sacroiliac joint fusions followed long-term it was discovered that 13 of these patients (87%), with 10 of these being in the “failed back” category, were found to have significant pain generators warranting fusion surgery in the lumbosacral spine as well. The pathological diagnosis



Fig. 2. — Axial CT scan showing long-term follow-up of a cage (Medtronic, custom) in the sacroiliac joint line with solid fusion (cage is being used off-label in this example).

found in the lumbosacral spinal evaluations consisted of non unions of previous fusions, adjacent segmental degenerative disease, spondylolisthesis, and degenerative segmental disease with and without stenosis or a combination of two or more of these conditions (Table I).

With the surgical technique used only one posterior midline incision was made through which the bilateral sacroiliac joint fusions were performed as well as any concurrently performed lumbosacral fusion surgery.

The average operating time was 264 min (173-437). Blood loss averaged 986 ml (150-2700). The average length of stay in the hospital was 4.9 days (2.5-6.5). There were no infections, neurovascular injuries, lasting morbidities or deaths. One non union (7%) of a sacroiliac joint fusion resulted in one further surgery with a satisfactory long-term

Table I. — Previous Lumbosacral Fusions and Hardware Removals compared to Concurrent Lumbosacral Fusions

	Previous lumbosacral fusions	Previous removal of hardware	Current documented non-union of fusion	Concurrent lumbosacral fusion performed in current study
1	L4-S1	+	+	L4-L5 repair
2	L3-L4	-	+	L3-L4 repair, L2-L3 & L4-S1 extension
3	L2-S1	+	-	L2-T9 extension
4	None	NA	NA	None
5	None	NA	NA	None
6	L3-S1	+	+	L5-S1 repair
7	L3-S1, left SIJ	+	+	L5-S1 repair
8	L2-S1	+	+	L5-S1 repair
9	L4-L5	+	-	L5-S1 extension
10	L4-S1	+	+	L5-S1 repair
11	None	NA	NA	New L4-S1 fusion
12	L4-S1	+	+	L4-S1 repair
13	L1-L5	+	-	L5-S1 extension
14	None	NA	NA	New L5-S1 fusion
15	None	NA	NA	New L5-S1 fusion

result. There was a statistically significant decrease in pain perception on the VAS ($p = 0.01488$) using the paired t-test. 86% of the patients were satisfied at long-term follow up with their procedure and 86% would go through it again for the same result. There were no cosmetic issues at follow-up. The functional level of patients did not change as a result of this surgery in terms of work, retirement or disability. There was a drop in the need for a pain clinic, but this was not statistically significant.

DISCUSSION

This study was initially designed to look at our results of consecutive patients having had a bilateral sacroiliac joint fusion. The reason for this was to find out if our results were different from the poor results reported by Shutz and Grob (17). The results in this study show that a bilateral sacroiliac joint fusion performed in the appropriate patient can produce statistically significant decreases in pain, solid fusions, low complication and reoperation rates, and high patient satisfaction scores. Another finding in our bilateral sacroiliac joint fusion group, which was unexpected, was the very high percentage of

patients who were “failed back pain patients” all having had multiple lumbosacral fusion surgeries prior to presentation at our clinic. There were also two patients who had not had previous lumbosacral fusions that, after appropriate evaluation, were found to have pathology in the lumbosacral spine that also required fusion surgery. This resulted in 13 of the 15 bilateral sacroiliac joint fusions patients also having a concurrent lumbosacral fusion. What can be implied by the results of this study is that in many patients the pain generators can be coming from both the sacroiliac joints and the lumbosacral spine in the same patient at the same time. This was also true in the Shutz study (17), as many of his patients had known severe low back pain with known pathology in the lumbosacral spine. He describes a large percentage of his study patients to have had multiple previous lumbosacral fusion surgeries as well. In that study the lumbosacral spine issues were not addressed in any way. Many of them were subsequently addressed in their further revision surgeries after the initial failures (17). Another recent study by Slinkard, et. al. describes performing unilateral anterior sacroiliac joint fusions in patients with and without previous lumbosacral fusions (18). In this

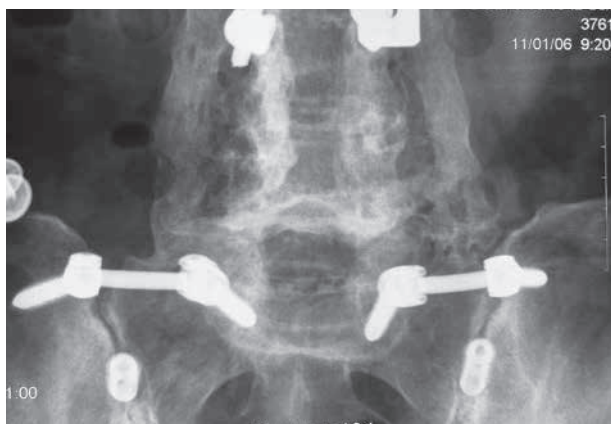


Fig. 3. — AP X-Ray showing bilateral sacroiliac joint fusions performed. Notice in the upper lumbar spine the instrumentation representing the extension of a previous lumbar fusion all being performed via a single midline incision. The cages (Medtronic, custom) are being used off-label in this example.

study the patients having had a prior lumbosacral fusion did poorly compared to those not having previous lumbosacral fusion surgery. In Slinkard's study, as in the study by Shutz, there was no attempt to evaluate the lumbosacral spine, especially in those with previous lumbosacral spine fusions, for current potential pathology that might also require surgical consideration. This would beg the question as to whether such pathology, not being treated at the time of the sacroiliac joint fusions, could be a reason for continued low back pain in the patients of both of these studies. Currently there are no studies in the literature discussing either the investigation of or the surgical treatment of both the sacroiliac joints and the lumbosacral spine when a chronic pain patient presents with pain both above and below the L5-S1 disc space, especially in the "failed back" patient.

Our approach to all chronic back pain patients who have pain both above and below the L5-S1 disc space is to initiate the algorithm for the diagnosis and treatment of the dysfunctional sacroiliac joint (5,10). The reason for the use of L5-S1 as a topographical marker comes from work done by Dreyfuss, *et al.*, providing highly suggestive science that rarely does the sacroiliac joint cause pain cephalad to the L5-S1 disc space (7). This algorithm has been used by us for over a decade and begins with the

fact that the lumbosacral spine must be ruled out as a significant pain generator as a first step. Only after this is done should the surgeon or clinician move into the steps of the sacroiliac joint algorithm. We have not created an algorithm for making the diagnosis to do a fusion in the lumbosacral spine as this process can vary greatly between surgeons and many varieties of it are available in the literature. The message in this study is that when a surgeon or clinician is faced with a patient needing a bilateral sacroiliac joint fusion, especially in a patient with chronic lumbosacral pain and a history of one or more failed back surgeries, to evaluate the lumbosacral spine for significant pain generators in whatever manner the surgeon is most confident. The other side of this argument, though not supported by this current study, is that in the patient with "failed back surgery", perhaps the sacroiliac joints should be evaluated as well. We do this routinely, but it is not considered a standard at this time, and further studies are certainly needed in these types of patients for scientific validation.

Concerning our evaluation of the lumbosacral chronic pain in our study patients there are some steps that we feel are logical that will be mentioned here. Since 65% of all our 99 consecutive sacroiliac joint fusion patients have had a prior lumbosacral fusion when they initially presented to us, we first fully evaluate that fusion. We will obtain flexion/extension plain X-Rays of the lumbar spine and a CT scan looking at the quality of the fusion, the stability of the instrumentation, gross degenerative changes above or below that fusion, and overall deformity issues. Whenever we obtain a CT scan of the lumbar spine we include both sacroiliac joints in the scan as well. This frequently shows the same degenerative arthritic processes in both areas. An MRI will also be performed to evaluate the soft tissues and the status of the nerves for compression or stenosis. If there are degenerative areas that are concerning and might be pain generators, we will obtain a SPECT bone scan to see if those areas are "hot" on the scan. Diagnostic and potentially therapeutic injections into these "hot spots", using both a long acting anesthetic and a long acting steroid compound would be done. EMG studies have not been useful for us except to verify what we are see-

ing clinically and to help provide a neurological prognosis.

When chronic disabling pain generators are found, using the mechanisms described above, in both the sacroiliac joints and the lumbosacral spine, in a patient who has failed all the reasonable treatment protocols for conservative treatment, we consider operating on all the pain generators at one time. The surgical technique we have chosen to use for bilateral sacroiliac joint fusions and, when appropriate, a concurrent lumbosacral fusion, allows for all fusions to be done through one posterior midline incision. This is fully described in the literature (2,6). Using this approach there are few patient size limitations, and the patients can be weight bearing as tolerated immediately after surgery, which helps with the overall rehabilitation of the patient.

The decision to operate on both the sacroiliac joints and the lumbosacral spine has evolved for us over the past two decades when early on we would do one or the other, only to come back and, as one might say, finish the job. We realize that this is a controversial issue and is for us based on two decades of clinical experience, bench research on the sacroiliac joint, multiple publications on lumbosacral fusions but not on actual scientific measures to specifically answer the question of operating on both areas at the same setting. At this time the we are involved in prospective studies in an attempt to scientifically validate this type of surgical protocol.

We feel that the main point to be made here is that the surgeon is responsible for making an accurate diagnosis of all the surgical pain generators, be they in the lumbosacral spine, the sacroiliac joints, or both, in patients that are being considered for low back surgery. How they determine to approach the surgical solutions for each patient is currently an individual decision as no firm criteria exist for surgeons in this situation. How we chose to approach our patients is our own creation and has not been tested beyond our institution.

This study has weaknesses. Despite the fact that it is a retrospective study of consecutive patients, our study group had 15 responders out of 21 potential patients (71%). The overall numbers of patients in this study is small, and one type of surgery was used by one surgeon making it difficult to arrive at

any concrete conclusions. In its current state this study stands alone as there is no study to equivocally compare it to.

Considering all the constraints on our data collected and with the literature review as previously discussed, we feel that we can make some relative conclusions regarding surgery in these types of patients. Published studies, where one or both sacroiliac joints were fused in patients having one or more previous lumbosacral fusions, including "failed back" patients, with no further investigation or treatment to the lumbosacral spine, tended to do poorly (17,18). In this study patients who are found to be bilateral sacroiliac joint fusion candidates frequently have had previous lumbosacral surgeries, have had chronic pain for long periods or time, have been in the conservative treatment system for years prior to presentation, are usually on chronic narcotic use, and are not very functional on presentation. Addressing pathology in both the lumbosacral spine and the sacroiliac joints, especially in the "failed back" patients, and addressing both areas during surgery resulted in a statistically significant decrease in pain, a very low re-operation rate, and very high patient satisfaction at long-term follow-up.

A disappointing finding in this study was that despite the decreases in pain and the high satisfaction scores, these patients did not improve their function at long-term follow-up. An argument can be made that they had been in the medical system for such a long time prior to their surgeries in this study, that they had established routines for narcotic use and had settled into a disabled way of life which was not an easy thing to change. We feel that in order to adequately deal with variables such as narcotic use and truly functional activity in society that multidisciplinary clinics, which were not part of our long-term treatment program in these patients, would be needed.

CONCLUSION

Bilateral sacroiliac joint fusions can be performed in the appropriate patients with statistically significant decreases in pain, low reoperation rates, and high satisfaction scores at long-term follow-up.

Many patients requiring bilateral sacroiliac joint fusions have had previous lumbosacral fusions and many of those are “failed back” patients. We believe that all the pain generators in both the sacroiliac joints and the lumbosacral spine should be fully investigated and treated, according to the surgeon’s preferences, as part of the patient’s overall treatment plan. Currently the improvement of function has not been realized in these surgical patients. Further prospective and multi centered studies are needed to further understand this patient group, the best surgical techniques to employ, and to validate these early relative conclusions.

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