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Clinical Study

Posterior iliac crest pain after posterolateral fusion with or without iliac crest graft harvest

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Abstract

BACKGROUND CONTEXT: Considerable debate exists regarding the incidence of persistent pain from the iliac crest bone graft (ICBG) harvest site. Different study designs have led to a variety of reported rates.

PURPOSE: The purpose of this study was to determine the incidence and severity of bone graft site pain after iliac crest harvest.

STUDY DESIGN: Cross-sectional.

PATIENT SAMPLE: One hundred and twelve patients, who had a posterior lumbar fusion, seen at a tertiary spine center for a routine postoperative visit.

OUTCOME MEASURES: Numeric rating scales (0–10) for pain over lower back, right, and left posterior iliac crests.

METHODS: An independent investigator, not directly involved in the care of the patient and unaware of the type of bone graft used in the fusion, examined the patient for tenderness over the surgical site as well as the left and right posterior iliac crest. After the examination, data on the source of grafting material, complications during harvest, and backfilling of the graft site defect were collected from the medical records. The patients were then classified as to whether ICBG was harvested or not. Chi-square test was used to determine any difference in the proportion of iliac crest pain between the bone graft group and no bone graft group. Correlations between body mass index (BMI), time since surgery, and the incidence and severity of bone graft site pain were also determined.

RESULTS: There were 72 women and 40 men with a mean age of 56.6 years (range, 16–84). Mean follow-up was 41 months (range, 6–211 months) with a median of 25 months. Iliac crest bone graft was harvested in 53 (47.3%) patients through the midline incision used for lumbar fusion. In 59 patients (52.7%), recombinant human bone morphogenetic protein-2 was used with no graft harvest. There was no statistically significant difference in the proportion of patients complaining of tenderness over both or either iliac crest between the two groups. Only 10 patients had pain over the same crest from which the graft was harvested. No correlations between number of levels fused, levels fused, BMI, length of follow-up, and the incidence and severity of bone graft site pain were seen.

CONCLUSIONS: The results of this study highlight the difficulty in differentiating pain originating from the graft site versus residual low back pain. The incidence of pain over the iliac crest was similar in patients in which iliac crest was harvested and those in which no graft was harvested.

Keywords: Iliac crest graft; Bone grafting; Donor site pain; Posterior iliac crest; Lumbar fusion

FDA device/drug status: not applicable.

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EVIDENCE & METHODS

Context
Avoidance of iliac crest bone graft (ICBG) site pain is one of the motivations for the use of bone graft substitutes in lumbar fusion. Some studies purport persistent pain problems in 30%–40% of patients after posterior ICBG. This study aimed to assess whether pain over the posterior iliac crest region, postoperatively, is more common in patients who have had graft harvested for short segment lumbar fusion than those who did not.

Contribution
The authors found high rates of persistent pain at potential harvest sites in the entire group. Independent, blinded examination at an average of 2-years follow-up showed the incidence of posterior crest pain following lumbar fusion was similar between patients who had ICBG harvesting performed and those who received rhBMP-2.

Implication
The authors point out the limitations of the study, including possibly being underpowered to detect small differences between groups. That said, the results certainly suggest the prevalence of bone graft site morbidity, attributable to harvesting for lumbar surgery, is much less than commonly supposed or is similar to pain processes induced by rhBMP-2. The use of bone graft replacements (especially bone growth factors with inflammatory or neuritis potential) to avoid a suspected high morbidity of ICBG harvesting in short segment fusion should be reconsidered.

—The Editors

Introduction

Autogenous bone graft harvested from the posterior iliac crest to achieve fusion has traditionally been the standard of care for patients undergoing lumbar arthrodesis. However, this procedure is not without problems. Numerous studies have cited the incidence of both major and minor complications associated with harvesting bone from the posterior iliac crest [1–7]. Some patients also report of residual pain from the bone graft site [4,5,8–17]. Bone graft substitutes have been introduced to obviate both the risk of complications and as a solution for the residual pain attributed to harvesting of ICBG [18–20]. However, considerable debate exists regarding the incidence of persistent pain from the iliac crest bone graft (ICBG) harvest site. Different study designs have led to a variety of reported rates [4,5,8–17]. Randomized clinical trials of lumbar fusion comparing ICBG to bone graft substitutes have shown no difference in clinical outcome measures such as the Oswestry Disability Index, Short Form-36, and rating scales for back and leg pain [9,18,19]. However, the incidence of bone graft pain was specifically sought and reported only in the ICBG group and not in the bone graft substitute group, such that the incidence of iliac crest site pain in patients who underwent fusion is unknown. The purpose of this study is to determine the incidence and severity of bone graft site pain after instrumented posterolateral lumbar fusion with and without iliac crest graft harvest.

Methods

Patients seen at the Norton Leatherman Spine Center on a routine postoperative visit who had an instrumented posterolateral fusion done at one to two levels from L1 to S1 were included in the study. Patients who had a possible or definite pseudoarthrosis based on imaging studies or had fusion extending into the thoracic spine were excluded. An independent investigator, not directly involved in the care of the patient and unaware of the type of bone graft used in the fusion, examined the patient for tenderness over the surgical site as well as the left and right posterior iliac crest. The patients were asked to rate the intensity of the pain with direct palpation over each crest on a scale of 0 to 10 with 0 being no pain and 10 being the worst pain experienced.

There is no scar over the donor graft site in these patients, because the graft is harvested through the midline lumbar incision. The fascia over the iliac crest was incised and the periosteum was lifted. A tricortical window was created using osteotomes, which was then hinged open. The outer table was removed, and cancellous bone was then harvested through the window using curettes. The defect was then packed with Gel-foam (Pfizer, New York, NY, USA). In cases where the outer table was not harvested, the defect was backfilled with a ceramic bone void filler (Pro Osteon; Interpore Cross, Irvine, CA, USA); and the tricortical window was replaced. The fascia was then closed.

After the examination, data on the source of grafting material, complications during harvest, and backfilling of the graft site defect were collected from the medical records. The patients were then classified as to whether ICBG was harvested or not. Chi-square test was used to determine any difference in the proportion of iliac crest pain between the bone graft group and no bone graft group. Correlations between body mass index, time since surgery, and the incidence and severity of bone graft site pain were also determined. For all analysis, the worst score over either iliac crest was used.

Results

One hundred and twelve patients, 72 women and 40 men with a mean age of 56.6 years (range, 16–84) were enrolled. Mean time elapsed since surgery, at the time of examination,

was 41 months (range, 6–211 months) with a median of 25 months. In 59 patients (53%), recombinant human bone morphogenetic protein-2 was used with no graft harvest. In these patients, the incidence of tenderness over either posterior iliac crest was 51% (30 of 59) (Table 1).

Iliac crest bone graft was harvested in 53 (47%) patients through the same midline incision used for lumbar fusion. The incidence of tenderness over either posterior iliac crest in these patients was 57% (30 of 53). Among the 47 patients who had iliac crest harvested from the right side, only 10 (23%) had pain over the right iliac crest. Among the six patients who had iliac crest harvested from the left side, none had pain over the left iliac crest. Thus, only 10 of 53 patients (19%) had concordant pain from the iliac crest graft harvest site.

In both groups, most patients who complained of iliac crest tenderness reported symptoms with palpation over both iliac crests. There was no statistically significant difference in the proportion of patients complaining of tenderness over both or either iliac crest between patients in which bone graft harvest was performed and those who did not (p=.543). The severity of pain on palpation was similar in patients in whom ICBG was harvested (3.8±3.2) and those in whom graft substitute was used (3.6±3.8, p=.745). Six patients who had iliac crest harvest had a backfill of the iliac crest defect using Pro Osteon. There was no difference in the incidence or severity of graft site pain between those whose crest defect was backfilled and those who did not (p=.830).

In the 10 patients with concordant bone graft site pain, the mean pain score was 4.4±2.8 (range, 1–9). No correlations between levels fused (r=−0.039, p=.683), BMI (r=0.194, p=.039), length of follow-up (r=−0.152, p=.107) (Table 2), and the incidence and severity of bone graft site pain were seen. There were no differences in the severity of iliac crest pain between patients who had a one-level versus a two-level fusion (p=.073).

Discussion

Criticisms of previous studies evaluating the incidence of pain from graft site harvest include the lack of blinding and the inadequate assessment of the contralateral iliac crest site [21]. In the present study, we have corrected these shortcomings and determined that the incidence of concordant pain from the iliac crest donor site was 9%. Previous studies looking at the incidence of iliac crest graft pain after fusion surgery included only patients known to have had iliac crest harvest [13,22]. The present study included both patients with and without iliac crest harvest who underwent instrumented posterolateral fusion and showed that even patients who did not have any iliac crest harvested, complained of pain over both iliac crests. Whether or not bone graft was actually harvested, 54% of patients complained of tenderness over the iliac crest, with the majority having tenderness over both crests rather than either one. The present study demonstrated that iliac crest graft site pain can occur even without iliac crest graft harvest and is, thus, a poor marker for graft site morbidity. This lack of specificity implies that posterior iliac crest pain cannot be directly attributable to bone graft harvest alone. Posterior iliac crest pain can be because of a myriad of causes in patients who had posterior lumbar surgery. This includes continued or new lumbar spine pathology with referred pain, postsurgical muscle scarring, radiculitis because of nerve root irritation, and inflammation.

Similar to previous studies [1,10,11,22,23], our data show that it is very difficult to delineate, with certainty, pain from the harvest site as opposed to pain primarily related to the lumbar spine. Robertson and Wray [23] found a greater incidence of graft site pain in patients who had lumbar fusion compared with those fused more proximally. Delawi et al. [22] reported similar findings in that patients whose fusion extended to L3 or more caudally had a greater incidence of graft site pain than those fused proximal to L3.

Although randomized clinical trials showed no difference in clinical outcome measures in patients undergoing lumbar fusion with ICBG compared with those receiving bone graft substitutes [9,18,19], the incidence of bone graft pain was specifically sought and reported only in the ICBG group and not in the bone graft substitute group such that the incidence of iliac crest site pain in patients who underwent fusion without ICBG harvest could not be reported. The results of the present study showed that even in patients in whom no graft was harvested from the iliac crest, the

Table 1
Summary of results

	Posterior iliac crest tenderness				
Graft	None	Left	Right	Both	Total
Graft substitute	29	4	9	17	59
Left ICBG	3	0	1	2	6
Right ICBG	20	3	10	14	47

ICBG, iliac crest bone graft.

Table 2
Mean pain score over iliac crest, 0 being no pain and 10 being the worst pain possible

Follow-up (mo)	N	Iliac graft site pain score
<12	14	3.86
13–23	32	3.53
24–35	27	2.37
36–47	10	3.90
48–59	5	4.00
60–71	8	2.88
72–83	7	3.14
84	9	1.89
Total	112	3.09

mo, months.

In patients with pain over both iliac crests, the more severe pain score was used.

incidence of tenderness over either posterior iliac crest was 51%.

There are limitations to this study. We were unable to determine the presence and degree of preoperative pain over the crest area. Also, radiographic studies to determine the presence of concomitant sacroiliac disease were not done. The study may be underpowered to detect differences between the groups as the incidence of iliac craft site tenderness in patients who had no graft harvest is unknown and thus an ad hoc power analysis could not be done.

The results of this study highlight the difficulty in differentiating pain originating from the graft site versus residual low back pain. The incidence of pain over the iliac crest was similar in patients in which iliac crest was harvested and those in which no graft was harvested.

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