A Novel Minimally-Invasive Technique for Harvesting Iliac Crest Bone Graft

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Abstract

Objective:

Graft site pain has been reported after procurement of autograft for spinal fusion surgery. We describe a minimally invasive technique of harvesting iliac crest bone graft (ICBG) and attempt to determine if patients can identify the donor site of their ICBG postoperatively.

Methods:

The graft was harvested through the same skin incision utilized for the decompression and fusion. After incising the fascia, a 7.5mm awl/tap was slightly advanced into the iliac crest. The tap was removed and the minimally invasive bone harvester was advanced into the bone until an adequate amount of cancellous bone was obtained. The fascial incision was closed in the usual manner. Postoperatively, patients were queried about which iliac crest was harvested and harvest site pain (NRS 10-point scale.)

Results:

Twenty-one patients were included in the study. A majority of the patients were female 76% (16/21), with the average age (61 years). The median follow up time was 3 months (range: 0.03-18 months). The majority of patients underwent a minimally-invasive single level transforaminal lumbar interbody fusion (TLIF) 71% (15/21). Thirty-three percent of patients, (7/21) were able to correctly identify the side of harvest with only 14% (3/21) being confident in their ability to identify the correct side. Ten percent (2/21), of patients, had mild pain (≤4/10 on NRS) at the harvest site at the time of follow up. No infections at the donor site were reported.

Conclusions:

We describe a minimally invasive procedure to harvest ICBG. The graft site pain was either non-existant or mild enough that patients were unable to accurately define their graft site.

Objectives

Objective:

A variety of allografts are available to assist with instrumented fusions. While allograft is shown to be osteoconductive, iliac crest autograft has been shown to be osteoconductive, osteogenic, and osteoinductive. However, graft site pain has been reported as a common morbidity secondary to this procedure.[1-3] In this technical report, we describe a minimally invasive tehcnqiue for the harvesting of iliac crest bone graft and attempt to determine if patients can identify the donor site of their

Figure 1

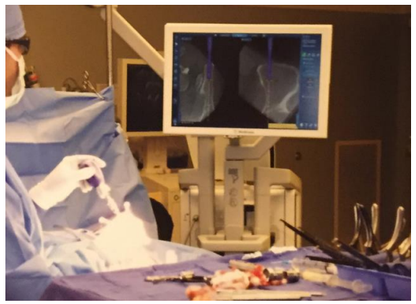

Figure 1: A navigated 7.5mm Awl/tap is advanced into the long axis of the iliac crest under image guidance. The tap was then removed and the Quickdraw bone harvester™ was passed through the dilator into cortical defect that was created in the iliac crest.

Methods

Operative Technique:

The device was most often utilized to harvest iliac crest autograft during minimally invasive posterior lumbar transforaminal interbody fusion with bilateral pedicle screw fixation surgeries. Rather than separate skin incision for each percutaneous lumbar pedicle screw, the surgeon's preferred method is to make a single skin incision on either side of the spine that allows for stab incisions through the muscle fascia for the pedicle screws and a larger fascial incision on the side of the decompression and interbody arthrodesis. Prior to performing the interbody arthrodesis portion of the operation, the surgeons harvested the iliac crest autograft in a minimally invasive fashion though a separate fascial incision, but within either the right or left skin incision. If using an implant system with flexible plastic towers attached to the pedicle screws, then the bone could be harvested either before or after placement of the screws. There was no factor that determined the side of iliac crest harvesting. Intraoperative spinal navigation was routinely used to help place all of the implants, define anatomy during the decompression and help to determine the optimal path of the Quickdraw bone Harvester™ (Figure 2).

After making a stab incision in the fascia, a navigated 7.5mm awl/tap was advanced into the iliac crest (Figure 1) with the Quickdraw outer dilator docking on the surface of the bone. The tap was then removed and the Quickdraw bone harvester™ was passed through the dilator into cortical defect that was created in the iliac crest. Using a twisting motion , the bone harvester was advanced into the bone until an adequate amount of cancellous bone was obtained. If more bone graft was needed, the bone harvester could either be passed deeper into the bone or another subcortical course could produce more graft until the necessary amount was harvested. After removal of the bone harvester and dilator, the area under the fascial incision was copiously irrigated with antibiotic solution, a piece of thrombin soaked gelatin foam was passed into the bony defect, hemostasis was achieved and the fascial incision was closed.

The cancellous iliac crest bone graft was then removed from the harvester using the company-supplied tools. For interbody arthrodesis, the cage was then firmly packed with the cancellous graft and the remaining bone was firmly packed into the interspace surrounding the cage. For posterior arthrodesis, the graft was packed into the decorticated facet joints and onto the decorticated posterolateral bone.

At varying points postoperatively, the patients were queried on whether they could tell 1) which iliac crest was harvested, and if so, 2) how much pain did it cause (NRS 10 point scale.)

Figure 2

Table 1: Results

Patient ID	Gender	Age	Procedure	Identification	NRS Pain 1-10
1	F	68	MIS L4-S1 TLIF	Incorrect	0
2	F	65	MIS L4-5 TLIF	Correct	3
3	F	46	MIS L4-5 TLIF	Correct	0
4	F	66	MIS L4-5 TLIF	Incorrect	0
5	F	70	MIS L4-5 TLIF	Incorrect	0
6	F	71	L4-5 TLIF	Incorrect	0
7	M	59	MIS L2-4 TLIF	Correct	0
8	F	76	MIS L5-S1	Incorrect	4
9	M	65	MIS L2-5 TLIF	Correct	0
10	F	44	MIS L4-5 TLIF	Correct	0
11	F	59	MIS L4-5 TLIF	Incorrect	0
12	F	44	MIS L4-5 TLIF	Correct	0
13	F	51	MIS L4-5 TLIF	Incorrect	0
14	F	51	MIS L3-4 TLIF	Incorrect	0
15	M	61	MIS L4-5 TLIF	Correct	0
16	F	49	MIS L5-S1 TLIF	Incorrect	0
17	F	67	MIS L4-5 TLIF	Incorrect	0
18	M	83	MIS L4-5 TLIF	Incorrect	0
19	F	62	MIS L4-5 PLIF	Incorrect	0
20	M	60	MIS L4-S1 TLIF	Incorrect	0
21	F	68	MIS L3-L5 TLIF	Incorrect	0

Table legend: MIS (minimally invasive surgery); TLIF (transforaminal lumbar interbody fusion); PLIF (posterior lumbar interbody fusion); NRS (numerical rating scale)

Results

Twenty-one patients were included in this study. A majority of the patients were female 76% (16/21), with an average age (61 years). The median follow up time was 3 months (range: 0.03-18 months). The majority of patients underwent a minimally-invasive single level transforaminal lumbar interbody fusion (TLIF) 71% (15/21). Thrity-three percent of patients, (7/21) were able to correctly identify the side of harvest with only 14% (3/21) being confident in their ability to identify the correct side. Ten percent (2/21), of patients, had mild pain (≤4/10 on NRS) at the harvest site at the time of follow up. No infections at the donor site were reported.

Discussion

Due to its osteoinductive, osteoconductive, and osteogenic properties, iliac crest bone graft remains the gold standard to assist with arthrodesis. However, due to concerns of donor site morbidity, most commonly donor site pain, surgeons have exceedingly switched to using synthetic and recombinant bone graft extenders in spinal arthrodesis. Along with donor site morbidity, other complications reported with iliac crest bone harvesting included prolonged surgery time, increased blood loss, longer hospital stays due to graft site pain, and decreased quality and quantity of the graft in elderly patients in whom fusion procedures are commonly performed. (Cite 4-6) However, the true severity of donor site morbidity after iliac crest harvest has remained a topic of debate with several publications reporting low long-term rates of donor site pain. (Cite 7-9)

We postulate that if patients experience a significant degree of pain associated with iliac crest harvest; they would be able to correctly identify the side of harvest. However, with the use of a minimally invasive technique and no additional skin incisions, a majority of patients were unable to correctly identify the side of iliac crest harvest. In fact, only two patients reported any pain at their donor sites with both reporting mild and improving pain at the site.

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