MORBIDITY AT BONE GRAFT DONOR SITES

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SUMMARY: A review of the medical records of 239 patients with 243 autogenous bone grafts was undertaken to document the morbidity at the donor sites. The overall major complication rate was 8.6%. Major complications included infection (2.5%), prolonged wound drainage (0.8%), large hematomas (3.3%), reoperation (3.8%), pain greater than 6 months (2.5%), sensory loss (1.2%), and unsightly scars. Minor complications (20.6%) included superficial infection, minor wound problems, temporary sensory loss, and mild or resolving pain. There was a much higher complication rate (17.9% major) if the incision used for the surgery was also the same incision used to harvest the bone graft.

KEY WORDS: Bone graft donor – Mordibity – Infection

Autogenous bone grafts have been used frequently since the early 1900s, and it is estimated that approximately 200,000 bone grafts are performed in the United States each year. Bone grafts are used in multiple clinical situations, including nonunions, acute fractures, arthrodeses, and joint reconstruction. The morbidity of taking a bone graft is generally considered to be quite low; however, no comprehensive review of donor site morbidity has been published in the orthopaedic literature. A recent study by Laurie et al in the plastic surgery literature compares the morbidity of 60 iliac donor sites to 44 rib donor sites in patients undergoing maxillofacial reconstruction. They found that incisions made directly on the iliac crest had wound problems in 21%, whereas those made superior or inferior to the crest had no problems. The mean duration of acute pain at the iliac crest was 6 weeks. Ten percent of the patients had pain for more than 2 years. Permanent sensory loss or hypesthesias in the distribution of the lateral femoral cutaneous nerve were present in 8%. They reported no fractures, infections, or reoperations.

Hernias through defects in the ilium have been reported by several authors; these were usually the result of taking large bicalvarial grafts. Fractures of the pelvis have occurred intraoperatively from direct trauma, as well as postoperatively from the stress riser effect of the defect. Pelvic instability secondary to disruption of the sacroiliac joint has been documented. Meralgia paresthetica has also been reported as well as numerous other isolated instances of donor site morbidity. Therefore, we undertook this study to document the morbidity of harvesting an autogenous bone graft.

Methods

The medical records of all patients who had autogenous bone grafts taken at the University of California, Davis, Medical Center from January 1982 through December 1983 were retrospectively reviewed. The procedures were performed by the orthopaedic, neurosurgery, and maxillofacial services. Grafts harvested locally near the
recipient site and rib grafts were excluded. Two-hundred thirty-nine patients receiving 243 bone grafts were reviewed. Several patients who had little or no follow-up after discharge from the hospital were included in the data for early complications (i.e., those occurring prior to discharge from the hospital), but not for late complications. The mean time to follow-up was 11 months (range 0-36 months).

Complications were divided into major and minor, as well as early and late. Major complications were those that caused an increase in hospital days, required additional surgery, or caused significant disability. Minor complications were those that responded to minor treatment, such as local wound care, or resolved without treatment and did not cause any permanent disability. Early complications were those that occurred in the perioperative period, usually while the patient was still hospitalized.

A chi-square statistical analysis was used to establish the significance of the difference in complication rates between the various donor sites, whether or not a drain was used, and whether the graft was harvested through the same or a different wound. A p-value of 0.05 or less was assumed to establish a significant difference.

Results

There were 153 male and 86 female patients in the sample. The mean age of the patients was 33 years (range 1-83 years). The average hospital stay was 20 days and the median stay was 11 days, with a range of 0-191 days.

The diagnosis requiring grafting was spine fracture in 54 (22.5%), scoliosis or kyphosis in 40 (16.7%), other spinal disorders in 34 (14.2%), acute fracture in 39 (16.3%), nonunion in 36 (15%), malunion in 15 (6.3%), tumor or bone loss in 13 (5.4%), and arthritis or other conditions in 8 (3.3%).

The donor sites were the posterior iliac crest in 141 (58%); the anterior iliac crest, outer table, in 65 (27%); the anterior iliac crest, inner table, in 11 (4.5%); proximal tibia in 8 (3.3%); distal radius in 4 (1.6%); the distal femur in 3 (1.2%); and other sites in 8 (3.2%).

The procedures performed were spinal fusion in 128 (54.3%), open reduction and internal fixation in 67 (27.7%), bone graft for nonunion in 17 (7%), osteotomy in 11 (4.5%), reconstruction in 10 (4.1%), and arthrodesis in 6 (2.5%). A separate incision was used to take the graft in 176 (72.4%) patients; in 76 (27.6%), the same incision used for the primary surgery was also used to harvest the bone graft. The same incision was used in 41% of spine fusions and 14% of internal fixations. In 4 spine fusions, bone graft was harvested from two sites—one through the primary incision and one through a separate incision.

A suction drain was used in 73% of the donor sites. Those patients who had a suction drain at the separate donor site lost an average of 152 ml of blood postoperatively. The drain was removed an average of 1.8 days after patients who had suction drains (9.6% major, 18.5% minor), but the difference was not significant. However, 2 of the 4 major complications in the latter group were large hematomas, which might have been obviated with a drain.
The overall major complication rate was 8.6% and the minor complication rate was 20.6%. Although some patients had more than one related complication (e.g., hematoma, drainage, infection, and reoperation), only the most significant one was counted for statistical purposes. There were 10 (4.1%) early major complications. These included 6 wound infections, 3 hematomas requiring treatment, and 1 broken drain tube that required operative removal. Eleven late major complications included 6 cases with prolonged pain, 3 with sensory loss, 1 with a wound breakdown, and 1 with osteomyelitis.

In the 176 grafts harvested through a separate incision, there were 9 (5.1%) major and 34 (19.3%) minor complications, whereas in the 67 grafts harvested through the primary incision, there were 12 (17.9%) major and 16 (23.9%) minor complications. The incidence of complications was significantly greater when the graft was removed through the same incision as the recipient site (usually a spine fusion) and the graft, the major complication rate was 20.4% and the minor complication rate was 27.8%. Of the 87 posterior iliac crest sites that had a separate incision, the major complication rate was reduced to 5.7% and the minor rate to 12.6% (p=0.008). The 65 anterior iliac-outer table donor sites had a major complication rate of 3.1% and a minor complication rate of 24.6%; however, in the 11 anterior iliac crest-inner table donor sites, the major complication rate increased to 18.2% and the minor rate to 27.3%(p=0.036, inner versus outer table). The complications were severe pain (2 cases), sensory loss (2 cases), and osteomyelitis (1 case). The major complication rate at the 26 extremity sites was 3.8%, and the minor complication rate was 19.2% (Table 1).

In 84 patients who had significant preexisting medical illness, there was a higher major complication rate (14.3%), than in those 155 patients who were healthy (5.8%) (p=0.02). Other complications from the primary surgery or from preexisting medical or traumatic conditions that could not be attributed directly to the harvesting of the bone graft occurred in 19.3% of the cases. Four patients died postoperatively from causes not directly related to the bone graft procedure.

In this group of 239 patients, there were no secondary pelvic fractures or instabilities, no herniae, and no cases of meralgia paresthetica.

Table 1
Clasification of bone graft donor site complications

<table>
<thead>
<tr>
<th>Early complications</th>
<th>Late Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major</strong></td>
<td><strong>Major</strong></td>
</tr>
<tr>
<td>Deep infection</td>
<td>Sensory loss</td>
</tr>
<tr>
<td>Prolonged wound drainage</td>
<td>Chronic severe pain</td>
</tr>
<tr>
<td>Large hematoma</td>
<td>Chronic infection</td>
</tr>
<tr>
<td>Reoperation</td>
<td>Unsightly scar</td>
</tr>
<tr>
<td></td>
<td>Large bony defect</td>
</tr>
<tr>
<td><strong>Minor</strong></td>
<td><strong>Minor</strong></td>
</tr>
<tr>
<td>Hematoma</td>
<td>Chronic mild pain</td>
</tr>
<tr>
<td>Wound drainage</td>
<td>Superficial infection</td>
</tr>
<tr>
<td>Severe pain</td>
<td>Delayed wound healing</td>
</tr>
<tr>
<td>Temporary sensory loss</td>
<td>Minor wound problems</td>
</tr>
</tbody>
</table>
Discussion

The morbidity of harvesting a bone graft is low but significant. The complications are similar to those encountered in other types of clean orthopaedic surgery; however, the severity of the complications is not as great as in other procedures.

The most significant difference in complication rates was between those patients who had the same incision and those who had a separate incision used to harvest the graft. The posterior iliac crest also had a higher complication rate, as it is the site that was most frequently used when the same incision was utilized. This occurred most often in spine surgery. A higher complication rate was found here because complications that occurred at the primary surgical site, such as hematoma, wound drainage, and infection, often spread to the donor site.

More complications were found when a drain was used; this is to be expected, as suction drains were used less often when there was a dry, small wound that has less risk of developing a hematoma, wound breakdown, drainage, or infection. A suction drain should be used if significant raw bone surfaces are exposed. In a case-controlled series, Waugh and Stinchfield found that suction drainage decreased the size of a hematoma and the risk of infection.13

Damage to the lateral femoral cutaneous nerve is a well-known complication of taking an anterior iliac crest bone graft. Harvesting from the inner table may increase this risk because of the position of the nerve. Two of the 11 patients who had a graft taken from the inner table and 1 of 65 who had it taken from the outer table had sensory loss in the distribution of the lateral femoral cutaneous nerve. To protect this nerve, the incision should be inferior to the iliac crest and not extend anterior to the anterior-superior iliac spine. Caution should be exercised if the graft is harvested from the inner table.

Chronic pain is probably an unavoidable result in a small number of patients. The factors involved in reducing chronic pain are not well known and may not be under the control of the surgeon. Hernias are avoided by not taking extremely large bicortical grafts. Fractures and pelvic instability are avoided by careful surgical technique.

This study documents that there is a definite morbidity to harvesting a bone graft. Some of the complications can be avoided by better surgical technique; however, many are unavoidable. To avoid complications altogether, it may be worthwhile to pursue the use of other materials, such as synthetic bone graft or banked allograft bone, in place of autogenous grafts, if they can be proven to be as effective.