Original

The iliac crest spacer

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Abstract

A prosthesis made of alumina ceramics was designed to prevent iliac crest deformity after full-thickness bone was taken for grafting. It fitted well in most cases and proved to have great benefits. Among 61 patients in whom the prosthesis was used, it became dislocated in one. Further, slight sinking and separation of the reapproximated trunk and gluteal muscles were seen in one case each.

Key words: bone transplantation, ilium, spine surgery, ceramics, prosthesis, implants

Introduction

In routine orthopedic surgery practice, we frequently have to remove the iliac bone for grafting. In the case of cancellous bone grafting, the iliac crest can be left as is.^{1,2,4,6} However, with inlay bone grafts for the treatment of pseudoarthrosis of a long bone or for spinal interbody fusion, tough bone pieces with the iliac crest should be used. In such instances, patients occasionally complain of discomfort or even pain because of deformity of the donor site.¹ The anterior superior iliac spine is raised like a spur beneath the skin, and the middle portion of the crest becomes hollow. The deformity can occasionally be detected even under the patient's clothing, and the belt doesn't fit well in some cases. At the same time, discomfort at the iliac donor site after spine

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surgery is sometimes as unbearable as the preoperative problems of the cervical or lumbar spine.

In order to minimize such difficulties, the authors have developed an iliac crest spacer to preserve the contour of the iliac crest. The prosthesis is made of alumina ceramics (Bioceram #) because of their chemical stability and inactivity in the body fluid.

Materials and methods

Design of the prosthesis

The prosthesis was designed to fit either side of the body and for both men and women. As a standard radius of the anterior half of the iliac crest, 90 mm was adopted. The width and thickness were 10 mm and 7 mm, respectively. Small projections were designed on both ends of the prosthesis to be secured to the iliac crest. Two small holes were made on both ends for suture materials for this purpose. The length of the prosthesis ranged from 30 mm to 65 mm and was increased by 5-mm increments (Fig. 1 A, B).

Operative procedure

The origins of the gluteal and trunk muscles as well as the periosteum were incised along the same line as the skin incision. After the full-thickness iliac bone graft was taken, small steps on which to place both ends of the prosthesis were made. Then, small notches were carved on both cut ends of the iliac crest with a sharp rongeur (Fig. 2 A).

The appropriate prosthesis was selected and snapped into the small notches of the iliac crest with weak impact. Strong, nonabsorbable sutures were passed through both holes of the prosthesis and drill holes of the iliac bone, and the prosthesis was secured in situ (Fig. 2 B). The origins of the gluteal and trunk muscles as well as the aponeurosis were approximated together over the spacer with strong interrupted sutures (Fig. 2 C). Care was (and should be) taken not to anchor the muscle to the prosthesis, which would lead to dislocation of the prosthesis.

In surgery for chronic osteomyelitis, the iliac bone was taken and the prosthesis inserted prior to the intervention at the primary focus to prevent contamination.

Clinical materials

We have used these prosthesis in 61 patients since the beginning of 1983. Among then, 49 were cases of spinal interbody fusion (cervical 24, thoracic 4 and lumbosacral 21), 10 were of pseudoarthrosis of long bones with or without chronic osteomyelitis

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Fig. 1 Iliac crest spacer.

Radius, width and thickness were 90 mm, 10 mm and 7 mm, respectively. The length ranged from 30 mm to 65 mm and was increased by 5-mm increments.

and two were of reconstruction of the elbow after removal of the total elbow joint of the hinge type. The patients ranged in age from 17 to 74, averaging 47. The follow-up periods were from eleven months to 3.5 years, with an average of 19.3 months.

Results

The preservation of the contour of the iliac crest was satisfactory in 58 of the 61 patients. No severe discomfort or local pain was detected. In many cases, new bone formation was observed in postoperative x-rays (Fig. 3). In patients with inter-body fusion of the lumbar spine, the severe pain at the donor site was decreased in

Fig. 2 Operative procedure.

- A. Small steps and notches were cut on both ends of the crest on which to place prosthesis.
- B. The prosthesis was secured with tough nonabsorbable sutures through the drill holes.
- C. The origins of the gluteal and trunk muscles were approximated together by strong interrupted sutures.

early ambulation, and postoperative lumbar braces were adapted satisfactorily without discomfort. No fracture of the prosthesis was noted during the follow-up periods.

In one patient, dislocation of the prosthesis was observed after the fracture of the anterior part of the iliac bone because the iliac graft had been taken too close to the base of the anterior superior iliac spine. Two others showed sinking of the prosthesis and soft tissue retraction, resulting in slight depression of the donor site. The sinking of the prosthesis was due to the steps' being too small, and the soft tissue retraction was considered to have arisen from inadequate approximation of the gluteal and trunk muscles over the spacer.

One patient with a giant cell tumor of the cervical spine, whose right iliac bone had been taken in the first operation resulting in deformity of the iliac crest, underwent surgery again because of local recurrence of the tumor. At the second operation, the iliac crest spacer was used on the opposite donor site, and the patient recognized great benefit from the prosthesis.

Fig. 3 6 months after the operation.
New bone formation (arrow).
The prosthesis was stable, and the contour of the
iliac crest was preserved satisfactorily.

Discussion

Several problems are known to arise commonly after taking a full-thickness iliac graft.^{1,3,5} Among them are deformity of the iliac crest, local pain, fracture of the anterior superior iliac spine and injury of the lateral femoral cutaneous and/or other cutaneous nerves. Fracture of the anterior iliac spine and nerve injuries could be avoided by careful surgical techniques. However, when a full-thickness graft with the iliac crest is taken, deformity of the iliac crest is inevitable. This disfigurement and the accompanying discomfort can be unbearable for some patients.

Several methods have been reported for removing a sufficient portion of the iliac

bone and preserving the contour of the crest when only cancellous bone or bicortical bone without the iliac crest was required.^{1,2,4,6} However, as mentioned above, tough iliac bone with the crest is absolute necessary for rigid spinal interbody fusion or inlay graft for pseudoarthrosis of a long bone.

We had been reconstructing the defect of the iliac crest with Kiel bone or resected rib. However, adaptation was not always satisfactory, and ribs were not always available.

The iliac crest spacers made with alumina ceramics were easy to use and fit well in all cases. Just after the operation, the prosthesis was fixed with tough gluteal and trunk muscles, and later, the newly formed bone began to surround and engulf the prosthesis, making it a part of the iliac bone.

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