Evaluation of Morbidity Associated with Iliac Crest Harvest for Alveolar Cleft Bone Grafting

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Received: 22 February 2011 / Accepted: 19 May 2011 / Published online: 9 June 2011
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Abstract

Purpose To evaluate the morbidity associated with iliac crest harvest for alveolar cleft grafting.

Patients and Methods 18 patients treated for alveolar clefts in oral and maxillofacial surgery unit at SRM dental college and Hospital were included. Patients were interviewed to fill a questionnaire on postoperative recovery. The donor site was evaluated for the following factors: Pain, neuropraxia, abnormal gait and scar evaluation.

Results The scars were evaluated, according to the satisfactory score—eleven patients (61.11%) had a score 2, Four patients (22.22%) had score 3 and three patients (16.66%) had score 1. The pain score after the first week—thirteen patients (72.22%) had score 2, five patients had score 3 (27.77%). After the first month—four patients (22.22%), had score 2, twelve patients (66.66%), had score 1 and Two patients (11.11%) had score 0. And when evaluated after 3 months, two patients (11.11%), had score 1 and sixteen patients (88.88%) had score 0. The gait was examined by asking the patient to walk and evaluated; in the first week, all eighteen patients had abnormality in gait; in the first month, five patients had abnormality in gait (27.77%), and in the third month, none of the patients had any abnormality in gait.

Conclusions Harvesting cancellous bone from anterior iliac crest in young patients is well tolerated, allows early resumption of normal activities, has no effect on growth, has minimal morbidity and a reasonable aesthetic outcome.

Keywords Secondary alveolar bone grafting · Cleft alveolus · Anterior superioriliac spine (ASIS)

Introduction

Osseous reconstruction of the alveolar crest is an accepted practice in overall management of cleft patients, with recognised benefits being (1) obliteration of oronasal fistula, (2) cross arch stability, (3) periodontal support to the teeth adjacent to the cleft, (4) allowance for the orthodontic alignment of the teeth, (5) improved alar base support [1–3].

Secondary bone grafting of a cleft alveolus is widely accepted [4], but the optimal donor site remains open to debate. Recognised sites include ilium, calvarium [5] tibia [6] rib [7] and mandible [8]. Bone from the ilium may be harvested by traditional open approach [9], or by a minimal invasive operation. It has been described as being the GOLD STANDARD for secondary grafting [10] with an acceptable degree of post-operative discomfort [11]. Much of the data regarding morbidity following harvesting from the iliac crest has been published in orthopaedic literature, and complication rates of over 15% have been reported [12].

Specific complications exist for each donor site. In one study, harvesting of rib was associated with pleural tear requiring a post-operative chest drain in 9% of cases [13]. In 75 consecutive cases of graft taken from proximal tibia, two patients sustained a post-operative tibial fracture [14]. The purpose of the study was to post operatively evaluate the morbidity associated with iliac crest bone harvesting for alveolar cleft grafting.

Patients and Methods

Eighteen consecutive patients were included in this study, who underwent secondary alveolar cleft grafting in our

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department of oral and maxillofacial surgery between June 2008 to July 2009. 12 Male and 6 female patients with an average age of 10 years and 11 months (range: 9–13 years 6 months). All the patients had unilateral cleft defects. In that 12 Rt side and 6 Lt side alveolar clefts and undergone harvesting from Rt side anterior iliac crest under general anesthesia.

Surgical Technique

All surgeries were performed by a single surgeon with a surgery trainee. The bone was harvested with the patient supine thereby simultaneous preparation of the recipient site. Prophylactic antibiotics (Amoxy clav with metronidazole) were given intravenously on induction of general anesthesia and none of these patients were allergic to penicillin. A sandbag is placed under the ipsilateral buttock, and the standard site preparation was performed. A marking pen was used to mark the iliac crest, and the anterior superior iliac spine (ASIS) was located (Fig. 1). The area of the incision was infiltrated with local anesthesia (Lig 2%) containing adrenaline (1:200000). The non-scalpel bearing had been used to displace the skin medially, placing the incision lateral to the iliac crest. The incision was made through the displaced skin directly over the crest, the limits of the incision not extending to within 1 cm of the ASIS and tubercle posteriorly. Gentle blunt dissection was continued down through the subcutaneous tissue to the insertion of the oblique fascia on the crest. The fascia and the underlying periosteum were sharply incised, exposing a segment of the iliac crest (Fig. 2). The bone was harvested between the ASIS and the iliac tubercle; here, the ilium was at its greatest width, facilitating abundant cancellous bone harvesting. A laterally based osteoplastic trapdoor flap was outlined (Fig. 3) with a scalpel, making

anterior and posterior stop cuts, which were joined with a crestal sagittal cut with a small osteotome. A 5 mm osteotome was used to elevate the medial aspect of the cap; the osteotome was directed laterally to minimise the risk of peritoneal penetration. Reflection or dissection of the muscle medially was kept to a minimum medially and the muscle and the periosteum were left intact on the lateral aspect of the iliac crest. The flap was hinged laterally, the outer most layer of the cancellous bone was discarded because of the presence of chondrocytes, and the cancellous bone as harvested with a hand gouge (Fig. 4) and the spoon curettes and little cortical bone was taken from the crest. Before closure thorough irrigation was done and meticulous haemostasis obtained. The osteoplastic flap was replaced and secured with 2/0 resorbable suture. A two layered closure was performed to approximate the fascia and subcutaneous tissues using 3/0 Polyglactin 910. Bupivacaine 5 ml were infiltrated under the fascia, and a final layer of simple interrupted suture using 5/0

Fig. 2 A segment of iliac crest exposed

Fig. 1 Marking done on the iliac crest

Fig. 3 Laterally placed osteoplastic trapdoor outlined

Fig. 4 Cancellous bone harvested

Fig. 5 Closure attained with 5-0 polypropylene

polypropylene (Fig. 5) was used to approximate the skin and compression bandages were placed and secured.

Postoperative Care

Patients were encouraged to mobilise on the first post-operative day with support from the nursing staff. Post-operative analgesic with Tramadol 100 mg were given twice a day orally. Patients were discharged as soon as they were comfortable. We gave advice of oral hygiene and patients were recommended to abstain from school for 2 weeks and to avoid sports activity for 2 months.

Results

The study group comprised of 18 patients: 12 males (66.66%) and 6 females (33.33%). 12 cases had Rt

(66.66%) and six cases had Lt cleft (33.33%) alveolus. Age-at the time of operation ranged between 9 and 13 years 6 months (avg 10 years 11 months). All the cases, cortico cancellous bone was harvested from Rt anterior iliac crest; the amount of the bone harvested was sufficient in all cases. Follow up was done for 3 months. The number of days patients spent in the hospital were between 2 and 3 days.

The morbidity of the anterior iliac crest as a donor site for bone grafting was evaluated based on the scar formation [satisfactory score (1–3) where; 1: good, 2: fair, 3: bad]. The scar evaluation and scar hypertrophy was assessed at the third month after the surgery. Pain was measured and analysed using visual analogue scale from the patient [(VAS) 0–3 where; 0: No pain, 1: mild pain, 2: moderate pain, 3: severe pain]. Gait disturbance (assessed by asking the patient to walk), the pain and gait evaluation was done in the first week, first month and third month. Other complications like neuropraxia were not seen in any of the patients; wound dehiscence was seen only in one patient (5.55%), which was due to infection and subsided after the administration of antibiotics; and scar hypertrophy was seen in two patients (11.11%).

The pain score after the first week—thirteen patients (72.22%) had score 2, five patients had score 3 (27.77%). After the first month—four patients (22.22%), had score 2, twelve patients (66.66%), had score 1 and two patients (11.11%) had score 0. And when evaluated after 3 months, two patients (11.11%), had score 1 and sixteen patients (88.88%) (Chart 1, 2, 3) had score 0. The gait was examined by asking the patient to walk and evaluated; in the first week, all eighteen patients had abnormality in gait; in the first month, five patients had abnormality in gait (27.77%), and in the third month, none of the patients had any abnormality in gait (Chart 4). The scars were evaluated, according to the satisfactory score—eleven patients (61.11%) had a score 2, four patients (22.22%) had score 3 and three patients (16.66%) had score 1 (Chart 5).

Chart 1 Pain evaluation after 1st week

Chart 2 Pain evaluation after 1st month

Chart 3 Pain evaluation after 3rd month

Chart 4 Gait evaluation

Discussion

The use of autogenous bone from the iliac crest for bone grafting in cleft alveolus has been well established, reliable and uncomplicated technique in oral and maxillofacial surgeries for many years [15, 16]. Complications at the donor site, however, are common. They include pain, bleeding, neuropraxia, gait disturbance.

The pelvis offers cortical, cancellous and corticocancellous bone in sufficient volume for all indications in the

Chart 5 Primary scar evaluation after 3 months

maxillofacial field. In oral and maxillofacial surgery the anterior approach to the iliac crest is more widely used than the posterior approach [17]. In adult patients, particularly in those cases, in which large volumes of bone are required posterior approach is preferred [12]. The disadvantages are slightly prolonged operation time, the necessity to change the position of the patient.

A number of other donor sites for cancellous bone have been suggested as alternatives to the iliac crest in children, but they have not gained wide acceptance because the bone quality was poor, the quantity was insufficient, or they caused associated morbidity [5–7]. Recently, there has been a surge in the popularity of the proximal tibia as a donor site for SABG grafts; reported reasons include ease of access, speed of performing operation, shorter duration of stay, less analgesic requirements and less blood loss [18].

The results of various reported studies must be viewed critically. Kalk et al. [19] concluded from a retrospective study of 65 patients that donor site morbidity was low, although 12.3% of patients complained of persisting pain and 9.2% complained of sensory disturbances. In studies rating long term morbidity after the harvesting of bone grafts from anterior iliac crest as insignificant or non-existent, many, it seems, have used debatable methods. In a study by Beirne et al. [20], for example, only scarring and sensory disturbances were evaluated, without any explicit enquiry about persisting pain.

In summary, after reviewing the published studies, we must conclude that the harvesting of bone grafts from the anterior iliac crest is accompanied by some risk of complication. In particular, long term morbidity with donor site pain, sensory disturbances, and functional disorders like gait, should be taken into consideration. Donor site morbidity after the harvesting of bone grafts from the anterior iliac crest was low for the patients evaluated in our study. There was only 11.11% (2 pts after 3 months) had persisting pain in the donor site. Four patients had a bad and unsatisfactory scar (22.22%) after 3 months, but

neuropraxia and gait disturbance were not present in any of our cases.

The problem of donor site morbidity after the harvesting of autologous bone grafts may in the future be reduced by modified or improved harvesting techniques or the use of other donor sites. Despite known donor site morbidity in the harvesting of bone grafts from the anterior iliac crest, patients are, almost without exception, pleased with the overall result of the procedure. A long term, prospective, multicentric study could provide useful knowledge and up to date information concerning donor site morbidity.

Conclusion

Compared with recent reports, the morbidity after iliac crest harvesting was found to be moderate to low. Although enormous efforts have been made in bone regeneration therapy, autologous bone grafting is still a necessary and frequently used procedure. Nevertheless, donor site morbidity after the harvesting of bone grafts from the anterior iliac crest remains a problem that should be openly discussed with patients, when a treatment plan is being devised.

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