

# MORBIDITY ASSOCIATED WITH HARVESTING OF ILIAC CREST BONE GRAFT FOR MAXILLOFACIAL RECONSTRUCTION

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## ABSTRACT

**Objective:** To evaluate the post-operative morbidity associated with harvesting of iliac crest bone graft.

**Materials and Methods:** This study was conducted in the Department of Oral and Maxillofacial Surgery, King Edward Medical University/Mayo Hospital, Lahore, from March 2010 to March 2012; and at the Department of Oral & Maxillofacial Surgery, Fatima Memorial Hospital Lahore, from June 2012 to June 2017. After approval of the study was obtained from Institutional Review Board (IRB), informed consent of the patients was taken on customized proforma. A total of 36 patients were subjected to reconstruction of maxillofacial bony defects with 36 bone grafts harvested from anterior iliac crest; 20 (55.56%) were male and 16 (44.44%) were female patients with mean age of  $23 \pm 10.31$  years (range 11-52 years).

**Results:** At 3 months postoperatively, the pain score was noted as: 02 patients (5.5%) had score 1 and 34 patients (94.44%) had score 0. Only one patient (2.77%) had abnormality in gait. The donor site scars were assessed according to the patients' satisfactory score whereby 24 patients (66.66%) had a score of 2; 04 patients (11.11%) had score 3 and 08 patients (22.22%) had score 1. While scar hypertrophy was seen in 2 patients (11.11%), wound dehiscence was seen in 1 patient (5.55%) only.

**Conclusion:** Harvesting of bone graft from the anterior iliac crest is a safe and predictable surgical procedure for reconstruction of defects of oral and maxillofacial region with high patient tolerance, low morbidity and fewer complications.

**Keywords:** Morbidity, iliac crest, bone graft, maxillofacial reconstruction

## INTRODUCTION

Autogenous bone grafting remains the mainstay and gold standard for the reconstruction of the bony defects of the maxillofacial region.<sup>1-4</sup> Free, non-vascularized bone grafts have been successfully harvested from intraoral as well as extraoral donor sites but

for reconstruction of larger defects, extraoral sites are preferably required.<sup>5-11</sup> Harvesting of bone graft from anterior iliac crest provides significant advantages of ease of access and the ability to take large quantity of bony graft for reconstruction.<sup>7</sup>

Non-vascularized bony grafts from anterior iliac crest are reported to create better contouring and bulk of bone for esthetics and future implant insertion, and could be the preferred option for secondary reconstruction of defects measuring not more than 9 cm.<sup>12</sup>

Ample amount of bone can be harvested from

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the pelvis, whether cortical, cancellous and/or corticocancellous, for all reconstructive indications of maxillofacial region. In oral & maxillofacial surgical practice, the commonly used approach to harvest the iliac crest graft is anterior approach, while some surgeons prefer the posterior approach which has disadvantages of prolonged operating time and the necessity of changing the patient's position.<sup>13,14</sup>

The traditional open surgical approach may be used to harvest bone from the ilium.<sup>15</sup> The medial and lateral approaches may cause morbidity which have been discussed in the literature.<sup>16</sup> Though several modifications have been proposed to the surgical technique to harvest bone from ilium.<sup>7</sup>

The purpose of this study was to evaluate post-operative morbidity associated with harvesting of iliac crest bone graft while most of the relevant data reporting on morbidity has been found in orthopedic literature with a rate of complications cited around 15%.<sup>14</sup> Very scarce local data is available in this regard. This study may contribute to provide local trend of morbidity associated with harvesting of iliac crest bone graft.

## MATERIALS AND METHODS

The approval of the study was obtained from Institutional Review Board (IRB) and patients meeting the inclusion criteria were selected. Informed consent of the patients was taken on customized proforma. A structured proforma was used to record the patient's demographic data like patient's name, age and gender, and data relevant to this study which was carried out in the Oral and Maxillofacial Surgery Department, King Edward Medical University/Mayo Hospital Lahore, from March 2010 to March 2012, and at the Oral and Maxillofacial Surgery Department, Fatima Memorial Hospital (FMH) Lahore, from June 2012 to June 2017. A total of 36 patients were subjected to reconstruction of maxillofacial bony defects with 36 bone grafts harvested from anterior iliac crest. 55.56% patients were male and 44.44% were females having mean age of 23±10.31 years (range 11-52 years) as shown in Table 1. Patients with maxillofacial bony defects of up to 5cm were included while patients with primary bony pathology or those with previously failed grafts were excluded from the study.

In 13 patients, the defect was secondary to on-

cological resection of oral pathological lesions of the jaws; 7 patients had defects due to facial firearm injury; in 6 patients, iliac crest graft was used for alveolar bone grafting; 4 patients required grafting for alveolar ridge augmentation to place dental implants; 3 patients had the defect after surgical debridement due to osteomyelitis of the mandible and in 3 patients, grafting was undertaken for post-traumatic bony defects of the jaws.

The iliac crest bone harvesting technique and surgical procedure was explained and thoroughly discussed with the patients pre-operatively. An informed consent was signed by the patients or their guardians and countersigned by the surgeon undertaking the procedure.

General anesthesia (GA) was used to perform surgery by a single surgeon with nasotracheal intubation and patients were placed supine. Betadine solution was used to prepare the skin of the surgical sites and isolation achieved with sterile drapes. Incision was marked and infiltrated with 2% xylocaine containing epinephrine 1:100,000 into the subcutaneous tissue planes. Incision was given 1 centimeter posterior to the anterior superior iliac spine and also 1 cm lateral to the iliac crest height. The incision length ranged from 2 to 4.5 cm keeping in view the required amount of bony graft. A mid-crestal periosteal incision was given one centimeter posterior to the anterior superior iliac spine after performing the scalpel dissection through Scarpa's fascia and then avoided both gluteal and iliopsoas musculature. In subperiosteal plane, the external oblique and iliacus muscles were reflected. A medial trap door approach was used in all patients to harvest the required bone graft in all patients. Removal of bone graft was performed between the iliac tubercle and 1 centimeter posteriorly to the anterior iliac spine. A block of corticocancellous bone was outlined along the anterior, posterior and crestal aspects by use of the surgical drill while inferiorly osteotomies were completed by malletting with the help of a curved osteotome. Harvested bone graft was kept in normal saline and osseous defect perimeter was rounded off with bone file. Hemostasis was achieved and assessed for any bleeding before wound closure. Surgical closure was achieved in layers with resorbable sutures. After suturing of the muscle-periosteal layer, the site was again infiltrated with Bupivacaine and passive drains were used to avoid any hematoma formation. Skin

was closed with non-resorbable nylon sutures. For next 48 hours, a pressure-dressing was applied and kept over the hip.

**Postoperative Care:** The nursing staff was instructed to encourage the patients to mobilize them on the first postoperative day with support. Postoperative analgesia was provided orally twice a day with 100 mg of Tramadol. Patients were discharged when they reported they were comfortable with it.

Pain was measured and analyzed using Visual analogue scale (VAS) 0-3 where 0: no pain, 1: mild pain, 2: moderate pain and 3: severe pain.

The gait was assessed by requesting the patient to walk and any abnormality in gait was noted on postoperative visits. Patients were assessed in 1st week postoperatively to check for pain and gait evaluation and then after 1<sup>st</sup> and 3<sup>rd</sup> months.

The donor site scars were assessed according to the patients' satisfactory score and scar formation, whereby 1: good, 2: fair, 3: bad. It was checked at the 3rd month postoperatively.

All patients maintained an average of 9 months follow up postoperatively (range 6-12 months) for assessment of the morbidity related to the anterior iliac crest harvesting, based on postoperative pain, wound dehiscence, gait disturbance, paresthesia of lateral cutaneous nerve and scar formation.

The collected data was entered into SPSS version 25 and analyzed. The variables of demography (age and sex) were presented as frequency giving mean and standard deviation of the age of the subjects. Any association between variables was tested for significance by applying the Chi-square test. A p-value of 0.05 or less was taken as significant.

## RESULTS

A total of 36 patients were evaluated for donor site morbidity associated with iliac crest bone graft harvesting, based on postoperative pain, wound dehiscence, gait disturbance, paresthesia of lateral cutaneous nerve and scar formation.

The pain score at first week postoperatively was such that 22 patients (61.11%) had score 2, 08 patients had score 3 (22.33%) and 06 patients had score 1 (16.66%). After the first month, 04 patients (11.11%) had score 2; 20 patients (55.55%) had score 1 and 12 (33.33%) patients had score 0. At 3 months

postoperatively, 02 (5.5%) patients had score 1 and 34 (94.44%) patients had score 0 (Table 2).

The gait was assessed by requesting the patient to walk and any abnormality in gait was noted on postoperative visits. At first week follow up, 30 (83.3%) patients had mild abnormality in gait, while at first month follow up, 07 (19.4%) patients showed gait abnormality.

The donor site scars were assessed according to the patients' satisfactory score. After 3 months post-operatively, 24 (66.6%) patients had score 2; 04 (11.1%) patients had score 3 and 08 (22.2%) patients had score 1. Scar hypertrophy was observed in 2 (5.5%) patients only (Table 2).

Wound dehiscence was noted in 1 (2.7%) patient only at 1 week postoperatively, which might be secondary to infection and settled with use of appropriate antibiotics over two weeks. We did not observe any other complication like neuropraxia in any patient.

**Table: 1 Gender Distribution**

<b>Male</b>	20	55.56%
<b>Female</b>	16	44.44%
<b>Total</b>	36	100%

## DISCUSSION

The usage of autogenous bone grafting from anterior iliac crest has been cited in the literature as a proven "gold standard" for alveolar bone grafting and bony reconstruction of maxillofacial region. The ilium provides a well-suitable site for harvesting bone graft as it has ample cancellous bone and has osteoconductive as well as osteoinductive properties. However, several mild to moderate complications have been reported with bone harvesting from ilium, including but not limited to post-op infection, inguinal and liver hernia, lateral cutaneous nerve injury, gait disturbance, tear in peritoneum, sensory loss and paresthesia, and rarer occurrence of iliac abscess. Associated complications could occur based on graft harvesting technique.<sup>17,18</sup> Anterior approach using medial trap door technique by dissecting the gluteus medius and tensor fascialata has been tolerated well by the patients with low rate of morbidity and fewer complications.

**Table: 2 Morbidity Associated with Harvesting of Iliac Crest Bone Graft**

At 1st week Postoperative	At 3 months Postoperative			
Wound Dehiscence	Pain	Gait disturbance	Paresthesia of lateral cutaneous nerve	Scar hypertrophy
2.7%(n=1)	5.5%(n=2) scored 1	2.7%(n=1)	NIL	5.5%(n=2)

Stam et al described their experience of iliac crest harvesting for orbital floor reconstruction. 194.6% of their patients complained of pain for up to 2 weeks which subsided over the period of few weeks thereafter. In the current study 5.5% of patients complained of mild pain and this is in line with the result of the study conducted by Stam et al.

Calori et al presented results of iliac crest bone harvesting used for non-union of long bones.<sup>20</sup> 14.28% of patients experienced pain (n=35) after one year in a group of standardized iliac crest bone grafting and this rate is quite higher as compared to the pain experienced by patients in the current study.

Schaaf et al described pain in 4% (n=75) patients as a long-term morbidity but there is no such finding in current study associated with pain.<sup>21</sup> They also mentioned sensory disturbance in 2.7% of patients which persisted as a long-term morbidity but we noted no sensory deficit in any of the patients.

Matsa S. et al reported gait abnormality in 27.7% of patients at one month while no patient had any gait abnormality after three months (n=18).<sup>22</sup> In the current study, only one patient (2.77%) reported gait disturbance after three months of surgery which also resolved in the next three weeks' time. The results of gait disturbance showed a very subtle difference as our sample size was larger than that of Matsa S. et al's study.<sup>22</sup>

When assessed for the patients' level of satisfaction about donor site scar, most of the patients (88.8%) were satisfied with the donor site scars. Our results corresponded well with those of Coventry et al's study.<sup>23</sup>

As far as sensory disturbance or numbness of lateral cutaneous nerve is concerned, no patient was noted in the current study with paresthesia or numbness of the donor site on three months follow up visits. When it was compared with other studies, the reported sensory disturbances were found to be in 22.7% of patients.<sup>21</sup>

Chronic pain, bowel herniation, delayed iliac abscess, cosmetic defects and fracture of the iliac crest are some of the unusual and rare complications reported in the literature.<sup>23-25</sup> None of these were observed in the cases under study in the current research.

## CONCLUSION

Bone graft harvesting from the anterior iliac crest is a safer and predictable surgical approach for reconstruction of defects of oral and maxillofacial region with high patient tolerance, low morbidity and fewer complications.

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