



EVALUATION BETWEEN THE MINIMALLY INVASIVE ILIAC CREST AND TREPHINE BONE HARVESTING METHOD FOR BONE HARVESTING

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ABSTRACT

Background and Aim: Current advances in theory and techniques of bone grafting have been the direct result of extensive research and clinical application. This study details the comparison between the

Trephine method of iliac crest bone graft harvesting and Minimally invasive method of iliac crest graft harvesting. The differences in surgical technique, the morbidity associated with the two methods have been compared to give an in-depth understanding of the method of harvesting the graft.

Materials & Methods: A total of 40 patients between the age ranges of 10 to 20 years were included in the study. The included patients were divided into two groups of 20 patients each. In group A the cortico-cancellous bone harvested from iliac crest by Trephine method. The group B had cortico-cancellous bone harvested by minimally invasive method.

Results: Even within the both groups pain experience became better as the days progressed and at the time of discharge all patients were pain free. The day wise improvement in gait was found to be significant for each procedure. It was found that minimally invasive method group mobilized early and returned to normal gait when compared to trephine group. There was no significant difference in scar perception or contour deficit at the end of six months.

Conclusion & Discussion: Morbidity of the iliac crest donor site in both groups was low. Minimally invasive method of bone harvesting of the iliac crest was found to have less morbidity even when compared to the trephine method of bone harvesting of the iliac crest. Minimally invasive method resulted in small scar in early healing phase, but patients perception of acceptability of scar by both methods were good.

KEYWORDS : Alveolar Crest, Bone Harvest, Grafting, Invasive Method, Trephine Method

INTRODUCTION

With the emergence of new reconstruction techniques, the demand for bone grafting, for repair or as a replacement material or extension of the native anatomy, has increased during the past decade. The quality and quantity of bone graft material needed is largely dictated by the recipient site. Harvesting of autogenous bone graft is often accompanied by significant morbidity at the donor site.^{1,2}

To harvest bone graft, Saleh³ recommended using a Meunier trephine, originally intended for bicortical iliac bone biopsies, which resulted in less substantial surgical trauma and postoperative pain. Others have also used a trephine to harvest bone specimens for the purposes of biopsy and bone graft with minimal morbidity.⁴

Because of its accessibility and the quantity of bone available, the ilium has become a favored donor site for Corticocancellous and Marrow grafting material. Several surgical approaches to the ilium as a source of bone grafts are described.⁵ More recently, the development of Microsurgical techniques with Vascular Reanastomosis has enabled grafts to be placed that remain vital and serve as a living transplant. The Bone grafts specific purpose is to induce osteogenesis and to provide a matrix on which ossification can take place, creating new bone.⁶

The iliac crest is considered to be the "gold standard" of donor sites. However, the main disadvantage with iliac crest harvest is reported to be the discomfort that results in delayed

ambulation and prolonged hospitalization.⁷ This postoperative morbidity has led surgeons to use cranial bone, the mandibular symphysis, allogenic bone, and alloplastic materials to lessen the morbidity associated with graft harvest. Current advances in theory and techniques of bone grafting have been the direct result of extensive research and clinical application.⁸ This study details the comparison between the Trephine method of iliac crest bone graft harvesting and Minimally invasive method of iliac crest graft harvesting. The differences in surgical technique, the morbidity associated with the two methods have been compared to give an in-depth understanding of the method of harvesting the graft.

MATERIALS & METHODS

The present study was undertaken in the department of oral and maxillofacial surgery with the sole objective of comparing the morbidity associated with the iliac crest donor site from minimally invasive method and trephine method. A total of 40 patients between the age ranges of 10 to 20 years were included in the study.

Patient who required undergoing secondary alveolar bone grafting from iliac crest as donor site were included in the study. Patients with unstable mental condition and patients whose parents did not give consent to the examination were excluded from the study. The included patients were worked up and evaluated pre operatively for the surgery. The included patients were divided into two groups of 20 patients each. In group A the cortico-cancellous bone harvested from iliac crest

by Trepine method. The group B had cortico-cancellous bone harvested by Minimally invasive method.

All the patients planned to undergo surgery were medicated pre operatively with antibiotics. Post operative medications consist of the same medication for 7 days and diclofenac sodium IV was administered till there was no pain. Patients were assessed after the first week, after surgery, later on one month after surgery and lastly by 6 months after surgery. Data were submitted for statistical analysis using Chi-square test and Fishers exact test which ever was appropriate.

Trepine procedure for harvesting bone:

the iliac crest is palpated and the anterior superior iliac spine is noted. The incision is kept one inch posterior to the anterior superior iliac spine and made by pulling up the skin medially and superiorly so that incision does not lie directly above the crest. The 1.5 inch incision is carried down till the bone and periosteum is incised. In children and young adults there may be a covering of cartilage over the crest and this has to be incised to form a window beneath which the bone is exposed. A Blackburn bone biopsy trephine is used to harvest the graft. The barrel has an internal diameter of 4 mm and an external diameter of 7 mm. The bone cores provided are approximately 7 to 12 mm in length, this being determined by a depth stop in the barrel. The purpose of such depth control is to minimize the risk of perforating the medial or lateral cortices. In selected cases in which limited amounts of cancellous bone and marrow are needed, a 7 mm diameter Michelle trephine is used. After correct positioning, the trephine is used to perforate the fascia, the iliac crest and cancellous bone to a depth of approximately 3 cm using an alternating, clockwise counter-clockwise rotary action. After sufficient graft material is collected, inspection and irrigation of the wound is performed. After establishment of adequate hemostasis, accomplished easily with pressure, the wound is closed in layers without the need for drainage with 4-0 monocril and 5-0 prolene with interrupted simple sutures. If a window is made in the cartilage it is sutured back before closing. The harvested bone was preserved in a cold saline solution.

Minimal invasive technique for bone harvesting:

The bone is harvested with the patient in the prone position. The skin a few centimetres posterior and caudad to the iliac crest is retracted with the fingers of the left hand up and over to the apex of the crest to ensure that the resulting scar does not lie directly over the crest. A small stab incision, between 5 and 8 mm in length, is made and extended down through the cartilage of the iliac crest, a curette is introduced, and the first pass removes a core of crest cartilage through which the cancellous bone from between the inner and outer iliac cortices whose resistances can be readily felt. A useful technique is one whereby the curette, once inserted down to coal face is pushed against the adjacent cancellous bone, rotated through 360 degrees to harvest bone, and then withdrawn heel down tip up to prevent the harvested bone from falling off the curette. When sufficient bone has been harvested, the skin is released, local pressure is applied for a few minutes to control bleeding, and the incision is closed. The scar is minimal and is in the bikini area.

RESULTS:

The present study aim to evaluate the use of trephine method of bone graft harvesting with minimal invasive method of harvesting in 40 patients. Cortico-cancellous bone was harvested in two groups consisting of 20 patients in each group. In group A harvesting was done with trephine method and in group B the minimal invasive technique was used.

The amount of bone harvested was almost same for both the groups. To stop the bleeding bone wax was used. The patients were assessed in the post-operative phase to evaluate the

occurrence of complications.

None of the patients included in the study presented any complications like malalignment, paraesthesia, chronic pain at the donor site, hernia, adynamic ileus and fractures.

Comparison of both groups

On comparison from day two to day seven the pain experience was much better in the minimally invasive group when compared to trephine group. Even within the both groups pain experience became better as the days progressed and at the time of discharge all patients were pain free. The day wise improvement in gait was found to be significant for each procedure. It was found that minimally invasive method group mobilized early and returned to normal gait when compared to trephine group. It was more evident on 6th and 7th postoperative day. There was no significant difference in scar perception or contour deficit at the end of six months.

Table 1: Comparison of pain between the groups at end of first week

Groups	Pain free	Mild pain	Moderate pain	Total
Group A	0	18	2	20
Group B	12	8	0	20
Total	12	26	2	40

Chi-square = 8.92, p-value

Table 2: Comparison of mobilization & gait between groups at end of first week

Groups	Normal gait	Limping gait	Total
Group A	6	14	20
Group B	20	0	20
Total	26	14	40

Table 3: Comparison of Mobilization & gait between groups on 7th Month

Groups	Normal gait	Total
Group A	20	20
Group B	20	20
Total	40	40

Table 4: Comparison of scar acceptability between groups at end of first week

Groups	Good aesthetics	Acceptable aesthetics	Bad aesthetic	Total
Group A	0	14	6	20
Group B	10	10	0	20
Total	10	24	6	40

Chi square = 7.12, p value = 0.021 (significant)

Table 5: Comparison of scar acceptability between groups on 7th month

Groups	Good aesthetics	Total
Group A	20	20
Group B	20	20
Total	20	40

DISCUSSION

In oral and maxillofacial region most common site of grafting is iliac crest and rib. This study compares the Trepine method of iliac crest bone harvesting and Minimally invasive method of iliac crest bone harvesting. This study aims to compare the operative procedures and morbidity and complications associated with both the above mentioned methods. Patients were divided into two groups. Group A consisted of patients from whom bone was trephined from the anterior iliac crest. Group B consisted of patients from whom cortico-cancellous bone was harvested by minimally invasive method of bone harvesting. The patients were evaluated for one week till discharge. Patients were evaluated for wound breakdown,

pain, gait, in the initial post-operative period and post 7 months period.

Duration of the procedure was similar in both the groups. As per previous studies the closed techniques are easier to perform with less morbidity as compared to open techniques. Bone harvested by both methods had more of cancellous bone. Because of its rich cellularity, it aids in revascularization, and its potential to induce new bone formation, cancellous bone is considered to be the material of choice. In the present study, both techniques provided sufficient quantities of bone, along with high concentration of osteoblasts, which induces additional bone growth at the recipient site. The long term effect of this method on growth of the ilium is not known.

Post-operative pain in the donor site is one of the immediate morbidity of ilium harvest. This pain was usually of longer duration than that associated with most other bone graft sites and usually more severe than the pain of the primary operative site. In our both study groups' pain lasted less than a week and chronic pain was absent. But all patients reported that pain was more severe at the donor site than the recipient site. The overall pain was much less in the minimally invasive method of iliac crest bone harvesting described by Boustred et al than trephine method of iliac crest bone harvesting. This was consistent with the study of Boustred et al.

Difficulty in ambulation and gait disturbance is a major morbidity associated with iliac bone harvest and has been reported in many studies as being dependent on harvesting technique. In our study mobilization and return to normal gait was faster in minimally invasive method of iliac crest bone harvesting than the trephine method of bone graft harvesting as reported by Boustred et al.

On evaluation of the scar, it was better evaluated by the patients who underwent minimally invasive method of bone graft harvesting. When the difference between the groups was found to be statistically significant in Group B at the end of 7th day and 6th month. Lateral placement of the incisions is the key to acceptance in both the groups. Despite the patient's general acceptance of their surgical scar, the scars are relatively wide. Widening of the scar could perhaps be caused by traction on the healing wound at this location. None complained of contour deformity, and in no case was this deformity grossly clinically obvious. Overall contour loss when both groups were compared was insignificant. None of the patients had any complications in the late post-operative period.

CONCLUSION

Morbidity of the iliac crest donor site in both groups was low. Minimally invasive method of bone harvesting of the iliac crest was found to have less morbidity even when compared to the trephine method of bone harvesting of the iliac crest. Minimally invasive method resulted in small scar in early healing phase, but patients' perception of acceptability of scar by both methods were good. Deformity of the iliac crest was not observed in both groups. Duration and ease of operation, average blood loss, quality of the bone harvest were similar by both methods.

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