

RESULTS OF AUTOGENOUS TREPHINE BIOPSY NEEDLE BONE GRAFTING IN FRACTURES OF RADIUS AND ULNA

S Lakhey*, Shrestha B P**, Pradhan R L*, Pandey B*, Rijal K P*

* KMC Teaching Hospital, Sinamangal, Kathmandu, Nepal

** BP Koirala Institute of Health Sciences, Dharan, Nepal

ABSTRACT

Cortico-Cancellous bone graft harvested from the anterior iliac crest by the conventional open method is associated with more morbidity and is more time consuming as compared to the percutaneous method using trephine biopsy needle. The aim of the study was to determine whether cancellous bone graft harvested from anterior iliac crest using trephine biopsy needle consistently achieved bone union in comminuted fractures and fractures of more than 3 weeks duration of radius and ulna and also to determine the morbidity at the donor site.

Autogenous cancellous bone graft was harvested percutaneously from 28 iliac crests in 16 patients and applied at fracture sites of 30 forearm bones using a 4mm trephine biopsy needle after the fractures had been fixed with plate and screws. The patients were followed up regularly upto 6 to 9 months post - operatively in the OPD to determine the union status of the fractured bones and the morbidity at the donor site.

29 of the 30 fractures of the forearm bones united without any problems. The shaft of a trephine got bent during the harvesting procedure at the beginning of the study due to improper technique.

Cancellous bone graft harvested from the anterior iliac crest results in predictable good union results in comminuted fractures of forearm bones and also fractures presenting after 3 weeks of injury. It is also an easier and quicker way of harvesting bone graft and is associated with lesser morbidity and earlier recovery as compared to conventional open method.

Key Words: Bone graft, trephine, fracture of radius and ulna morbidity.

INTRODUCTION

Autogenous bone grafting in fractures of radius and ulna is done in fracture comminution involving more than one third its circumference¹ and fractures presenting after 3 weeks of injury. Corticocancellous bone graft is harvested from iliac crest by the conventional open method and is associated with morbidity at the donor site.^{2,3,4,5} Percutaneous cancellous bone graft har-

vesting using trephine biopsy needle, as described in the literature,^{2,3,4,6,7,8} is quicker and associated with lesser morbidity at the donor site.^{2,3,4,6,7,8} If union of the fracture forearm bones occur consistently with the advantages of bone graft harvested by the percutaneous method, this method can be used routinely in situations where lesser quantities of bone graft is required. Thus, the aim of the study was to determine: (1) Whether cancellous bone graft harvested from anterior iliac crest using trephine

Address for correspondence :

Dr. Shishir Lakhey

Kathmandu Medical College Teaching Hospital, Sinamangal, Kathmandu, Nepal

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biopsy needle consistently achieved bone union in comminuted fractures and fractures of more than 3 weeks duration of radius and ulna. (2) The morbidity at the donor site.

MATERIAL AND METHODS

All simple, comminuted fractures of radius and ulna involving more than one third of their circumference were included in the study. Autogenous cancellous bone graft were harvested percutaneously from anterior iliac crests in 16 patients and applied at the fracture sites of 30 forearm bones using a 4mm trephine biopsy needle after the fractures had been fixed with plate and screws. All the patients were followed up for a period of six to nine months.

Technique of Percutaneous Bone Graft Harvesting

The flare in the anterior iliac crest which is around 3 to 6 centimeters posterior to the anterior superior iliac spine was chosen as the donor site. An 8 to 10mm incision was made on the skin along the iliac crest along the iliac crest over the above-mentioned site and deepened to reach the bone. The trephine with the trochar (Figure 1,2) was inserted to penetrate the cortex directed slightly medially, parallel to the inner and outer

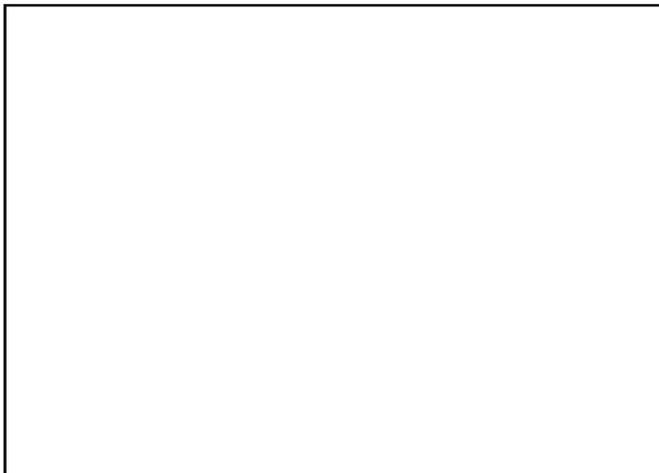


Fig. 1 : Trephine biopsy needle.



Fig. 2 : Trochar and plunger of trephine biopsy needle (end on view)

cortices of the iliac wing. The trochar was removed and the hollow instrument advanced into the cancellous part of the iliac bone by gentle taps with the mallet. With every 5 to 7 mm of advancement, the shaft of the instrument was rotated vigorously in a clock-wise or anticlockwise direction to facilitate easy retrieval of the harvested graft. The instrument was withdrawn when a core of 20 to 30 mms was harvested or the inner or outer cortex was broken and no more bone could be harvested. A plunger was used to push out the graft from the hollow trephine. (Figure 3) The trochar was then again reapplied to har-

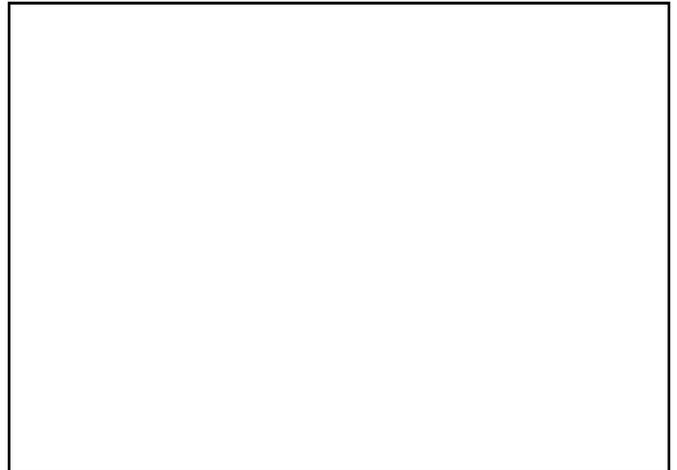


Fig. 3 : Harvested cores of bone.

vest more bone from the iliac crest in a similar manner from a different direction. 4 to 6 cores can be harvested from each iliac crest. (Figure 4) When more cores of cancellous bones

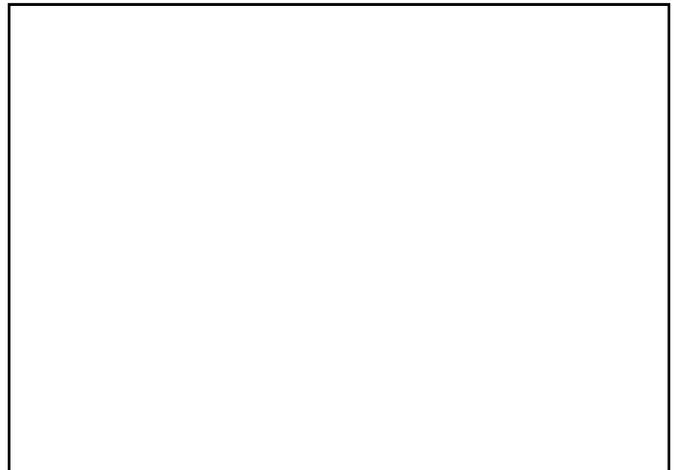


Fig. 4 : Harvested cores of bone (magnified view).

were required, the opposite iliac crest was harvested in a similar manner. The skin wound at the iliac crest was closed with a single 2"o" silk or prolene stitch.

RESULTS

16 patients with 30 fracture forearm bone (radius and ulna) were included in the study. 12 of the patients had bone graft harvested from bilateral iliac crests and 4 patients from their ipsilateral side.

The age of the patients ranged from 20 to 58 years. 10 of the patients were males and 6 were females.

Cores of bone of 20mm to 30mm length and 4mm width were harvested. From each iliac crest, 4 to 6 cores were harvested. 3 to 4 such cores were applied around each forearm bones that were included in the study.

There was minimal bleeding per operatively and soakage at the donor site in the immediate post op period. All patients could walk to the toilet unassisted by the next day of surgery. A trephine got bent during the process of harvesting bone graft. This complication at the beginning of the study occurred because the shaft of the trephine was rotated in a clock-wise or anti-clockwise direction for an advancement of about 10 to 15mm and not 5 to 7 mm.

All patients were followed up for 6 to 9 months. 29 of 30 fractures of the forearm bones united without any problems. One female patient persistently complained of pain at fracture site of radius during washing clothes even 4 months after the grafting. There was doubtful tenderness at the fracture site (Grade I tenderness)⁹ X-ray showed trabeculae passing across the fracture site except for a lucency around 2mm at the site of the old fracture. The fracture site was explored with the intent of re-grafting. On the table, the fracture site appeared solidly united. Petalling around the fracture site was done before closure. The pain stopped on a further 3 months follow-up.

DISCUSSION

Cancellous bone graft harvested from the anterior iliac crest by the percutaneous method using the trephine biopsy needle is quicker and is associated with lesser morbidity at the donor site as compared to the open method.^{2,3,4,6,7,8} In our own study group involving 16 patients with 30 fractured bones, 29 of 30 bones achieved union after applying 3 to 4 cores of cancellous bones 4mm in diameter and 20 to 30 mm long at each fracture site when followed up to 6 to 9 months after surgery.

There were two complications. A trephine got bent in the early part of the study during the process of graft extraction due to lack of refinement in the technique. This did not recur later with better understanding and application of the technique. A female patient complained of persistent pain at site of radius fracture on physical activity. On examination, there was grade I tenderness⁹ at the fracture site. X-ray revealed a small lucency (2 mm by 2 mm) at the fracture site. Exploration revealed bony union. Following petalling of the bone done around the fracture site, the pain stopped on a further 3 months follow-up. X-rays still showed the lucency at the end of follow-up. The cause of pain could not be asserted. One possible explanation was that soft tissue tethering about the fracture site could have been

released during re-exploration.

There was minimal donor site morbidity. Bleeding per-operatively and bleeding and soakage at the donor site in the immediate post-operative period was minimal. All patients could walk to the toilet unassisted by the next day of surgery as compared to an average of 2.8 days⁴ by the open method. There was no gait disturbance (as compared to 4.3%⁵ to 68%⁴ by the open method) or residual pain (as compared to 11%⁵ by the open method) at the end of 6 months of surgery. The scar was smaller (at less than 8 mm long) and there was no cosmetic defect as compared to the open method.

CONCLUSION

Percutaneous bone graft harvesting from the anterior iliac crest is a quicker way of harvesting bone graft and is associated with lesser morbidity and earlier recovery as compared to the conventional method. 3 to 4 cores of cancellous bone 20 to 30 mm long and 4mm in diameter harvested by the percutaneous method is adequate to achieve bone union in forearm bones and can be recommended as a routine procedure after a larger number of cases are studied. This method of bone graft harvesting can be recommended in any procedure requiring bone graft involving lesser quantities of bone graft.

REFERENCES

1. Fracture of Shoulder Girdle, Arm and Forearm. Campell 's Operative Orthopaedics (Vol 2) 8th Edition. Page 1039. A. H. Crenshaw. Mosby Year Book
2. Hardy SP, Wilke RC, Doyle JF. Advantage of percutaneous hollow needle technique for iliac bone harvest in alveolar cleft grafting. *Cleft Palate Craniofac J.* 1999; 36 (3): 252-5
3. Jansma J. Use of the trephine for harvesting bone from the iliac crest. *Ned Tijdschr Tandheelkd.* 2002; 109 (30) 88-90.
4. Sandor GK, Nish IA, Carmichael RP. Comparison of conventional surgery with motorized trephine in bone harvest from anterior iliac crest. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2003; 95(20); 150.
5. Cricchio G, Lundgren S. Donor site morbidity in two different approaches to anterior iliac crest bone harvesting. *Clin Implant Dent Relat Res.* 2003; 5(3): 161-9.
6. Sandor GK, Rittenberg BN, Clokie CM, Caminiti MF. Clinical success in harvesting autogenous bone using a minimally invasive trephine. *J Oral Maxillofac Surg.* 2003; 61(20): 164-8.
7. Thaller SR, Patel M, Zimmerman T, Feldman M. Percutaneous iliac bone grafting of secondary alveolar clefts. *J Craniofac Surg.* 1991; 2(30): 135-9.
8. O' Neill D B. Tips of the trade No: 23. Simplified iliac crest cancellous grafting. *Orthop Rev.* 1990; 19 (4) : 383 – 4.
9. Pandey S. *Clinical Orthopaedic Diagnosis.* 1995. First Edition. McMillan India Limited, New Delhi. 13.

