Functional outcome of non-vascularized fibula in gap non union

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INTRODUCTION

Gap non-union is one of the most perplexing problems facing the orthopedic surgeon today due to the advancements in trauma and tumor diagnosis and management. Gap non unions may be caused either by trauma, tumor excision or bone loss due to osteomyelitis. Fibular bone graft with metallic implant stabilization is one of the definitive managements in gap non unions.\(^1\)\(^-\)\(^3\) The other effective method is Ilizarov ring fixator or monorail systems, using the principle of distraction osteogenesis.\(^4\)\(^-\)\(^6\) But compared to fibular grafting, fixators have morbidity associated with them, need expertise for application and also have low patient compliance. Fibula is the preferred site of non-vascularized bone graft due to its easy accessibility to surgical resection and minimal donor site complications.\(^7\)

METHODS

We conducted a retrospective study in Grant Medical College and Sir JJ group of hospitals Mumbai from August 2016 to May 2019 which included 11 patients of gap non-unions. The age of the patients ranged between

ABSTRACT

Background: Gap non-union is one of the most perplexing problems facing the orthopedic surgeon today. Fibula is the preferred site of non-vascularized bone graft due to its easy accessibility to surgical resection and minimal donor site complications.

Methods: The study comprised 11 patients of gap non-union between 13 to 80 years (mean=34.9 years). The fibular graft was harvested from the mid shaft and cortico-cancellous bone graft taken from the iliac crest was applied at both ends of the fibular graft to aid in union.

Results: The average bone gap was 7 cm (4-13 cm). 64% of the patients achieved bone union after the first procedure, of the remaining 4 patients, 1 patient showed union after secondary cortico-cancellous bone grafting, while two are planned for the same. The remaining one patient has only completed 16 weeks follow-up at present and is not showing signs of union at present. Functional range of motion was achieved in both the proximal and distal joints in all cases.

Conclusions: Non-vascularized fibular bone grafting is a simple and effective treatment option which does not require any special skill, has a very low complication rate and has very high patient compliance.

Keywords: Gap non-union, Non-vascularized fibula, Bone graft

INTRODUCTION

Gap non-union is one of the most perplexing problems facing the orthopedic surgeon today due to the advancements in trauma and tumor diagnosis and management. Gap non unions may be caused either by trauma, tumor excision or bone loss due to osteomyelitis. Fibular bone graft with metallic implant stabilization is one of the definitive managements in gap non unions.\(^1\)\(^-\)\(^3\) The other effective method is Ilizarov ring fixator or monorail systems, using the principle of distraction osteogenesis.\(^4\)\(^-\)\(^6\) But compared to fibular grafting, fixators have morbidity associated with them, need expertise for application and also have low patient compliance. Fibula is the preferred site of non-vascularized bone graft due to its easy accessibility to surgical resection and minimal donor site complications.\(^7\) Fibular grafting therefore due to the above mentioned advantages is the better technique in developing countries where the necessary infrastructure and skill may not always be available and patient compliance to follow up is poor. The aim of study is to evaluate functional outcome of non-vascularized fibular graft in gap non-union.

METHODS

We conducted a retrospective study in Grant Medical College and Sir JJ group of hospitals Mumbai from August 2016 to May 2019 which included 11 patients of gap non-unions. The age of the patients ranged between
13 to 80 years (mean=34.9 years). Of the 11 patients 5 (45%) were male and 6 (55%) females. The average bone gap was 7 cm (4-13 cm). The technique involved thorough debridement and clearance of fibrotic tissue and crushed devitalized bone or tumor to create a gap. The fibular graft was harvested from the mid shaft region under tourniquet using the standard posterolateral approach. For tibial and fibular defects, the contralateral leg was used as a donor site. The graft was fixed at the site of gap using plate and screws in 7 (64%) patients, Tens nail in 3 patients and monorail system (LRS) in one patient (Figures 1 and 2). Cancellous bone graft taken from the iliac crest was applied at both ends of the fibular graft to aid in union.

Postoperatively limb was immobilized for variable period’s minimum being 6 weeks in appropriate slab or cast. All patients were given Intravenous antibiotics in perioperative period and continued post operatively for 48 hours to 7 days depending on surgical site condition. Post 48 hours patients were shifted on oral antibiotics for 5 days. Follow up was conducted at 1 ½ months, 3 months, 6 months, 9 months, and 12 months and later at 6 monthly intervals till the time of submission of this article. Follow up focused on identifying complications and conducting serial radiographs to assess union. In doubtful cases, a metal artifact reduction system-computed tomography scan was done to assess union.

The statistical analysis was done by using SPSS-20.

RESULTS

Out of the 11 patients included in the study, 5 (45%) were males and 6 (55%) were females (Figure 3). Of the 11 patients with gap nonunion, 6 (55%) involved the femur, 1 tibia, 1 fibula, 1 humerus, 1 radius and 1 ulna (Figure 4). Of the 11 gap non unions 7 (64%) were due to trauma, 2 were due to tumor excision, 2 were due to osteomyelitis (Figure 5).

The patients were followed up for a mean period of 56 weeks (24 to 80 weeks). The average bone gap was 7 cm (4-13 cm). 64% of the patients achieved bone union after the first procedure. One of these, a case of radius shaft osteomyelitis managed with excision and fibular bone grafting with tens nail, developed a superficial infection.
at the surgical incision site which was managed with five days of intravenous antibiotics followed by oral antibiotics. Patient had an uneventful course with bony union achieved at 24 weeks. Of the remaining 4 patients, one patient a case of femur shaft gap non-union managed with fibular strut graft with distal femur plating in an operated case of bipolar hemi-arthroplasty, the patient had a stress fracture at the tip of the bipolar prosthesis at 54 weeks follow-up due to weight bearing which further complicated the union process resulting in non-union till present follow up at 74 weeks. Another patient a case of femur shaft gap non-union operated with fibular strut graft with angle blade plating showed signs of graft resorption from site at around 50 weeks follow up. This was managed with multiple sittings of bone marrow aspiration and injection over the fibular graft followed by one sitting of tricortical bone graft, harvested from the iliac crest, at the resorption site. This patient achieved union at 18 weeks following the second grafting surgery. In a similar case of resorption following being operated for a similar fracture, was still found to be in non-union at present follow up of 80 weeks and is now planned for bone marrow aspiration and injection followed by bone grafting. In the latest case of tibia shaft gap non-union due to trauma, fibular bone grafting with monorail system or limb reconstruction system (LRS) was attempted with a patient. Present follow up of 16 weeks still not showing any signs of union, but this patient needs subsequent follow ups to assess the same.

CONCLUSION

From our results mentioned above we conclude that non vascularised fibular bone grafting is a simple and effective treatment option which does not require any special skill, has a very low complication rate and has very high patient compliance.

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