

## GAP Non Union Managed in Radius and Ulna by Non –Vascularized Fibula Graft in Adults

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### ABSTRACT

**Background:** The gap nonunion considered to be a common and complex problem for orthopedic surgeon. The most common bone which is used to fill this gap is usually fibula. Fibula is easy to access with minimum complication at donor site.

**Aim:** To evaluate the result to fill the gap in forearm bones with fibula.

**Methods:** 13 patients were selected. The age was between 20to 50 years. The mean age was 34.9 years. The graft was taken from the mid shaft of fibula and cancellous bone graft taken from the proximal tibia. Both grafts were placed at gap and fixed with small fragment narrow DCP.

**Results:** The bone gaps were from 4cm to the 13cm. The means gap was of 7cm. Bone union was achieved in 12(92.30%) patients after first procedure. The bone union was achieved in remaining 1(7.67%) patients after secondary bone grafting. There was satisfactory range of motion at distal and proximal joint in all patients.

**Conclusions:** Fibular bone grafting is a treatment of choice in gap nonunion because procedure is simple, and effective with low complication rate and high satisfaction rate.

**Keywords:** Gap non-union, fibula, Bone graft

### INTRODUCTION

The nonunion of shafts of forearm bone is very common<sup>1</sup>. There are many reasons of this nonunion but most common etiology is disturbance of arterial supply to the long forearm bones<sup>2</sup>. Other causes are infection and lack of stability. The high level of forces transmitted through long levers and inadequate reduction of fracture are other causes<sup>3</sup>.

In order to control to infection debridement is necessary. The debridement consists of removal of all dead bone and soft tissues. Any foreign body and loose implants should also be removed. A bone defect is always left after proper debridement<sup>4</sup>.

There are various methods to cover these defects. Osteogenesis by bone segment transport by external fixators is most common method. Cancellous bonegraft, non-vascularized and vascularized fibula graft are other options<sup>5</sup>. About 2-3cm defects are usually fill by autogenous bone. About 6 cm or more bone defects are covered by fibula bone graft. The fibula grafts may be non-vascularized or vascularized. Special skills for microsurgical anastomosis are mandatory for vascularized fibular graft. This procedure is technically very demanding and also has a risk of vascular compromise and graft rejection<sup>6</sup>. Bone gap are may be covered with the use of ring external fixator, a procedure called distraction osteogenesis<sup>7</sup>.

These external fixators are not commonal used in upper limb but many surgeons reported favorableoutcomes<sup>8</sup>. There are minimum chances of recurrence of infection with these external fixations because metal work is not used in the bones<sup>9</sup>.

A few complications are reported with wire insertion because there are narrow safe corridors present in the forearm<sup>10</sup>. A study of 9 patients with nonunion of forearm bones treated with ring external fixator is conducted. The study reported that patients are not satisfied by the treatment<sup>11</sup>. But microsurgical techniques like free vascularized tissue transfer are not available in all hospitals<sup>12</sup>.

The main reasons for gap in bones are open fractures and trauma Tumor excision from bone and osteomyelitis. Fibular bone graft fixed with implant considered to be a best treatment option in gap non unions, although ring fixator and monorail fixators are other options<sup>4-6</sup>.

Our main aim is to evaluate the result to fill the gap in forearm bones with fibula.

### METHODS

The study was conducted from 1-1-18 to 1-8-18 at Mayo Hospital Lahore. The age of the patients was ranged from 20 to 50 years with the mean age was of 34.9 years. 9(69.23%) patients were male and 4(30.76%) patients were females. The bone gap calculated was from 3 to 13cm with the acreage gap was of 7.5cm.

#### Inclusion criteria

Either gender  
Adult between 20 to 50 years  
Closed non infective non union  
One bone involves either radius or ulna

#### Exclusion criteria

Gap more than 14 cm  
Infected graft site  
Pathological bone  
Patients Neuro muscular disorder  
Gap at both forearm bones

Through appropriate approach soft tissues were removed with carefully. Both ends of the bone refashioned and marrow cavity opened after trimming the sclerosed margin. After traction the gap size was measured. Under pneumatic tourniquet control through posterolateral incision fibula was approached. The measured fibular graft was taken from the mid shaft. The graft was fixed at the site of gap using plate and screws. 3 to 4 screws should be inserted in to the proximal and distal end of forearm bones to gain maximum strength The fibula graft was fixed by 2 to 3 screws Cancellous bone graft taken from proximal tibia was applied at both ends of the fibular graft to aid in union. Back slab given for 4 weeks.

Intravenous antibiotics were given for 5 days then oral antibiotics were given for further 5 days. Follow up was conducted at one month. Two month. 3 months, 5 months and 7 months. In 5 (38.40%) cases of with a suspension of delayed union bone, about 10 to 15 mm bone marrow aspiration from iliac crest and injected in both ends of fibula. The statistical analysis was done by using SPSS-20.

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## RESULTS

Out of total 13 patients, male were 9(69.23%) and females were 4(30.76%). Ulna was involved in 8(61.53%) patients and radius in 5(38.46%) patients. Right side was involved in 9(69.23%) patients and left side in 4(30.76%) patients. The nonunion was due to trauma in 8(61.53%) patients and open fractures were in 2(15.38%) patients. On union was due to the tumor excision in 1(7.69%) patient and in 2(15.38%) patients the reason was osteomyelitis.

Follow up period was from 12 weeks to 30weeks and 16 weeks was mean period of follow up. The gap in the bones was from 4cm to 13cm and average bone gap was about 7cm (4-13cm). Union achieved in 7(53.84%) patients after the first procedure. Union was achieved in 5(38.46%) patients after the second procedures (bone graft) Bone marrow aspiration was injected at both graft ends as an out patient's procedure in main operation theater under local anesthesia. Cancellous iliac crest bone grafting has to be done in 1(7.69%) patient under general anesthesia after 5 months and we achieved union after 2 months.

In 11(84.61%) patients at both proximal and distal joints the range of motion was satisfactory and pain free and in 2(15.38%) patients the range of motion was not full. In one patients distal and in second patient proximal joint was painful and stiff joint. Both patients recovered completely by physiotherapy and gained satisfactory range of motion. No complications noted both at the legs and forearm. No implant failure, re fracture or infection noted during study period.

## DISCUSSION

The use of fibula graft in gap nonunion is not a new procedure which is very simple and easy. There are very less complications at donor site. This method is relatively easy and patient friendly. Swamy et al worked on 20 patients of nonunion. All patients were of pediatric age. He reported 80% union rate with first procedure and remaining 4 patients achieved union after second procedure of bone grafting<sup>8</sup>.

Patwardhan et al worked on 26 patients of pediatric age group. They achieved union in 24(92%) patients in first operation and remaining 2 patients suffered with delayed union. These 2 patients got union after bone grafting<sup>9</sup>. They were on opinion that this is simple procedure without any special skills with low complication rate.

Lenze et al reported excellent results with minimum complication rate in gap nonunion treated by fibula graft, they concluded this procedure is very valuable in gap less than 12cm<sup>10</sup>.

El-Sayed et al reported union rate of (92%) in their 11 patients in a study of 12 patients. Their patients were with post traumatic bone defects. They used external fixator in tibia and used plates and screws in upper limb. They placed corticocancellous bone graft in the entire length of fibula<sup>11</sup>.

Morsi et al reported union rate of 6(86%) in his total 8 patients. Steinlechner et al found union in 7(88%) patients. total patients were 8 and Lowell et al reported union rate of 8(80%) in his patients. total patients were 10. They all reported separately excellent results with a non-vascularized fibular graft<sup>12-14</sup>.

Al Zahrani et al reported 92% union rate in his patients with gap nonunion due to different reasons. He found stress fractures in 26% of his patients. There was no significant hypotrophy<sup>3</sup>. As compared to all the above studies, we report similar outcomes in non-vascularized fibula grafting in gap non-unions secondary to trauma, osteomyelitis and tumor. Limitations of study are small sample size. Our results are similar and comparable to these studies

## CONCLUSION

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.

**Conflict of interest:** Nil

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