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**BIG FOREARM BONE GAP, A REPORT OF TWO CASES****Mahmood H Kubba**

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**Abstract**

Two cases of large forearm bone gap about 7 and 13 centimeters respectively treated by auto-nonvascularized fibular graft are presented. Both cases showed a good union and regain nearly full function of the forearm at 3, 8 months respectively.

**Case one**

Fifteen year old boy admitted to the orthopedic ward, Basrah General Hospital with history of a heavy object (gear of car) fallen directly over his right forearm on 8/8/2009. The forearm was swollen with 2 small wounds about 2cm, at the volar aspect as shown in Fig.1.



The movements of the wrist and fingers are preserved but limited with no evidence of peripheral nerve injury. The arterial pulses are preserved. Radiography of the forearm bones, showed a missing big diaphysial segment from the middle of the ulna (measure 13 cm.) with transverse fracture of lower 1/3 of the radius as shown in fig. 2.



The forearm was cleaned, dressed and put in a back-slab above the elbow and the patient was kept on antibiotics for 11 days. After which the operation was done.

*Operation:* In supine position and tube anesthesia, 2 teams worked at the same time. The first team harvests a suitable length of the fibula from the middle third of the ipsilateral leg through Henry<sup>1</sup> approach under tourniquet control. The second team and under tourniquet control expose the radius first anteriorly and fixed it by a semi-tubular plate of 6 cortical screws.

The ulna was then approached dorsally the tract of the missed segment was clean and a preliminary suitable K-wire was adjusted to fix the missing segments by passing the ulna intramedullary.

The gap of the ulna was measured, it was about 13 cm. the fibular segment was threaded through the K-wire and filled the gap of the ulna. Cancellous bone graft was taken from the upper ipsilateral tibia and applied around both ends of fibula graft. Ten days post operatively, the slab & stitches was removed and changed by a complete plaster.

The patient was followed every 3-4 weeks by changing the plaster and x-ray, up to 16 weeks ( Figures 3&4).



One year later the patient present with good union of both bones and nearly full function of the forearm (Fig.5). Seven months postoperatively another surgery was done for removal of the K-wire and the plate.



**Case Two:**

A ten year old boy, had history of osteomyelitis of the middle third of the radius four months before presentation, treated by resection of the middle third of the radius. The patient admitted in orthopedic ward at Basrah General Hospital at 26/4/2010.

On examination, there was a scar at the anterior aspect of the forearm with atrophy of the muscles and limited movements at the wrist & elbow joint with a K-wire out of the skin near the wrist joint (Fig. 6).



One week later and under antibiotics control the same procedure was done. The fibula graft measured about 7cm. and it was fixed at the radial gap by a K-wire in the similar technique but here no cancellous bone added. Only the bone ends of both proximal and distal segments were cleaned. The limb was splinted in a slab with elevation for 10 days and antibiotic control. New x-ray was taken (Fig.7).



Complete cast was done at frequent interval of 3-4 weeks and serials of x-rays. Three months later a good union was achieved with slight stiffness of the both elbow & wrist. The K-wire was then removed on 7/7/2010 and physiotherapy started. Nearly one year later new x-ray was done and showed a complete union of the radius (Fig.8).



## Discussion

Filling a bone gap is common daily orthopedic practice, but to fill a big bone gap in a functioning and weight bearing limb is in the most time challenging in term of management. Today with the great revolution both regarding the technique and science in orthopaedic field many options are available: 1-Direct auto cancellous bone graft. 2-Direct auto corticocancellous bone graft. 3-Non vascularized fibular graft. 4-Vascularized bone graft. 5- Carrying cortical segment by Illizarov principal. 6- Bone substitutes.

Reconstruction of bone defect of long bones by a non vascularized autograft mainly from the iliac crest, tibia and fibula, has been the principal for alternative to amputation. In 1956, Nicoll described a method of overcoming the problem of bone gap by filling defect with cancellous bone from the anterior iliac crest, securing the graft by plate and screws<sup>2</sup>.

Modified Nicoll's technique had been used later using the cortico-cancellous or cancellous bone graft also from the iliac crest.

Another modified Nihecolls technique to fill the big bone gap at the forearm bones is by the use of full iliac crest without removing any cortex and stabilized the strut at the non-union site or the gap by an intra-medullary nail like a signet ring<sup>3</sup>.

Another slightly modified Nicolls technique involving key stating, a block of cortico-cancellous graft in to the defect and securing it by plate<sup>4</sup>.

In our two cases, the bone defect was big, especially the first case (13 cm). The ideal method for management is vascularized bone graft, it have many advantages over conventional bone graft, it usually heals quickly and fight infection<sup>5</sup>. But in our locality vascularized bone graft, although it is possible with the help of vascular or plastic surgeon can be a technically demanding and some times impossible<sup>6</sup>.

Among free non-vascularized bone graft, fibula offer a handy site to the orthopedic surgeon, being a superficial bone, it is easy to harvest with very low donor site morbidity if peroneal nerve and vessels are protected<sup>7</sup>.

Fibula is the strongest autogenous bone graft available when compared to other cortical autograft donor sites such as iliac crest and anterior tibial shaft<sup>8</sup>.

Steinlechner et al have found non-vascularized fibula graft to be a straight forward technique with a reliable results and were able to salvage the limb in all the seven patients who were reviewed<sup>9</sup>.

The greater the defect, the more the chance of failure of this technique. This finding conformed to the logic that the scarred and relatively avascular soft tissues surrounding traumatic bone defect reflect the course and final out come of fibular grafting adversely<sup>10</sup>.

Enneking has successfully treated defect as wide as 12.5 cm. with single or double devascularized fibular grafting, reporting a union success rate of 67% for gaps of 7.5-12.5 cm<sup>11</sup>.

In Medhat et al study, they achieved union rate of 60% of cases with traumatic bone defect ranging 4-10 cm<sup>12</sup>.

We agree with other authors that: non-vascularized fibular graft is simple procedure that is still a valid option to successfully bridge bone defects in selected cases with good vascular bed and soft tissue coverage<sup>13</sup>.

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