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A RETROSPECTIVE & PROSPECTIVE STUDY OF DONOR SITE MORBIDITY FOLLOWING FIBULAR BONE GRAFTING

Orthopaedics

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ABSTRACT

Introduction: Fibula has been used as a bone graft in different reconstructive Orthopaedic procedures viz, core decompression, limb salvage surgery in giant cell tumour of distal end radius, like a strut graft for bone defects etc. Despite this widespread use of fibula, there is very limited literature available on the donor site morbidity. **Objective:** The purpose of our study is to assess the complications related to bone grafting site of the fibula that we have encountered after these graft had been obtained and to evaluate morbidity following free fibular bone grafting. **Methods:** We conducted a Prospective and Retrospective Study from January 2015 to August 2019, comprising of 60 patients with a mean age of 35 years who underwent free fibular grafting, with follow up at 1 month and 6 months. **Results:** The average ankle-hind-foot score for the 60 patient evaluated was 92.33 of a possible 100 (range 55-100). Radiographic analysis of donor and contralateral side showed no difference in ankle joint. **Conclusion:** Harvesting fibular strut graft is not without complications, although which can be minimized by following standard protocols and meticulous soft tissue dissection.

KEYWORDS

Fibula, Bone Graft, Donor Site, Morbidity.

Introduction

Fibula has been used as a bone graft in different reconstructive orthopaedic procedures viz, core decompression, limb salvage surgery in giant cell tumour of distal end radius using proximal fibula[1,2,3], like a strut graft for bone defects, bridging defects in long bones resulting from tumour or trauma[4,5,6] etc. The fibula bone graft efforts many advantage[7]:- long length of donor bone (>25 cm), adequate bone stock, bone strength permits good screw fixation and solid reconstruction, bony reconstruction can be shaped with multiple segmental osteotomies, thin, pliable overlying skin, very little soft tissue bulk, resemblance in shape to distal end of radius.

However, harvesting fibula is not without complications. Delayed wound healing, nerve injury, ankle instability, ankle valgus deformity, donor-site pain, edema, haematoma, distal fibular osteoporosis, osteomyelitis, gait-alteration, muscle weakness, isolated flexor hallucis longus flexion contracture, extensor hallucis longus weakness, multiple claw toe deformity, pseudo-compartment syndrome and muscles necrosis has been reported in the literature following fibular bone grafting[8-15]. When cases are reported in follow-ups, investigators usually concentrate upon treatment outcome of the principle problem and not on the donor side morbidity from harvesting the fibula.

Despite the widespread use of fibula as a bone graft, there is very limited literature available on the donor site morbidity. The purpose of our study is to assess the complications that we have encountered and to evaluate morbidity following free fibular bone grafting by evaluating patient satisfaction using the ankle-hind-foot scale[16] (**Kitaoka et al**) and radiographic analysis.

Materials and Methods

In our retrospective & prospective study, 60 patients of age group 18-60 years, who were treated with fibular graft for various surgeries like avascular necrosis of femoral head, tumor or large bone defects, between January 2015 to August 2019 were included. Patients where either fibula or the surrounding soft tissues were unhealthy from injury or any pathological condition, history of old neglected mid fibula fracture & soft tissue infection at donor-site were excluded. The study was approved by Institutional Ethics Committee, and informed consent was taken from all the patients. Average age of cases was 35 years. There was a male preponderance with 47 male (78.3%) and 13 female cases (21.7%). Minimum duration of follow up was 6th month. Maximum grafts were taken from left fibula with a frequency of 55% and from mid fibula (70%). Maximum grafts were of the size between 1-9 cm (76.6%) and the remaining 10-18 cm (23.4%), with mean graft size of 6.25±3.42 cm.

Follow up was recorded at immediate post-op, at 1st month and at 6th months. Clinical and functional outcomes were assessed using Ankle-hind-foot-score. Radiological parameters were assessed on X-ray films of AP and Lateral view including both knee and ankle of the same and contra-lateral side, radiological signs seen at donor-site regeneration, osteoporosis at graft site, varus and valgus instability.

Results

Ankle-Hind Foot Scale (Kitaoko Score):

The function of ankle and hind foot joint was assessed by the Kitaoko Ankle-Hindfoot Scale, a 100 point scoring system, in which 50 points were assigned to function, 40 to pain and 10 to alignment. In our study, there was a significant rise in total ankle-hindfoot scale scores during follow up period from 1st month (74.07 ± 6.57) to 6th month (92.33 ± 3.55). P-value was found to be <0.0001 and hence statistically significant, which shows excellent score. 57 (95%) patients were excellent and 3 (5%) good results.

Table 1: Number of Patients according to Grade of Kitaoka score

Kitaoka Score (Points)	Number (%) of donor site	
	At 1st month	At 6th month
• Excellent (90-100)	2 (3.3%)	57 (95%)
• Good (75-89)	22 (36.6%)	3 (5%)
• Fair (60-74)	35 (58.3%)	0
• Poor(<60)	1 (1.6%)	0

Fig. 1 Osteoporosis of Distal Fibula

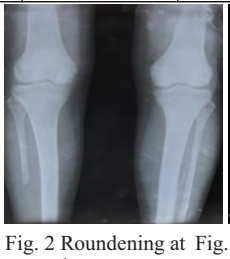

Fig. 2 Roundening at cut end

Fig. 3 Regeneration

Osteoporosis on Radiographic follow-up:

The most significant radiographic finding was osteoporosis of distal fibular remnant (Fig. 1) in patients with fibular resection in 17 patients (28.3%). The radiograph showed roundening of cut ends of fibula. There was a thin bridged bone formation in fibular bed (Fig. 3) in 9

cases (10.58%). None of the cases had varus and valgus instability of knee and ankle, or proximal migration of fibula. In our study, proximal fibula regeneration was found in 11 (18.3%) cases.

Donor site related complication

In our series of 60 cases, mainly minor complication were found, cosmesis linear scar in 36, minor pain in 11, wound healing minor complication in 22, and neuroma and sensory deficit in 14 cases. Most frequent complication after the fibular grafts had been obtained was cosmesis related.

Table 2: Frequency of Complications at Donor Site

Complications	No. of patients (%)	
	Moderate	Minor
• Cosmesis	2 (3.3%)	36 (60%)
• Pain	-	11 (19%)
• Wound healing	-	22 (36.7%)
• Iatrogenic injury	-	14 (23.3%)

Discussion

The donor site morbidity is considered to be low in existing published study. However, most of these studies did only a subjective evaluation of the functional consequences[5,6,7], so incidence of donor site complications has been variable, ranging from 10% to 40%[8]. Paucity in the Indian literature regarding donor site morbidity following fibular bone graft compelled us to investigate it.

Alan Garrett[17] (2006) studies showed the mean average ankle- hindfoot score to be 84.82 in 14 patients. Peter Siege[18] (2009) studies showed mean average score to be 93 in 62 cases. Philip Catala Lebnen[19] (2012) reported mean average score to be 85.7 in 42 patients and Damien Feuvnier[20] (2015) reported 78 in 11 patients. In our study, there was a significant rise in total ankle-hindfoot scale scores during follow up period from 1st month (74.07 ± 6.57) to 6th month (92.33 ± 3.55).

E H Lee et al[14] (1990) studies showed 90% of patients had radiological osteoporosis of distal fibular remnant which is a direct result of a decrease in load transmission. In our study after 6 months, 28.3% had osteoporosis seen in distal fragment of fibula in 17 cases out of 60.

After completion of our study, we were also able to assess the overall morbidity of donor site of fibula by comparing the proximal and mid part of fibular donor site and also assessed the different size of graft, which was found to be statistically insignificant.

Conclusion

Fibular graft is associated with minor clinical morbidity related to pain, numbness range of motion, osteoporosis of distal fibula remnant and muscular weakness. Donor site morbidity in some patients was severe, even requiring the patient to use walking aids, but in follow up most patients had little functional impairment that did not affect their daily or recreational life.

Careful soft-tissue dissection may decrease the morbidity and a distal fibular remnant of at least 8- 10 cm should be retained for ankle stability. Attention to wound closure and meticulous wound care are required to further reduce donor leg complication. The resected part of fibula may be regenerated completely or in part from the periosteum, especially in younger patients.

Also the morbidity is not significantly dependent upon the part of fibula resected (either proximal or distal) and also not on the length of the fibula resected. However, long term follow-up is recommended for assessment of donor site morbidity. Short term follow-up of 6 months seems to be the only limitation of our study.

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