

Treatment of femoral shaft nonunion

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ABSTRACT

Background: Even with the remarkable ability of fractures to heal by the reconstruction of the injured bone to the original form, some situations occur in which there could be delayed union or nonunion. Attending to the cause of the nonunion would usually yield a positive result.

Objective: To determine the incidence of osseous union in cases of nonunion of the femoral shaft fractures managed by open reduction and internal fixation.

Patients and Methods: Over a two-year period, 17 patients with nonunion of the femoral shaft were treated by open reduction and internal fixation and followed up. The follow up period in each case was 6 months. Clinical and radiological parameters were used in the assessment of osseous union.

Results: Majority of the patients seen were in the 18-29-year category (35%) while the male:female ratio was 1.4:1. The average time from injury to presentation was 20 months. Six of the cases were hypertrophic nonunion while 11 were atrophic nonunion.

Conclusion: The treatment of femoral shaft nonunion at the National Orthopaedic Hospital, Enugu by open reduction and internal fixation produced osseous union in 88.2% of cases.

Keywords: Enugu, femoral shaft, nonunion

INTRODUCTION

Fractures heal by the reconstitution of the injured tissue to the original form.^{1,2} The healing of a fracture initiates a complex of overlapping sequence of events which includes inflammation, repair and remodeling.¹ Even with this remarkable ability of fractures to heal, some situations occur in which the condition results in nonunion or delayed union. A number of factors can lead to this which includes the treatment modality and some patient related factors.

In the management of nonunion, detailed history, clinical examination and investigations will often lead to a solution to the problem. Failure to attend to the specific problem will usually result in recurrence.

The purpose of the present prospective study was to assess the outcome of treatment based on osseous union in cases of nonunion of femoral shaft fractures managed by open reduction and internal fixation.

PATIENTS AND METHODS

Seventeen patients with nonunion of the femur presenting at the National Orthopaedic Hospital, Enugu between November 2003 and June 2005 were included in the study. Patients with pathological fractures or who failed to accept operative management and those below the age of 18 years were excluded from the study.

An observer – administered questionnaire was opened for each patient on presentation, and an informed consent was obtained from each. Following detailed history and physical examination, plain radiographs of the affected femur were taken and indicated laboratory tests done. The diagnosis was confirmed operatively.

The surgery was done under general anaesthesia or spinal anaesthesia. The nonunion site was exposed and any existing implant removed. In avascular nonunion the fracture ends were freshened. The medullary canal was fully opened on both sides. Specimens were taken for culture and antibiotics administered. The appropriate

length of plate was applied following reduction and fixed with screws.

If indicated, cancellous bone grafts were harvested from either iliac crest and placed around the fracture. Wound closure was in layers with suction drain in place. Post-operatively, prophylactic antibiotics were continued for 48hours, and in infected cases antibiotics were continued for at least 6 weeks. Immediate post-operative X-ray was done. Patients were seen in the post operative period at 4 weeks, 6 weeks, 12 weeks and 6 months. On each visit, clinical and radiological assessments were done.

Final evaluation of treatment was done at 6months post-operative period. The outcome was categorized into two groups based on clinical signs and radiological findings of union.

Clinical Parameters: Painless weight bearing and negative findings on varus – valgus and antero-posterior stress tests.

Radiological parameters: Presence of bridging callus or healing callus across the nonunion site in at least three cortices in two orthogonal radiographic views.^{3, 4, 5}

Thus treatment resulted in either:

- Osseous union – when all the above parameters were met or
- Nonunion – when one or more of the conditions were not satisfied.

RESULTS

Seventeen patients were recruited for the study. Of this number, 10 (59%) were male:female ratio was 1.4:1 while 7 (41%) were females. The male to female ratio was 1.4:1. The highest number of cases was in the 1–29-year category (35%) while the lowest incidence was in the 30–41-year category (12%); see Table 1. The average age at presentation was 40-41-year (range = 18–64 years).

Table 1: Age distribution

Age (years)	No. of patients	%
18-29	6	35.3
30-41	2	11.8
42-53	5	29
54-65	4	23.5
Total	17	100

All the cases seen were initially close fractures. The method of initial treatment in 11 of the cases was non-operative while 4 cases were initially managed by plating and 2 by intramedullary nailing, see Table 2.

Table 2: Method of initial treatment

Method of treatment	No. of patients	%
Non-operative	11	64.7
Plating	4	23.5
Intramedullary nailing	2	11.8
Total	17	100

The time interval between injury and presentation was 6–18months in 12 cases while the time in the remaining cases are shown in Table 3.

Table 3: Time interval between injury and presentation

Time interval (mo)	No. of patients	%
6-18	12	70.6
18-36	2	11.8
>36	3	17.6
Total	17	100

There were 6 hypertrophic and 11 atrophic cases of nonunion. Six postoperative complications were recorded as shown in Table 4.

Table 4: Post-operative complications

Post-operative complication	No. of patients	%
Infection	2	33.3
Joint stiffness	2	33.3
Recurrence	2	33.3
Total	6	100

Osseous union was achieved in 15 cases (88.2%).



Fig. 1a. Antero – posterior and lateral radiographs of a 24 year old lady with fracture of the left femur, 7 months after injury



Fig. 1b. Antero – posterior radiograph of the same patient 72 hours after open reduction and compression plating.

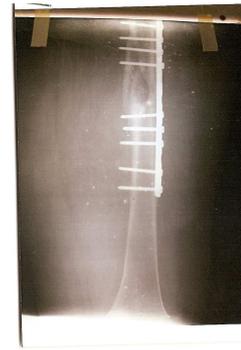


Fig. 1c. Antero – posterior and later radiographs of the same patient taken 6 months after surgery showing bony union.



Fig. 2a. Antero – posterior radiograph of a 28year old lady with nonunion of the left femur seen 3 years after injury.



Fig. 2b. Antero – posterior radiograph of the same patient, 72 hrs after open reduction and compression plating.



Fig. 2c. Antero – posterior radiograph of the same patient, taken 4 months after surgery showing bridging callus.

DISCUSSION

The management of nonunion poses a great challenge to the Orthopaedic Surgeon. This study involved 17 patients with nonunion of the femoral diaphysis. There was a male preponderance in the study. Ten (59%) were males while 14% were females, with a male: female ratio of 1.4:1. This is close to the result obtained by a number of other authors in the literature, most of whom reported a male preponderance.^{6, 7, 8}

The age distribution ranged from 18–64 years with an average age of 40.4 years at presentation. The highest number of cases was however in the 18 – 29 - year category (35%). This may be explained by the fact that this is the most active age group in the society and are more likely to come down with fractures. These findings were supported by the works of Beredjikhian, *et al*⁶ and Chauri, *et al*.⁹

Most of the cases (64.7%) were initially managed non-operatively. This is against what obtains in the Western world. In the work of Beredjikhian, *et al*,⁶ 75% of cases were initially managed operatively while in that of Rubel, *et al*,⁴ 68% of cases were initially managed operatively.

In this study, non-operative treatment was by application of splints and massage by traditional bone setters, while in hospital, it was by application of casts and traction. Operative treatment was by plating and intramedullary nailing. Majority (88.2%) had union while 11.8% failed. This result is similar to works done elsewhere. Muller, *et al*¹⁰ in their work on 113 patients with long bone nonunion got a union rate of 91% while Ring, *et al*⁵ got a union rate of 98% in their study on complex nonunion of the femoral shaft. A similar result was achieved by other authors,^{11, 12, 13, 14, 15} as well.

CONCLUSION

The treatment of femoral shaft nonunion at the National Orthopaedic Hospital, Enugu by open reduction and plating produced osseous union in 88.2% of cases. This is comparable to results achieved elsewhere.

Compression plating is being recommended as a satisfactory treatment method for nonunion of the femoral shaft.

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