

Role of Exchange Nailing in Non Union of Long Bones of Lower Limb. Case Series of 25 Cases

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Abstract: *Study Design:* Prospective consecutive series. *Objective:* To Evaluate the role of exchange nailing in non union of fractures of long bones of lower limb. *Summary of Background data:* Exchange Nailing which includes removal of current intramedullary nail, reaming of medullary canal and placement of larger diameter nail shows increased union rate as seen in various studies. *Methods:* A Prospective study of 25 cases of non union in fractures of tibia and femur previously operated with I.M Nailing were treated by Exchange Nailing and observations were made regarding various parameters like size of exchange nail and time of union of fracture. *Results:* We found an excellent union rate of 88% in our study both clinically and radiologically in a minimum of 1yr follow up.

Keywords: I.M (Intra Medullary) Nailing.

1. Introduction

The absence of any clinical or radiological evidence of progression of fracture healing for 2-3 months after expected time period for healing constitutes non-union. Most common causes of non union in humans despite modern treatment is excessive motion at fracture site & secondly loss of blood supply to fracture site. High energy trauma resulting in severely displaced fractures particularly if open or segmental can severely devascularize the bone ends by severely stripping of soft tissues and by disrupting medullary and extramedullary blood supply.^{1,2,3}

Intramedullary Nailing (I.M) has been standard treatment method for acute adult long bone shaft fractures. The non union rate after I.M nailing for acute long bone shaft fractures has been low, ranging from 0.8% to 2%^{4,5} and certain authors predict it as high as 6.3% to 12.5%⁶.

Exchange Nailing includes removal of current intramedullary nail, reaming of medullary canal and placement of nail larger in diameter than the removed nail. Union rate for exchange nailing of femoral and tibial diaphyseal non-union have ranged substantially from less than 50% to over 90%⁷⁻¹⁰. One study on exchange nailing reported higher failure rates with one or more additional procedure required to achieve fracture union¹¹. Another study achieved 96% union rate without need for additional procedure¹².

Purpose of present study was to evaluate the result of this technique in order to compare with previously established result and to determine those variables that are predictive of successful outcome.

2. Materials and Methods

Over a period of 2 years, 25 cases of non-union of long bones of lower limb following I.M Nailing admitted to our department were treated with exchange nailing without bone grafting. **Inclusion criteria** included Non-Union in long bones of lower limb with prior intra medullary nailing with both atrophic and hypertrophic types. **Exclusion criteria**

included infected Non Unions and previous exchange nailings. Preoperatively written consent was taken from all patients and surgery was performed after proper pre-medication under spinal anaesthesia.

Post-operatively patients were ambulated with partial weight bearing as early as tolerated by patient. Intravenous antibiotics were given for 3 days post operatively. Dressings were changed on 3rd post-operative day and sutures removed on 10-11th post-operative day. Regular follow up of patients was done and observations were made regarding various parameters like type of non union, time of union and relation of increase in size of nail to time of union. Fracture union was defined clinically as having no pain, no tenderness and no need of aids to assist ambulation and radiologically as a solid callus with sufficient cortical density bridging the three out of four cortices on AP & Lateral radiographs.

3. Figures and Tables

Case Example 1



Figure 3.1(a)

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Figure 3.1(b)

Table 1: Showing FREQ of Type of Non-Union & Union Rates in Each

| Type of non union | Exchange Nailing | | | |
|-------------------|------------------|------------------|-----------------------------------|-----------|
| | No of case | Percent of total | No of cases united radiologically | % |
| Hypertrophic | 12 | 48.00 | 11 | 91 |
| Atrophic | 05 | 20.00 | 04 | 80 |
| Oligotrophic | 08 | 32.00 | 07 | 87 |
| TOTAL | 25 | 100 | 22 | 88 |

Table 2: Showing Relationship of Increase in Size of Exchange Nail to the Radiological Union

| Size inc (in mm) of the exchange nail compared to initial nail | Exchange Nailing | | | |
|--|------------------|------------|------------------------------------|-------------|
| | Total no of case | % | NO of case united radiographically | % |
| 1 mm increase | 13 | 52.00 | 11 | 84.6 |
| 2 mm increase | 12 | 48.00 | 11 | 91.0 |
| Total | 25 | 100 | 22 | 88.0 |

Case Example 2



Figure 3.2 (a)



Figure 3.2(b)

4. Observation

Sex predilection

Among 25 patients 18 were male and 7 were female.

Age

Maximum no of patients (12) were in age group of 18-40 years with mean age of 42.25 years.

Time to Union

The average time required for radiological union was 17.5 weeks ranging from 09 to 30 weeks.

5. Discussion

Exchange nailing is an easy, effective & simpler procedure with high union rate as compare to other procedures used for non union of long bones shaft fractures treated initially by i.m nailing.

Exchange nailing provides biological and mechanical effects that promote osseous healing.

Biological effects: Reaming of medullary canal increases periosteal blood flow and stimulates periosteal new bone formation. A large portion of the cortex loses perfusion after reaming as the endosteal circulation is destroyed and bone marrow blocks the intercostal canals.^{13,14,15} In response, periosteal blood flow increases in order to maintain circulation in the cortical bed.^{16,17} Several authors have suggested that products of reaming which contains osteoblasts and multipotent stem cells,^{18,19,20} serve as local bone graft that stimulates medullary healing at the non-union site.^{21,22}

Mechanical Effects: A nail that has a larger diameter than intramedullary nail that was removed provides greater bending rigidity and strength than original nail.^{21,23,24}

| Study | Average Duration of Radiological Union |
|------------------------------|--|
| Wu ¹⁰ et al | 4.4 months |
| Shroeder ²⁵ et al | 4 months |
| Rajaq ²⁶ et al | 4.97 months |
| Hsiao ²⁷ et al | 4.7 months |
| Present Study | 17.5 weeks |

6. Complications

The only peri-operative complication observed in exchange nailing surgery was difficult removal of previous implant in 03 cases which was observed in those patients who have their initial nail broken or bend. Out of these 03 patients, 02 had their initial nail broken & 01 had his nail bend. In all 03 patients, fracture site was required to be opened.

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