

A Comparative Study of Intramedullary Expandable Nail and Interlocking Nail in Tibial, Femoral & Humeral Shaft Fractures: A Prospective and Retrospective Study.

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Abstract: In this paper, authors compare two types of intramedullary nails i.e. conventional interlocking nail and expandable nail, in treatment of diaphyseal fractures of long bone. Main comparative factors were blood loss during surgery, operative time, fluoroscopic radiation time, infection rate and fracture union time. Research is based on the complete data of 21 patients of diaphyseal fractures who presented to our department at Rockland Hospital, New Delhi, between July'04 to April'07, of all age groups and both sexes. During the analysis of results we observed that operative time was significantly low in expandable nail cases as it doesn't require mandatory reaming and locking screws. Fluoroscopic radiation exposure was also significantly low in expandable nail series as compared to interlocking nail series. Otherwise no significant difference was noted with respect to fracture union, blood loss or infections in both the implants.

Key words:- Fractures; Expandable Nail; Interlocking Nail

INTRODUCTION

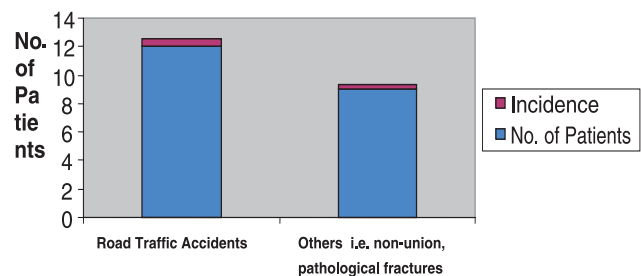
Intramedullary locking nails are considered to be treatment of choice in most long bone fractures. Operative time and exposure of surgeons to radiation are matter of concern when such devices are applied. The choice between reamed and non-reamed intramedullary nailing also varies from one surgeon to other with varying results. We present our limited comparative experience with applications of a new device – expandable intramedullary nail with interlocking nail in long bone fractures. The study aims to compare all the facets of the surgical aspects like blood requirement, surgery time, radiation exposure in minutes, infection rate and time of fracture union. Expandable intramedullary nail can be inserted with ease through the fracture fragments. It doesn't require reaming. The operative time and the radiation exposure were significantly decreased in this series.

MATERIAL AND METHODS

From the period July'04 to April'07, we treated 21 cases of long bone fractures with intramedullary fixation devices i.e. expandable nails and interlocking nails. The expandable nail is characterized with new biomechanical concept of fixation as compared to three point fixation in interlocking nail. We had 6 femoral fractures, 8 tibial and 7 humeral fractures.

Though it was not the aim of the study to examine the pattern of anemia, we tried to rule out from the history the possibility of hemolysis, hemorrhage in each case. Aplastic anemia was ruled out from the general blood picture. We empirically started oral iron therapy in all patients as a routine practice. A review of literature shows high incidence of anemia in Indian patients even in the higher. Among these, there was 1 femoral and 2 humeral pseudoarthrosis. There were 13 males and 9 females with a mean age of 38 yrs (18-80 yrs.). The mean follow up time was 14.7 month (7-28 month).

Technique: The expandable intramedullary nail is a sealed, stainless steel, cylindrical rod without interlocking holes. The proximal end has a one way valve for maintaining inflation pressure. The expandable nail is supplied in its reduced diameter to be filled with saline after introduction. During insertion, the nail is connected to a driver handle which assists in insertion. The driver handle also serves as a conduit for saline during the expansion process. Once the surgeon is satisfied with the reduction and alignment of the fracture components, nail is



Mode of Injury

inserted and driven through the fracture fragments using driver handle. Once in position, the nail is expanded with inflation of saline with the attached hand pump. Expansion of the nail is done by means of a pump that connects to the driver handle. The expandable nail system consists of four longitudinal bars that are connected radially by thin membranes with the inflation of the expandable nail, the fixation of fracture fragments is achieved by the abutment of the longitudinal bars to the inner surface of the intramedullary canal along the entire length. Through out the surgical procedure, insertion and inflation of the nail was monitored fluoroscopically and clinically to ensure satisfactory reduction and rotational stability. Open reduction with osteoinduction using iliac bone cancellous graft was done in all non-union case.



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Post operatively, all patients with lower limb fracture were ambulated with non-weight bearing for 4 weeks. Partial weight bearing for another 4 weeks. Once satisfactory callus seen radiologically, patients were allowed to bear weight i.e. after 8 weeks. Patients with humeral fractures were advised full range of movements after 2 weeks and to avoid manual work for 3 months except in 1 case where we applied POP 'U' slab for 10 weeks.

RESULTS

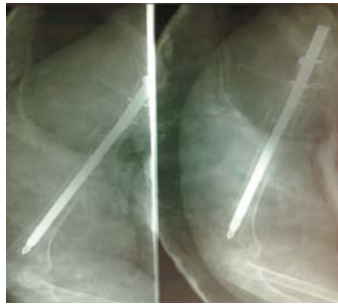
The mean surgery time for expandable nail was 22 min humerus fracture, 32 minutes for tibial fracture and 48 minutes for femoral fractures as compared to 46 min, 57 min and 71 minutes each for humeral, tibial & femoral fractures treated with interlocking nail. The radiation was very high in interlocking cases (maximum 21 min) when compared to expandable nail (1.5 min.).

All cases showed satisfactory callus formation with this technique. There was not significant change in blood requirement when pseudoarthrosis cases are excluded.

Only one case had superficial skin infection which was managed by oral antibiotics.



12 yr old fracture non-union humeral shaft with implant in-situ with severe osteoporosis, operated thrice earlier.



After 12 weeks

DISCUSSION

For last few decades, interlocking nail has become the treatment of choice in this country for most long bone fractures. The fixation technique is quite demanding. There are always difficulties in distal locking of the interlocking nails which can result in expanding the

operative time as well as radiation time.

In this work, we present our limited experience in use of expandable Vs interlocking nails.

All the cases irrespective of location, united in our study the 3 pseudoarthrosis cases required open reduction, freshening of the fracture ends and osteoinduction using cancellous bone graft from ipsilateral iliac crest.

The operative time was significantly lower in expandable nail as it doesn't require mandatory reaming and time consuming exercise of locking screws. However in old cases of displacement of long bones introduction of the guide wire required some degree of skill and perseverance. Occasionally the expandable nails got stuck in the cortex and then had to be renegotiated over the guide wire introduced again.

Fluoroscopy with image intensifier was a special requirement during fractures reduction, introduction of the nail and inflation period.

Although our experience is still limited due to small size of the study. We conclude that expandable nail can be used in all diaphyseal fractures of long bones irrespective of etiology. It scores over the interlocking nails in case of osteoporotic, pathological fractures as it doesn't require reaming which can weaken the already diseased bone.

REFERENCES

1. Levin PE, Schoen RW Jr, Browner BD. Radiation exposure to the surgeon during closed interlocking intramedullary nailing. *J Bone Joint surgery Am* 1987, 69 : 761 – 766.
2. Levin PE, Schoen RW. Radiation exposure to surgeon during closed interlocking nailing. *J Bone & Joint Surgery Am.* 1987, 69: 761 – 766.
3. Lorich G, Shoden Yacubian: An innovative method of intramedullary fixation: Review of moderu surgery 2002 sterling publications.
4. Betz A, Schimonski R.: Preliminary clinical results of non union long bone fractures using fixation intramedullary nail system: presented at EFORT meeting (June 2001 Rhodes, Greece).
5. Steinberg EL, Blumberg: Role of expandable nails in the management of acute traumatic diaphyseal humeral fracture. Presented at OTA meeting, Oct. 2001 San Diego USA.
6. Blumberg N, Steinberg E. Role of fixation expandable nails in stabilization of humeral pathological fractures. Presented at EFORT meeting (June 2002, Rhodes, Greece).
7. M. Tauber, N. Shasho:- Fixion IM nail – An innovative inflatable self locking intramedullary nailing system for fractures of long bones. Presented at AAOS (Feb. 2001, San franciscad).
8. Ascher R, Tauber M: - Fixion IM nail. An inflatable self locking intramedullary system. Presented at EFFORT congress (June 2006, Prague, Cze Republic).
9. Blumberg N, Tauber M. A preliminary clinical experience with expandable IM nail in traumatic humerus, tibia & femur fractures. Presented at Israel ortho association Dec. 2006, Tel aviv, Israel.
10. John crates, Page Whittle: Antegrade intramedullary nailing of acute humeral shaft fracture. *Clinical orthopaedic* 350, 40 – 49, 1998.
11. Stefano Lepose, Nicola Capuano: preliminary clinical & radiographic results with the fixation intra medullary Nail: An inflatable self locking system for long bone. *J Orthopaedic Traumatology* (2003) 3: 135-140.

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ERRATA

Names of the authors of the article entitled: "Effectiveness of Reproductive Health Education in Adolescent, Rural School Girls of Udupi Taluk, Karnataka" published in JIMSA October-December 2010 Vol. 23 No. 4 Page No 249-250 ; may be read as follows: R. S. Rao, A. Lena, N. S. Nair, V. Kamath, A. Kamath, A. Barua".

The error is highly regretted.

P. D. Gulati, Editor, JIMSA