

Indications and outcome of Open Reduction and Internal Fixation of Long Bones in Benue State North Central Nigeria

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ABSTRACT

Background: Open reduction and internal fixation (ORIF) is a well-established surgical treatment of fractures worldwide. However, the indications and modes of stabilization of long bone fractures vary and are evolving. The general trend now is towards fixation with locked intramedullary nail (i.m nail) rather than plate and screws.

Objective: To identify the common indications for ORIF in our environment, the implant commonly used and ascertain the outcome of such fixations.

Materials and Methods: A four year retrospective review of all the patients who had ORIF at NKST Rehabilitation Hospital Mkar Benue State between January 2007 and December 2010 was done. The data obtained included the age, sex, diagnosis, implant used (plate and screws or i.m nail), outcome (united or failed implant), complications and bones involved. All case notes with incomplete data were excluded from the study. Follow up was for 24 months. The data was analyzed using SPSS 16.

Results: There were 361 ORIF done on 355 patients, 245(66.4%) males and 124(33.6%) females giving a male to female ratio of 2:1. The age range was 3 to 82 years with mean age of 36.4 years (SD 14.7). The indications for ORIF were closed fractures 187(50.7%), Nonunion 103(27.9%), Malunion 57 (15.4%), Failed implant 13(3.5%), Delayed union 4(1.1%), open fracture 4(1.1%), and congenital pseudoarthrosis of the tibia 1(0.3%). The commonest bone involved was the femur 205(55.6%) followed by the tibia and fibula 78(21.1%) and humerus 58(15.7%) then others 28(7.6%). Plate and screws were used in 354(95.1%), i.m nail in 15(4.1%). The fractures that united were 357(96.7%), 12(10 plates and screws, 2 i.m nails) (3.3%) had failed implant. Infection was documented in 8(2.2%), joint stiffness in 4(1.1%) and limb length discrepancy in 4(1.1%).

Conclusion: The study shows that plates and screws are the commonest implants used at NKST Rehabilitation Hospital. Closed fractures are the commonest mode of presentation, and the femur is the commonest bone fractured that requires ORIF. The fracture union rate is also acceptable but might be better if intramedullary nails are used where indicated.

Key words: Plates and screws, nails, implant closed fracture, fracture union, Benue.

Long bones normally refer to the humerus, radius, ulna, femur, tibia, and fibula. The main functions of the long bones include supporting the trunk to separate it from the ground and providing a firm framework for movement. Therefore, once a long bone is fractured, the ability of movement may be lost

immediately. In every case, the utmost speed of repair of a fracture is required¹. All fractures may be treated with non-operative or operative methods according to individual advantages and disadvantages. In principle, non-operative methods should be considered a priority. If operative methods are chosen, intramedullary nails are the treatment of choice for long-bone fractures.²⁻⁴

Hans Willenegger recognized the importance of judgment when considering the indications for operative treatment. He promoted excellence of treatment, whether it was

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operative or non-operative. When the basic tenets of internal fixation are correctly observed, reliable and predictable outcome is attainable. Weber, defining the foundation for successful application of internal fixation, wrote that crucial to the success of these techniques are an appropriate indication, observance of correct biomechanical principles, and strict aseptic technique.⁵

Some of the indications for ORIF in long bones are acute fractures, nonunion, delayed unions and malunion. Whereas acute fractures refers to those patients with fractures who present within hours or days after injury, nonunion refers to a fracture that has not healed after 1 year of treatment, or repeated surgeries must be performed to achieve union^{6,7}. Malunions include shortening, rotational deformity and angular deformity⁸. Normally, they are caused by relatively uncertain stabilization or carelessness with fragment alignment during fracture treatment. Malunions in an upper extremity generally can be tolerated without treatment and might not be clinically evident⁹. However, in a lower extremity which requires weight bearing, malunions not only can cause a limp but also can induce joint degeneration¹⁰.

Factors favoring fracture repair are a minimal gap, adequate stability, and sufficient nutrition supply¹¹. Lack of any of these factors will cause a malunion or nonunion. To reduce fracture fragments and minimize the fracture gap, either an open or closed reduction may be chosen.

In previous years absolute fracture stability was the principal goal of internal fixation with plates. Absolute stability leads to primary bone healing, and callus formation was seen as a sign of instability, leading to loosening of the fixation. Reduction and fixation was achieved using open techniques, which required extensive surgical approaches and considerable soft tissue dissection. The stability of conventional plate osteosynthesis relies on friction. This friction is induced by compression between the bone and the plate. Compression between bone and plate leads to cortical porosis as a result of impaired

periosteal blood supply¹². A considerable degree of surgical skill and expertise is required to minimize the additional biologic compromise associated with surgery. Nevertheless, osteosynthesis with plates providing rigid fixation is still an important technique of operative fracture treatment¹³. This study was done to ascertain the indications for ORIF in our environment and also determine the outcome based on the implants available at our disposal while observing strict surgical principles.

MATERIALS AND METHODS:

A four year retrospective review of all the patients who had ORIF at NKST Rehabilitation Hospital Mkar Benue State between January 2007 and December 2010 was done. The hospital is a missionary institution that offers specialist orthopaedic services to many patients in Benue state and the neighboring states of Cross River, Taraba, Nasarawa, Enugu and beyond. The data obtained included the age, sex, diagnosis, implant used (plate and screws or i.m nail), outcome (united or failed implant), complications and bones involved. All case notes with incomplete data were excluded from the study. Follow up was for 24 months. The data were analyzed using SPSS 16.

RESULTS:

There were 361 ORIF done on 355 patients, 245(66.4%) males and 124(33.6%) females giving a male to female ratio of 2:1. The age range was 3 to 82 years with mean age of 36.4 years SD 14.7(Figure 1). The indications for ORIF were Closed fractures 187(50.7%), Nonunions 103 (27.9%), Malunion 57 (15.4%), Failed implant 13(3.5%), Delayed union 4(1.1%), open fracture 4(1.1%), congenital pseudoarthrosis of the tibia 1(0.3%) (Table 1). The commonest bone involved was the femur 205(55.6%) followed by the tibia and fibula 78(21.1%) and humerus 58(15.7%) others 28(7.6%) (Figure 2). Plate and screws were used in 354(95.1%), i.m nail in 15(4.1%). The fractures that united were

357(96.7%), 12(10 plates and screws, 2 i.m nails) (3.3%) had failed implant . Infection was documented in 8(2.2%), joint stiffness in 4(1.1%) and limb length discrepancy in 4(1.1%).

DISCUSSION:

This study shows that the commonest indications for ORIF in both male and female at NKST Rehabilitation Hospital Mkar Benue State are closed fractures(50.6%).This is followed by

Table 1: Indications for ORIF by sex distribution

nonunion accounting for 27.9% and malunion 15.4% . The average age of the patients was 36.4 years , the productive age group of our population. This finding was similar to earlier studies by Agaja¹³ and Ifesanya et al ¹⁴. The male to female ratio was 2:1 which was also similar to earlier studies^{13,14,15}. This may be because men are more involved in high risk lifestyles and occupations that make them prone to injuries. The femur was the commonest bone (55.6%) that had ORIF in our study.

Diagnosis	Sex		Total
	Male	Female	
Nonunion	67(18.1%)	36(9.7%)	103(27.9%)
Malunion	33(8.9%)	24(6.5%)	57(15.4%)
Closed fracture	128(34.7)	59(15.9%)	187(50.6)
Open fracture	4(1.1%)	0(0%)	4(1.1%)
Congenital pseudoarthrosis of tibia	0(0%)	1(0.3%)	1(0.3%)
Delayed union	4(1.1%)	0(0%)	4(1.1%)
Failed implant	9(2.4%)	4(1.1%)	13(3.5%)
Total	245(66.4%)	124(33.6%)	369

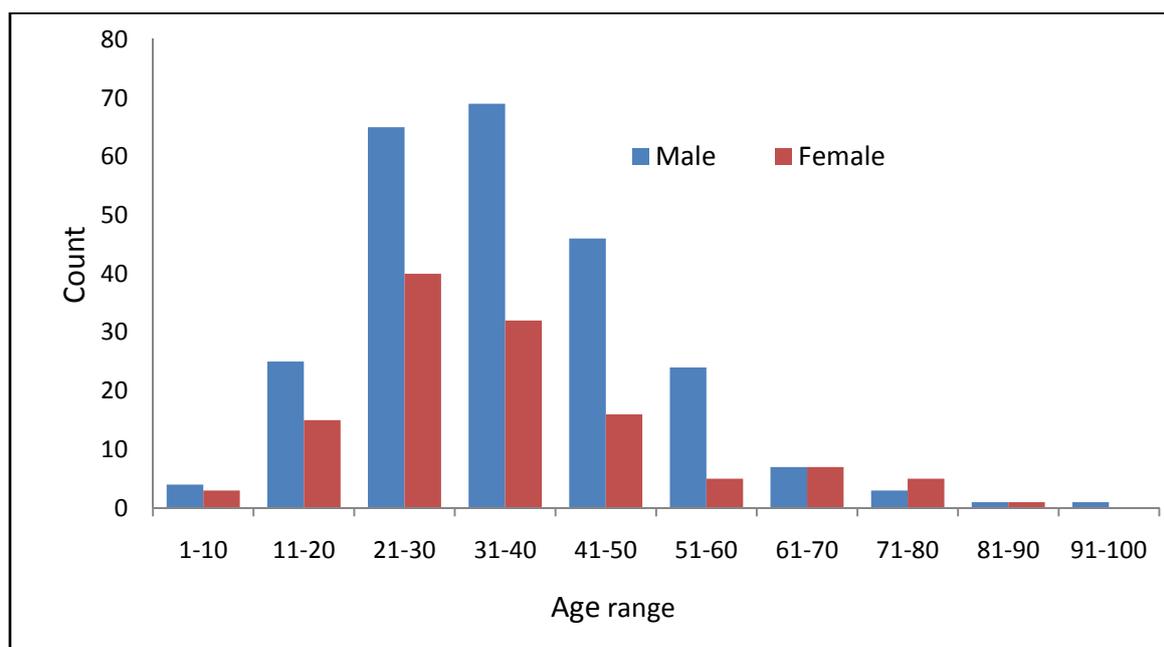


Figure 1: Age and sex distribution among the studied patients.

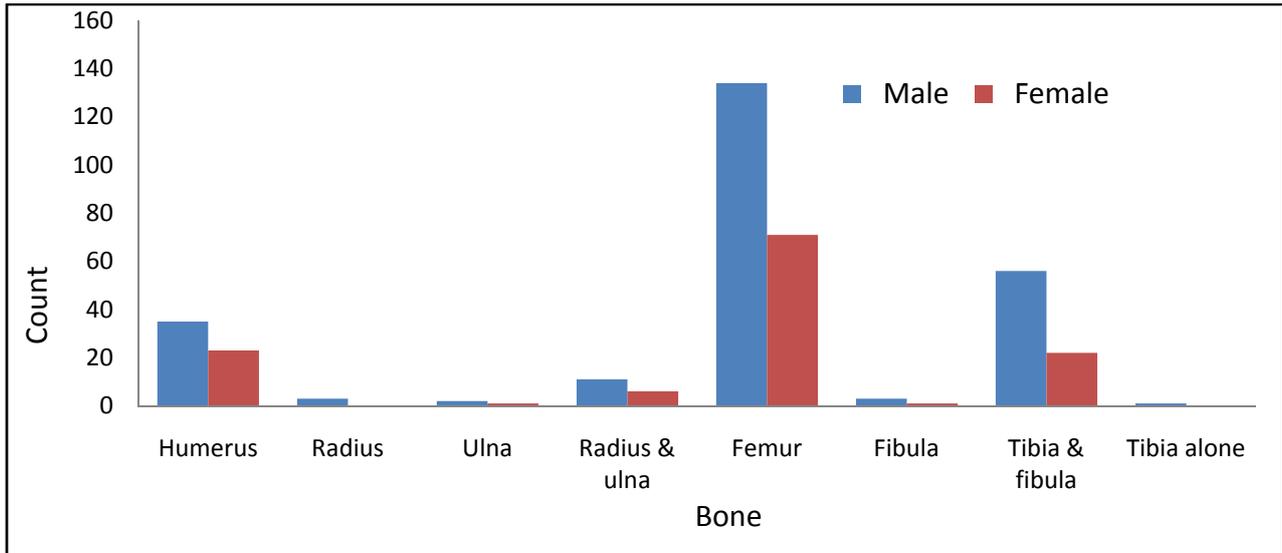


Figure 2: Long bones affected and sex distribution among the study group.

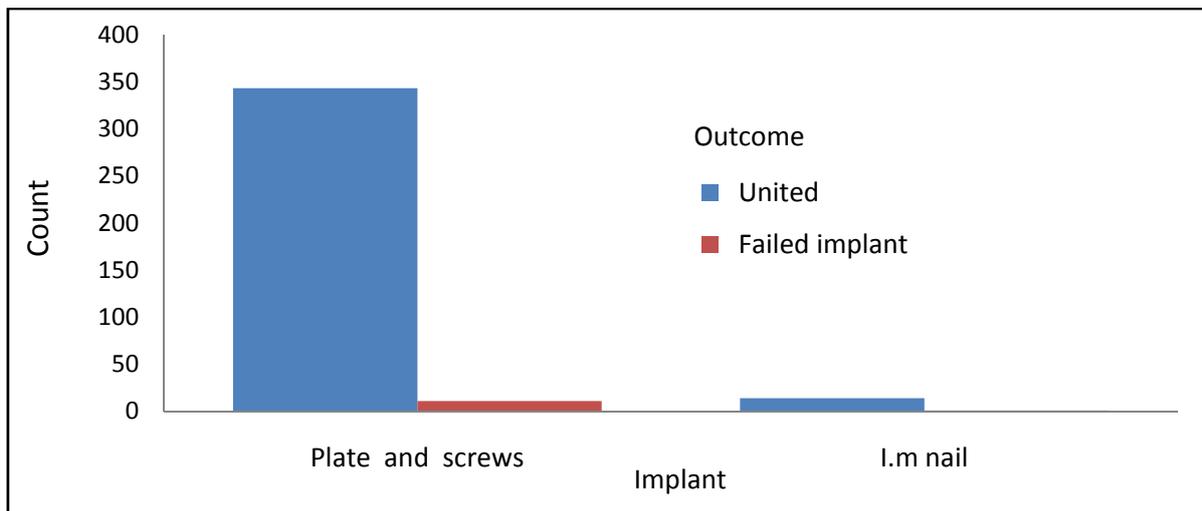


Figure 3: Implant used and outcome of the studied patients.

This finding is similar to that of Agaja who recorded 54.2% and Ogbemudia 52.1%¹⁵. This is because of the higher predilection towards nonunion and malunion in the femur due to relative higher muscle bulk and therefore displacement of fracture fragments.

Plate and screws were the commonest implants (95.1%) used in our study for fixation of long bones. This is because they are more commonly available, cheaper and with a more familiar and less capital intensive instrumentation. Another study done by Ifesanya et al, plate osteosynthesis was in 63% of the cases. Most of our fixations united (96.7%) while ten plates

and two intramedullary nails failed and needed revision. This finding is similar to Ogbemudia et al who recorded an implant failure rate of 3.4%. He documented that implant failures arise mainly from loosening or breakage of the internal fixation device. Because bones are more flexible than metal plates, screwing a metallic plate to bone stiffens it and produces "stress riser" at each end of the plate¹. In the absence of union, even the strongest metal plates and screws will eventually break or pull out of bone.¹ Fatigue arising from cyclic loading can cause fracture of an implant² which effectively leads to failure of the fixation device. Even though plate and

screws are commonly used for fracture fixation, interlocking intramedullary nails should be used where available to reduce infection and implant failure. Some of the complications were infection (2.2%), joint stiffness (1.1%) and limb length discrepancy (1.1%). These complications are similar to those documented by Ifesanya et al and Ogbemudia et al.

CONCLUSION:

The study shows that plates and screws are the commonest implants used in our environment. Closed fractures are the commonest mode of presentation, and the femur is the commonest bone fractured that requires ORIF. The fracture union rate is also acceptable but might be better if intramedullary nails are used where indicated.

The limitation of this study is that only failed implants and infected osteosynthesis that presented in the same hospital where the study was done were captured in the data. Outcome may be better evaluated if some of these patients can followed up.

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