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Management of Tibia Shaft Fractures Using Unreamed Locked Intramedullary Nails: Our Experience from Jos, North Central, Nigeria

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Abstract
Background*: The tibia is the most commonly fractured bone in the body and majority of the fractures occur among the most economically productive age group of the populace. The hallmark of treatment of this fracture is locked intramedullary nailing.*
Patient and methods*: The study design was retrospective descriptive, done over a one year period on all consecutive patients who sustained tibia shaft fractures and were managed by unreamed locked intramedullary nailing.*
Result: *Eighteen tibia shaft fractures in eleven males and seven females with an age range of 19-67years were studied. The causes of injuries were: vehicular road traffic accidents (12 patients), motor cycle accidents (2 patients), bomb blast (2 patients), sporting injury (1 patient) and gunshot (1 patient). The duration of the fractures before treatment ranged between 12hours to 2weeeks mean of 5.1days (±4.09). 9mm nails were inserted in 10 fractures, 8mm in 3 fractures and 10mm in 5 fractures. The outcome using the modified Keterjinar criteria showed that it was good in 15 patients, moderate in 2 patients and poor in 1 patient.*
Conclusion: *Unreamed nailing through results in the insertion of smaller less snuggly fitting nail was associated with a satisfactory outcome*
Key words: *Tibia Fracture,Locked Intramedullary Nailing.*

I. Introduction

Long bone fractures are prevalent in our society, the most common of which is the tibia fracture [1-4]. Over the years the treatment has evolved from the non-operative functional brace casting to various operative modalities. The operative modalities include open reduction and plating, but these have been associated with extensive soft tissue stripping and disturbance of the fracture hematoma leading to increased incidence of nonunion and infection. Although today,less invasive plating is being advocated when plating is done and has being shown to be more biologically compactable. The use of external fixator has also being done especially with case of open fractures or severe soft tissue compromise [4]. In recent times, intramedullary nailing isbeing advocated as the hallmark in the treatment of tibia shaft fractures,either the unlocked nailed or the locked nails [5-8]. The medullary canal could either be reamed or unreamed. Reaming of the medullary canal allowsfor the insertion of larger and more snuggly fitting nails and is associated with less complication of nonunion. On the other hand,none reaming of the medullary canal preserves the cortical blood supply and this is useful in preserving the precarious blood supply to the tibia shaft. Unreamed nailinghas lower average operative times and lower average estimated blood loss [9, 10]. The aim of thisstudy was to highlight our experience in the management of tibia shaft fractures using unreamed locked nails.

II. Patient And Method

This is a retrospective study carried out at the Jos University Teaching Hospital and DaisylandOrthopedic Hospital located within Jos, North Central Nigeria from Jan 2014 to Dec 2014. All consecutivepatientsthat sustained tibia shaft fractures that were managed by locked unreamed intramedullary nailing where studied. Fractures within 5cm of either joints of the tibia bone were excluded from the study as they were treated by other more appropriate methods of fixation. Data were collected using a proforma, they were analyzed and results presented as means, percentages and tables.

Procedures

Patients who presented fresh were resuscitated using the ATLS protocol and all other life threatening injuries were treated. Operation was done in the supine position using a patella tendon splitting incision which was centered between the patella and the tibia tubercle. Guide wire was initially introduced for the cannulated nails and reduction was achieved by traction. Locking was achieved with the use of the external jig, sleeves and

slot finder [11, 12]. It was confirmed with the use of a guide wire as a sound for the cannulated nails. Immediate post-operative x-ray was done to confirm the adequacy of reduction, nail position and the locking screws.

III. Result

A total of 18 patients with Tibiafractures were studied 11 males (61.11%) and 7(38.89%), femalesan age range of 19-67 years and a mean of 37.3 years ±12.64. Vehicular road traffic accidents accounted for 12 (66.67%) of the fractures, motorcycles 2 (11.11%) and the others are as shown in table 1. Sixteen (88.89%) of the patients presented as isolated tibia shaft fractures while the remaining two (11.11%) presented as a polytraumatised patients. Closed tibia fracture accounted for 11 61.11%) of the fractures while 7 (38.89%) were open. The duration of the fracture from time of trauma to treatment ranged between 12hours to 2weeks with a mean of 5.1days ±4.09days. Size 9 nail was the most commonly used nail while the other size distribution is as shown on figure 1 and the length used ranged from 30cm to 38cm nails. Commencement of full weight bearing ranged between 6 weeks to 12 weeks with a mean of 8weeks. Superficial surgical site infection was the most common complication seenwhile the others are shown in table 2. Using the modified katerjinarfunctional criteria 16 of the patients had an excellent outcomeas shown in table 3.

IV. Discussion

In this retrospective study regarding our experience in undreamed nailing of tibia fracture, it was shown that young male adults were the predominate group in the study making up 61.11% and mean age of 37.3±12.64years. This is comparable with other trauma studies which assert that trauma affects the young and economically productive strata of or society [1, 8, 11]. This is also the age group that is likely to be involved in physically demanding and dangerous sports.

Motor vehicular collision accounted for the bulk of the fractures; this could be attributed to an increase in vehicular movements, over-speeding by motorists,and poormaintenance of vehicles, bad roads and poorly trained drivers. The high energy nature of this injuriesresult in complex pattern of fractures with or without open fracture component. Injuries from motor cycle were very low in the study (11.11%) as compared to other studies. This is due to enactment of a local legislature which banned the operation of motor cycle within the study area as against other studies which showed a high prevalence because the motorcycles were being used for commercial transportation. [1]

Most of the fractures were closed (61.11%) but the open fracture still formed avery significant part of the study (38.9%). The open tibia fractures were Gustilo and Anderson type 1 and 2 fractures.Type 3 fractures were managed using external fixators. Open fractures are usually associated with increase in morbidity, such as infection and nonunion.Nonunion of the fracturesresult from the high energy nature of the injury which not only caused fracture of the bone but also causes extensive soft tissue injury. To manage this type of injuries appropriately it will require modalities which limit further injury to the already compromised tissues.Unreamed nailing has shown a decrease in the destruction of the cortical blood supply and a faster revascularization, this translates to a decrease in the rate of nonunion in open fractures.

Reaming of the medullary canal of the shaft allows the insertion of larger snuggly fitting and more stable nails which has being found to be associated with decreased rate of nonunion, however, relatively smaller nails inserted in these study(bulk of which were size 9 nails 55.6%) were not associated with any case of nonunion.All the fractures went on to unite clinically and radiological as evidenced by the presence of callus formation in three cortexes within 14weeks which is comparable with other works. Unreamed nailing also has lower average operative times and lower average estimated blood loss.

The commonest complications seen were surgical site infection (22.22%), these could be due to the fact that a lot of the fractures were open (38.9%) and mean surgery time was late 5.1±4.09 days. Two of the infections were superficial and resolved after management without any residual sequelae. The deep infection required removal of the implant after the fractures had united and no clinical evidence of infection were seen afterwards. Other complications notedwere stiffness of the knee and a case of common peroneal nerve injury, the stiffness of the knee was managed with active range of motion exercises,this improved significantly with very little residual disability while the common peroneal nerve palsy resolved with no residual deficit.

Based on the functional scale of Ketenjian and Shelton [14] which was modified by Yokoyama et al[15] it was excellent in 77.78%, good in 5.56%, fair in 5.56% and poor5.56%. This was comparable with other study, even though the study was on open fractures [16].

Although this study is limited by retrospective, nonrandom design, it raises questions about the routine use of unreamed nailing with regard to healing potential and other postoperative complications. Further study is thuswarranted.

V. Conclusion

Tibia fractures is the most common form of fracture in the human body and these occurs in the most economically productive age group of the population and every effort should done to limit the morbidity associated with these injury through the use of early appropriate mode of treatment. Locked intramedullary nailing is the hallmark in the management of this fracture however question of the effect of reaming of the canal on the biologic activity of the fracture needs to be considered.

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Table 1: Causes of Fractures

Etiology	Frequency	Percentage (%)
Motor Vehicular Collision	12	66.6
Motor Cycle Accidents	2	11.1
Bomb Blast	2	11.1
Gunshot	1	5.5
Sporting Injury	1	5.5

Table 2: Complication

Complication	Percentage
Superficial surgical site infection	22.22%
Common Peroneal Nerve palsy	5.56%
Joint stiffness and chronic Osteomyelitis	5.56%

Table 3: Outcome

Criteria	Frequency
Excellent • Normal	15 Fractures
Good • Occasional pain with prolonged use • Joint motion, 75% normal • Trivial swelling • Normal gait	1 Fractures
Fair • Pain on ordinary activity • Joint motion, 50% normal • Small amount	1 Fractures

of swelling • Slight limp	
Poor • Constant pain • Joint motion, < 50% normal • Any visible deformity • Limp, gait on cane or crutch	1 Fractures

Functional Results as per Ketenjian and Shelton [12]Criteria modified by Yokoyama et al,.[13]

Figure 1: Size of Nails Used