ORIGINAL ARTICLE

Unreamed Tibial Nailing in Open Tibial Shaft Fractures

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ABSTRACT

Aim: Intramedullary nailing has been considered as treatment of choice for tibial shaft fracture. There is still a debate whether to do reamed or undreamed tibial nailing in open fracture as both have merits and demerits. We have performed undreamed tibial nailing in Gustilo and Anderson (GA) Type 3-A open tibial shaft fractures and evaluated the results.

Methods: The prospective cohort study was done using non-probability consecutive sampling technique.We operated 85consecutive patients with GA Type 3-A open tibial shaft fractures. Standard intra medullary nailing was done without reaming the medullary canal. Eightypatients were followed up to four years and four months& 5 patients lost to follow up. The time of union, infection, delayed union, hardware failure,non-union and compartment syndrome and any secondary procedure to achieve union were recorded.

Results: Out of the total 85 participants there were 36 (42.35%) male and 49 (57.65%) were females.The mean age of the patients was 30.25±12.01 years (16 to 58 years). The primary union rate was 70% (56 patients). There were 15 (18.75%) delayed union and 9(11.25%) non-union. The average time of union was 23.57±2.347 weeks (9-28 weeks). Moreover, there were 9(11.25%) superficial and 7(7.5%) deep infections. Three (3.75%) nail failure and four screw breakages.

Conclusion: This study showed a possible benefit of un-reamed intramedullary nailing for open 3A fracture of Tibia.

Keywords: Open Fractures, Un-reamed nailing, Tibial shaft fractures & Gustilo Anderson (GA).

INTRODUCTION

Long bone open fractures are among the most common Orthopedic admissions in the emergency department andtibial fractures constitute the majority of such fractures[1]. External fixation has been accepted and largely used method for management of open fractures with extensive soft tissue trauma and has been coined as the standard treatment of these challenging Orthopedic dilemma[2-4]. There controversy exits whether to do a reamed or un reamed nailing especially in open tibial fractures[4-8]. Un reamed nail is believed to preserve the blood supply and is associated with less risk of infection; on the other hand, reamed nail is biomechanically more stable[9 -14].

Various trials and Meta-analysis have been done to solve this controversy; nonetheless the mystery remains unsolved yet. Neither of the procedure could prove the advantage of one procedure over the other. In this study we did un reamed intramedullary nailing in GA[21] type 3A fracture of tibial shaft.

METHODOLOGY

It was a prospective cohort study. The sampling technique was non-probability consecutive type. The study was carried out in the Department of Orthopedics Surgery Unit-II, Mayo Hospital, Lahore and Akhtar Saeed Trust Teaching Hospital Lahore from 2nd January 2012 to 30th April 2016. Our sample size was 85 patients. We lost follow up with 5 patients Our target population was Gustillo Anderson type 3A tibial fractures. The data was collected on a proof-read questionnaire. They were explained about the purpose of the study. We took written informed consent from all the participants.

Our inclusion criteria of the study were skeletally mature patient of both male and females with GA type 3-A tibial shaft fractures. The exclusion criterion of the study was all patients with open physis, peri-articular tibial fractures, closed fractures, poly trauma and multiple fractures patient.

We obtained standard antero-posterior (AP) and Lateral view of tibia with knee and ankle joint pre-operatively. All patients were given intra-venous cephradine1gm 30 minutes prior to the procedure and was continued for 48 hours after the surgery. The width was measured at the isthmus on the pre-operative radiographs. We performed un-reamed tibial nail in all cases. A 2mm diameter smaller nail was used in all cases while 10mm diameter nail was upper limit. Proximally one screw and distal locking with two screws was done in all cases under image intensifier.

Our follow up period was 4 years and 4 months. Standard antero-posterior (AP) and Lateral view radiographs were obtaining from 2nd till last follow up. The follow up consists of 2nd and 6th week with 3rd, 6th and 9 months. Union was assess radiographically using Hammeret. al [(15)] criteriawhich has 5 grades with grade 1 & 2 regarded as union with “obliterated and barely discernible fracture line” with “union” achieved. The grade 3 has “uncertain” union with “discernible fracture line” and grade 4 & 5 defined as stage of union “not achieve” while infection was assessed using South-Hampton criteria [(16)].Data was analyzed on SPSS version 20.0. Chi square test was used as test of significance.

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RESULTS

We recruited 85 patients for this study. There were 36 (42.35%) female and 49 (57.65%) were male patients in the study. The mean age of the patients was 30.25±12.01 years (16 to 58 years). There were 43 (53.8%) right sided and 37(46.2%) left sided fractures. Only 5 (5.88%) patients lost to follow up. Among these 5 patients; 3 (60%) patients never turned up in the fracture clinic and other 2 (40%) were followed up to 6 weeks and then lost to follow up. Overall 80 patients were followed up to the time of union.

Amongst the total 80 patients, primary healing was seen in 56 patients (70%). There were 15 (18.75%) delayed union and 9(11.25%) non-union. Among those with non-union; 6(66.6%) had deep infection requiring removal of implant, debridement and culture sensitive antibiotics and ring fixator application. At the final follow up all 06 fractures united without any evidence of infection. Three (33.4%) patient had atrophic non-union with nail breakage. They had removal of implant, bone grafting and plate fixation. At final follow up, the fracture was clinically and radiologically united.The average time of union was 23.57±2.347weeks (9-28 weeks).

In the delayed union group, out of total 15 patients, 10 (66.66%) patients had dynamization of the nail, which led to successful union of fractures. Five (33.33%) patient had persistent pain around knee with delayed union. He opted removal of nail and plate fixation which achieved successful union.

There were 15 (18.7%) both superficial and deep infection. Out of them, 7(46.67%) had deep infections and 08 (53.33%) had superficial infections. All superficial infections were treated with prompt antibiotic regimen with Inj. Cephradine 2gm in 24 hours for 3 days and later they were given oral antibiotic cephradine 500mg TDS (8 hourly) for 10 daysand at final follow up all had uneventful union of fracture.Out of total 7 (46.67%) infected cases, 6 (85.71%) patients had non-union had removal of implant, debridement and culture sensitive antibiotics therapy and later they were applied ring external fixator While 1 (14.28%) patients with deep infection had union of their fractures at around 22 weeks.

In summary, 78 out of 80 patients (97.5%) had union of their fractures at the final follow up.At the last visit in fracture clinic, one patient had no evidence of union while the second patient ended up with chronic osteomyelitis. There was no compartment syndrome in this study.

Table 1: Demographic data, Union rate & Complication of the patient

Variables	Frequency (n=80)	%age
Male	36	(42.5%)
Female	49	(57.5%)
Age in years	Mean 30.25±12.01 years (16 to 58 years)	
Side of the patient		
Right side	43	53.8
Left side	37	46.2
Types of union		
Primary union	56	70
Secondary union	22	27.5
Non union	02	2.5
Time of union	Mean 23.57±2.347 weeks (9-28)	
Infection		
No Infection	65	81.25
Superficial Infection	09	11.25
Deep Infection	07	8.75

Table 2: Cross tab of infection with healing phase

Variables	Phases of Healing				P value
	Primary Healing (n=56)	Delayed Healing (n=15)	Non-Union (n=9)	%age (n=80)	
Superficial Infection	00 (00%)	08 (53.33%)	00 (66.675)	08 (10%)	<0.001
Deep infection	00 (00%)	07 (46.66%)	09 (100%)	16 (20%)	
No infection	56 (100%)	00 (00%)	00 (33.33%)	56 (70%)	

DISCUSSIONS

Treatment of long bones open fractures and control of infection in bone is a challenge for Orthopedics Surgeon. Osteomyelitis is serious complication that may result into non-union, delayed union, prolong period of in-activity& hospital stay, financial burden for patientand hospital, may ends up in limb loss. There are conflicting evidence in literature about the use of reamed or un reamed nailing[1,5,6,7,8]. It has been proved that reamed nailing is biomechanically more stable but is associated other drawback included endosteal blood flow damage, bone necrosis, compartment syndrome and occasionally infection at the fracture site[4-14,17,18]. On the other hand, un-reamed nailing has no such issues but is considered biomechanically weak and controversy exits whether it leads to more implant failure or not[18,19].

In our study, the average time of union was 23.57±2.347weeks[5-22] which was similar Loother studies in which there reported mean time for union was 23.9 (range 11-134) weeks[22,21]. Both delayed union 15(18.755%) and non-union 9(11.25%) which were found to be high in our study when compared with delayed union (DU) that occurred in 13 (14 %) casesand non-union (NU) in 7 (8 %) fracturesin another study [(20)]. It showed that misconception exist for delay union and nonunion in open tibial fractures as there is no significant difference in results.

In this study, there 15 (18.7%) had both superficial and deep infection. Out of them, 7(46.67%) had deep infections and 8(53.33%) had superficial infections when

compared with GA[21] who reported 2-16% incidence of infections, a majority of which were type III A, B & C compound injuries. Similarly, Tabatabaei et al[22] ,Keating et al[17] and Bhandari et al [24]reported low superficial infection rate in um-reamed interlocking nail as compared to reamed interlocking nail. He also reported that deep infection was same in both reamed and un-reamed interlocking nail [22] and their results are consistent with the data in our study. We treated all superficial and deep infection with wound debridement and antibiotics after culture and sensitivity which proved an effective way of managing open wound in our study.

Our study proved that un reamed nailing for GA Type 3A open fractures is a good option as 78(97.5%) patients had union of their fractures which is considerably high in terms of outcome was similar to other studies [22] because we selected only GA Type 3A while in other studies they selected type III a, b & C open tibial fractures. When we compared the results of secondary procedure we applied plate with screws and bone graft in 8(10%) cases and ring external fixatot in 5 (6.25%) patients were consistent with Finkemeier et al[23] and Bhandari et al[24].

The complication rate in terms ofnonunion rate was not noticeably high. Contrary to the conventional belief, the implant failure rate was also not very high in our studyas reported byBhandari et al [24]. They reported that implant failure was low in reamed nail contrary to un-reamed nailwhich showed that un-reamed nail can be used for GAIIIA type open tibial shaft fractures.The fear economic burden related to smaller diameter nail being biomechanically more unstable and may lead to failure and revision surgery has also been proven as more a misconception.

CONCLUSION

We concluded that un reamed tibial nailing in open tibial fracture is a very good option. Our study showedbetter union rate and very low incidence of complications. We believe, further randomized controlled trails will be required for the generalizability of the un reamed tibial nailing for open tibial shaft fractures.

Conflict of interest: The authors don't have conflict of interest. There is no external or internal source of funding.

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