Original Article

Treatment of open tibial fractures: Comparison between unreamed and reamed nailing A prospective randomized trial

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ABSTRACT

Objective: Treatment of open tibial fractures is an orthopedic challenge. Interlocking nailing is one of the accepted forms of treatment in these fractures. Two accepted methods of nailing are unreamed and reamed which have been largely used in closed fractures of the tibia but their use in open tibial fractures is still challenging. In this randomized clinical trial, we treated open tibial fractures using these methods and compared the results.

Methodology: Between May 2008 until September 2010 we treated 119 healthy young patients with open tibial fractures (types I, II, IIIA) by two methods of interlocking nailing. We chose the type of nailing using random table of numbers. The age of the patients was between 20 to 45 years. One hundred and six male and thirteen female patients were in two groups. Parameters including type of open fracture, length of operation, amount of blood loss during operation, superficial and deep infection, mean union time, need for dynamization and bone graft, nail and screw breakage in two respective groups were compared and the data analyzed using SPSS 13 and T-test and the P value of less than 0.05 considered as significant difference.

Results: Fifty-eight and sixty-one patients were treated in unreamed and reamed groups respectively. The time of operation was 54 minutes in unreamed and 71 minutes in reamed group with significant difference (P= 0.023). Superficial infection was seen more in reamed group in comparison with unreamed group (P=0.01) but for deep infection there was no significant difference between two groups. (P=0.31). Screw breakage was seen more in unreamed group in comparison with reamed group with significant difference (P=0.026). There was not any case of nail breakage in two groups. The time to complete union was similar in both groups.

Conclusion: Unreamed and reamed interlocking nailing can be used in open tibial fractures types I, II and IIIA with **quite** similar rates of success.

KEY WORDS: Tibial fracture, Open, Reamed, Unreamed, Interlocking nailing.

Pak J Med Sci October - December 2012 Vol. 28 No. 5 917-920

How to cite this article:

Tabatabaei S, Arti H, Mahboobi A. Treatment of open tibial fractures: Comparison between unreamed and reamed nailing a prospective randomized trial. Pak J Med Sci 2012;28(5):917-920

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* Received for Publication: May 5, 2012
* 1st Revision Received: May 11, 2012
* 2nd Revision Received: July 6, 2012
* Final Revision Accepted: July 15, 2012

INTRODUCTION

The incidence of open tibial fractures has increased because of motor vehicle accidents and war injuries.[1] Although external fixation has been largely used in management of these fractures particularly in cases with severe soft tissue trauma, and has been coined as the standard treatment of these challenging orthopedic dilemma.[2-4] Since 1970s the use of reamed interlocking nailing is begun in treating small series of these fractures with unacceptably high infection rates.[5]

In 1990s the studies in open tibial fractures reported superior results for unreamed tibial nailing compared with external fixator in Gustillo types I, II, and IIIA open fractures.[6-10] Thus, more recent studies compare the results of two different methods of interlocking nailing of open tibial fractures.[11-15]

The purpose of our study was to compare the results of unreamed and reamed nailing in open types I, II, IIIA tibial fractures in otherwise healthy patients.

METHODOLOGY

Between May 2008 until September 2010 a total of 119 patients with open tibial fractures were treated in Razi hospital trauma research center in Jundishapur University of medical sciences in Ahvaz, Iran. We treated the patients with reamed and unreamed interlocking nailing according to the random table of numbers.

The inclusion criteria consisted of patients more than 18 years with tibial shaft open fractures (Gustilo types I, II, and IIIA) and the body mass index of less than 30 without contraindication for intramedullary nailing (e.g. narrow tibial canal). Patients with types IIIB or IIIC open fractures or history of preexisting medical condition or pathologic fracture were excluded from the study.

After admission of the patients, a questionnaire consisting of general information about the patients, mechanism of the trauma, exact time of the fracture, type and pattern of the open fracture, completed by the responsible resident. The type of interlocking nailing determined according to the random table of numbers and the patient was scheduled for the operation. After the operation the observations as the length of the operation, amount of bleeding and the length and the diameter of the applied nail added to the previous questionnaire.

The patients were followed up routinely until complete union and during this time period serial roentgenogram and photos were taken according to their condition. The protocol of follow up was similar for all of the patients. They were permitted to bear partial weight with crutches after three weeks and full weight bearing without support was permitted after complete clinical and radiological union.

If there was not any fracture callus in serial roentgenograms after six weeks, the patients were scheduled for autogenous cancellous bone graft. Bone graft was repeated after six weeks if it was not successful and if the second bone graft was not successful, exchange nailing was performed for the patients. In all steps of follow up the respective information was added to the questionnaire and the follow up continued until completion of the union.

RESULTS

The total number of the patients was 119. Sixty-one patients underwent reamed and Fifty-eight patients underwent unreamed nailing. In reamed group, the age range was between 20 to 40 with mean of 26.4 years and in unreamed group it was between 20 to 45 with mean of 26.9 years. In reamed group there were 55 male (90%) and 6 female (10%) and in unreamed group there were 51 (88%) male and 7(12%) female patients.

In reamed group 35% of the fractures involved right side and 65% involved left side and in unreamed group this proportion was 36% and 64% respectively. The most common mechanism of injury in all of the patients was motorcycles-to-car accident. The most common type of the fractures according to AO classification was B2 in reamed and A3 in unreamed group.

The most common types of open fracture according to Gustilo-Anderson classification in reamed and unreamed group were II and IIIA respectively. Ninety percent of the fractures occurred in middle 1/3 of the tibia in both groups.

Fig.1 (A and B): Screw cutout and deep infection otherwise good union in Type IIIA open tibial fracture treated by reamed nailing.

Fig.2 (A and B): Complete union after unreamed nailing in type I Gustilo open fracture.

In reamed group 36% of the patients were operated before 24 hours 64% after 24 hours of the fracture and in unreamed group these numbers were 40% and 60% respectively.

The average diameter of the nail in reamed group was 11.2mm (range 10-12) and in unreamed group was 9.5mm (range 9-11). The mean time of the operation was 71.7 minutes in reamed and 54 minutes in unreamed group with significant difference (P value= 0.023). The mean of blood loss during operation was 165 cc in reamed and 95 cc in unreamed group without significant difference (P value= 0.07).

In reamed group 21.3% of the patients (13 patients) had superficial infection and this number was 8.6% (5 patients) in unreamed group with significant difference (P value= 0.01). The rate of deep infection was 4.9% (3 cases) in reamed (Fig.1) and 8.6% (5 cases) in unreamed group without significant difference (P value= 0.31). Seventeen patients (27.8%) in reamed and 16 patients (27.5%) in unreamed group underwent bone grafting or dynamization without significant difference (P value=0.96).

Mean union time was 27.9 weeks in reamed and 30.18 weeks in unreamed group (Fig.2) without significant difference (P value= 0.08). Screw breakage observed in 8 cases (13%) in reamed

Fig.3: Screw breakage in reamed nailing in patient with type IIIA Gustilo open fracture.

(Fig.3) and in 18 cases (30%) of unreamed groups with significant difference (P value= 0.026).

DISCUSSION

Intramedullary nailing has been used in the treatment of open tibial fractures since 1970s as a complementary measure after external fixation.[16,17] Although disappointing results has been reported after the use of reamed interlocking nailing for the treatment of open tibial fractures[5], the use of this device continued in treating Gustilo types I,II.III open tibial fractures with satisfactory results.

The earlier studies of interlocking nailing in open tibial fractures included the experience with unreamed nails.[6,18,19] Keating et al[20] in 1997 compared the results of interlocking nailing of the open tibial fractures treated by unreamed and reamed nailing and reported similar results in two groups although more common screw breakage were seen in unreamed group.

After that some clinical trials are against the use of unreamed tibial nails in the treatment of open tibial fractures. One of these studies[12] in a randomized clinical trial with 3.8 year follow up concludes that unreamed tibial nails may be associated with higher rate of complications, and malunion compared with reamed nailing and in the other,[21] the authors conclude that UTN does have a high complication rate and, they suggest early dynamization or exchange nailing to hasten union and prevent screw breakage.

Different clinical results and controversies motivated us to perform this randomized clinical trial to compare the results of unreamed and reamed nailing in open tibial fractures. The clinical

and statistical results of our study are similar to the results of Keating's study.

In our study there are significant differences regarding mean time of the operation, superficial infection and screw breakage between two groups. The length of the operation is more in reamed group because of the time required for canal reaming.

More screw breakage in unreamed group can be due to smaller nail diameter (9.5 mm) and more stress applied on locking screws compared with larger diameter (11.2 mm) in reamed group.

Unlike earlier studies[18-20], the results of reamed and unreamed nailing are seen to be almost comparable with minor differences and this can be due to the design of the modern nails. A few patients were lost to follow up but we called them and collected some of the information in this way.

CONCLUSION

By comparing the results of different types of nailing in open tibial fractures, both reamed and unreamed nailing can be used in open types I, II, III tibial fractures with quite similar results. Minor differences are not sufficient to alter the final results.

ACKNOWLEDGEMENTS

This study was the postgraduate Thesis of my resident Dr. Abdolghader Mahboobi and the authors thank Jundishapur University of Medical sciences for their support via grant number U89175.

Source of funding: A grant from Jundishapur University of Medical Sciences.

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