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Dr. Mohan Kumar K
Prof., Department of
Orthopaedics, Stanley Medical,
College, Chennai, Tamil Nadu,
India

Dr. H Varrdhaman Dhariwal
Asst. Prof, Department of
Orthopaedics, Stanley Medical,
College, Chennai, Tamil Nadu,
India

Dr. T Tholgapiyan
Prof., HOD, Department of
Orthopaedics, Stanley Medical,
College, Chennai, Tamil Nadu,
India

Dr. S Parthasarthy
Major, Rtd Department of
Orthopaedics, Stanley Medical
College Chennai, Tamil Nadu,
India

Correspondence
Dr. H Varrdhaman Dhariwal
Asst. Prof, Department of
Orthopaedics, Stanley Medical,
College, Chennai, Tamil Nadu,
India

A comparative non-randomized study between locking compression plate and intramedullary nail-in the management of distal tibial fractures

Dr. Mohan Kumar K, Dr. H Varrdhaman Dhariwal, Dr. T Tholgapiyan and Dr. S Parthasarthy

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Abstract

37.8% of tibia fractures occur in the distal tibial region. Due to the poor soft tissue envelope and precarious blood supply in the distal tibial region, there is a very high incidence of complications like non-union, delayed union and wound dehiscence, with increased secondary procedure rate especially after implant failure. Literature review shows that there is no optimal treatment (implant) for the management of these fractures. Nailing provides lesser chances of wound dehiscence but fails in providing adequate stability. Compression plating provides increased complication due to bulky implants causing wound dehiscence. Some of it is offset by locking compression plate. Hence we decided to study which implant would be ideal to treat these fractures with the best functional outcome and low incidence of complications.

This was a prospective study of 72 patients who had unilateral, displaced fracture of distal tibia. 41 patients were managed with intra-medullary interlocking nailing and 31 patients were managed with locking compression plate osteosynthesis.

The incidence of complications was found to be higher in nailing when compared to that of plating. 2 of patients developed non-union in nailing. 4 of patients developed implant failure and required secondary procedures in nailing group when compared to 1 in LCP group which was attributable to poor biomechanical construct.

25 age matched pairs of patients were selected from each group and were assessed with the help of modified Klemm and Borner scoring system. Based on this scoring system the results were analyzed for the study group. Patients in the locking compression plate osteosynthesis group yielded scores that were significantly higher than the nailing group and were found to be statistically significant with a p value of < 0.05. 76% had excellent results, 16% had good results and 4% had fair results in the plating group when compared to 24% excellent results, 40% good results, 20% fair results and 16% poor results in the nailing group.

The results of current study show statistically advantageous for locking compression plate osteosynthesis when compared to close intramedullary interlocking nailing for distal third of tibia fractures. With decreased incidence of complications & secondary procedure in LCP group. Particularly in MIPPO with LCP group did much better as no secondary procedures were required. A multicentric study with large population is necessary to confirm this.

Keywords: distal tibia fracture, nail, LCP

Introduction

Closed distal tibial fractures traditionally have been treated with closed reduction and a cast while operative treatment has been reserved for situations in which an adequate closed reduction could not be obtained or maintained. During the three years excellent results have been reported by a number of investigation after treatment with LCP. The purpose of the current prospective study was to compare the radiographic and clinical results of closed intramedullary nailing of a unilateral fracture of the tibial shaft with those of LCP

Materials and methods

Seventy six patients who had a unilateral, distal tibial fracture were analyzed prospectively between Jan 2005 to Jan 2007 at our hospital.

Forty four patients were managed with closed intramedullary nailing and thirty two had locking compression plate osteosynthesis. There was no protocol to determine which fractures would be treated with intramedullary nailing or locking compression plate osteosynthesis; out of the two senior consultant's one decided to treat with locking compression plate osteosynthesis and other with closed intramedullary nailing under C-arm control. Four patients were lost for follow up (three with intramedullary nailing and one with LCP). This left a total of seventy two patients: forty one who were managed with nailing and thirty one with plating.

The criteria for inclusion in the study were, an age of at least twenty years, closed as well as grade I and II compound fracture of the distal tibia (eight cm above the ankle joint) with displacement and an absence of associated compartment syndrome or neurovascular injury.

Patients were followed up as outpatients in OPD radiographs were used to identify the patients and to assess the time to union of the fracture and the rate of complication

The intramedullary nailing procedures were performed between the first day (day of arrival) and within two days after the injury. After the fracture had been reduced and the limb had been placed in a splint and elevated, the timing of the operation was determined according to the degree of the soft tissue swelling and associated medical complication. All of the nails were inserted after reaming and eleven millimeters (range eight to eleven millimeter) was the most common size of nail that was used.

The use of locking screws was determined by the location and the stability of fracture. Rotationally or axially unstable fractures were locked statically with proximal and distally two screws to prevent either shortening or malrotation. Thirty seven of the forty-one patients managed with nailing had static locking.

The time to weight bearing was determined on the basis of the stability of the fracture, the degree of cortical continuity and comfort of the patient, as well as evidence of fracture healing. No patient who had nailing was made to bear full weight on the extremity before six weeks.

The patients who were managed with plating had the procedure done on the day of injury and within 8 days of injury to wait for the soft tissue swelling to disappear

Through the antero-medial approach fracture site open reduction achieved and fixed with locking compression plate minimum four to six cortices purchase with plate placed on antero-medial aspect.

Partial weight bearing started at six weeks and full weight bearing after eight to twelve weeks after surgery.

Radiographs were used to determine the location, amount of comminution and displacement, classification and time to healing of the fracture. The fractures were graded according the AO/ Orthopaedic trauma association classification and the classification of system of Winkquist and Larsen for comminution of fractures of long bone.

Radiographic healing was defined as the presence of bridging callus as seen both anterior posterior and lateral radiographs. Rotational alignment was assessed both clinically and with use of radiographs of the knee and ankle.

A fracture that had not united at nine months was considered as non-union and that did not show callus at twelve weeks was considered as delayed union. The time to healing was determined by one of the two senior consultants.

Dressing was changed once in 3 days. Suture removal was done at 2 weeks. Patients were examined at 6 weeks interval

with serial radiographic followup.

Of the seventy six patients, four were lost to follow up. Thus seventy two patients (forty one who had nailing and thirty one who had been managed with plating) returned for long term follow up and from this group twenty five matched pairs of patients were identified on the basis of age (20-50), location and type of the fracture. Matches could not be found for the remaining twenty two patients (sixteen who had nailing and six who had been managed with plating. However, with the number available, we found no discernible difference in the outcome for these patients compared with those for twenty five matched pairs.

The matched pairs, consisting of twenty five patients who had nailing and plating were assessed at a mean of two years (range one and half years to three years). Each patient completed the Klemm Borner scoring system.

All the patients were examined by one of the two senior consultants to determine the degree of alignment to complete the scoring system. The time to union was compared for the matched pairs. In addition, all seventy two patients were asked when they had returned to work after injury.

Statistical analysis

Statistical analysis was performed using of the paired student test to compare differences between the two groups with respect to the time to union, the Klemm Borner scores, the functional outcome scores and the time until the patients returned to work. The Chi-square test was used to assess differences in the rate of complications between the two groups. Significance was defined as $P < 0.05$.

Results

The mean time to radio-graphic union was eighteen weeks (range, twelve to fifty two weeks for the patients treated with locking compression plate osteosynthesis compared with twenty six weeks (range sixteen to fifty two weeks) for the patients treated with nailing ($P = 0.02$).

Table 1: Table show IM Nail and LCP

	IM Nail	LCP
n	25	25
Delayed union	9	0
Implant failure	4	1
Nonunion	2	0
Skin grafting	0	1
Direct union	10	24

Implant failure occurred in one patient who had been managed with LCP compared to 4 in nailing group. Two nonunion occurred in patients who had been managed nailing. Three patients had varus malalignment of more than 10 degrees in nailing. 4 patients in nailing group had implant failure who required implant removal and re-surgery with locking compression plate subsequently. One patient in locking compression plate osteosynthesis group, wound closure was difficult. It was managed with primary closure of tibia wound & skin grafting of fibular wound after muscle closure.

Delayed union occurred in nine patients treated with nailing for which dynamization was done and subsequently the fractures united. Twenty out of 41 patients treated with nailing wanted to have the implant removed and hence the nail was removed. The usual cause for removal of nail was pain in the knee.

According to the Modified Klemm and Borner scoring

system, out of the twenty five matched paired of patients who had been managed with locking compression plate osteosynthesis, nineteen patients had excellent results with the score of 16, four patients had good results with score of 13, two patient had fair results with the score of 10. Whereas six patients had excellent results, ten patients had good results, five patients had fair results and four patients had poor results in the poor results in the group treated with nailing respectively.

The twenty five patients who had undergone locking compression plate osteosynthesis returned to work significantly sooner than the 25 patients who had been managed with nailing (Mean of 2.3 months compared with 4 months).

Conclusion

By identifying the matched group of patients who had long term follow up we tried to minimize some of the selection bias in our study.

The results of current study show statistically advantageous for locking compression plate osteosynthesis when compared to closed intramedullary interlocking nailing for distal third of tibia fractures. With decreased incidence of complications & secondary procedure in LCP group. Particularly in MIPPO with LCP group did much better as no secondary procedures were required. A multicentric study with large population is necessary to confirm this.

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