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COMPARISON OF TWO TECHNIQUES OF INTERLOCKING INTRAMEDULLARY NAILING IN FRACTURES OF TIBIA

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Abstract:

Aim: *To compare the results of reamed and unreamed interlocking intramedullary nailing in fractures of tibia in terms of their advantages and disadvantages, fracture stabilization, maintenance of alignment, complications and functional outcome.*

Design: *A Prospective comparative study*

Place and Duration: *The study was conducted at the Department of Orthopedic Surgery at Mayo Hospital Lahore for one-year duration from April 2019 to April 2020.*

Patients and Methods: *A total of 40 patients having closed or grade1 open fractures of tibia that presented within 12 hours of injury were admitted through emergency department. The detailed history was taken. The patients were evaluated both clinically and radiologically. Complete physical and systemic examination was performed to rule out associated injuries. The laboratory investigations were carried out and surgery was planned. Long leg splint was applied. By random selection Unreamed interlocking intramedullary nailing was performed in one group of 20 patients and in the 2nd group intramedullary interlocking nailing was done after reaming of the medullary cavity. Patients were informed about the nature, cost, advantages and limitations of the procedure.*

Results: *The patients treated by the unreamed method of interlocking intramedullary nailing had better results regarding the rehabilitation, functional outcome, as scored by the evaluation criteria and radiological union time in comparison with the reamed method of interlocking intramedullary nailing which in relation to patients rehabilitation, functional outcome residual deformities, and post-operative complications, scored less. There were no cases of nonunion resulting from either technique. Two patients developed superficial wound infection, both treated by the reamed method of intramedullary nailing but none developed chronic osteomyelitis*

Conclusion: *In the case of tibial shaft fractures, Unreamed interlocking nailing is a better solution, as it is associated with fewer complications, better rehabilitation, fewer cases of residual deformity, and thus a better functional outcome.*

Keywords: *reamed, untreated, intramedullary, nail*

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INTRODUCTION:

Fractures of the tibia are a common symptom in emergency rooms than any other long bone. The increase in traffic volume leads to an increasing number of accidents and limb injuries. The tibial subcutaneous medial part presents a particular treatment challenge, especially in the case of open fractures. Supporters can be found in treatment with casts or functional braces, open reduction, and internal fixation with plates and screws, or locked or unlocked intramedullary nails, and external fixation techniques. The best treatment remains controversial but should be determined by careful analysis of the fracture morphology, the amount of energy transferred to the limb, the characteristic bone mechanics, the age and general condition of the patient, and most importantly the patient's condition. a delicate handkerchief. Non-surgical treatment with casts and braces, minimizing the risk of infection, often leads to unacceptable shortening, incorrect rotation and / or kinking. Fixation with plates and screws resulted in an unacceptably high rate of infection and implant failure. External fixators provide a rigid fixation, relatively lower rates of deep infection, but this technique has the disadvantage of infection of the stem tract, defective union, non-union, unacceptable appearance. Intramedullary Locking Nailing has solved most of the problems because it provides control of length, angle and rotation, and facilitates rehabilitation. However, it was found that insertion of a larger diameter nail after reaming the medullary canal is associated with a lower number of implant failures. Intra-spinal nailing without reaming is less detrimental to the intraosseous blood supply and has historically led to lower infection rates. However, nails inserted without reaming provide less bone stability and may therefore delay healing compared to larger diameter nails, and problems with delayed fusion and hardware failure with smaller implants used for nailing without drilling have prompted some researchers to revert to the use of nailing reamed in open fractures of the tibia. The aim of this study was to compare the results of reamed intramedullary and solderless closed static nailing in tibial fractures in terms of functional results, residual deformities, radiological fracture healing time, the need for additional surgery, and the assessment of advantages and disadvantages. both techniques.

PATIENTS AND METHODS:

This comparative invasive prospective study based on a random selection of 40 patients with tibia fractures was conducted at the Department of Orthopedic Surgery at Mayo Hospital Lahore for one-year duration from April 2019 to April 2020. All Grade 1 closed and open fractures of the tibia where closed reduction was not possible or unsatisfactory were included in the study. The patients were randomly divided into two groups. Group A and group B of 20 patients each. Odd serial numbers were listed in group A and even serial numbers in group B. Patients in group A were treated with statically locked intramedullary nails after reaming of the core cavity, and patients in group B were treated with intramedullary-locking nailing without reaming the core. Post-operative care and rehabilitation were similar in both groups.

Admission Criteria

1. This study included both adult males and females 14 to 80 years of age with Grade 1 closed or open fractures of the tibia shaft (simple, wedge-shaped, and complex) located 7 cm below the knee joint to 7 cm. above the ankle joint. joint and who reports within 2 weeks of the injury.
2. Fractures where closed reduction was not possible or was unsatisfactory.

Exclusion Criteria

1. Patients who had old fractures in which closed reduction had failed were excluded from the study.
2. Patients with fractures of the tibial plateau, fractures and dislocations of the ankle and accompanying fractures of the tibial plafond.
3. Patients with pre-existing limb deformities
4. Patients with infected fractures and fractures previously treated with an external fixator were also excluded from the study.

Anterior-posterior and lateral X-rays of the injured limb were taken showing the entire length of the tibia and fibula. In patients with Grade 1 open fractures, with superficial wounds and minor cuts to the skin, the wounds were thoroughly rinsed with saline and a dressing was applied. Patients were splinted in long legs splints in the period between admission and intramedullary nailing, which was performed in the next operating list. Basic studies have been performed to rule out any comorbid pathologies. Each patient received a preoperative dose of 1gm of 1st generation cephalosporin, and patients with Grade 1 open fractures received an additional dose of 80 mg of injection gentamicin. Patients were operated in the supine position on the fracture table with the knee bent to 90 degrees. The incision was made medially from the patellar tendon and after a careful excision of the subcutaneous fat pad, a curved bone awl was inserted anteriorly through the epiphysis to gain access to the medullary canal. When the nailing was to be performed using the reamed method, bent guide wires with a diameter of 3.2 mm were inserted into the defect with bent tips up to 1 cm proximal to the ankle joint. Reamers of various diameters from the smallest to the corresponding maximum diameter were threaded onto the guide,

and the proximal and distal segments were reamed. A nail was selected whose diameter was 1 to 1.5 mm smaller than the last reamer used. Care was taken to ensure that the fracture was properly aligned when the nail entered the distal medullary canal. The diameter of the canal was measured on the basis of preoperative X-rays of the narrowest part of the isthmus after subtraction of 10% magnification. A nail 1 mm smaller than the actual diameter was selected for insertion. Proximal locking screws were inserted from the mid and side positions through the insertion device port. The distal screws were then inserted from the medial to the lateral with the distal handgrip, guided through the image intensifier. After insertion of the then nail, the wound was thoroughly rinsed and closed with suction drainage and an aseptic dressing was applied. All patients received doses of antibiotics for 3 days after surgery. Drains were removed 24-48 hours after surgery. Most of the patients started walking without load. The load was dictated by the type of fracture, the size of the nail and the patient's comfort. A range of knee and ankle movement exercises began immediately. Patients most often discharged from the hospital on the 4th or 5th day after surgery. Patient evaluation was initiated shortly after surgery, closely monitoring postoperative complications of surgery and anesthesia. The sutures were removed after 14 days. All patients were followed at 3-week intervals at the clinic after discharge from the hospital with biplane radiographs and clinical assessment of patients for the degree of mobility, compliance with physiotherapy and subjective postoperative complaints. The collected patient data was reviewed 6 months and one-year after surgery and the results were assessed according to the evaluation criteria proposed by Ahlo et al. 1992.

RESULTS:

The selected patients were aged 15–60 years with a mean of 37.65 ± 12.07 years. Of the 40 patients, 34 were male and 6 were female. Group A consisted of 16 men and 4 women. Group B consisted of 18 male and 2 female patients. Of the 40 patients, 26 had closed tibia / fibula fractures and 14 patients had an open first-degree tibia / fibula fracture. The final evaluation was made 6 months and at one year after the operation. All patients were assessed radiographically and clinically, and the results were assessed according to the criteria proposed by Ahlo et al. The calculated mean results of patients in group B were significantly ($p < 0.05$) higher than those of patients in group A. In group A, the mean time to radiological union was 20 weeks. The range was 18 to 22 weeks. Whereas in group B the mean time was 18 weeks and the range were 16 to 20 weeks. Our patients did not have any complications related to anesthesia. There was a fracture of distal locking screws in two patients treated with non-transmission. There was a superficial infection at the site of the distal locking screw in 2 patients treated with reamed nailing and treated with intravenous antibiotics.

Table 1:

Derangement	**E**	**G**	**F**	**P**
Varus or Valgus	3	5	10	>10
Ante or recurvatum	5	10	15	>15
Internal rotation	5	10	15	>15
External rotation	10	15	20	>15
Shortening	1 cm	2cm	3cm	>3cm
Knee flexion	>120	120	90	<90
Knee extension Deficit	5	10	15	>15
Ankle dorsiflexion	>20	20∘	10∘	<10∘
Ankle plantar flexion	>30	30	20	<20
Foot motion	5/6	2/3	1/3	<1/3
Pain or swelling	None	Minor	Significant	Severe

Table 2: Final Assessment

Derangement	**E**	**G**	**F**	**P**	**Calculated Score**
Valgus or varus					
Group A	16	4	0	0	76
Group B	13	7	0	0	73
Ante or recurvatum					

Group A	16	4	00	76	
Group B	18	2	0	0	78
Internal rotation					
Group A	17	3	0	0	77
Group B	19	1	0	0	79
External rotation					
Group A	20	0	0	0	80
Group B	20	0	0	0	80
Shortening					
Group A	15	4	1	0	74
Group B	18	2	0	0	78
Knee flexion					
Group A	1	15	4	0	57
Group B	18	2	0	0	78

Table 3: Final Assessment

Derangement	**E**	**G**	**F**	**P**	**Calculated Score**
Knee extension deficit					
Group A	11	8	1	0	70
Group B	18	2	0	0	78
Ankle dorsiflexion					
Group A	1	17	2	0	59
Group B	4	14	2	0	72
Akle plantarflexion					
Group A	8	10	2	0	70
Group B	18	1	1	0	77
Foot motion					
Group A	2	15	3	0	59
Group B	7	12	1	0	66
Pain or swelling					
Group A	4	7	8	1	54
Group B	10	9	0	1	69

DISCUSSION:

Treatment of tibial shaft fractures can be hampered by problems with defective union, non-union, infection and limb deformities. Recent improvements to the fixation devices and the available surgical techniques and equipment have reduced the incidence of these complications. In our study, the mean time to radiological union in group A was 20 weeks, and in group B it was 18 weeks. In the serial radiographs of Group, A patients, we found no evidence that the reamed material was incorporated into the callus. In a study of 152 patients, Blachut showed that the beneficial effects of reaming could not be quantified. Deep infection did not turn out to be a problem in any of the groups, the more so as the selected patients did not include patients with grade 2 and 3 open fractures, and most importantly, the operation was performed with the best possible sterilization. Paige and Thomas in their study found that among 50 patients with open fractures of the tibia treated with intramedullary nails without prophylaxis of deep infection, patients with Grade 3 open fractures, especially at the wound site, developed while Grade 1 and Grade 2 no infection was reported. open fractures. Therefore, any consideration of preserving the blood supply in preventing infection seems to be only theoretical, and the size of the wound and contamination contribute to the development of the infection. Varus and valgus of the tibia can occur especially in minor or segmental nail fractures, and especially when the patient begins to gain weight. A nail with a smaller diameter in the case of severely fragmented or segmented fractures may result in increased axial force acting across the fracture, thus affecting the shape of the soft callus and causing varus / valgus flexion. In our study, valgus / varus angulation averaged less than 3 degrees in group A and less than 3.5 degrees in group B, which is consistent with international studies. The scale of the knee flexion and extension deficit in different patients

can be explained by the fact that the presence of the surgical wound just below the knee and the rupture of the patellar tendon fibers causes pain and swelling, causing the patient to hesitate while exercising the knee exercise. In our study, the results showed that the range of knee motion after 20 weeks of observation averaged 0-120 degrees in group A and 0-135 degrees in group B. These results are consistent with the results of international studies. The disturbance of the range of motion of the ankle joint can be attributed to the fact that, even in the absence of pain, the patient does not follow strict physiotherapy recommendations for the affected limb. If a fracture heals at varus angulation, this leads to the development of inflammatory lesions in the subtalar area, which can also affect ankle and foot movement. In our study, the results of ankle and foot movement were better in group B. One patient treated with the unrealized method developed distal locking screws fractures. The bolts, due to their smaller size and different design, were more prone to breakage. It is envisaged that the locking screws used to drive the nails without reaming could be modified to reduce the failure rate. There was a superficial infection at the site of the distal locking screw in 2 patients treated with nail boring, which occurred after 13 weeks in one patient and after 18 weeks in another, in whom distal screws had been removed and treatment was started. on antibiotics. Time to full load depends on fracture geometry, fixation stability, implant strength, patient compliance, and evidence of fracture healing. On average, our patients moved on an outpatient basis with full load after 12 weeks in group A and 13 weeks in group B. Delayed union and non-union may be related to both biological and mechanical factors. Two of our patients in group A developed delayed adhesions that were dynamized (proximal locking screws removed) and then healed successfully. Our fracture healing results are satisfactory. The median time to breakdown in group A was 22 weeks and 18 weeks in group B with a significant p-value. This is consistent with local and international studies. In evaluating the results of this study, we concluded that the technique of intramedullary nailing in the treatment of tibial fractures without reaming the medullary cavity gives better overall functional outcome in terms of the criteria developed by Ahlo et al. leukemia. It should be mentioned, however, that the success of each of the intramedullary nailing techniques and its final result also depends on the morphology of the fracture, the fracture site and, above all, on the patient's compliance with rehabilitation.

CONCLUSION:

On the basis of the conducted research, we recommend using the technique without painting the statically blocked intramedullary nail in the treatment of closed and open fractures of the tibia grade 1.

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