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Original Article

EFFECTS OF MINIMALLY INVASIVE PLATE OSTEOSYNTHESIS (MIPO) ON PATIENTS WITH DISTAL TIBIA FRACTURES: A CROSS-SECTIONAL STUDY.

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Abstract

Background

Distal tibia fracture accounts for around 6-11% of tibia fractures. A distal tibia fracture is also known as a Pilon fracture. A distal tibia fracture is not easy to handle. The prime motive of this research is to examine the result of minimally invasive plate osteosynthesis for distal tibia fractures.

Materials and Methods

A cross-sectional study was conducted, and 107 patients were included in this research. All the detailed history of the patients was recorded. Complete lesion detersion was first done. Advance soft tissue covering is performed if needed. Plates are arranged on the lateral side of the tibia. If it is required, extra cortical screw utilizing minimally invasive plate osteosynthesis.

Results

The study examined the effects of Minimally Invasive Plate Osteosynthesis (MIPO) on distal tibia fracture patients found 70 males, 37 females, with most aged 30-40 years (45), then 40-50 years (40), 20-30 years (13), and 50-60 years (9). Professions varied: farmers (50), businessmen (35), daily wage workers (11), office workers (11). Road accidents caused 65 injuries, falls 42. Injuries were split between right (52) and left sides (55). These insights deepen understanding of MIPO's impact on distal tibia fracture patients.

Conclusion

The study indicates that minimally invasive plate osteosynthesis (MIPO) has minimal impact on blood circulation, promoting faster recovery with less hematoma and trauma. MIPO also accelerates bone union, requiring minimal time and no specialized instruments. Non-union reasons include pressure, fragment issues, and fracture design.

Recommendation

Minimally invasive plate osteosynthesis is a safe, effective treatment for distal tibia fractures, yielding quick bone union, improved leg mobility, and ample blood supply to the periosteum. It's a favorable option for treating such fractures.

***Keywords**: Distal Tibia Fracture, Minimally Invasive Plate Osteosynthesis, Bone Union, Leg Mobility, Pilon Fracture*
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Introduction

Distal tibia fracture is caused by aggressive injury and it accounts for 6-1% of tibia fracture [1]. These fractures are not easy to handle because of hypodermic position, shortage of vascularity, and occasionally association with anklebone. Open reduction internal fixation was introduced by Ruedi and Allgower [2-4], but it has many problems and accounts for damaging soft tissue. Two treatment modalities are preferred nowadays, the first mode is wire fixators and the other is minimally invasive plate osteosynthesis. The least soft tissue pulverization and least damage of soft tissue occur in the process of minimally invasive plate osteosynthesis [5,6]. Minimally invasive plate osteosynthesis is utilized lately, because of its adequate results.

The main purpose of tibia fracture therapy is to get advanced unification of fracture, anatomically sustainable orientation. If the fracture is left untreated may cause such as extended immobility, incomplete union, shrinkage, and arthralgia. Open reduction and internal fixation cause issues such as no unification, late unification, contaminations, and implantation collapse. The only principal element in the therapy of distal tibia fracture is superficial soft tissue. According to Rhinelander [7], vascular circulation is the prime source for the recovery. Therefore, by taking care of the vascular supply the bone helps in getting great outcomes. The main problem of tibia fracture is it causes injury to soft tissue.

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The basis of minimally invasive plate osteosynthesis are indirect reduction technique, vacating crushed particles out, protecting their circulatory system, utilizing less flexible coefficient compatible substances, and restricted surgical time. Minimally invasive plate osteosynthesis is the best mode for the treatment of fractures in the lower part of the body [8]. There is a delay in recovery due to a hematoma. Blood supply to the periosteum is maintained in minimally invasive plate osteosynthesis in comparison with the convention reduction method. Bone stability is achieved by locking compression plating [9]. The bodily structure of the plate averts mispositioning of the fracture and helps in the balanced dispersal of force. Locking screws avert the plate to put force on the bony framework and thus not affecting the blood supply. The prime purpose is to achieve bone unification without harming the surrounding tissue.

Complete lesion detersion is first done. Advance soft tissue covering is performed if needed. Plates are arranged on the lateral side of the tibia. If it is required, extra cortical screw utilizing minimally invasive plate osteosynthesis. High carefulness is needed to reduce soft tissue injury. A flap is enough if there is no involvement of the proximal tibia. If inpatient sufficient soft tissue envelop is not present then a small operation is required due to serious infections and supra-added diseases [6]. After the surgery, patients are advised to stretch their legs straight for the proper mobilization and flexing knees also. Patients were followed up for two months. The only problem that can occur is contamination. Therefore, antibiotics are prescribed to the patients. Appropriate follow-up is needed for the examination of the movements of the leg. Patients need to do regular exercise to maintain the mobility of the leg and knee joint. A distal tibia fracture is not easy to handle. The prime motive of this research is to examine the result of minimally invasive plate osteosynthesis for distal tibia fractures.

Materials and Methods

Study design

A prospective cross-sectional study was conducted.

Study setting

The study was carried out in Pandit Jawahar Lal Nehru (Pt. JLN) government medical college, Chamba, Himachal Pradesh, India, from March 2020 to December 2023.

Study population

107 patients were included in this research.

Inclusion criteria

Gustillo type 1 closed fracture with or without articular extension, patients who gave consent.

Exclusion criteria

Patients having shaft breakage, old age patients, patients with co-existing diseases.

Data collection

All the detailed history of the patients was recorded. Complete lesion detersion is first done. Advance soft tissue covering is performed if needed. Plates are arranged on the lateral side of the tibia. If it is required, extra cortical screw utilizing minimally invasive plate osteosynthesis.

Bias

There was a possibility that bias may have occurred during the beginning of the research but was circumvented by providing patients with similar details which doesn't prevent bias but it instead makes analysis difficult.

Ethical consideration

The study was approved by the Pt. JLN government medical college ethical Committee. The aim of the research was demonstrated. Consent was taken from all the research subjects. The privacy of the subjects was kept.

Statistical analysis

Statistical package for social sciences version 21.0 statistical analysis software was utilized for the statistical evaluation. The categorical data was described as prevalence and percentage.

Result

In Table 1, classification according to the gender is shown. 70 patients were male and 37 patients were female.

As shown in Table 2, the majority of the patients were in the age range of 30-40 years. 13 patients were in the age range of 20-30 years. 45 patients were in the age range of 30-40 years. 40 patients were in the age group of 40-50 years. 9 patients were in the age range of 50-60 years.

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As shown in Table 3, most of the patients were farmers. 50 patients were farmers. 35 patients were businessmen, 11 patients were daily wage workers and 11 patients were office workers.

As shown in Table 4, 65 patients got injured due to road accidents, and 42 patients due to falls.

As shown in Table 5, 52 patients had injuries on the right side and 55 patients on the left side.

Table 1: Classification according to the gender

Gender	Number of patients
Male	70
Female	37

Table 2: Classification according to the age of the patients

Age	Number of patients
20-30years	13
30-40 years	45
40-50 years	40
50-60 years	9
Total	107

Table 3: Classification according to the profession of the patients

Profession	Number of patients
Farmer	50
Businessmen	35
Daily wage worker	11
Office work	11

Table 4: Classification according to the mode of accident

Mode of accident	Number of patients
Road traffic accidents	65
Fall	42
Total	107

Table 5: Classification according to the side of the injury

Side of injury	Number of patients
Right	52
Left	55

Discussion

A distal tibia fracture is very tough to handle. Intramedullary interlocking nailing is one of the treatment modalities for tibia fracture but it has disadvantages which include incomplete unification and implantation collapse [10]. Minimally invasive plate osteosynthesis helps in proper blood supply to the bona and less damage to the surrounding tissues. Subordinate reduction technique and administration of fasten bolt in minimally invasive plate osteosynthesis method avert damage during surgery and vascularity of the bone. As seen in this study most numbers of the patients were in the age range of 30-40 years. Most of the patients were male as compared to female.

Fractures which is sound, do not need surgery but can lead to incomplete unification, compression, firmness, and arthritis of the adjoining bone [11]. The operative resection necessary to attain anatomy leads to injury to the surrounding tissue and causes hematoma, contamination, late bone unification, and nonpositioning [12]. Minimally invasive plate osteosynthesis decreases the operative injury and creates appropriate surroundings for recovery. However, minimally invasive plate osteosynthesis does not permit straight imaging, thus during surgery, fluoroscopy is needed [13]. The management of tibia fracture is based on fracture design, adjacent tissue damage, co-existing conditions, and operative exposure. The drawback of minimally invasive plate osteosynthesis is subjection to emission. Minimally invasive plate osteosynthesis provides stability to the joint, mobility of the joint, the least chances of infection, and proper blood supply for wound healing. Tibia fracture affects the mobility of the leg and stiffens the muscles of the leg.

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The benefit of external fixators is they provide the least injury to the periosteum because of the least proximity to the bone. The basic concept of recovery from trauma is sooner functioning management and sooner stability of the bone [14]. When intra-articulation is involved, nailing cannot be done in bone, due to this lock plating is favorable for the treatment of the fracture. According to research by Stannard et al [15], LISS is a great option for the management of severe trauma without any contamination. Treatment of tibia fracture in stages leads to secure and helpful planning, yet an additional process is required for the reduction. The principle of minimally invasive plate osteosynthesis causes less contamination. Minimally invasive plate osteosynthesis in stages has more chances of contamination. The surgical procedures of both principal minimally invasive plate osteosynthesis and minimally invasive plate osteosynthesis in stages are similar. And the results of both methods in terms of bone unification are also similar. The majority of the patients got injured in road accidents. Most of the patient's right side was injured. Minimally invasive plate osteosynthesis has the least chance of complications and great outcomes. Minimally invasive plate osteosynthesis is a secure method for the treatment of tibia fracture.

Conclusion

According to the present study minimally invasive plate osteosynthesis method does not effect blood circulation and therefore leads to low intervention with the hematoma and trauma recovery. The unification of the bone is also quick in minimally invasive plate osteosynthesis. The time required for the minimally invasive plate osteosynthesis method is very little and no special instruments are needed for this procedure. It maintained the vascularization of the bone. Reduction becomes more tough if the treatment is not done on time. The reason for nonunification was soon pressure endurance, fragments, and fracture design. As per the procedure, minimally invasive plate osteosynthesis `is safe and secure and gives quick results. The unification of bones is also quick and mobilizes the leg in less time.

Limitations

The restraints of the current study involve a smaller number of patients associated with this analysis. The observation of the current research cannot be extrapolated for a larger number of people. Additionally, the lack of the combined category also acts as a limitation of this study's finding

Recommendation

Minimally invasive plate osteosynthesis is a safe and useful method for the treatment of distal tibia fracture. It has great results with the early union of bone and mobility of the leg. The procedure is also less complicated and provides sufficient blood supply to the periosteum. Therefore, minimally invasive plate osteosynthesis is a good choice for the treatment of distal tibia fracture.

Conflict of interest

There was no difference of opinion.

Funding

No funding was provided for this research.

Abbreviation

MIPO: Minimally invasive plate osteosynthesis

LISS: Less invasive stabilization system.

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