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RESULTS OF MIPO FIBULA PLATING IN LOWER END FIBULA FRACTURE IN CASE OF ISOLATED FIBULA AND POTT'S FRACTURE

Orthopaedics

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ABSTRACT

INTRODUCTION: The anatomy around the ankle in- particular provides minimal soft tissue coverage for most orthopaedic implants as well as regions of poor vascularity that can be disrupted by trauma as well as surgical techniques. Surgical site infection is one of the most common complications following ankle fracture surgery

OBJECTIVES: The purpose of this study was to describe in detail the minimally invasive approach for distal fibula fractures that allows for anatomic reduction, minimal soft tissue disruption and providing the surgeon with the means of converting to the more conventional open procedure if required.

MATERIALS AND METHODS: The study was prospective type of 18 patients (14 males, 4 females) with age group 18-75 years having isolated (8)/ pott's(10) fibula fracture were fixed with 3.5 mm anatomical plating by MIPO approach. Patients were followed at 6 weeks,8 weeks, 12 weeks, 6 months and 1 year & functional assessment of the patient was done according to the AOFAS Ankle-Hindfoot Scale.

RESULTS: At the final follow up, 13 patients had 85% AOFAS Ankle-Hindfoot Scale, 4 patients had 70% while 1 patient had <50% AOFAS Ankle-Hindfoot Scale. 13 (72%) patients had less than 30% postoperative restriction of ankle joint movement, 4 patients(22%) had 30-60% restriction of ankle joint movement while 1(6%) patient had a severe restriction (>60%) of ankle joint movement. Average valgus angulation was 5.95. The complication was superficial infection seen in 1 patients and 1 patient had ankle stiffness. No deep infection/ non-union observed.

CONCLUSIONS: The MIPO technique is established for managing fractures of the distal fibula that has a reliable fixation approach while preserving the osseous vascularity and hematoma, thus facilitating better biological repair giving good result and early rehabilitation. This may in future become the preferred method of fixation by most surgeons. Considering the good outcome in this study, We recommend use of the MIPO technique for treatment of distal fibular fractures.

KEYWORDS

MIPO fibula plating, Pott's fracture

INTRODUCTION

Surgical fixation of distal fibula fractures can be difficult, and requires careful preoperative planning, fracture pattern, soft tissue injury, and bone quality critically influence the selection of fixation technique. [1,2] Wound complications are a major concern for the orthopedic surgeon. Patient-specific factors such as diabetes, smoking and peripheral vascular disease all predispose patients to an increased risk of wound healing complications after surgery [6,7]. The anatomy around the ankle in- particular provides minimal soft tissue coverage for most orthopaedic implants as well as regions of poor vascularity that can be disrupted by trauma as well as surgical techniques. Surgical site infection is one of the most common complications following ankle fracture surgery [8-10]. While medial malleolar fractures can often be stabilized with less invasive techniques such as percutaneous screw fixation, fixation of the fibula is usually performed with open reduction and internal fixation (ORIF) utilizing a 7-10 cm skin incision directly over the lateral malleolus. Minimally invasive techniques in fibula fractures are technically feasible and may be advantageous in that it minimizes soft tissue compromise and devascularisation of the fracture fragments.[3-5]

With the advent of anatomical implants and minimally invasive surgical techniques wound complications are minimized. Many authors have reported minimally invasive techniques to address distal fibula fractures, although most achieved fixation without anatomic reduction of the fracture site [11-16]. Chiang et al. published a comparative cohort study and demonstrated that MIS approaches for treating distal fibula fractures leads to equivalent radiographic and functional outcomes as compared to standard ORIF with fewer wound complications[17].

AIMS AND OBJECTIVES

The purpose of this study was to describe in detail the minimally invasive approach for distal fibula fractures that allows for anatomic reduction, minimal soft tissue disruption and providing the surgeon with the means of converting to the more conventional open procedure if required.

MATERIALS AND METHODS

Place of study: The study concluded 18 patients admitted to the tertiary care hospital with distal end fibula fractures.

Type of study: The study was prospective type of study.

Sampling methods: The simple random sampling method was used in this study.

Sample collection: The sample collection period was from june 2015 to May 2017.

INCLUSION CRITERIA:

The selection criteria are closed fractures and open fractures of gustilo type I in the lower third tibia and fibula fracture in age group 18-75 years.

EXCLUSION CRITERIA:

- patients less than 18 years of age
- fracture in a paralytic limb
- open fractures
- patients medically unfit for surgery
- inflammatory arthritis or other arthritis of the injured ankle
- Old neglected fractures

PRIMARY & PRE-OPERATIVE MANAGEMENT:

Upon arrival in the department of casualty, thorough clinical examination of patients was done including neurovascular examination. Radiography in form of x- rays was done to know the exact geometry of fracture. Written informed consent was obtained from every patient regarding the surgery and inclusion in the study. The patients were evaluated using a standardized pre-anaesthetic work-up, and other associated injuries were treated using the appropriate treatment for that particular disease.

Surgical Management - Technique Of Tibia Fixation Using MIPPO Technique:

the patient was position supine on a radiolucent operating table with padding under the leg to assist lateral imaging. The image intensifier was placed in the opposite side and rotated for AP and lateral views. A

tourniquet was usually not required, but could be applied and inflated later during the operation, if required. The location of the surgical approach depends on the individual soft tissue situation and the fracture pattern as well as what was required for adequate reconstruction of the articular surface of the distal fibula. Generally, the distal fibulal locking plate was inserted from distal to proximal through a tunnel between periosteum and intact overlying tissue. The direct lateral approach was commonly used. The length of incision varied from 1.5-2 cm. We used towel clips/ pointed reduction forceps to hold the fracture fragments. We inserted proximal 3.5 mm cortex screws in diaphysis by separate stab incisions followed by distal 3.5 mm cortex locking screws through plate entry incision bypassing the fracture site.

After fixing fibula, medial malleolus fixation was done in case of pott's fracture



Fig.-Wound MIPO fibula plating

POSTOPERATIVE REGIME:

Post-operatively, patients were instructed to move their toes actively and limb elevation was maintained. Clean dressing was done on every third day post-operatively. On every dressing ankle was put to full range of motion once as per tolerability of the patients. Intravenous antibiotics were given for 4 days, later converted to oral until suture removal. Sutures were removed on the 11-14th postoperative day and check x-ray in antero-posterior and lateral views were obtained. Patients were later discharged with the below knee posterior POP slab and advised to perform active toe and knee movements. Patients were advised not to bear weight with affected limb.

DATA COLLECTION, FOLLOW-UP & EVALUATION:

At the end of 6 weeks, the plaster slab was then removed, crepe bandage was given and the patient was advised to do an active range of ankle movements as the pain permits. Patients were asked to return at 8 weeks, 12 weeks, 6 months and 1 year. At follow up, a detailed clinical examination was done and patients were assessed subjectively for the symptoms like pain, swelling and restriction of joint motion. Patients were instructed to perform physiotherapy in the form of active movments and weightbearing.

The functional assessment of the patient was done according to the AOFAS Ankle-Hindfoot Scale.

STASTICAL METHOD:

All the statistical analysis was performed using Microsoft Excel Software. Data were presented as mean±SD and proportions as appropriate. Nonparametric data was compared using chi-square test while independent t-test was used to compare the parametric variables. A 2-sided p-value of less than 0.05 was considered statistically significant.

RESULTS

Total 24 patients underwent fibula plating in the Department of Orthopedic Surgery, Tirtiary care Hospital Surat, were studied. Out of these patients, 6 were lost to follow-up and these cases were discontinued from the study. The remaining 18(14 male & 4 female) cases were follow-up for an period 2 years. The series included patients between 18 to 75 years of age. The mean age of the patients in our study was 46.72 years. The side involvement was almost equal with 10 fractures on the left side and 8 on the right. Majority (13) of the patients sustained injury due to road traffic accidents while 5 patients sustained injury due to fall. 8 patients had isolated fibula fracture while 10 patients had pott's fracture.

The fractures of the distal humerus were classified according to **Danis–Weber classification** classification. In our study maximum number (11 patients) had C type of fracture followed by B type (5 patients). A1 type fracture was seen in 2 patients.

Maximum numbers of patients were operated within first week of injury. Delay in Surgery was either due to delayed presentation to the institution or due to management of comorbid conditions. Mean duration between injury and surgery was 4.78±3.48 days and mean duration of hospital stay was 8.84±3.37 days. The average follow-up was 15.3 months with a range of 12-24 months.

Out of the 18 patients, 3 had hypertension, 2 had diabetes and 1 had both hypertension and diabetes which were treated pre-operatively according to physician's advice.

The complication was superficial infection seen in 1 patients (treated with antibiotics according to culture and sensitivity). Three patients had complains of itching at local site seen 4-5 months after surgery. None of our patient had deep infection or implant failure. None of our patient had Non-union at fracture site. Only two patients had moderate to severe degree of pain. Pain was associated with malrotation or angulation.

In the entire series, average valgus angulation was 5.95 with standard deviation of 1.09. Range of motion of ankle joint was graded according to the extent of restriction to the normal range of movement of that particular joint, expressed as a percentage of normal. 13 (72%) patients had less than 30% postoperative restriction of ankle joint movement, 4 patients(22%) had 30-60% restriction of ankle joint movement while 1(6%) patient had a severe restriction (>60%) of ankle joint movement.

At the final follow up, 13 patients had 85% AOFAS Ankle-Hindfoot Scale, 4 patients had 70% while 1 patient had <50% AOFAS Ankle-Hindfoot Scale.

DISCUSSION

The treatment of ankle fractures can be associated with an increased rate of complications including skin necrosis, infection and nonunions in certain patient populations[8,23,24]. The MIPO technique is established for managing fractures of the distal fibula that has a reliable fixation approach while preserving the osseous vascularity and hematoma, thus facilitating better biological repair. With the advent of newer low profile implants, locking plate and screw technology and MIS approaches the armamentarium for the treatment of fibula fractures with associated soft tissue trauma and those who are at increased risk of wound complications has broadened. Minimal invasive plate osteosynthesis (MIPO) is a form of MIS that was developed in an effort to prevent periosteal devascularization and major soft tissue dissection. Cadaver studies have demonstrated that MIPO techniques are better at preserving perforating vessels and subsequently the periosteal and medullary circulation of long bones[24,25,26].

MIPO approaches to the fibula have also been described specifically using percutaneous fixation with intramedullary screws or plates. Hess, et al. reported on a series of 20 cases using a MIS approach with locking plates and screws to treat distal fibula fractures associated with distal tibia fractures. 17/20 fractures healed without complications and they concluded that this technique was a viable option for patients with complex fractures of the distal fibula with critical soft tissue conditions[11]. Ray, et al. examined percutaneous intramedullary nailing of distal fibula fractures in diabetics and found that if closed reduction could be obtained, this technique was a viable option for fixation of the lateral malleolus with minimal soft tissue dissection and good to excellent results. While both groups demonstrated good results and adequate stabilization of the fractures using MIPO technique, anatomic reduction with direct visualization at the fibula fracture site was not achieved nor attempted[27]. Recently, Chiang et al reported a comparative cohort study comparing MIS techniques to traditional ORIF for distal fibula fractures. The authors reported less postoperative pain and fewer wound complications in the MIS group as compared to the ORIF group. The authors described two MIS techniques and reported on 24 patients utilizing a technique similar to ours.

If inadequate visualization of the fracture site or extension is required in order to gain reduction or place additional fixation, the MIS

approach can be made extensile by simply extending the proximal and distal aspects in a gentle curvilinear fashion. This is preferable to excessive retraction which can result in contusion of the soft tissue envelope. The MIS approach described is amenable to distal oblique fibula fractures. Weber C fractures are typically not amenable to this technique given increasing soft tissue thickness more proximally which necessitates a greater exposure. Obese patients similarly may require more formal exposure. Additionally, highly comminuted distal fibula fractures may require a bridge-plating technique and direct visualization of the fracture site is not recommended as it may lead to increased bone devascularization. Finally, patients with cresting of the lateral fibula, a normal anatomic variation occasionally encountered, may require an extensile approach as the plate often needs to be applied posterolaterally in these cases.

Manipulative reduction and internal fixation by percutaneous locking compression plate for the treatment of distal fibula shaft fracture an article by Xia YB et al showed that less invasive, more stable fixation, shorter healing time and better functional rehabilitation are observed.[18-22] The objective of this study was to evaluate functional outcome of fibular fixation using MIPO technique in fracture of fibula. Parametric tests like the unpaired t-test were used to compare the quantitative outcomes like time taken for radiological fracture union etc. while non-parametric tests like the Chi-square test were used to compare the qualitative outcomes like incidence of mal-union, etc. the results were considered significant if the P-value was less than 0.05. There are certain limitations of this study as well. A larger sample population needed to be studied to reduce the "type II" or beta error of the study. The patients could not be followed up for a longer period. Trauma surgery interval needed to be minimized as far as possible.

We have utilized this MIS approach for 18 patients with distal fibula fractures. Average total combined incision length was 4.2 cm (3.8-5.0cm). Average operative time from skin incision to completion of fibular fixation was 37.5 minutes (30-48 minutes) and 38.6 minutes (17-53 minutes) for the MIS group as compared to the traditional ORIF group. 1/19 patients in the MIS cohort sustained a wound healing complication. One patient had a superficial dehiscence treated with local wound care. Seventeen of the 18 patients in the MIS cohort achieved an anatomically aligned mortise at final follow up as compared. We describe the use of a minimally invasive approach for fixation of distal fibula fractures. This approach allows for minimal soft tissue dissection with recent reports demonstrating decreased wound healing complications. Direct visualization of the fracture site and anatomic reduction of the fracture can be achieved with the use of this MIS approach if incision is kept directly over fracture site.

CONCLUSION

The MIPO technique is established for managing fractures of the distal fibula that has a reliable fixation approach while preserving the osseous vascularity and hematoma, thus facilitating better biological repair giving good result and early rehabilitation. This may in future become the preferred method of fixation by most surgeons. Considering the good outcome in this study, We recommend use of the MIPO technique for treatment of distal fibular fractures.

ABBREVIATIONS:

MIPO – Minimally invasive plate osteosynthesis

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