



International Journal of Orthopaedics Sciences

ISSN: 2395-1958

IJOS 2019; 5(3): 383-386

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www.orthopaper.com

Received: 03-05-2019

Accepted: 07-06-2019

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Management of compound fractures of distal tibia and fibula by JESS (Joshis external stabilizing system)

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DOI: <https://doi.org/10.22271/ortho.2019.v5.i3g.1557>

Abstract

Introduction: Study is to evaluate the outcome of fixation of compound fractures of distal tibia by JESS fixator and to analyse the soft tissue healing and fracture union, functional outcome. Different modalities of treatments are available for this fractures, timing of surgery plays a vital role in the management of this compound fractures of distal Tibia with condition of the soft tissues. Although the severity of these injuries, complexities of a variety of treatment methods, and limitations of management having been well documented in the literature, excellent long-term results of treatment continue to elude patients sustaining these fractures. The open fractures of distal tibia are very common, and which adds complexity to distal tibial fracture treatment and union. So this study is a prospectively evaluating the results of compound fractures of distal tibia (AO 43-A) that is extra articular fractures managed using JESS fixator.

Material and Methods: Patients with distal tibia fracture with compound injury are selected for the study. Study conducted in Gulbarga institute of medical science (GIMS) department of orthopaedics Kalaburgi, Karnataka from January 2017 to December 2018. Total 12 patients selected with the criteria and treated with jess and followed up for 12 months. Antibiotic prophylaxis with injection given preoperatively and continued till 5th postoperative day. Regular dressing and knee and ankle passive and active mobilization started from day one. And non-weight bearing till three weeks and gradual weight bearing after 3 weeks. On an average patient discharged on 15th postoperative day, then regular followed-up. Check x-ray done first postoperative day. Another x ray done before jess removal that is on 6-8 week postoperative. Patient followed up closely and the functional outcome, ankle range of motion assessed.

Results: The evaluation, based on clinical and radiographic findings and subjective complaints of the patients, was made with the use of the American Orthopaedic Foot and Ankle Society score (AOFAS). 12 patients were followed up. AOFAS scoring: excellent in 83% (10). Average hospital stay: 15 days. Non union in one case and infection in one case.

Conclusion: JESS fixator is a safe and useful modality in compound tibial fractures as definitive modality, however caution is advocated as cohort is short.

Keywords: JESS, compound fractures, tibia

Introduction

External fixators are used since 1907 Lambotte ^[1] many devices have been presented for the fixation of fractures by external methods ^[2, 3, 4, 5, 6]. A number of devices have been used only rarely some of them have required additional fixation with a plaster cast. Distal tibia fractures especially compound, pose a therapeutic dilemma. Such fractures are usually associated with soft tissue damage which is minimal. The management of such injuries becomes a challenge to the surgeons. Stable external fixation of compound tibial fractures has confirmed the observation that this method promotes fracture healing of skin and soft tissue damage, reduces the risk of infection, and facilitates the treatment of patients with multiple injuries. In cases of very severe open fractures the method seems to be the treatment of choice and can reduce the frequency of amputation. The goals of management of these compound distal tibia fractures are: anatomic reduction of the fragments, stable fixation of fragments thus allowing early joint movements, and proper care of injured soft tissues. Various authors have reported their results open reduction and extensive internal fixation with high rates of wound problems, infection and other major complications ^[7, 8, 9, 10]. In earlier days, uniplanar external fixations were used with very high rates of pin-tract complications ^[11]. These fixators require placement of pins across the adjacent joints, thus causing joint stiffness.

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Recently, great emphasis has been laid on limited internal fixation supplemented with external fixation of the Periarticular fractures [12]. We present the use JESS fixator as a definite modality of treatment of compound fractures of distal tibia with or without fixation of fibula.

Materials and Methods

From January 2017 to December 2018 12 patients with open distal tibial fractures were treated at the Department of Orthopaedic GIMS Kalaburgi using JESS fixator using a prospective study. Inclusion criteria are Distal tibia extra articular fractures (AO Classification 43-A), Compound fracture without neurovascular injuries, with or without lower fibula fracture, Age above 18 yrs (epiphyseal closure), Patient giving consent for the study. Exclusion criteria are Co-morbidities like diabetes, age above 60 yrs, neurovascular injuries. Total 12 patients selected with the criteria and treated with jess and followed up for 12 months. Antibiotic prophylaxis with injection piperacillin and tozabactam 4.5 gm intravenous given preoperatively and continued till 5TH postoperative day. After preoperative x ray (Figure 1) patient is operated on same day with in 12hr of admission and within 24 hrs of injury and primary wound closure done with drain and fracture fixed with JESS. First dressing done on 3rd postoperative day. Patient knee and ankle active and passive mobilization started from day one. Non-weight bearing till three weeks and partial weight bearing after 3 weeks. On an average patient discharged on 15th postoperative day, then followed-up weekly for first 6 weeks to check for pin tract infection and pin and clamp loosening. And check x-ray done first postoperative day (Figure 2), if reduction not satisfactory frames readjustment done on next day. Another x ray done before jess removal that is on 6-8 week postoperative (Figure 3). Patient followed up closely and the functional outcome, ankle range of motion assessed at 3month, 6 months, 12 months post operative. There were 9 males and 4 females, with the mean age being 31.5 years (Table 1). Mean follow up 6 months (4-12 months). The fractures, evaluated by the AO classification, included 8 AO43A2, 3 AO43B3, 1 AO43C2 (Table 2). There were 1 type I, 9 type II, 2 type IIIA open fractures according to the Gustilo-Anderson Classification [13]. Fibula fracture was seen in 12 patients and 9 where fixed. In order to prevent ankle stiffness active and passive motion of ankle joint is initiated after 5 days. All the patients were followed-up and evaluated both clinically and radiographically. Results were evaluated using American Orthopaedic Foot and Ankle Society score (AOFAS) which included assessment of pain, range of motion and swelling.

Table 1: Age distribution

| Age of patients | Number of patients |
|-----------------|--------------------|
| <20 | 1 |
| 21-30 | 5 |
| 31-40 | 3 |
| 41-60 | 2 |

Table 2: Fracture categorisation

| Number of cases | AO classification |
|------------------|-------------------|
| 8 | AO43A2, |
| 3 | AO43B3, |
| 1 | AO43C2 |
| Gustilo Anderson | |
| 1 | Type 1 |
| 9 | Type 2 |
| 2 | Type 3A |



Fig 1: Preoperative X ray

Fig 2: Post operative X ray



Fig 3: 3 month X ray

Results

The present study was conducted in the Department of orthopaedics, GIMS Kalaburgi Karnataka of two year from Jan 2017 to Dec 2018 to evaluate the efficacy of JESS. 12 cases compound distal tibia fracture were taken to study. In which male 8 and female where 4 that is 2:1 ratio. mean age of the patients is 31.5 years and mean stay in the hospital is 15 days The evaluation, based on clinical and radiographic findings and subjective complaints of the patients, was made with the use of the American Orthopaedic Foot and Ankle Society score (AOFAS). 12 patients were followed up. AOFAS scoring: excellent in 83% (10).Average hospital stay: 15 days. Non union: one case and one infection .Mean time to union 2.5 months (Figure 4 & 5).



Fig 4: Clinical result



Fig 5: Clinical result

Table 3: Results of the series

| AOFAS | |
|-----------|----|
| Excellent | 10 |
| Good | 00 |
| Fair | 01 |
| Poor | 01 |

Discussion

The treatment of compound tibia fractures, is often associated with difficulties. The problems are attributable mainly to the skin injury, injuries to other soft tissues, and the severity of the bone damage [15]. An open wound over a fracture almost invariably means that the fracture is contaminated, implying a risk of infection. Other soft tissues as a rule, more severely injured in patients with open than in those with closed fractures. This makes the fracture more unstable and compromises the circulation in the fracture area, which is an important cause of delayed healing or non-union of a fracture. Moreover, bone damage is usually more severe in open than in closed fractures. Open fractures tend to be more comminuted and are more frequently accompanied by cortical bone defects. In general, cortical avascularity is more extensive in fractures of the open type. In this situation revascularization of the cortical fragments, which in tibial fractures are often relatively thick, can require considerable time. Ruedi and Allgower in 1973 [16], Schatzker in 1988 [17], McFerran *et al.* in 1992, Teeny and Wiss in 1993 and Wyrsh *et al.* in 1996 advocated open reduction and internal fixation for high-grade tibial fractures respectively, which necessitated extensive soft tissue stripping for adequate exposure. However, such procedures were associated with a high incidence of complications such as non-union, wound dehiscence and infection [18, 19, 20]. With a view to avoiding therapeutic difficulties and a high incidence of healing disturbances and complications in severe open distal tibial fractures, an increasing number of orthopaedic surgeons seem to be accepting external fixation as a relatively safe and risk-free method if it is performed in the proper manner [21]. In our study, 12 cases of compound distal tibial fractures were treated using JESS fixator. We had one non union and one infection which subsequently united with bone grafting and antibiotic treatment respectively, there were few pin tract infections which were easily treated by cleansing, incision or excision around pins, elevation of the limb, and a relatively

short period of appropriate antibiotic therapy. In no case did the infection prolong the time of treatment or healing. As previously indicated, mild infections of pin tracts can be avoided by adequate drainage. This can be achieved by making sufficiently large incisions, which can then be supplemented as required with further incisions and excisions if skin tension or skin tenting occurs. [22, 23, 24]. Ankle equinus and stiffness was prevented passive and later active ROM of anklein post-op follow up. The healing times for the present series are in good accordance with the mean healing time of 7.5 months found by Anderson *et al.* [25] in their series of tibial fractures treated by plaster casts and transfixing pins. It should be noted, however, that in the latter series only 46% of the fractures were open and that cases of delayed healing were not included. The mean healing time of 5.9 months in the last four years of the present series, therefore, seems very favourable, even when compared with plate-fixed open fracture [26, 27].

Conclusion

JESS fixator is a safe and useful modality in compound tibial fractures as definitive modality, however caution is advocated as cohort is short.

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