A Short-Term Study of 18 Cases of Distal Femur Fractures Managed By Locking Compression Plate [Lcp] Using A Less Invasive Skeletal Stabilisation System [LISS]

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KEYWORDS

Less invasive skeletal stabilisation system (LISS); locking compression plate (LCP); inter-condylar fractures; supra-condylar fractures; fracture femur

ABSTRACT

Distal femur fractures have traditionally been the most challenging to treat. Restoring full motion and function to the knee may be challenging due to these fractures' proximity to the knee joint. Regardless of the treatment method, comminution, damage of soft tissue, fracture extension into the knee joint, and related injury to the quadriceps mechanism frequently concludes in suboptimal outcomes. The early surgical fixation notion, increased implant availability, early postoperative knee joint immobilization, and a better understanding of damage patterns have all significantly improved the patient's functional result. Our study focuses on distal femur fractures managed by LCP [locking compression plate] using a less invasive skeletal stabilization system [LISS]. This is a retrospective research of 18 cases of distal femur fractures in adults who had LCP treatment with the LISS. The operation at Saveetha Medical College and Hospital in Chennai runs from January 2021 to January 2022. All types of intercondylar and supracondylar fractures are included. Children's fractures and pathological fractures were not included. Age distribution, side of injury, sex distribution, anatomy of injury, mechanism of injury, damage grading, subtype of fracture, concomitant injuries, and open fractures were the parameters used to assess the cases. AP and lateral views of the X-ray were taken. A thorough preoperative workup was completed. Every case was scheduled for surgery as soon as feasible. External fixators were used in the initial treatment of complicated cases. Patients underwent locking compression plate (LCP) fixation with the LISS. Radiological examination immediately following surgery, four weeks, six weeks, eight weeks, twelve weeks, four months, and every six months for a maximum of one year.The age range of the patients was 21 to 70 years, with a mean age of 30 years. A maximum incidence of fractures was noted in individuals aged 40 to 60. Males accounted for the majority of the 18 cases, with a female-to-male ratio of 3:5. Our series was predominantly right-sided. The most frequent cause of injury has been traffic accidents. Throughout the research period, no patients were lost to follow-up. Of the eighteen cases, the majority involved distal femur fractures, with intercondylar extension accounting for a higher number of cases, and isolated supracondylar fractures following. A head injury was present in one case, and acetabular fracture in another, a Boxer's fracturein a third case, and 2 open fractures (1 compound grade III A, the other compound grade II). The fractures took an average of 13.3 weeks to heal. It required an average of 15.3 weeks longer in cases of compound fractures. Less than six degrees of malalignment (varus, valgus) were present. Every patient exhibited optimal articular alignment.Excellent outcomes were obtained with the LISS, which combines appropriate physiotherapy with an LCP (angle stable build). In principle, an LCP implant is the best option for fractured and osteoporotic bones. In summary, the use of LCPs in the LISS appears to yield superior outcomes when managing distal femur fractures.

1. Introduction

Distal femur fractures have traditionally been the most challenging to treat. Restoring full motion and function to the knee may be challenging due to these fractures' proximity to the knee joint. Supracondylar femoral fractures internal fixation resulted in improved functional outcomes compared to non-operative techniques (1, 2, 3, 4, 5, and 6).

The LISS and LCP are two examples of technological advancements for distal femoral fracture treatment. In addition to providing more stability, they lessen the likelihood of varus collapse by providing several "points of fixed angle contact among the plate as well as screws in the distal femur (Angle stable construct)". By decreasing fractures indirectly, "biological plating" is possible (7).

Regardless of the treatment method, comminution, damage of soft tissue, fracture extension into the knee joint and related injury to the quadriceps mechanism frequently concludes in suboptimal outcomes. The early surgical fixation notion, increased implant availability, early postoperative knee joint immobilization, and a better understanding of damage patterns have all significantly improved the patient's functional result. This study aims to examine and discuss the results of distal femur

fractures treated with the LCP as part of the LISS.

2. Methodology

This is a retrospective research of 18 cases of distal femur fractures in adults who had LCP treatment with the LISS. The study at Saveetha Medical College and Hospital in Chennai was done from January 2021 to January 2022. All types of inter-condylar and supracondylar fractures were included. Fractures in children and pathological fractures were not included. Age distribution, side of injury, sex distribution, mechanism of injury, injury anatomy, damage grading, subtype of fracture, concomitant injuries, and open fractures were the parameters used to assess the cases. AP and lateral views of the X-ray were taken. A thorough preoperative workup was completed. Every case was scheduled for surgery as soon as feasible. External fixators were used in the preliminary treatment of complicated cases.

Under spinal anesthesia, the patient was placed supine on the radiolucent table, allowing for both AP as well as lateral views. Injection cefazolin with a dose of 1 gram was given to patients at the time of administering spinal anesthesia and continued for 5 days post surgery. The damaged limb is wrapped to provide the gastrocnemius muscle with 30 to 60 degrees of flexion. To accomplish proper limb adjustment as well as comparison of length and also rotation in complex fractures, preparation of both limbs has been carried out. The plate was aligned along the shaft, and then a k wire was used to temporarily hold the reduction. The 2nd K wire entered the plate, jig, and condyle after the reduction and plate location were confirmed to be parallel to the condyles. The distal femur and the anatomically pre-bent implant align in this position. The 6.5mm cannulated locking head cancellous screws that held the condyles to the plate had no effect on the reduction. Clinical management and the assistance of an image intensifier were used to control the reduction and plate location (axis, length, and rotation). According to the pre-operative planning, the locking head screws were introduced utilizing a stab incision and a jig sleeve assembly with an image intensifier. A portion of the holes were left empty for biomechanical purposes. After removing the guide wire, the “wound is sealed over a suction drain. The sterile, non-bulky dressing was applied”.

On the second postoperative day, a range of hamstring movements and quadriceps exercises have been initiated. In the first week, the range of movements was combined with continuous passive movement (CPM). Weight-bearing was initiated from the 10th postoperative day. After four to six weeks, partial weight bearing was begun. Complete weight bearing began by weeks 14 to 16. Radiological examination immediately following surgery, four weeks, six weeks, eight weeks, twelve weeks, four months, and every six months for a maximum of one year. Every patient was closely monitored for any complications every two weeks until the fracture healed. Following this, follow-up was done every month for up to six months, then at the end of one year.

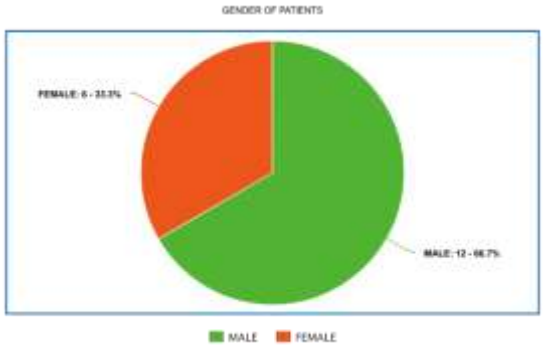

Figure 1 showing gender distribution of patients

3. Result and Discussion

With a mean age of 30, the age groups ranged from 21-70 years. The age range of 40 - 60 years was found to have the highest fracture incidence. With a female-to-male ratio of 3:5, men constituted the

majority of the 18 cases (Figure 1). Our series was predominantly right-sided (Figure 2). The most frequent cause of injury has been traffic accidents (Figure 3). Intercondylar extension was the most common, followed by isolated supracondylar fractures. A head injury was present in one case, and acetabular fracture in another, a Boxer's fracture in a third case, and 2 open fractures (1 compound grade III A, the other compound grade II). No patients have been lost to follow-up at the time of the study period.

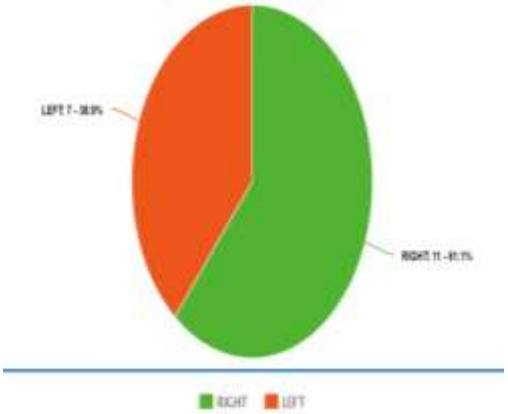

Figure 2 showing side of injury

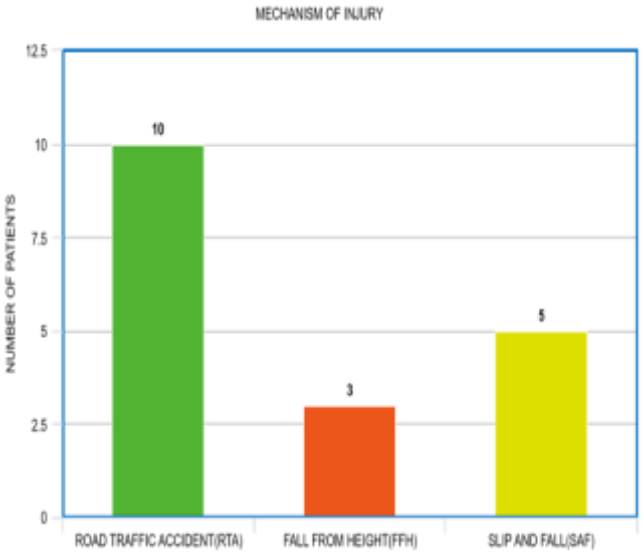

Figure 3 mechanism of injury

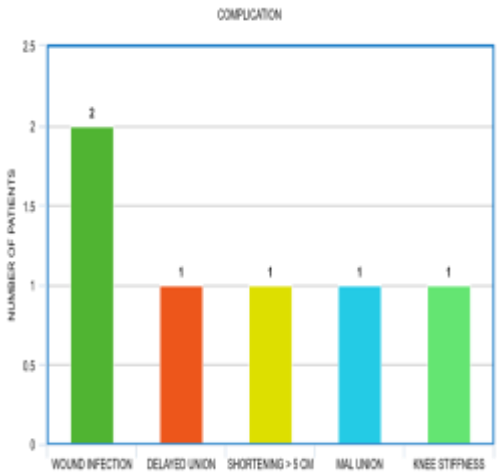

Figure 4 showing the number of patients with different complication

Table 1 shows that the fractures healed on average in 13.25 weeks. It took an average of 15.3 weeks longer in cases of compound fractures. Less than 6 degrees of misalignment existed (valgus, varus). Good articular alignment was present in every patient. No patient had step greater than 2 mm. In our series, the average knee flexion was 90°, with a range of 15° to 130°. The knee flexion varied depending on the fracture subtype. Eight cases had a recorded shortening of less than 1 cm, and two cases had a recorded shortening of more than 5 cm. Two of the cases experienced wound infection during the recovery period. By 16 weeks, all patients had effectively stopped using their walking aids, and only 1 patient was still utilizing a heel as well as sole rise.

Two patients experienced wound infections; one had a deep infection that resulted from a compound fracture, and the other had a superficial infection (Figure 4). The appropriate antibiotics were continued for three weeks, along with daily dressings with antiseptics, as part of the treatment protocol for superficial infections. The wound healed well and without any complications. All slough was completely removed, the deep-seated infection that developed after surgery was properly debrided, and the prescribed antibiotics were continued. In this instance, the healing process took longer. There were two cases of knee stiffness. These patients received active as well as assisted range-of-motion exercises for their knee joints after undergoing manipulation under anesthesia. In one instance, there was a malunion, but the patient received no treatment because his functional impairment was low and his knee joint motion range was good. One case involved a delayed union. Four cases had shortening of less than 1 centimeter, and they all functioned normally without the need for intervention. In one case, which involved a compound injury with bone loss that was first treated with a knee-spanning external fixator and then later with a LISS System that used an LCP and bone grafting, there was a shortening of more than 5 cm. The difference in limb length was handled properly.

DISCUSSION:

The reduced soft-tissue dissection and periosteum, as well as the blood supply disruption necessary for insertion, are two benefits of the LISS, which was created by AO in the late 1990s for the repairing of distal femur fractures. The device has a fixed angle. Compared with traditional procedures, it promotes quick bone union with minimal risk of problems including infection and bleeding (8). Numerous reports have surfaced detailing the advantageous outcomes of utilizing LISS for stabilizing fractures surrounding the knee. Following fracture reduction, <5 mm translation, <5–10-degree angulation, <10-degree rotational deformity, and <1cm femoral shortening are acceptable alignments (8).

Although the operation took less time during the procedure than formal fixation techniques, it did take longer at first. We achieved adequate knee function by performing appropriate physiotherapy with CPM and little soft tissue dissection, which allowed us to have a good range of motion in the knees. Since the plate is slid proximally across a greater distance, we did not apply the tourniquet as recommended by Chapman et al (9).

While most series adhere to NEER's approach for rating method, some including Shewring et al (10), used different systems, such as Schatzker's. We used the NEER rating method for functional analyses, which assigns equal weight to radiological (angulation) markers, clinical (shortening, knee flexion), and practical (pain, disability) markers. With this system, we obtained 20% good and 80% excellent results. Based on the NEER rating system, the results ranged from excellent to fair. The good and fair outcomes have been caused by patients' noncompliance, which resulted in poor knee motion. The one failed case in our series was linked to an infection. With respect to the study by Hernanz-Gonzalez et al., with careful patient selection, thorough pre-operative planning, and expert per-operative execution, the LISS is the best approach for severely comminuted fractures (11).

Knee range of motion was 15°–130° on average. The outcomes were similar to the research conducted in September 2005 by Ja, Zlovodzki, Kregor Pj Standard, and core PA, which published preliminary

LISS LCP results in 103 fractures (12). The literature on LISS plates is ambiguous about when weight bearing should be permitted; patients had to refrain from bearing any weight for eight to twelve weeks; partial weight bearing was mandated for the 1st four to six weeks; and then partial weight bearing has been required for the 1st eight to twelve weeks after surgery [13]. Fankhauser et al. [14] proposed that the decision to bear weight was made on an individual basis. Weight-bearing must be postponed if the location of the LISS plate is aberrant, according to Liu et al. [15].

We discovered that the LISS is a useful approach, and the LCP is the perfect implant for distal femur fractures by concentrating on the significance of minimal soft tissue injury and early knee mobility utilizing appropriate postoperative rehabilitation.

Limitations of the study were there is no uniformity in sampling as it is a retrospective study and there is no control group to compare with so compared with other similar studies

4. Conclusion and future scope

Excellent outcomes were obtained with the Less Invasive Skeletal Stabilisation System (LISS), which combines appropriate physiotherapy with a locking compression plate (LCP). In principle, a locking compression plate (LCP) implant is one of the best options for fractured and osteoporotic bones.

The most frequent complications we saw in our series were infection, knee stiffness, and fracture mal alignment, all of which could be managed with skilled surgery, careful soft tissue handling, prudent antibiotic usage, and intensive early knee mobilization.In summary, the use of LCPs in the LISS appears to yield superior outcomes when managing distal femur fractures.

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