

The Effects Of Non-Locking Dynamic Compression Plate Versus Locking Compression Plate On Tibial Condyle Fracture Treatment

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Abstract

The goal of this study is to compare the treatment outcomes of a tibial condylar fracture treated with regular non-locking dynamic compression plates with locking compression plates in terms of anatomical and function restoration, as well as post-operative complications. For this trial, 40 patients were randomly assigned to one of two groups. To establish statistical significance for the study's continuous data, an unpaired t test was performed. With a p value of 0.05, this difference was declared significant (or 0.04 in the current study). Patients who underwent tibial condyle fracture surgery with locking compression plates healed faster and had better functional outcomes than those who underwent surgery with non-locking buttress plating. A larger sample size and a longer study period are required to draw a firm conclusion.

INTRODUCTION

High-energy, complicated tibial plateau fractures have increased in recent years as a result of an increase in high-velocity trauma.¹ These are commonly linked with severe soft tissue and bony injuries, resulting in a high complication rate such as infection, necrosis of overlying soft tissue, varus collapse, knee stiffness, articular malreduction, and secondary osteoarthritis.² Depression fractures happen more often in older people with osteoporosis because their subchondral bone is less able to handle direct axial loading.³ Intra-articular tibial fractures are difficult to cure. Age, skin condition, osteoporosis, comminution, and fracture pattern are key operative factors. The goal of surgery for proximal tibia fractures is to fix the joint surfaces, keep the mechanical axis, and give the patient a knee that works and doesn't hurt.⁴ Henceforth, We studied locking compression plates and non-locking buttress plates for treating tibial condyle fractures.

AIM

To evaluate and compare the treatment outcomes of a tibial condylar fracture treated with typical non-locking dynamic compression plates versus locking compression plates with restoration of anatomy and normal function, as well as to look into post-operative complications.

SOURCE OF SAMPLE

Within the scope of this study are individuals who visited the Orthopaedic Department of the Krishna Institute of

Medical Sciences in Karad between June 2019 and June 2021.

INCLUSION CRITERIA

1. Age > 18 years
2. Patients of any sex
3. Radiologically demonstrable tibial condyle fracture with fracture line extending into articular surface of knee joint.
4. Fractures should be classifiable according to Schatzker's method of classification.
5. Patients who are medically fit for surgery.
6. Patients who are willing to participate in study.
7. All patients must have unilateral closed fractures without open wound or neuromuscular complications.

EXCLUSION CRITERIA

1. Pathological fractures
2. Patients requiring revision surgeries.
3. Patients with compound fractures
4. Patients younger than 18 years or older than 60 years.
5. Ipsilateral fractures of the femur and tibia

STUDY DESIGN: Randomized prospective comparative study.

STUDY PERIOD: All 40 patients were followed up for a period of at least 6 months.

VARIABLES STUDIED:

1. Using the KNEE SOCIETY SCORE, determine the functional outcome based on pain, function, alignment.
2. Valgus-Varus alignment using the Medial Proximal Tibial Angle.
- 3.

MATERIAL AND METHOD

The study comprised 40 patients who experienced tibial condyle fractures. Once we acquired their informed written consent in the predefined format, we recruited each participant in the study. The current study, which was a prospective, randomized comparative study, compared the outcomes of treating tibial condyle fractures with a conventional non-locking buttress plate versus a locking compression plate using the Chit system. The research focused on patients who had undergone surgery and had tibial condyle fractures.

CASE ILLUSTRATIONS

Case 1: Schatzker's type I fracture operated with non-locking proximal tibia plate.



Case 2: Schatzker's type V fracture operated with non-locking proximal tibia plate.



Case 3: Schatzker's type VI fracture operated with locking compression proximal tibia plate.



GENDER DISTRIBUTION

FIG 1: SEX



DISTRIBUTION

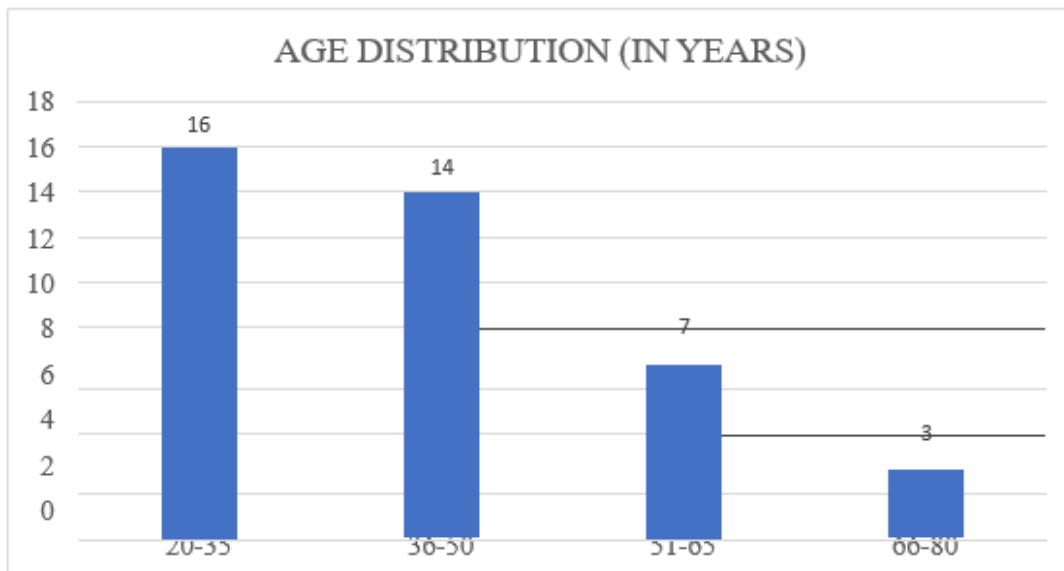


FIG 2: AGE DISTRIBUTION

SIDE DISTRIBUTION

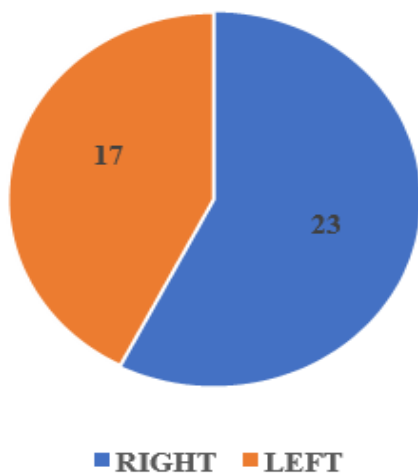


FIG 3: SIDE DISTRIBUTION OUT OF 40 PATIENTS

MODE OF INJURY

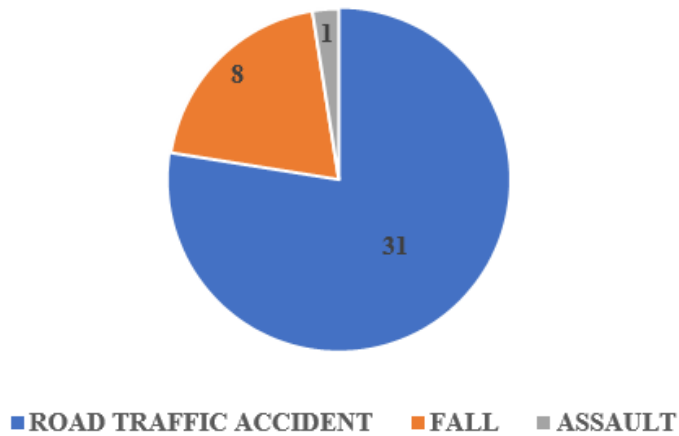


FIG 4: MODE OF INJURY

Prior to surgery, the fractures were classified as follows using Schatzker's classification method:

1. X-rays of the affected knee's antero-posterior and lateral views with the proximal 2/3rd tibia.
2. CT scan of the knee.

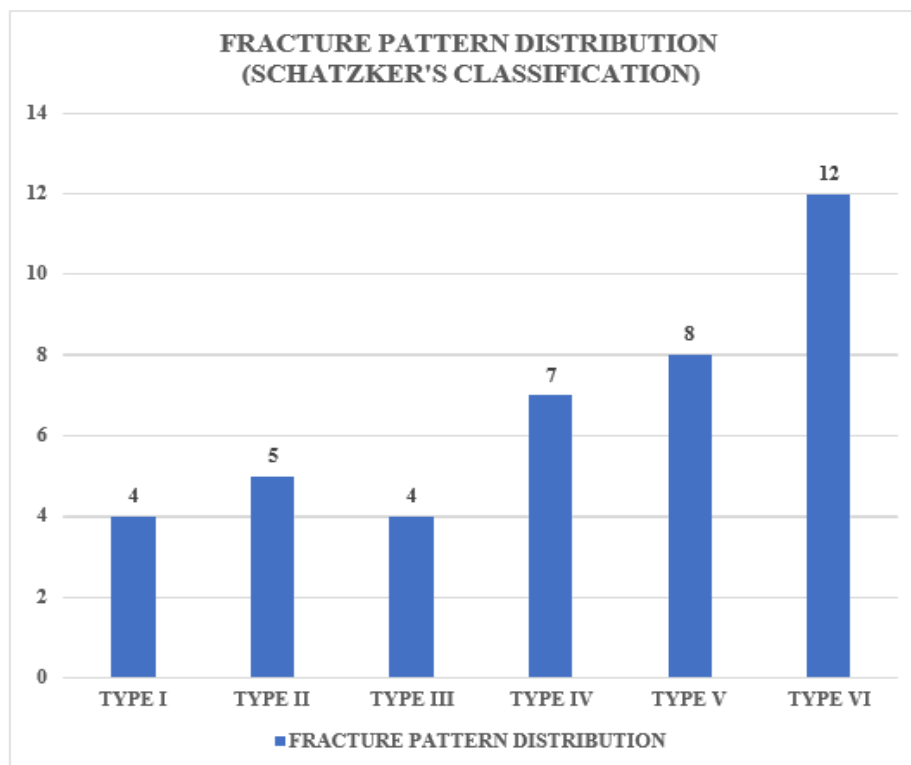


FIG 5: FRACTURE PATTERN DISTRIBUTION

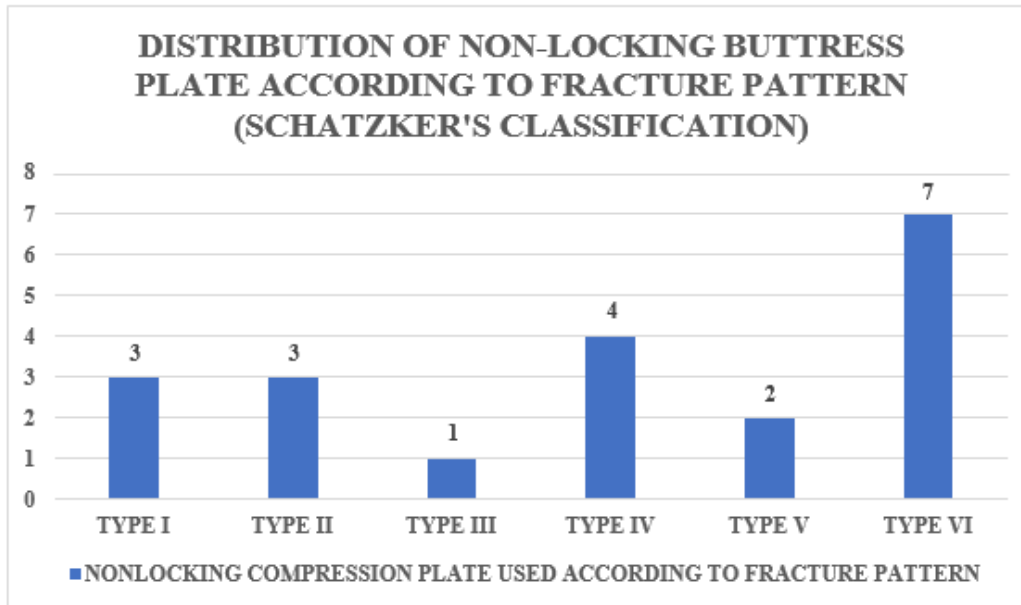


FIG 6: DISTRIBUTION OF NON-LOCKING BUTTRESSING PLATES ACCORDING TO FRACTURE OF PATTERN.

| FRACTURE PATTERN (SCHATZKER'S CLASSIFICATION) | NUMBERS | PERCENTAGE |
|---|---------|------------|
| TYPE I | 3 | 15% |
| TYPE II | 3 | 15% |
| TYPE III | 1 | 5% |
| TYPE IV | 4 | 20% |
| TYPE V | 2 | 10% |
| TYPE VI | 7 | 35% |

TABLE 1: DISTRIBUTION OF NON-LOCKING BUTTRESSING PLATES ACCORDING TO FRACTURE OF PATTERN.

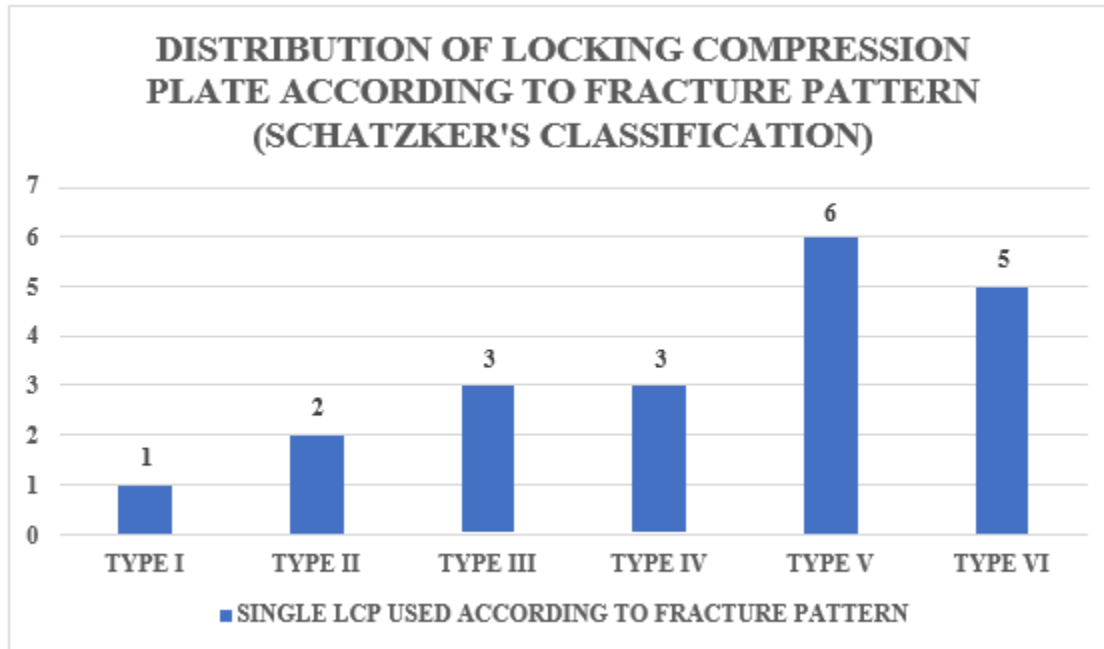


FIG 7: DISTRIBUTION OF LOCKING BUTTRESSING PLATES ACCORDING TO FRACTURE OF PATTERN.

| FRACTURE PATTERN (SCHATZKER'S CLASSIFICATION) | NUMBERS | PERCENTAGE |
|---|---------|------------|
| TYPE I | 1 | 5% |
| TYPE II | 2 | 10% |
| TYPE III | 3 | 15% |
| TYPE IV | 3 | 15% |
| TYPE V | 6 | 30% |
| TYPE VI | 5 | 25% |

TABLE 1: DISTRIBUTION OF LOCKING BUTTRESSING PLATES ACCORDING TO FRACTURE OF PATTERN

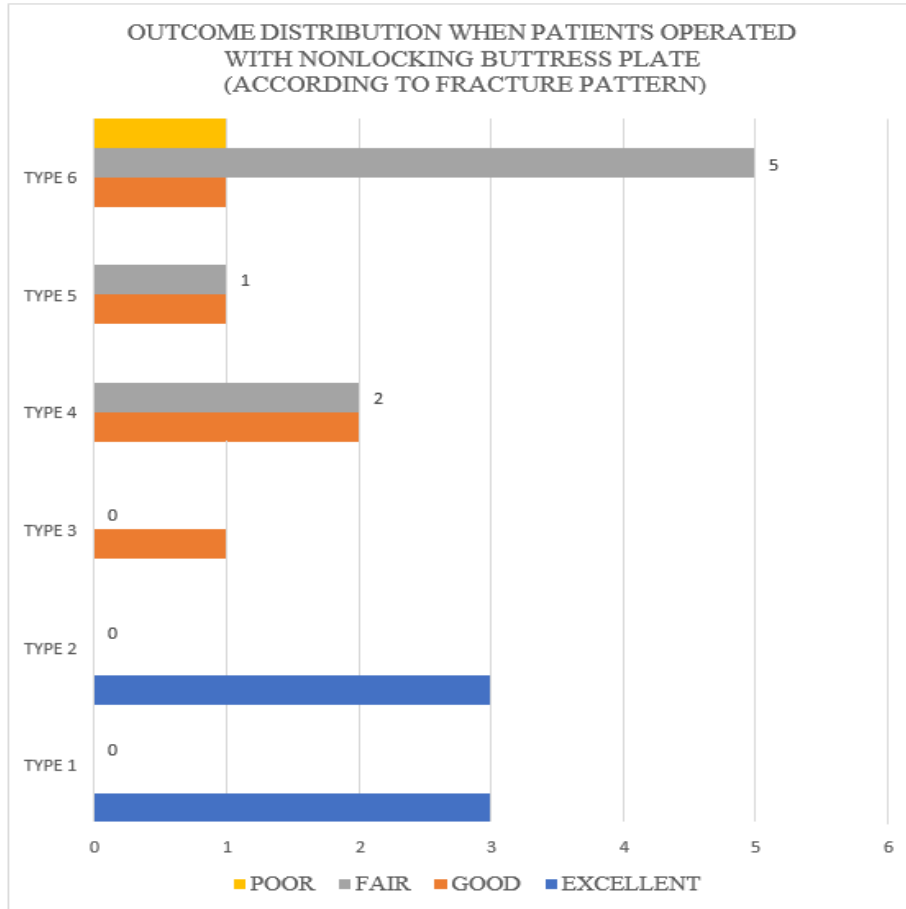


FIG 8: DISTRIBUTION OF OUTCOME IN PATIENTS OPERATED WITH NON-LOCKING BUTTRESS PLATING ACCORDING TO SCHATZKER'S FRACTURE PATTERN.

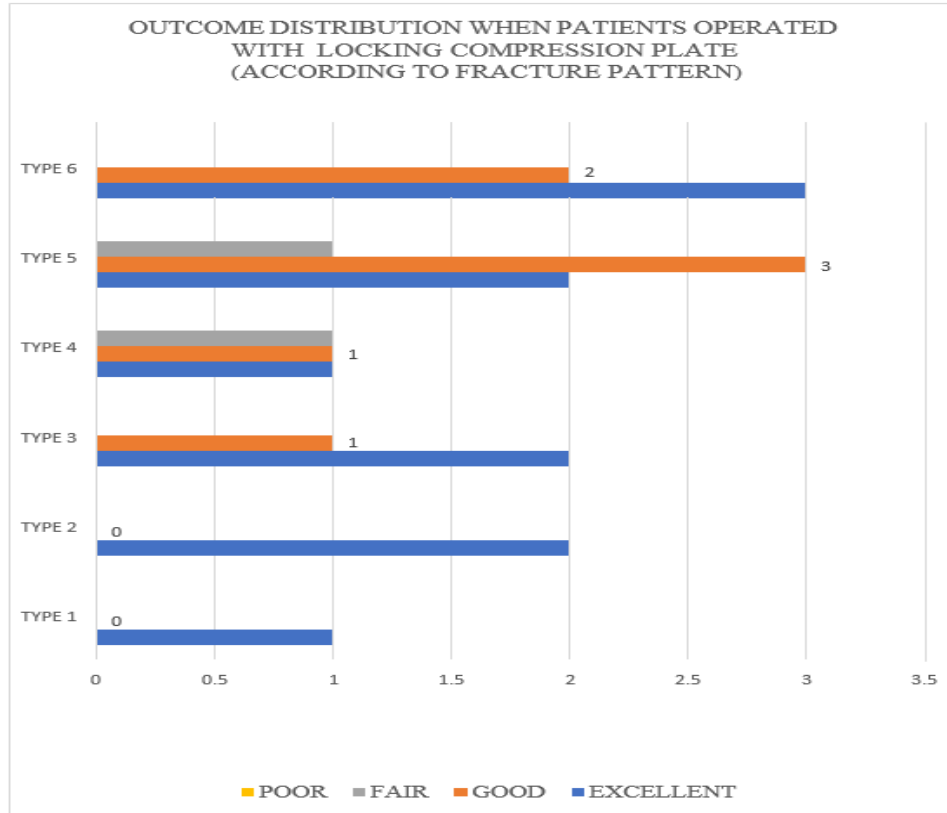


FIG 9: DISTRIBUTION OF OUTCOME IN PATIENTS OPERATED WITH LOCKING COMPRESSION PLATING ACCORDING TO SCHATZKER'S FRACTURE PATTERN.

| SCHATZKER'S TYPE I | EXCELLENT | GOOD | FAIR | POOR |
|--------------------|-----------|------|------|------|
| NON-LOCKING | 3 (100%) | 0 | 0 | 0 |
| LOCKING | 1 (100%) | 0 | 0 | 0 |

TABLE 2: DISTRIBUTION OF OUTCOME AT 6 MONTHS POST-OPERATIVELY IN SCHATZKER TYPE I FRACTURE PATTERN.

- Patients who had a Schatzker's Type 1 fracture pattern were randomly divided into two groups. The first group had their surgery performed with non-locking buttress plates, and the second group had their surgery

performed with locking compression plates. Excellent in terms of Knee Society score.

| SCHATZKER'S TYPE II | EXCELLENT | GOOD | FAIR | POOR |
|---------------------|-----------|------|------|------|
| NON-LOCKING | 3 (100%) | 0 | 0 | 0 |
| LOCKING | 2 (100%) | 0 | 0 | 0 |

TABLE 3: DISTRIBUTION OF OUTCOME AT 6 MONTHS POST-OPERATIVELY IN SCHATZKER 'S TYPE II FRACTURE PATTERN.

- Patients who had a Schatzker's Type 2 fracture pattern were randomly divided into two groups: one group received non-locking buttress plates, and the other group received locking compression plates. Both groups underwent surgery.

| SCHATZKER'S TYPE III | EXCELLENT | GOOD | FAIR | POOR |
|----------------------|-----------|-----------|------|------|
| NON-LOCKING | 0 | 1 (100%) | 0 | 0 |
| LOCKING | 2 (66.6%) | 1 (33.3%) | 0 | 0 |

TABLE 4: DISTRIBUTION OF OUTCOME AT 6 MONTHS POST-OPERATIVELY IN SCHATZKER'S TYPE III FRACTURE PATTERN.

- Patients who had a Schatzker's Type 3 fracture pattern were randomly assigned to have either non-locking buttress plates or locking compression plates implanted during surgery. In total, four patients had their fractures treated. When patients were operated on with a locking compression plate, an excellent outcome in terms of the Knee Society score was attained in two out of three, which is 66.6% of the total. However, none of the patients who were operated on using plates that did not lock together had a successful outcome.

| SCHATZKER'S TYPE IV | EXCELLENT | GOOD | FAIR | POOR |
|---------------------|-----------|-----------|-----------|---------|
| NON-LOCKING | 0 | 0 | 2 (50%) | 2 (50%) |
| LOCKING | 1 (33.3%) | 1 (33.3%) | 1 (33.3%) | 0 |

TABLE 5: DISTRIBUTION OF OUTCOME AT 6 MONTHS POST-OPERATIVELY IN SHATZKER'S TYPE IV FRACTURE PATTERN.

- Patients diagnosed with a Schatzker's Type 4 fracture pattern were randomly divided into two groups: those who underwent surgery received non-locking buttress plates, and those who underwent surgery received locking compression plates. When patients were operated on with a locking compression plate, an excellent outcome in terms of the Knee Society score was reached in one out of every three, or 33.3% of patients. However, none of the patients who were operated on using plates that did not lock together had a successful outcome. Two out of four, or fifty percent, of the patients who underwent surgery with non-locking plates had a poor outcome, but in our study, not one of the patients who underwent surgery with locking compression plates had a poor prognosis despite having a similar fracture pattern.

| SCHATZKER'S TYPE V | EXCELLENT | GOOD | FAIR | POOR |
|--------------------|-----------|---------|-----------|------|
| NON-LOCKING | 0 | 1 (50%) | 1 (50%) | 0 |
| LOCKING | 2 (33.3%) | 3 (50%) | 1 (16.6%) | 0 |

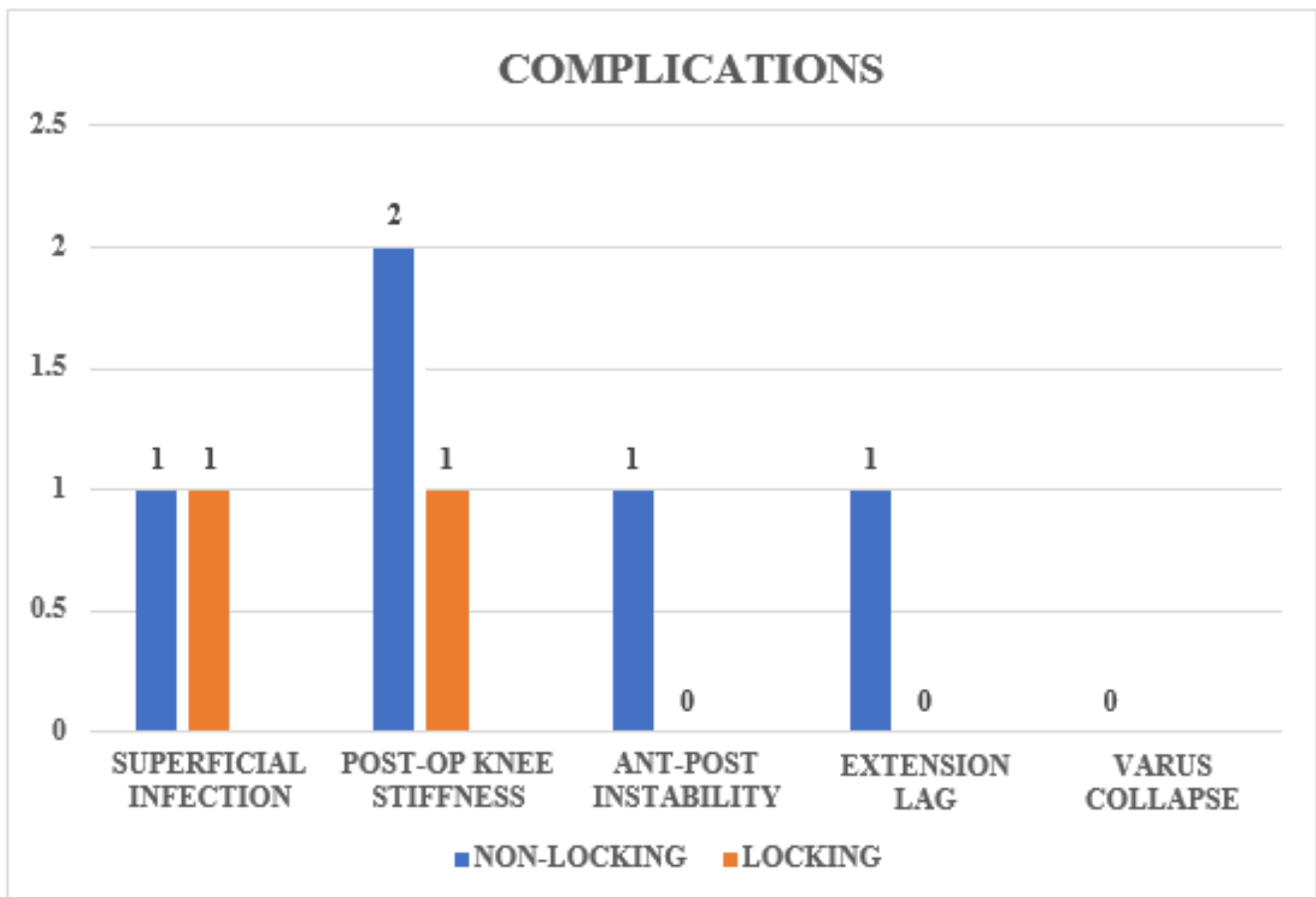
TABLE 6: DISTRIBUTION OF OUTCOME AT 6 MONTHS POST-OPERATIVELY IN SHATZKER'S TYPE V FRACTURE PATTERN.

- Two patients with a Schatzker's Type 5 fracture pattern were randomly assigned to have their operation performed with non-locking buttress plates, and the remaining six patients had their operation performed with locking compression plates. When patients were treated with a locking compression plate, an excellent outcome in terms of Knee Society score was achieved in two out of six, or 33.3% of the total patients. However, none of the patients who were operated on using plates that did not lock together had a successful outcome. In our study, 1 out of 2 patients, or 50%, with the same fracture pattern treated with non-locking plates had a fair outcome, but only 1 out of 6 patients, or 16.6%, with the same fracture pattern treated with locking compression plates had a fair outcome.

| SCHATZKER'S TYPE VI | EXCELLENT | GOOD | FAIR | POOR |
|---------------------|-----------|-----------|-----------|-----------|
| NON-LOCKING | 0 | 1 (14.2%) | 5 (71.4%) | 1 (14.2%) |
| LOCKING | 3 (60%) | 2 (40%) | 0 | 0 |

TABLE 7: DISTRIBUTION OF OUTCOME AT 6 MONTH POST-OPERATIVELY IN SHATZKER'S TYPE IV FRACTURE PATTERN.

- 7 patients with a Schatzker's Type 6 fracture pattern were operated on with non-locking buttress plates, and 5 patients with a Schatzker's Type 6 fracture pattern were operated on using locking compression plates. When patients were treated with a locking compression plate, an excellent outcome in terms of the Knee Society score was achieved in three out of five, or sixty percent, of the cases. However, none of the patients who operated with non-locking plates achieved a favorable outcome. In our study, patients who had comparable fracture patterns and were operated on using locking compression plates did not exhibit any signs of a bad outcome. However, 1 out of 7 patients, or 14.2%, who had their fractures treated with non-locking plates had a poor outcome.



| COMPLICATION | GROUP A (OPERATED WITH NON-LOCKING PLATE) (N) | GROUP B (OPERATED WITH LOCKING COMPRESSION PLATE) (N) |
|-----------------------------------|--|--|
| SUPERFICIAL SOFT TISSUE INFECTION | 1 (5%) | 1(5%) |
| POST OPERATIVE KNEE STIFFNESS | 2 (10%) | 1 (5%) |
| ANTERO-POSTERIOR KNEE INSTABILITY | 1 (5%) | 0 |
| EXTENSION LAG | 1 (5%) | 0 |
| VARUS COLLAPSE | 0 | 0 |

These complications that came up in our study are listed below: -

At the site of the suture, two patients got superficial soft tissue infections, which were treated with a daily dressing and medicine. Three patients experienced post-operative knee stiffness (less than 90 degrees of knee flexion). (Two patients had non-locking buttress plates installed, and one patient had a locking compression plate installed.) For the same reasons, regular physiotherapy exercises were recommended. One case each of antero-posterior knee instability and an extension lag of approximately 10 to 15 degrees was observed in the group of patients operated on with a non-locking buttress plate. In the group of patients who underwent surgery with locking compression plates, there were no incidences of post-operative knee instability or extension lag. In our study, there were no cases of post-operative varus or valgus collapse. In the current investigation, there were no incidences of post-operative articular surface re-depression or implant failure.

DISCUSSION

A knee fracture causes severe morbidity and reduces life quality. The surgeon must achieve a solid bone fixation and a quick recovery for the patient. Intra-articular proximal tibial fractures are prevalent. These fractures impact knee biomechanics, joint stability, and articular surfaces. Surgical treatment of a proximal tibia fracture aims to restore articular surfaces, maintain the mechanical axis, and achieve a functional and painless knee. We evaluated locking compression plates and non-locking buttress plates for tibial condyle fractures. Forty people with broken tibia condyles were put into two groups at random: those who got nonlocking buttress plating and those who got locking compression plating. In this study, 77.5 percent of injuries were traffic-related. 20% of our patients fell, and 2.5% were assaulted. Patil et al. (2015) found that motor vehicle accidents were the most common kind of trauma (63.3% of patients). In another study, all 21 fractures (100%) were from automobile incidents.⁵

In Schatzker type 1 fracture patients, 3 received non-locking buttress plates, and 1 received locking compression plates. Both patient groups had excellent Knee Society scores. In Schatzker Type 2 fracture patients, 3 received non-

locking buttress plates, and 2 received locking compression plates. Both groups had excellent Knee Society scores. Abghari M et al. found no clinical evidence to support the routine use of locked plating for uncomplicated split depression fractures of the lateral tibial plateau.⁶

In Schatzker Type 3 fractures, 1 patient received non-locking buttress plates, and 3 received locking compression plates. 2 out of 3 (66.6%) patients with locking compression plates had excellent scores from the Knee Society. Non-locking plate patients had poor outcomes. In Schatzker Type 4 fracture patients, 4 received non-locking buttress plates, and 3 received locking compression plates. In 33.3% of patients with locking compression plates, Knee Society scores were excellent. No patient with non-locking plates had a good outcome. In our study, 2 out of 4 (50%) patients with non-locking plates had a poor outcome, but none with locking compression plates did. In patients with the Schatzker Type 5 fracture pattern, two patients were operated on at random with non-locking buttress plates and six patients with locking compression plates. When using a locking compression plate, 2 out of 6 patients (33.3%) had an excellent outcome in terms of the Knee Society score. However, none of the patients operated on with non-locking plates had a good prognosis. In our study, 1 out of 2 (50%) patients who underwent surgery with non-locking plates had a good outcome, whereas only 1 out of 6 (16.6%) patients with a comparable fracture pattern who underwent surgery with locking compression plates had a good outcome. Five patients underwent surgery with locking compression plates, while seven patients underwent surgery with non-locking buttress plates for patients with the Schatzker Type 6 fracture pattern. When using a locking compression plate, an excellent result in terms of the Knee Society score was attained in 3 out of 5 patients, or 60% of cases. However, none of the patients who underwent non-locking plate surgery experienced a successful outcome. In our investigation, none of the patients with similar fracture patterns who underwent surgery with locking compression plates demonstrated a bad outcome, compared to 1 out of 7 (14.2%) patients who underwent non-locking plate surgery. In a research study by Bipan Shrestha et al., the majority of cases treated with locking compression plates (19 patients) at 6 months after surgery had positive outcomes, with 10 patients being Schatzker type VI. The average score for the Knee Society was 78.22.⁷

The MPTA (medial proximal tibial angle) ranged from 77 to 94 (mean = 87.6 +/- 22). At the moment of fixation, three cases (7.5%) were outside the usual range (82/92). They were classified as maligned because two (one nonlocking and one locking) had a varus angulation (i.e., 82) and one (in the nonlocking group) had a valgus angulation (i.e., >92).

Two patients (one with a non-locking buttress plate and the other with a locking compression plate) developed a superficial soft tissue infection that was managed with antibiotics and regular treatment. Three patients had post-operative knee stiffness (two patients operated with a non-locking buttress plate and one patient operated with a locking compression plate). Regular physiotherapy exercises were recommended. In one example, a non-locking buttress plate caused anterior-posterior knee instability. One patient with a non-locking buttress plate had a 10–15-degree extension lag. Locking compression plates did not cause post-operative knee instability or extension latency.

CONCLUSION

Our goal was to establish a stable, congruent, painless, movable joint to prevent subsequent osteoarthritis and achieve a favorable functional outcome. We tested locking compression plates and non-locking buttress plates in tibial condyle fractures. Schatzker's Type I and Type II fractures had similar Knee Society scores and union times when operated on with a non-locking or locking buttress plate. At 6 months, implant choice did not affect the end result. Locking compression plates yielded excellent and good outcomes for Schatzker's Type III, IV, V, and VI Tibial Condyle Fractures.

For a firm conclusion, we would need a larger sample size and a longer follow-up period. However, it is safe to say from our study that the group of patients who were treated for tibial condyle fractures with locking compression plates had a better functional outcome in terms of Knee Society Score, return to normal function, and lack of deformity than the group who were treated with non-locking plates. According to Schatzker's classification, this is especially true for tibial condyle fractures of types III, IV, V, and VI. For Schatzker's Type I and Type II fractures, the results were the same whether a non-locking buttress plate or a locking compression plate was used during surgery.

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