



Supracutaneous plating: Use of locking compression plate as external fixator for intra-articular compound fractures

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ABSTRACT

Compound intra articular fractures of distal femur and proximal tibia is the one of the most common injury encountered by orthopaedic surgeons these days. Metaphyseal juxtaarticular and intraarticular compound fractures are not good indication for intramedullary nails and open reduction and plate fixation due to limitation of short proximal and distal fragment and marked comminution at these areas with greater chances of infection, soft tissue complications and risk of plate exposure. These fractures are mostly managed by external fixators, ring fixators or hybrid fixators. We managed these fractures by locking compression plates as an external fixator; supracutaneous plating and results evaluated. A study of eight (six male and two female) patients with compound injuries to distal femur and proximal tibia or both during a period of one year. Total ten fractures were treated by external fixation i.e precontoured anatomical locking plate application. Cases were followed up at regular interval and functional outcome assessed using knee society score. Mean period for implant in situ was around 16 weeks. 100% fracture union rate was achieved. There was 1 case of low grade infection at fracture site seen. Good to excellent outcome achieved according to knee society score in 87.5% cases. We concluded that primary plating as an external fixator of compound fracture is a good method of management. There is a high rate of union with a low complication rate when using external locked plating for open fractures of distal femur and proximal tibia.

Keywords: Supracutaneous plating, compound fracture , intra articular fractures external fixator.

INTRODUCTION

Compound Intra-articular fractures of distal femur present a huge surgical challenge. These fractures are difficult to treat and operative treatment is usually recommended for favorable outcome^[1-4]. These are associated with high energy trauma (in the youngsters) and osteoporotic bones (in the elderly)^[5] and are frequently comminuted and intra-articular.

Compound fractures of the tibia is one of the commonest injury encountered. Diaphyseal compound fractures are well managed by primary interlocking nails or external fixator with good to excellent results. Metaphyseal juxtraarticular and intraarticular compound fractures require a combination of soft tissue as well as anatomic reduction of bone^[6,7].

Metaphyseal juxtraarticular and intraarticular compound fractures are managed by various staged procedures. Low-profile external fixation application a locking plate, is a good option^[8,9]. Current generation of distal femoral and proximal tibia locking compression plates is precontoured based on the average bony anatomy of the adult population and they form a fixed angled construct.

The purpose of this study was to evaluate functional outcome, soft tissue and fracture healing, and the complications of compound distal femoral and proximal tibia fractures using locking compression plates as external fixator.

MATERIAL AND METHODS

An observational study of eight (six male and two female) patients with compound injuries to distal femur and proximal tibia or both during a period of one year. Total ten fractures were treated by external fixation i.e precontoured anatomical locking plate application. Their mean age was 32.3 years (25 to 54). Mode of trauma were as follows; one by machinery(farming), six were caused by traffic accident, and one by physical violence.

Inclusion criteria:

- All new cases of compound fracture of distal femur and proximal tibia
- Fracture without severe periosteal stripping
- Compound fracture upto grade 3A

Exclusion criteria:

- Fracture with severe contamination were excluded
- Compound fracture without adequate soft tissue coverage.
- Patients with high risk for infection due to medical conditions like diabetes

Technique:

- With patient under anesthesia (spinal or GA) the involved limb is painted and draped after preparation under sterile fashion.
- Pre operative antibiotic administered as per the grade of compound fracture and intervention is carried out without tourniquet as to allow adequate antibiotic perfusion.
- Through debridement and wound wash is given and fracture alignment achieved prior to wound closure (usually compound wound is closed in one layer before the placement of LCP as plate may hinder with access to wound).
- LCP metaphyseal plate of appropriate length is chosen according to the position of fracture(distal femur or proximal tibia).
- Plate is initially fixed to proximal and distal fragments with the help of K wire after fracture reduction under fluoroscopy guidance.
- LCP is placed at such distance from underlying skin such that providing adequate space for swelling and wound care and adequate mechanical stabilization(picture 1).
- Usually a custom made spacer helps in keeping equal distance of plates.
- Bi cortical screw fixation is done with locking screw and plate fixed.
- At least 3 to 4 screws are recommended in both proximal and distal fracture fragment.
- Successive holes are drilled through stab incision over soft tissue and screws placed first distally then successively proximally after good reduction obtained.
- Screw tract and wound dressing is done.[picture 2]
- Knee range of movement and non weight bearing walking was started after a minimum of 2 days or as per severity of compound fracture.
- After 4 weeks partial weight bearing was allowed and complete weight bearing was started according to stability of fixation and healing of fracture(picture 3).

RESULTS

- Complete follow up was done for a minimum of 1 year with average follow up of 6 weeks.
- Out of 8 cases 7 cases (87.5%) showed complete bony union in follow up radiographs. The average radiological union time was from 12 weeks to 18 weeks with average 14.2 weeks.
- Plate was in situ for an average of 16 weeks.
- In all cases operated plate was left in place until full bony healing both clinically and radiologically(picture 4).
- There was 1 case of screw tract infection and no case of loosening or failure of the hardware and no case of loss of reduction.
- There was 1 delayed removal of plate because of low grade infection.

- The skin tolerated well around screw tract and at an average of 3 months patients were full weight bearing with healed tibia and femur.
- Out of 8 cases 7 had full range of motion(87.5%) and 1 had terminal lag of movements(12.5%).
- The final outcome of the study based on knee society score^[10] [table 1]was , 4 excellent (50%),3 good (37.5%) and 1 fair (12.5%).

Table 1 - Knee society score

Knee score points : Pain : 50 points Stability : 25 points Range of motion : 25 points	Results
80 – 100	Excellent
70 – 79	Good
60 – 69	Fair
< 60	Poor



Intraoperative (picture 1)



(Picture 2) post operative



6 weeks follow up



Picture 3

12 weeks follow up



(Picture 3)

6weeks

12 weeks



At Removal

DISCUSSION

- Prevalence of infection increases with severity of open fractures.
- The endosteal and periosteal blood supply is extensively destroyed when open fracture occurs which is regarded as prime most factor for fracture healing.
- Use of locking compression plate as an external fixator helps in fracture stabilization and preserves vascularity and promotes union as non union due to infection in compound fractures is a commonly encountered scenario.
- Locking compression plates as an external device is superior and advantageous than standard and circular external frames because of the fact that
 1. There are fewer tendencies for the frame to strike the contra lateral limb during ambulation.
 2. Removal of hardware is done under LA.
 3. Provides less conspicuous silhouette for imaging allowing ease of healing assessment.
 4. Small axial micro motion reduces stress shielding at fracture site.
 5. Controlled dynamization by removing screws is possible interfering load sharing process.
 6. Multiple screw holes provides more stability compared to standard axial external fixator.
- In our series a union rate of 100% was achieved.
- Certain complications arising from use of plate were :
 1. During application of plate as external fixator both plate and bone fragments move independently making accurate screw placement difficult.
 2. Construct doesn't provide enhanced stability if locking screws are not put bicortical.

CONCLUSION

In conclusion primary plating as an external fixator of compound fracture is a good method of management. There is a high rate of union with a low complication rate when using external locked plating for open fractures of distal femur and proximal tibia. Though the use of locked plates as external fixators is not a generally acknowledged technique, and there is little experience with it in the literature but it has the advantage of less financial burden to rural population and better acceptance as early mobilization of joints are allowed with lesser complication.

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