



Orthopaedics

FUNCTIONAL OUTCOME OF LIMB RECONSTRUCTION SYSTEM IN LOWER LIMB COMPOUND FRACTURES - A RETROSPECTIVE STUDY

Dr Vishal Agrawal	Sr In Orthopaedics, Acpm Medical College, Dhule
Dr Padmanabh Dhananjay Mulay*	Junior Resident In Orthopaedics, Acpm Medical College, Dhule *Corresponding Author
Dr Yash Goyal	Associate Professor In Pharmacology, Acpm Medical College, Dhule
Dr Nandkishor Goyal	Professor in Orthopaedics, ACPM Medical College, Dhule

ABSTRACT **Background:** Open fractures of the lower limb long bones continue to be challenging for orthopaedic surgeons and the treatment option ranges from external fixators, nailing, ring fixators, bone grafting, soft tissue reconstruction. Limb reconstruction system (LRS) provides rigid fixation for fracture fragment and it's easy to treat soft tissue injury and it provides early mobilisation to achieve pre-injury status & activities. **Aim:** To assess the functional and radiological outcome of limb reconstruction system in lower limb compound fractures. **Materials And Methods:** A prospective study of 20 cases with open fractures of lower limb long bones with age group between 20 to 60 years of both the sexes. Closed fractures and fractures treated conservatively were excluded from the study. Clinical and radiological evaluations were done at specific interval and patients were asked to weight bear to achieve early union. Function outcome was assessed by Association for the study and application of methods of Ilizarov (ASAMI) criteria. **Results:** The mean age of the patients in this study was 36.85 years with male predominance. Majority of the patients were injured by Road traffic accident and the mean union time of fracture was 29.2 weeks (Ranges 20- 32 weeks). Bone results as per ASAMI scoring were Excellent in 90% (18/20), good in 5% (1/20) and poor in 5% (1/20). Functional results as per ASAMI scoring were excellent in 80% (16/20), good in 15% (3/20) and fair in 5% (1/20). The most common complication encountered was pin tract infection which occurred in 3 cases and treated with dressing and antibiotics. **Conclusion:** LRS found to be simple and effective mode of treatment in case of open fractures of long bone. It is definitive single stage procedure with advantage of early union with early mobilisation, simple surgical technique, easy wound management which avoids multiple surgeries and has high patient compliance.

KEYWORDS : Open fracture, long bone, Tibia, Femur, LRS, ASAMI criteria.

INTRODUCTION:

Now-a-days, due to increase in road traffic accidents, open fractures of long bones are common especially in lower limbs (femur and tibia). Open fractures are considered as surgical emergency and early intervention is needed to avoid infection rate drastically. A fracture of long bones not only leads to functional disability but also leads to economic burden in families and loss of self esteem. These patients are treated by early administration of intravenous antibiotics, irrigation, wound debridement and usually operated several times to avoid infections and to enhance healing they might require skin grafting, muscle flap or bone grafting which in turn sometimes leads to deformity, limb length discrepancies, disuse atrophy, osteoporosis and joint stiffness because of prolonged immobilisation, hence open fractures are still challenging to manage. Limb reconstruction system is a unilateral rail system, which consists of shanz pins, rail rod and sliding camps. LRS fixators is a better option to treat open fractures because it promotes soft tissue healing, preserve long bone vascularity, accessibility to wound, early mobilisation which reduces emotional and economical burden and enhance fracture healing by compression and distraction osteogenesis. This study was conducted to assess the efficacy, functional outcome and complication associated with LRS fixation in open fractures of lower limb long bones.

MATERIALS AND METHODS:

This study was conducted in our institute, over a period of 2 years from Jan 2022 to Jan 2024, retrospective study. A total of 20 patients selected from the Emergency department of our college with compound fractures in lower limb. Patients of Age between 20 to 60 years of both the sexes were included.

Patients with compound fractures- Gustilo Anderson Type II, IIIA & B were included. Patient with Closed fractures and fractures which can be treated conservatively, were excluded. Other exclusions are Pathological fractures, Compound fractures Type IIIC.

Operative Procedure:

Once patient is haemodynamically stabilised after doing primary survey and ruling out any immediate life-threatening conditions, patients were administered with prophylactic intravenous antibiotics, tetanus toxoid and tetanus immunoglobulins. All the patients were subjected to routine radiological & blood investigation and under

spinal or general anaesthesia through wound debridement and through lavage with large amount of normal saline was given for site of open fracture and for inserting Shanz's pin stab incision was made and blunt dissection was done until the bone is reached and 3 x 6mm Shanz's pin is inserted proximal and 3 pins inserted distally with distance of 2.5cm from fracture site, after achieving the reduction with gentle manipulation, clamps and rails were connected and tightened. For tibia LRS frame is applied in anteromedial aspect and for femur LRS frame is applied on lateral side of thigh, wound was managed with regular dressing, delayed primary closure, secondary closure, split skin graft and to heal by secondary intention depending on wound status.

Post operatively patients were administered with intravenous antibiotics and analgesics, quadriceps strengthening exercise, knee and ankle range of motion exercise were encouraged from 1st & 2nd post operative day, immediate weight bearing was advised in case of fractures without bone loss, in case of bone loss compression & distraction technique was used at the rate of 1mm/day started after 2 weeks postoperatively, patients and their relatives were taught to use compression and distraction unit, and weight bearing with support was started once radiological signs of union starts. Regular follow up at the interval of 1month was maintained till radiological signs of fracture union and thereafter followed by once in two months interval. Clinical assessment includes 1) presence or absence of pain, 2) pin site infection and loosening 3) deformities 4) joint stiffness 5) Limb length discrepancy 6) wound status. Final functional outcome was assessed using Association for the study and application of the method of Ilizarov (ASAMI Score) criteria. LRS fixator was removed in average of 8-9 months and after removal of LRS, limb was immobilized with patellar tendon bearing cast or above knee cast for 3 weeks.

Review Of Literature:

Vijay c et al. from India, during 2007-2010 conducted a prospective study on 45 cases of open fracture of tibia type IIIA & B managed with LRS fixator, in his study he assessed the cases using modified Andersons and Hutchins criteria and 90% of fractures united well and 72% of cases gives excellent to good result and moderate & poor results were seen in 18% & 10% respectively, he concluded that LRS fixator usage in open fracture tibia found to be simple, effective, enables fracture union, soft tissue care and allows to return to their day-to-day life activity early¹.

Ajmera et al. from India, during 2009-2012 conducted a study on outcome of LRS in open tibia diaphyseal fractures, gives excellent results in 76% and good results in 2%, fair & poor results in 4% & 8% respectively.

Kale AB et al, in his study results were assessed, gives good result in 24 cases and moderate in 5 cases & poor result in 1 patient⁴.

Singh P et al. from India, in their study found bone union was excellent in 65% of cases and good results in 25% of cases, 5% of cases shows fair and poor results respectively and functional outcome was excellent in 70% of cases and good in 20% of cases and 5% of cases shows fair and poor results⁴.

Uikey et al. from Indian, during 2022, studied on 26 cases of complicated lower limb trauma managed with limb reconstruction system, scored excellent results were seen in 73% and 19% shows good with 4% of cases shows fair and poor results, functional results were excellent in 84.7% and good results in 11.5% cases and fair in 3.8% cases⁵.

Asami Scoring System:

ASAMI Scoring system is based on Radiological and functional results.

I) Radiological results:

- A) **Excellent-** union, no infection, limb length discrepancy <2.5cm, deformity <7°.
- B) **Good-** union plus any two of the above criteria.
- C) **Fair-** union plus any one of the above criteria.
- D) **Poor-** non union or re-fracture.

II) Functional results- 5 criteria

1) presence of limp, 2) stiffness of knee or the ankle, 3) pain, 4) soft tissue sympathetic dysfunction, 5) Ability to perform previous activities of daily living.

- A) **Excellent-** Active, no limp, minimum stiffness, no reflex sympathetic dystrophy, insignificant pain.
- B) **Good-** Active with one or two of the following- 1) limp, 2) stiffness, 3) reflex sympathetic dystrophy, 4) significant pain.
- C) **Fair-** Active with three or all of the following- 1) limp, 2) stiffness, 3) reflex sympathetic dystrophy, 4) significant pain.
- D) **Poor-** Inactive- inability to return to daily activity due to injury or unemployment.
- E) **Failure-** Amputation.

RESULT (INCLUDING OBSERVATION):

A 20 cases of compound fracture in lower limb have been treated with LRS fixator in our Institute. The radiological and functional outcome was evaluated using ASAMI scoring system at the interval of 1 month till radiological signs of fracture union and thereafter followed by 2 monthly intervals. The results were classified as excellent, good, fair and poor. Postoperatively quadriceps, hamstring strengthening exercise, knee and ankle mobilisation exercise were started in 1st -2nd post op day, immediate weight bearing was started in transverse fractures (5 cases) and for comminuted, oblique & spiral fractures partial weight bearing was allowed in 1st week (13 cases) and full weight bearing was started within 3 weeks post operatively, partial weight bearing could not be done in 2 cases due to associated others fractures in opposite limb. Satisfactory fracture union was evaluated by signs of bridging callus in radiography, which occurred in all the cases at 3-12 months, but maximum union was achieved in 5-8 months. Excellent radiological results were present in 18 cases, good results in 1 case and poor result in 1 case. Excellent functional results were observed in 16 cases, good and fair results in 4 cases. Most common complication encountered was pin tract infection in 3 cases, which is managed by wound swab for culture and sensitivity and started on appropriate antibiotics and daily dressing, other complication encountered was pin loosening for which LRS realignment done.

DISCUSSION:

Compound fractures of lower limb are very common in developing countries due to high velocity road traffic accidents, compound fracture are surgical emergencies which should be treated as early to save the life, limb and avoid infection. Hence LRS fixators are preferred modality as it is easy to use and gives easy access for soft tissue injury postoperatively. LRS fixators provides immediate stability to fracture fragments and it allows immediate weight bearing post operatively when there is no bone loss, which provides early fracture healing and reduces financial burden for family. In this study, age of patients was ranging from 20 to 60 years with commoner age

group ranging from 25 to 45 years with male predominance. Road traffic accident was the major cause of injury and it accounts for 90% of total cases. In this study, maximum number of cases were belonging to Gustilo Anderson grade IIIA 9 cases (45%) and Grade IIIB 9 cases. The common complication encountered was pin tract infection in 3 cases (15%) which healed on suitable parenteral antibiotics after culture and sensitivity, which is comparable to study conducted by Chahar HS et al.³ In this study excellent radiological bone result were obtained in 90% of cases and 5% showed good and 5% of cases shows poor results and excellent functional results were obtained in 80% of cases and 15% of cases shows good result and 5% shows fair results. In a study conducted by Chahar HS et al. compound fractures and infected non union of femur treated by LRS, bone result was excellent in 85.72% of cases and 7.14% shows good and 7.14% shows fair results and function result were excellent in 71.43% of cases and good & fair results were seen in 28.57% of cases³. In this study there were no shortening of limb at final follow up. LRS fixators are light weight, patients friendly and day to day activities can be done easily and its uniplanar frame allows early mobilisation of joints, early weight bearing, and it gives easy access for soft tissue repairing procedures. These fixators can be reused for another patient with proper handling and autoclaving. In this study compound fractures of lower limb treated by limb reconstruction system- radiological result were excellent in 90% and function result were excellent in 80% of cases. Main disadvantage is that it could not correct angulations or rotational deformity.

CONCLUSION:

Limb reconstruction system is a simple and easy technique which is used as primary and definitive single stage fixation for compound fracture of lower limb due to its strong fixation, early weight bearing & early bone union and easy access for soft tissue care. It reduces hospital stay, financial burden and patient compliance is excellent, implant can be reused hence it is cost effective.

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Figures And Illustrations



Case 1- Pre-operative Clinical Images

Case 1- Pre-operative X-rays



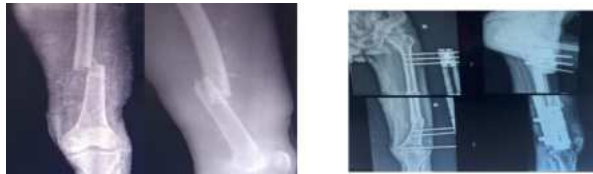
Case 1- Post Operative X-rays



Case 1- Follow Up X-rays



Case 1- X-rays And Clinical Images After Lrs Removal



Case 2- Pre-operative X-rays

Case 2- Post-operative X-rays



Case 2- X-rays After Lrs Removal

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