



STUDY OF FUNCTIONAL AND RADIOLOGICAL OUTCOME OF ILIZAROV FIXATION IN MANAGEMENT OF GAP NON UNION OF LONG BONES

Orthopaedics

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ABSTRACT

Due to increasing motor vehicular accidents, there is high incidence of compound fractures of long bones particularly Gustillo type 3a or 3b with extensive soft tissue damage and periosteal stripping. These type of injuries have decreased vascularity of the tissues around the fracture site and increased probability of complications. In these injuries Ilizarov fixator provides single step definitive fixation method that deals with gap nonunion and bone infection simultaneously. This study aims to assess functional and radiological outcome using ASAMI criteria of Ilizarov fixation in gap nonunion of long bones. a total of 30 patients were included in the study suffering from gap nonunion which fulfilled inclusion and exclusion criteria. Patients underwent Ilizarov fixation and were followed up for a period of minimum 6 months and assessed using ASAMI functional and radiological criteria. radiological results: 12 patients (40%) had excellent, 15 patients (50%) had good, 2 patients (6%) had fair and 1 (4%) had poor results. Union was achieved in all 30 patients. Functional results: 09 patients (30%) had excellent, 18 patients (60%) had good and 2 patients (6%) had fair results and 1 (4%) patients had poor results: Ilizarov ring fixation is a versatile approach for patients with gap nonunion as it provides excellent results and aid in early weight bearing, decreased dependency, and increased quality of living.

KEYWORDS

gap nonunion, ilizarov ring fixator, Distraction Osteogenesis, Limb lengthening

INTRODUCTION

Due to increasing motor vehicular accidents, there is high incidence of compound fractures of long bones particularly Gustillo type 3a or 3b with extensive soft tissue damage and periosteal stripping. These type of injuries have decreased vascularity of the tissues around the fracture site and increased probability of complications like non-unions as compared to simple fractures [1]. Non unions may be complicated by gap, infections, deformity, shortening and segmental bone loss. This type of fractures requires extensive debridement of soft tissues and sometimes there is bone loss as a result of which bone gap increases between fracture fragments and hence management of this gap is important to get good results Ilizarov method addresses all the above problems simultaneously. The stability of the fixation allows the patient to bear weight, ambulation and joint mobilization [2]. The current study aims to evaluate the functional and radiological outcome of the Gap non-union of long bones treated by Ilizarov external fixator using Compression and Distraction Osteogenesis.

MATERIAL AND METHODS

It is a type of Descriptive Study carried out in department of orthopedics, AIMS, Bathinda between December 2020 to July 2022. 30 patients with gap non-union of long bone presenting to Dept. of Orthopedics AIMS Bathinda satisfying the inclusion and exclusion criteria were taken for study.

Inclusion Criteria

Patients Aged between 18 to 60 years with nonunion of long bones with gap >1cm after /before debridement and who give consent for surgery.

Exclusion Criteria

Patients with initial neurovascular injury, non-union involving intra-articular region, severe peripheral vascular disease, presence of any hormonal or mental disorder, co-morbid conditions like severely deranged liver or renal functions or uncontrolled diabetes or hypertension, non-union with gap <1cm and Patients not giving consent.

Surgical procedure

Patient was placed in supine position. Depending upon non-union site, post debridement, non-union site was stabilized with 4 or 5 ring Ilizarov ring fixator with the help of 10 – 12 wires. 2 rings were placed proximal to non-union site and 2 distal to non-union site. 1.8 mm

diameter wires were used for femur and tibia [3]. In case of Tibia 1st wire was inserted from lateral to medial through head of fibula protecting the common peroneal nerve, 2nd wire was placed parallel to ankle joint and 2cm proximal to ankle joint at distal end of tibia and fibula incorporating the lower end of fibula. Then appropriate wires were passed in proximal and distal segment with if needed a ring and wire for transporting the fragment from corticotomy site. The distance of ring from the limb should be kept equal on all 4 sides with minimum 2 finger distance from each side. these wires were tensioned to 110 kg using a dynamometer. corticotomy was done with a mini incision at appropriate site using corticotome.

Broad spectrum IV antibiotics were given for three days' post operation. Physical therapy was started. Graduated gait-training was attempted with the help of walker. Suture removal was done around 10-15 days' post-operative, and pin-track dressings was done with normal saline and betadine. Distraction was started after 7 days' post op at the rate of 0.25 mm/6 hours [4,5].

Follow-up check-list

Patients were followed up at monthly intervals for a minimum of 6 months

Clinically Pain at fracture site and regenerate site, Distance moved on threaded rods compared to previous visit was seen and radiologically on X Rays Distraction gap increasing as required, Quality of regenerate, Consolidation was seen

The fracture union, complications and functional recoveries were recorded during follow-up. Union was defined clinically by the absence of pain and mobility at fracture site. the radiological union was the presence of bridging trabeculae on at least three cortices. Functional and radiological outcomes was assessed using the Association for the Study and application of methods of Ilizarov criteria (ASAMI criteria) [6,7].

RESULTS

In our study age of the patients ranged from 18 –60 years with overall mean age of 38.4 years. Maximum number of patients were in age group 36–45 (40 %) with mean age 40.5 years signifying the productive age group. Males predominated the study group. Road traffic accident was found as the commonest mode of trauma (25 cases i.e. 83%). The possible explanation of this is that patient is more likely

to have compound fractures after road side accidents. Tibia was involved more than femur. The possible explanation is that tibia is a subcutaneous bone surrounded by least soft tissues so the chances of tibia going into gap nonunion are high. In our study right lower limb was involved more than the left. Most of the patients already underwent surgical procedures. Most of the patients fall into the category of ≤ 1 . the possible explanation is that most of the doctors treating compound injuries use simple external fixator first as ilizarov is a technically demanding and difficult procedure. Most of the patients present after 3 – 4 months of injury (15 patients). The delay was most likely because patients already had previous procedures done so present late to us. Corticotomy was done in 29 patients. In one patient acute docking was done. 67% patients in our study group didn't require any additional procedure. Split skin graft was used in 13% (4) patients in which there was skin loss. Muscle Flap was done in 7% patients (2) with both skin and muscle loss. Skin tensioning using skin tensioning technique was done in 13% (4) patients which had adequate muscle coverage but with skin loss instead of SSG.

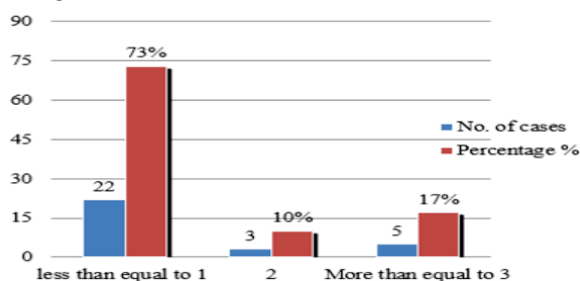


Figure 1: previous surgeries

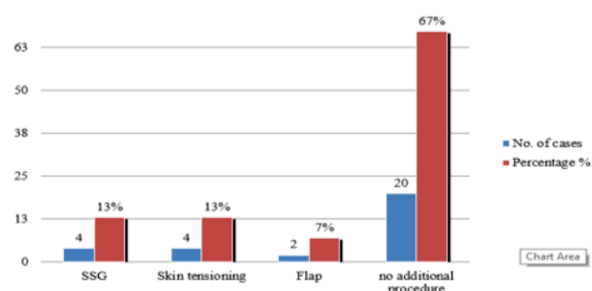


Figure 2: additional procedures required

Table –1 Functional results

Results	Excellent	Good	Fair	Poor
Present study	30%	60%	7%	3%
Paley	64%	28%	4%	4%
Madhusudhan et al.	5.56%	22.22%	33.33%	38.89%
Dendrinis et al.	25%	39.2%	14.3%	2.15%
Lalit et al.	26.7%	40%	10%	28.3%

Table 2 Bone results

Results	Excellent	Good	Fair	Poor
Present study	40%	50%	7%	3%
Paley	60.87%	26.09%	8.7%	4.35%
Madhusudhan et al.	22%	36.34%	22%	18.18%
Dendrinis et al.	50%	29%	3.6%	17.4%
Lalit et al.	70%	10%	0%	20%

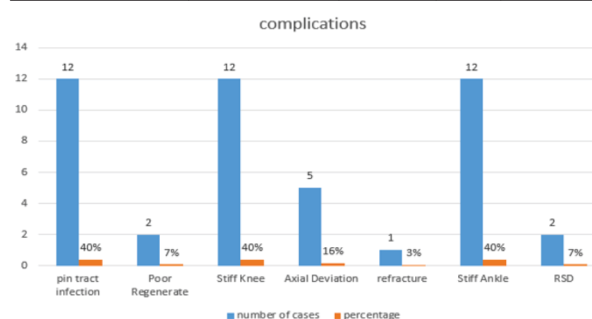


Figure 3 – complications encountered

DISCUSSION

In our study 30 patients were followed up. Outcome was analyzed based on: Union, Complications, Bone results, Functional results. union was achieved in 30 cases. Union time ranged between 2 months to 15 months. Smoking, persistent infection, patient himself not able to walk, these factors affect the union.

According to ASAMI Radiological results - 12 patients (40%) had excellent, 15 patients (50%) had good, 2 patients (7%) had fair and 1 (3%) had poor results. Union was achieved in all 30 patients. Out of 30 patients 12 had pin tract infection and 5 had deformity >7 degree and none had Limb length discrepancy >2.5 cm. One patient had poor result because patient was a smoker and drug abuser along with diabetic on irregular medications so already in an immunocompromised state and patient had poor hygiene and patient developed refracture with in 1 year of surgery. ilizarov was again applied and fracture healed.

Functional Results:

09 patients (30%) had excellent, 18 patients (60%) had good and 2 patients (7%) had fair results and 1 (3%) patients had poor results. The problems observed after functional assessment were: Joint stiffness (up to 15 degrees) - 12 patients, Ankle Equinus deformity - 6 patients. functional result was poor in 1 patient as patient had persistent infection and ankle Equinus deformity >20 degrees and inability to walk. These complications were most probably attributed to noncompliance of patient as no physiotherapy was done in post op period by patient and poor hygiene of the patient.

CONCLUSIONS

Ilizarov system allows early ambulant thus decreasing chances of osteoporosis and soft tissue dystrophy. Average union rate was found out to be 6 months and was influenced by comminution, gap, infection, nonunion type, smoking and fracture pattern. In our case Ilizarov fixator provides 100% union rate. Compliance of the patients is the major factor that influences the result of the study. Even through Ilizarov ring fixator is an external fixator still it can be concealed by proper dressing so that patient can continue his / her regular day to day activity. Ilizarov ring fixation is the safest, simplest, most economical and effective method for management of infected nonunion long bones. In cases of acute docking, union was seen to occur early.

REFERENCES:

- Papakostidis, C., Kanakaris, N. K., Pretel, J., Faour, O., Morell, D. J., & Giannoudis, P. V. (2011). Prevalence of complications of open tibial shaft fractures stratified as per the Gustilo-Anderson classification. *Injury*, 42(12), 1408–1415. <https://doi.org/10.1016/j.injury.2011.10.015>
- Morasiewicz, P., Dragan, S., Dragan, S. L., Wrzosek, Z., & Pawik, L. (2016). Pedobarographic analysis of body weight distribution on the lower limbs and balance after Ilizarov corticotomies. *Clinical biomechanics (Bristol, Avon)*, 31, 2–6. <https://doi.org/10.1016/j.clinbiomech.2015.10.009>
- Singh, A. K., Parihar, M., & Bokhari, S. (2019). The Evaluation of the Radiological and Functional Outcome of Distraction Osteogenesis in Patients with Infected Gap Nonunions of Tibia Treated by Bone Transport. *Open access Macedonian journal of medical sciences*, 7(4), 559–566. <https://doi.org/10.3889/oamjms.2019.112>
- Abbott, L. C., & Saunders, J. B. (1939). the operative lengthening of the tibia and fibula: a preliminary report on the further development of the principles and technic. *Annals of surgery*, 110(6), 961–991. <https://doi.org/10.1097/0000658-193912000-00001>
- Teisworth, K., Paley, D., Sen, C., Jaffe, M., Maar, D. C., Glatt, V., Hohmann, E., & Herzenberg, J. E. (2017). Bone transport versus acute shortening for the management of infected tibial non-unions with bone defects. *Injury*, 48(10), 2276–2284. <https://doi.org/10.1016/j.injury.2017.07.018>
- Santy, J., Vincent, M., & Duffield, B. (2009). The principles of caring for patients with Ilizarov external fixation. *Nursing standard (Royal College of Nursing (Great Britain): 1987)*, 23(26), 50–56. <https://doi.org/10.7748/ns2009.03.23.26.50.c6835>
- Foster, P. A., Barton, S. B., Jones, S. C., Morrison, R. J., & Britten, S. (2012). The treatment of complex tibial shaft fractures by the Ilizarov method. *The Journal of bone and joint surgery. British volume*, 94(12), 1678–1683. <https://doi.org/10.1302/0301-620X.94B12.29266>