

Common Complications of Ilizarov External Fixator

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ABSTRACT

Objectives: To evaluate the complications of Ilizarov external fixator.

Methods: This descriptive study was conducted between January 2012 and December 2016. Data includes demographics, functional outcome and complications of surgery were documented on a pre-formed proforma. Ninety patients requiring Ilizarov fixator fixation for various indications were studied. A; the record was kept in database.

Results: 90 patients were treated with Ilizarov for different indications. Male population was dominant, 65(72.2%) while only 25(27.8%) were females. The fixator was applied for an average of 17.9 \pm 10.3 SD weeks with a range of 7-48 weeks. Outcome graded as per ASAMI criteria as excellent in 60 (66.6%), good in 21 (23.33%), fair in 6 (6.66%) and poor in 3 (3.33%) patients. The main complications in 29 (32.2%) cases were infection, of which 4 (4.44%) were major infections and 25 (27.7%) were minor pin tract infections. Joint stiffness was found in 12 (13.3%) patients and limb shortening in 5 (5.5%) patients of more than 2.5 cm.

Conclusion: Observing Ilizarov principles can reduce complications. Cleaning of pin tracts should be done to minimize infection and vigorous range of motion exercises and weight bearing to reduce joint stiffness. Respecting planes would reduce neurovascular injuries.

Despite its complications, this is still a valuable tool for treating complex skeletal disorders which otherwise would require amputations.

Key words: Ilizarov frame. Complication

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INTRODUCTION

In the mid 1960s, Dr. Gavril Ilizarov revolutionised Orthopaedic management of difficult fractures, with his invention of ring external fixator, by treating his first patient with this technique in 1950s. Many have adapted and modified this fixator, but the principles remain the same.

Ilizarov external fixator is a versatile system, applicable in vast number of Orthopaedics cases. Fixator has edge over various internal fixation system as it preserves soft tissue and periosteum, does not disrupt fracture hematoma, can be applied in open fractures and weight bearing can be started early on. Like internal fixation, it has its dis-advantages though. Ilizarov external fixator is associated with high morbidity, when applied for prolonged durations [1]. Difficulties that are encountered while Ilizarov is applied can be classified into problems, obstacle and complications. Problems are difficulties which get remedied without a surgical intervention, while

obstacles, on the contrary, requires a surgical intervention. Complication represents all intra-operative events that does not resolve before treatment ends.

Pin track infections are at the top of list of complications of Ilizarov. Different studies have shown different incidence of this occurrence, ranging from 1-100% [2,3]. Degrees of infection varies, some needing local wound care only, while others may need pin removal and even sequestrectomy. Pin site care remains pivotal in prevention of infection [4]. Data suggest that minimizing skin motion at pin-skin interface is more important than type wound cleaning agent.

Neurovascular and muscle/tendon impalement is another issue. Surgeon must be vigilant about established safe zones before inserting a wire or half pin. The Radial nerve, Dorsal sensory radial nerve in upper limb and Anterior tibial artery and deep peroneal nerve in lower limb are common structures at risk. Restraining a muscle or tendon by passing a wire through it poses a threat of contracture of that area.

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Ankle equines and knee flexion lag are common examples.

Bony complication and articular problem with Ilizarov fixation are not uncommon. Too much a rigid frame can cause a nonunion or a delayed union. Fracture or re-fracture of the bone may occur with this fixator. A rigid fixation may result in a union which is entirely endosteal. Frame removal will make this weak bone, prone to re- fracture. During deformity correction bones might get fractured or joint may be subluxed [5,6,7].

Compartment syndrome, poor regeneration of bone during distraction osteogenesis ankle stiffness can be result after Ilizarov fixation, that can be avoided by placement of wires in safe zones and optimal timing of distraction respectively.

METHODS

This study was conducted from January 2012 till December 2016. Informed written consent was taken from all patients after taking approval from hospital ethical committee. All surgeries were done under general anesthesia or regional blocks. An Ilizarov fixator was pre-assembled and applied to the patients. Pyodine was used to clean the pins twice a day and twice weekly bathing was advised. Range of motion exercises and quantitative weight bearing was advised. followup interval was two weeks. All fixators were removed in operation theaters which incorporated pin tract curettage and immobilization with plaster of paris for one to one and a half month.

The complications were classified into category I (minor), category II (major) and category III (sequae). Conservative management was chosen for Category I while the rest were managed operatively. The Association for the Study and Application of the Method of Ilizarov ASAMI Classification of bone and soft tissue healing was used to assess results, based on 4 parameters, deformity, infection, union, and discrepancy of limb length. An excellent result was

union with deformity of less than 7 degree, no signs of infection, and leg length discrepancy less than 2.5 centimeter. Union with 2out of 3 of the other features defined a good union while any one of the latter features showed fair union. Poor result was nonunion or none of the latter features or a re-fracture.

RESULTS

90 patients were treated with Ilizarov for different indications. The most common indication was open fractures of long bones in 30 patients, followed by Congenital deformities/ knee flexion contracture in 23 patients (Table 1). 65(72.2%) were male and 25(27.8%) were female. Fixators were fixed for an average of 17.9 9±10.3 weeks, with a range of 7-48 weeks). Outcomes assessed by the ASAMI criteria in 60 patients (66.6%) were excellent, good in 21 (23.3%), fair in 6 patients (6.6%) and poor in 3 (3.3%). The main complications were infection in 29(32.2%) cases, of which 25 (27.7%) were minor pin tract infections, which subsided with oral antibiotic and pin tract hygiene and 4 (4.44%) were major infections which required pin removal and curettage. We had joint stiffness in 12 (13.3%) patients, mostly in those which had supra condylar femur fracture and bone transport of more than 4 cm. 4 patients required quadriceptoplasty for knee stiffness while rest of patient improved progressively with range of motion exercises. limb shortening in 5 (5.5%) patient was seen in excess of 2.5 cm. 6 patients had mal-unions, 4 were acceptable and 2 required re application and adjustment. 5 patients had RSD (reflex sympathetic dystrophy) which were treated with physiotherapy 3 patients had delayed unions or non-unions, which were treated with chipping method of the non-union site and bone graft. 2 patients had re-fractures after frame removal which were treated with re Ilizarov frame application and bone graft. 1 patient had bleeding from pin site which was managed conservatively. (Table 2).

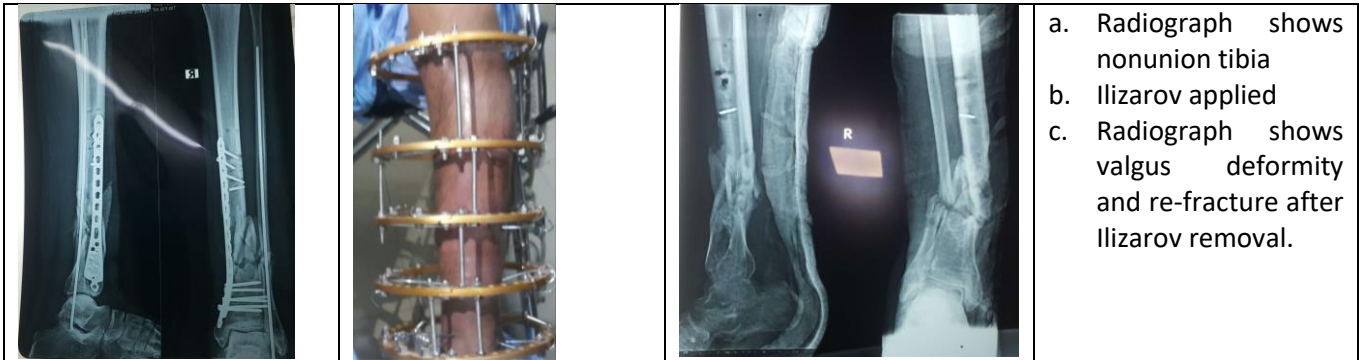
Table: 1: Indications of Ilizarov

S. No	Indication	Number of patients	Percentage
1	Open long bones fractures	30	33.3%
2	Non-union/ infective fractures	18	20%
3	Mal-unions	8	9%
4	Congenital deformities / Joint contracture	23	25%
5	Arthrodesis	4	4.44%
6	Pelvic support reconstructive osteotomy	2	2.22%
7	Miscellaneous	7	7.77%

Table 2: Complications of Ilizarov

S. No	Complication	Number of patients	Percentage
1	Pin tract infections	29	32.2%
2	Joint stiffness	12	13.3%
3	Mal union	6	6.66%
4	RSD	5	5.56%
5	Delayed union/ non-union	3	3.33%
6	Re-fracture	2	2.22%
7	Mal alignment	2	2.22%
8	Bleeding from pin site	1	1.11%





a. Radiograph shows nonunion tibia
 b. Ilizarov applied
 c. Radiograph shows valgus deformity and re-fracture after Ilizarov removal.

DISCUSSION

In our study pin tract infections were 32.2 % (29) of which 27.7% (25) were superficial and remaining deep. Superficial infections were treated with local wound care and oral antibiotic while deep infections needed pin removal and curettage. This was comparable to the study done by C Sen [8] who noted 30% minor, 10% major infections while it was higher than the study of Axel et all [9] who reported 13% pin problems and 21% pin tract complications were reported by Holbrook 1989 [10]. our infections rate was less than Pasha IF [11] who noted 40% infections in their study. Other studies showed infection rate as 19% by Kenneth AE [12], 26.6% by Saleh M [13] and 40 % by Sahibzaba AS [14].

Knee stiffness was another complication that we encountered in 13.3% patient, the reported incidence is 20%. Majority of the patients recovered with range of motions exercises and physiotherapy while 4 patients required quardeceotoplasty.

Other complications may arise during course of treatment. Poor new bone formation can occur and resulting into delayed union or nonunion, which might require adjustment of the frame and bone grafting. Likewise, premature removal can lead to deformity and re-fracture of the new bone. A rare complication is under or over lengthening, with 5 (5.5%) showing an excess of 2.5 cm shortening. Paley D [15], noticed one docking site re-fracture of the docking site for which union was achieved by reapplication of Illizarov. Nine fractures were reported by Danziger 1995 in their 18 femoral lengthening case series [16].

No neurovascular complications were noted in this study with the exception of one patient who bled from a single pin site which was managed by pin removal after admission. Neurovascular injury and severe infections including gas gangrene may require

amputating the limb [17], while minor vascular injury may result in a doubling of anastomotic thrombosis and reduced healing of soft tissue [18].

CONCLUSION


The Ilizarov technique can be used for variety of complex problems. Complications of Ilizarov can be minimized by following standard Ilizarov principles. Pin tracts care must be done, motion exercises must be followed to reduce stiffness of joints. Knowledge of and respect for planes prevent neurovascular injuries.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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