Out Come of Ankle Arthrodesis with Ilizarov Method

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ABSTRACT

Objectives: To determine the functional and radiological outcome of arthrodesis of the ankle using the ilizarov method.

Methods:

This descriptive study was conducted in Bolan Medical Complex Hospital Quetta and National institute of Rehabilitation Medicine Islamabad, from January 2015 to December 2018.Twenty patients fulfilling the inclusion criteria under went arthrodesis of the ankle using ilizarov method. At follow up visit patients were assessed clinically for pain and walking and radiologically for union.

Results: A total of 20 patients with mean age 41.0 years ± 13.61 were included in our study. In 18(90%) a stable pain free ankle arthrodesis was achieved successfully after a mean ilizarov external fixator time of 147 days (range 105-195 days). There were minimal complications despite early weight bearing. No further surgery was required except in 02(10%) cases in which primary arthrodesis was not achieved.

Conclusion: Ilizarov external fixator used for ankle arthrodesis give excellent stability, allowing early weight bearing without pain and results in higher rates of union with minimal post operative complications.

Key words: Ankle, Arthrodesis, Ilizarov Method.

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INTRODUCTION

Arthrodesis of the ankle is widely accepted surgical salvage procedure for various ankle joint pathologies including septic arthritis, inflammatory arthritis like rheumatoid and gouty arthritis, post traumatic, degenerative arthritis, tumors around the ankle joint, some paralytic disorders, osteonecrosis of the talus, neuropathic joints and failed total ankle joint replacement. These are the conditions in which conservative measures or other surgical procedures have failed.[1] Ankle arthrodesis in acceptable position is compatible with excellent functional results. Absolute contraindication to the ankle arthrodesis includes vasculopathies of the limb and infection of the skin through which the approach is planned. Relative contraindications include preexisting moderate to severe same site foot arthritis and contralateral ankle arthritis.

Albert was first to describe arthrodesis of the ankle in 1879. Since then a number of ankle arthrodesis techniques have been described.[2] The ankle arthrodesis is not a simple procedure. The bone surfaces that are available for arthrodesis are small and very difficult to fix, so great accuracy is required during fixation. The final position of arthrodesis is very important for the functional outcome. It may be sometime very difficult to get the accurate position, especially when bone loss or previous deformities are present. Another obstacle for arthrodesis may be pseudoarthrosis which is associated with vascular necrosis of talus body, infection, or joint bone loss.[1,2]

There is no consensus on the ideal method to be used for ankle arthrodesis and there are many questions which need to be answered. There are few conditions like infections and bone loss where other procedures especially internal fixation are difficult or even not possible and these are the conditions where ilizarov method is an ideal procedure.[2,3,4]

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The purpose of this study was to describe the functional and radiological results of ankle arthrodesis with ilizarov apparatus.In our set up ankle arthroplasty is infrequently done and ankle arthrodesis is usually the preferred procedure for chronic ankle pathologies. We chose the Ilizarove method because other implants used for ankle arthrodesis like retrograde nails, special plates and screws are not freely available in our country. Furthermore these implants are not only costly but technically demanding and patients are immobilized for longer time post operatively.

METHODS

This descriptive study was conducted in Bolan Medical Complex Hospital Quetta and National institute of Rehabilitation Medicine Islamabad, from January 2015 to December 2018. All the patients those had osteoarthritis**,** sequale of septic arthritis, tubercles arthritis or post traumatic arthritis were included in the study. All those patients who had vascular insufficiency, chronic prednisolone use or immunocompromised were excluded from the study. The study was approved by the Institutional Review Board of the hospital. Informed consent was taken from all the participants. In the included subjects complete history, clinical examination and X ray Ap and Lateral view was obtained.

SURGICAL TECHNIQUE

In the supine position under tourniquet control and pre operative antibiotics, the ankle joint was opened through interior or lateral incision. The ankle joint was exposed through subperiosteal dissection, gaining direct view of the tibio talar and talofibular joint surfaces. Pre-existent deformities of the ankle joint were corrected upon removal of the bone wedges, with their size determined by clinical aspects and evaluating the pre operative x-ray films. The desired position was the neutral, in relation to the flexion-extension axis of the ankle, with about 5° of valgus and about 10° of internal rotation. The foot can be translated interiorly or posteriorly and medially or latterly as needed to achieve proper alignment. A pre assembled frame was used for all cases, with adjustments during surgery. The ilizarov external fixator is applied with one ring in the proximal metaphyseal area of the tibia with three to four transfixation k wires. Another ring in the distal metaphyseal area of the tibia with three to four transfixation k wires. The third ring, a special foot ring is applied over the foot. Two cross calcanium wires two taller wires and two foot wires were used.(Figure I,II,III)

Figure I: Pre operative x ray of the ankle.

Fig II: Per operative photograph after application of Ilizarov apparatus

Fig. III: Post op Xray

In two patients a modification in frame was done with two rings in the distal metaphyseal- diaphyseal area. (Figure IV,V)

Fig. IV: Post op Ilizarov apparatus with two distal metaphyseal rings

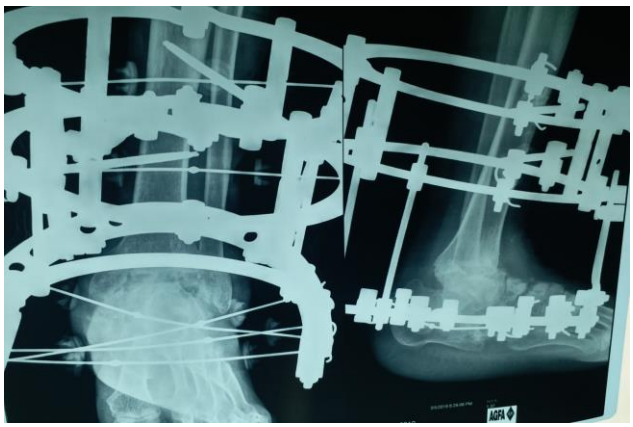

Figure V: Post op xray after Ilizarov application.

All smooth wires were 1.8 mm in diameter. If there was any skin tenting it was released. Anterioposterior and lateral radiographs of the foot and ankle were taken on the operation table, so that if any correction/adjustment was done when needed.

After debridement of the joint surfaces ilizarov external fixator was applied and compression was started post operatively. Partial weight bearing was allowed next day after surgery. All the patients were called for follow up every two weeks, for control x-rays and additional compression on the arthrodesis site. Control x-rays films were taken to confirm bone union. The external fixator was kept until solid bone union and removed under i/v sedation. Patients were encouraged to walk without any kind of aid one week after the fixator removal.

Data was stored and analysed using IBM-SPSS version 23-0.Decriptive anlaysis was done using count and percentages of base line characteristics, diagnosis, clinical characteristics and complications.

RESULTS

The results of all 20 patients with mean age 41.0 years ± 13.61 were evaluated. All the patients under went arthrodesis of the ankle using ilizarov method. Ten patients(50%) had osteoarthritis of the ankle joint. Four(20%) patients had sequale of septic arthritis. Four(20%) patients had tubercles arthritis and two(10%) patient had post traumatic arthritis of the ankle joint. Previous surgeries include arthrotomy in 4(20.0%) patients, synovial biopsy in 4(20.0%) and talar screw fixation in 10(50.0%) patients. Full weight bearing was allowed a mean of 145 ± 34.7 days (range105-195 days). The average follow up in frame was 174 ± 40.8 days (range 120 -240 days). The average follow up after frame removal was 21 months (range 12 -24 months). In eighteen patients a stable arthrodesis was achieved successfully after a mean ilizarov external fixator time of 147 days (range 105-195 days) and in two patients where arthrodesis was not successful redo ilizarov external fixator was applied after debridement and bone grafting and ultimately arthrodesis was achieved. There were minimal complications despite early weight bearing. No further surgery was required except in two(10%) cases in which primary arthrodesis was not achieved.

No patient required post operative cast immobilization or brace. The frames were removed in the clinic or minor operation theatre under intravenous sedation/ analgesia .

In our study 14 (70.0%) patients had superficial pin site infections. All the pin site infections were treated successfully with proper pin site care and first generation oral cephalosporins. No patient needed readmission to the hospital for a pin site infection treatment and no wires or pins needed to be removed. There were no wire/ schanz screws loosening.All the patients were free of pain after removal of fixator.Only two patients (10.0%) who had refracture at the arthrodesis site required a second surgery and Ilizarov external fixator was again applied and ultimately union was achieved.

During the post operative period fourteen (70.0%) patients reported mild pain which was successfully treated with oral Paracetamol and Tramadol Hydro Chloride. No patient required a walker. All the patients

were satisfied with the treatment and returned to a near normal life style post operatively.

DISCUSSION

In the published literature there are more studies on secondary arthrodesis of the ankle after failed total ankle arthroplasty, mostly after infection.[5,6,7] In our local circumstances total ankle replacement is infrequently done, instead there are other many general orthopaedic conditions like septic arthritis of the ankle, tumors around the ankle joints, neglected trauma, neuromuscular disorders, rheumatoid arthritis etc, for which arthrodesis of the ankle is required as a salvage procedure. There are few studies on Ilizarov application in ankle arthrodesis internationally and almost no local study. Most current techniques of ankle arthrodesis achieve fusion in 80 to 90 % patients.[8]

Various authors have reported the use of screws, steinmann pins, absorbable screws, intra modular rods, k wires, screws and plates, with different degrees of success. Rowan and Davey[9] reported a high fusion rate (94.0%) and few complications with the use of anterior AO T-plates in 33 patients. Braly[10] reported good results with use of lateral T-plates and cited as advantages early fusion, better cosmatic results and less complications then with other fixation methods. Gruen and Mears[11] used a posterior blade plate for five ankles with complex deformity, three had excellent and two had good results. They recommended posterior blade plate fixation for infected non union, collapsed talus body or with segmental bone loss. Moore[12] used intramadulary nails to obtain fusion in 14/19 arthrodesis. They recommended that this technique be reserved for significant post traumatic arthritis and bone loss after tibial plafond fracture, severe osteopenia, additional sub teller arthritis and neuropathic arthropathy. Weltmer[13] reported good results with the use of an anterior Wolf blade plate because of the minimal dissection required. Shalaby [14]used an interior tension plate to obtain fusion in 14/17 arthrodesis.; they suggested that this method should be used for ankles with minimal deformities or bony distruction.Carrier[15] used vertical steinman pins for fixation of 5 arthrodesis in patients with severe rheumatoid arthritis and they achieved fusion in all 5 patients; they suggested that this technique should be used in patients of rheumatoid arthritis with decreased bone density and osteopenia.

The ideal method of arthrodesis should have a high rate of fusion with minimum complication rate, no cumbersome device, few visits to hospitals and a reduction in the need for further treatment. The normal anatomical alignment should be restored. The ilizarov method provides almost the ideal method of arthrodesis except that it is considered cumbersome according to some authors.[16] It has numerous additional advantages. It is reported that the extent of bone loss is the most important factor influencing ankle arthrodesis. Acute joint infection is an absolute contraindication for immediate bone grafting. The ilizarov external fixator provides stimulus for bone formation with progressive distraction and compression. This improves the quality of bone formation at the arthrodesis site. The ilizarov frame provides more rigid fixation due to its circular configuration. It gives the surgeon the opportunity to increase or decrease the hardware's rigidity by adding or removing the points of fixations. In patients requiring ankle arthrodesis who have significant limb length shortening, limb lengthening can be done with ilizarov method by either bifocal or trifocal methods. The ilizarov method also offers the ability to correct alignment at the arthrodesis site by using hinges.[17, 18]

The overall results of external compression arthrodesis reported in the literature have been good. In a study by Hayes and Gonzalez the authors used an ilizarov technique for ankle fusion in 21 patients with complex distal tibia pathology or failed ankle arthrodesis and reported that 60 % of the patients had a good result after solid ankle arthrodesis, with expected functional capacity after fusion and no reports of pain or infection.[19]

The ilizarov external fixator is the only solution in certain complex and challenging cases needing arthrodesis in the presence of chronic active infection, inadequate soft tissue coverage, poor bone quality, established bony deformity and failed arthroplasties that precludes the use of internal fixation.[20,21,22]

Our sample size was smaller.We recommend further studies with larger sample size and comparing other modalities of ankle arthrodesis with Ilizarove apparatus**.**

CONCLUSION

Ilizarov external fixator used for ankle arthrodesis give excellent stability, allowing early weight bearing without pain and results in higher rates of union with minimal post operative complications.

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Authorship and Contribution Declaration

Karim Bakhsh, conception and design of the study
Farid Ullah khan Zimri, acquisition of data
Amanullah, interpreted the data, drafted the manuscript
Eid Mohammad, revised the manuscript critically for important intellectual content
Attiq Ur Rehman, final approval of the version for publication