

Use of Ilizarov Technique in correction of complex Clubfoot

Ruta Kulkarni¹, Rajiv Negandhi¹

Abstract

Neglected and recurrent clubfoot present with two primary types of deformities namely dynamic deformities and rigid deformities. Soft tissue tightness cause dynamic deformities while bony elements leads to rigid deformities. Deformity correction in cases of clubfoot with ilizarov frame works well if principles of deformity correction are followed well. Dynamic deformity can be stretched out well with soft tissue distraction, while rigid deformity will require bony procedure. Ring fixators can achieve painless, functional plantigrade foot with minimal complications, however patient compliance and acceptability are practical issues. This article reviews various clinical scenarios and provides a detailed management plan using ring fixators.

Keywords: Ilizarov ring fixator, clubfoot, osteotomy, distraction histiogenesis

Introduction

In most children conventional surgical management of idiopathic clubfoot gives good results, but a recurrent deformity requiring further operation may occur. In 10-15 % of children, its treatment depends upon the nature and severity of the foot. A foot which is supple may require recasting or dynamic transfer of tibialis anterior. A rigid foot is likely to require repeated soft tissue procedures and sometimes bony procedures in form of lateral column shortening and calcaneal osteotomy. This can make foot more stiff and shorten already short foot. An alternative is to use the Ilizarov technique. Application of this external fixator allows gradual distraction of joints and correction of all aspects of the deformity.

Foot deformities can be corrected by: (1) Soft tissue distraction, and (2) osteotomy distraction by Ilizarov method. Ilizarov apparatus is best suited for complex three-dimensional correction of foot deformities. The foot has multiple joints functioning in different directions with different axis of rotation. When the osteotomy is distracted wedge type of new regenerate bone is formed, correcting the deformity.

Principle of Deformity Correction

Paley has laid down the principles of deformity correction in the book "Principles of Deformity Correction" Springer-Verlag[1,2]. The deformities of the foot are corrected on two principles as promulgated by Ilizarov. Principle of tension stress which states that gradual traction on living tissues stimulates tissue genesis and growth throughout the distraction period. The second principle is the shape forming processes acting upon bone tissue are dependent upon the magnitude of the applied load and the adequacy of blood supply. An increase in the pressure load on a supply to that region results in bone atrophy. If however, the increased load is accompanied by adequate blood supply, the bone hypertrophies according to Wolf's law remains normal[3,4].

Conventional Surgery

Conventional surgery in most cases has given excellent results and is definitely indicated in uncomplicated cases of foot deformities. The conventional procedures for correction of deformities are: (1) tendon transfers, (2) tendon lengthening, (3)

arthrodesis, (4) osteotomies, and (5) soft tissue release.

There are many complications of the conventional operations: (1) the surgery may cause shortening of the foot which is already shorter because of the paralysis, deformity or lack of blood supply, (2) infection may occur which may cause further deformity, (3) pseudarthrosis may occur, (4) the osteotomy may not unite and may cause further stiffness of an already stiff joint, (5) if there is infection, conventional surgery may be associated with complications of osteomyelitis, arthrodesis may occur, and (6) recurrence of deformity is known[5,6].

The Advantages of Ilizarov Method

- It is a minimally invasive procedure with minimal dissection, and therefore, decreased risk of neurovascular and soft tissue injury and infection.
- This is particularly advantageous in the multiply operated foot.
- The Ilizarov method is also not limited by the magnitude of the deformity. Even very severe deformities can be treated by this method.
- It allows a comprehensive approach to foot deformity correction by treating not only the foot deformity, but also the associated tibial deformities; leg and foot length discrepancies and even the thin calf can be widened.
- Another important advantage is any

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Figure 1: A 12 year old boy with bilateral relapsed clubfoot deformity. Such patients are prone to develop callosities at dorsolateral aspect of foot as shown with arrow.

residual deformity after surgery can be corrected during the postoperative period. It is adjustable even after an acute correction is performed.

Achieving a perfectly plantigrade foot in the operating room, whether with an osteotomy or an arthrodesis, is difficult. With the circular external fixator it is possible to obtain the desired correction either acutely in the operation room or gradually after operation.

Non-osteotomy treatment may still be considered in the presence of fixed bony deformity if limited arthrodesis are planned

to maintain the correction that is obtained by joint distraction. This reduces the amount of bone that needs to be resected at the time of arthrodesis.⁴

Disadvantages of Ilizarov Method

- Ilizarov method is associated with many complications especially in the foot, because foot has a large number of small joints and axes. Axis of rotation of each joint is different from other joints,
- The pain factor: Most of the patients do complain of pain.
- The treatment period is lengthy with

prolonged joint immobilization. Functional loading, however, including full weight bearing as tolerated, is permitted during treatment. This helps to counteract effects of the prolonged joint immobilization.

Strategies

There are two strategies of Ilizarov method to correct the foot deformity: (1) soft tissue distraction with or without surgical release of the soft tissue. (2) Bony distraction by osteotomy. In this strategy, the distraction occurs through osteotomies, regenerating new bone and eliminating deformities by

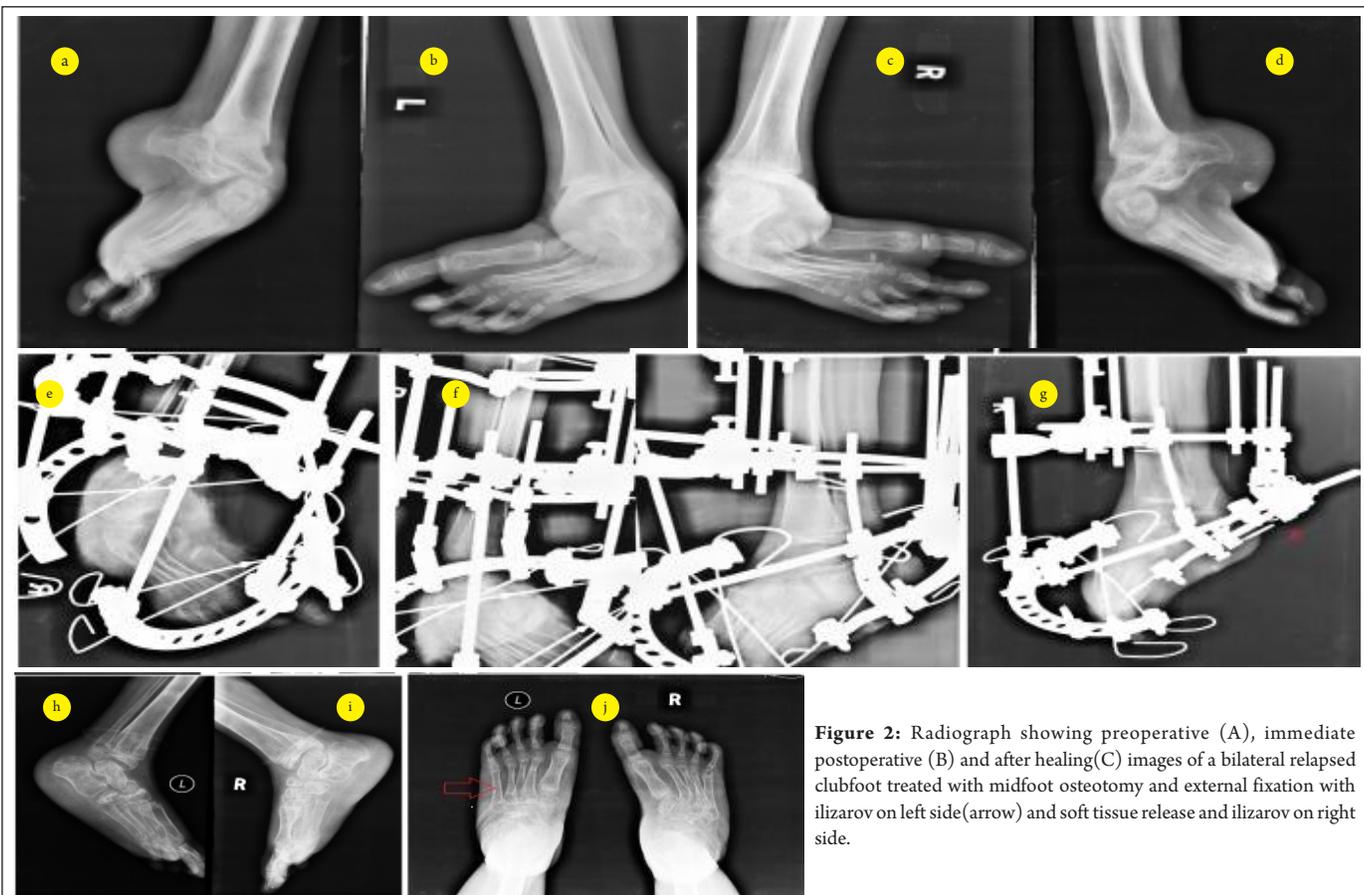
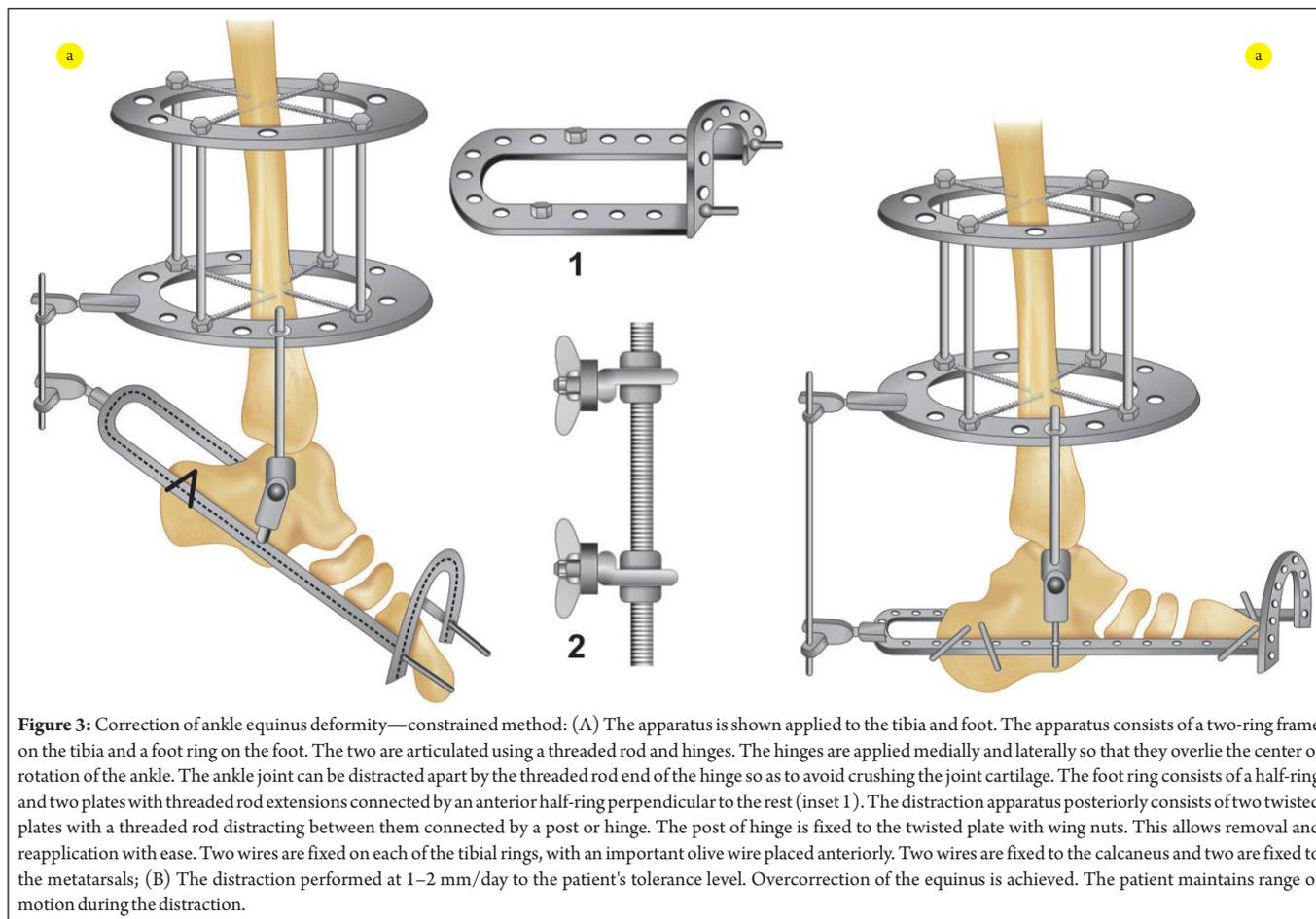


Figure 2: Radiograph showing preoperative (A), immediate postoperative (B) and after healing (C) images of a bilateral relapsed clubfoot treated with midfoot osteotomy and external fixation with ilizarov on left side (arrow) and soft tissue release and ilizarov on right side.



opening wedge-type corrections.⁷ The joints remain undisturbed with osteotomy distraction techniques.

The strategy depends on: (1) the age of the patient, (2) the presence of bony deformities—here the deformity is corrected by distracting across joints in an attempt to bring them into a new congruous relationship to a plantigrade position, and (3) the stiffness of the foot. (4) Presence of arthrodesis.

Indications for Soft Tissue and Osteotomy Distraction (Fig 1. & 2)

Paley has given the following guidelines:

- Age is an important consideration in deciding non-osteotomy or osteotomy treatment.

According to Paley, non-osteotomy should be done in children below 8 years of age. The deformed foot can be corrected by a soft tissue distraction in children below the age of 8 years. In this group, shape of the foot bones can get remodeled. Soft tissue distraction relies on biologic plasticity of cartilaginous bones. This capability is unreliable in older patients. Cartilage fills

the incongruities. During the postoperative period, distraction induces reshaping of bones by activation of the circumferential physis of these bones, leading to a new congruous alignment of the foot bones. The bones adapt to the new position. Adolescents and adults: An older patient with no bony deformity but a soft tissue contracture leading to cavus, equinus, varus, etc. is a good candidate for the soft tissue distraction. If the bones of the foot are congruous only soft tissue distraction can correct the deformity, irrespective of age.

Stiffness of the joint is an important consideration in decision making. When soft tissue distraction is to be done, if the joint is very stiff, there is significant risk of physeal disruption rather than joint distraction. In these cases osteotomy is preferable. Therefore, it is better to grade the stiffness. The author has graded the stiffness into three types: Mild, moderate and severe. Mild grade has a mobile foot, which can be brought to normal foot position from the deformed position. In moderate stiffness, deformed foot is

corrected from the deformed position to 30° away from the normal position. In severe stiffness, foot is fixed at 30° or more. Mild and moderate stiffness can be corrected by a soft tissue distraction. Severe degree of stiffness needs osteotomy. In very stiff deformities, especially as a result of multiple previous surgical attempts, osteotomy should be considered, despite the young age. One contraindication to soft tissue distraction is the presence of limited or extensive arthrodesis. These cases obviously require osteotomy. The soft tissue technique depends on the ability to distract them through multiple joints simultaneously. If these joints are already arthrodosed, this is no longer possible. Thus, the contraindications for soft tissue distraction are: (1) incongruity of the joints after the age of eight, (2) severe stiffness of the foot, and (3) arthrodesis of joints.

Recurrence of a deformity after Ilizarov frame removal is rare in bony corrections (osteotomy), but is common in soft tissue distraction technique, usually due to neurovascular imbalance. An osteotomy in

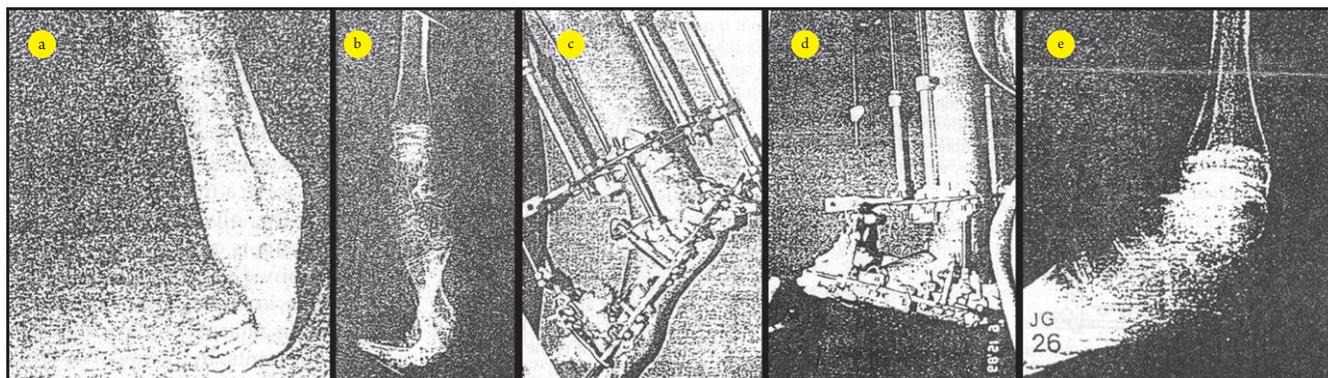


Figure 4: (A and B) Lateral photograph and radiograph of the ankle before correction; (C and D) The apparatus is shown from the lateral view during correction and at the end of overcorrection—note that in this example, a wire was inserted across the axis of rotation of the ankle joint and connected to the hinges: This is another modification of the constrained technique; (E) The lateral radiograph after correction.

such patients provides a lasting correction through bone instead of joints. Therefore, it is important to consider judicious use of adjunctive muscle balancing surgery (tendon lengthening or transfer) to maintain the correction obtained by the Ilizarov soft tissue method. In many cases, tendon lengthening is done at the time of the Ilizarov frame application.⁸ Casts are applied immediately on removal of the apparatus, and orthotics is often used long-term to maintain correction.

There are two systems of ilizarov construct to correct the foot deformities: (1) constrained system, and (2) unconstrained system.

In the **constrained system** (Fig 3A & B) (Fig 4 A&B) trained system, hinges are used so that the movement occurs in one direction only, in the plane of the hinges. It is necessary to find the instant center of rotation of the joint and to perform the correction around this single

center of rotation. The advantage in the constrained system is one can mobilize the joint, e.g. in an equinus deformity, the ankle joint can be mobilized with a hinge at the center of rotation of ankle joint. The center of the rotation of ankle is in the lateral facet of the talus in line with the sinus tarsi. While doing the ankle movements, the posterior distraction rod between tibia and hindfoot is removed. This system is particularly applicable to joints such as elbow, knee, ankle and wrist.

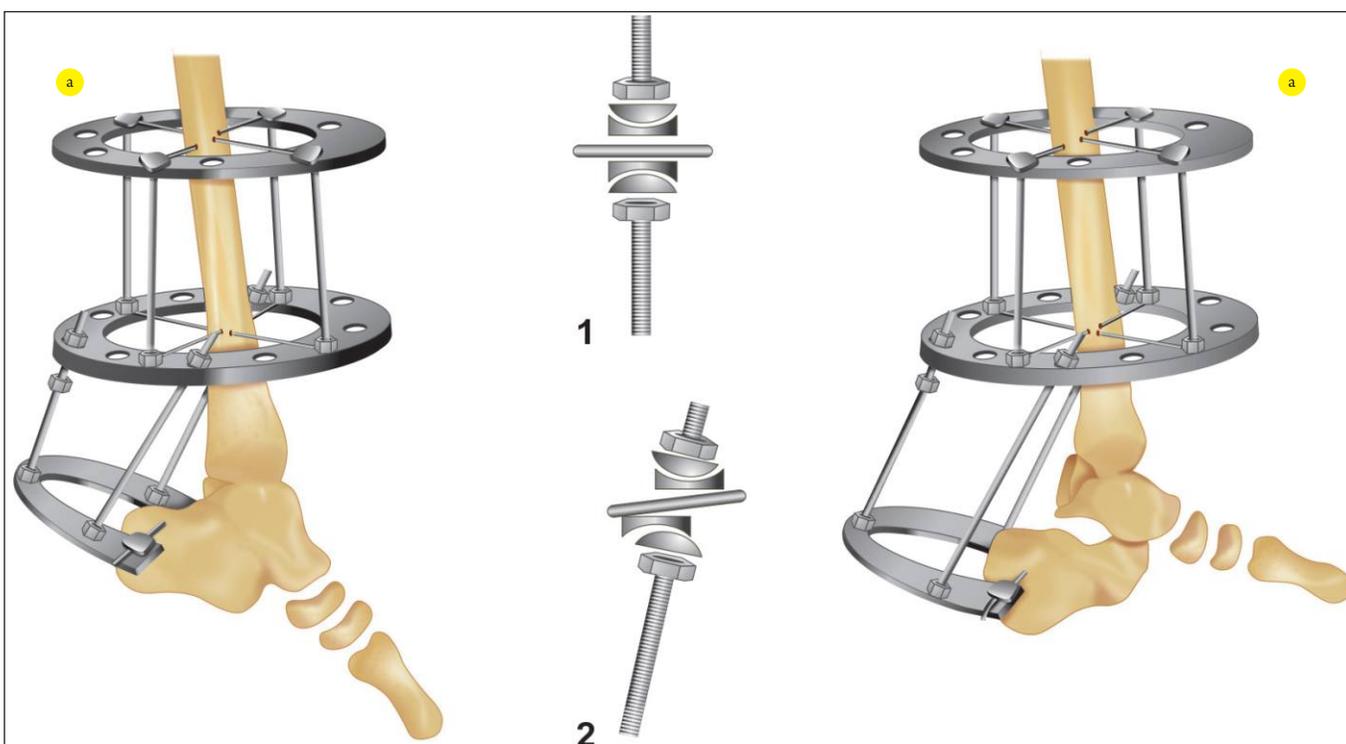


Figure 5 A and B: Correction of ankle equinus deformity—unconstrained apparatus consists of two rings in the tibia and a half-ring in the heel. One or two-wire fixation is used in the heel, and two wires are used on each of the tibial rings, with an olive anteriorly on the distal ring. (A) Three threaded rods are used to suspend the half-ring. These are fixed with nuts directly to the half-ring but are fixed with interposing conical washers on the distal tibial ring. This shows the half-ring to be tilted posteriorly by approximately 7°; (B) At the end of the correction, the foot has been distracted downward and posteriorly at a 7° tilt. This keeps the ankle in the mortise. Notice that the ankle capsule in the uncorrected position runs vertically from the posterior lip of the tibia to the back of the talus. In the corrected position, the ankle capsule is oriented with a posterior slope to it. This slope parallels the 7° direction of distraction. Note also that the ankle and subtalar joints are over distracted. This method does not allow removal of the rods for exercise of the joints therefore, the over distraction is important in maintaining a loose joint.

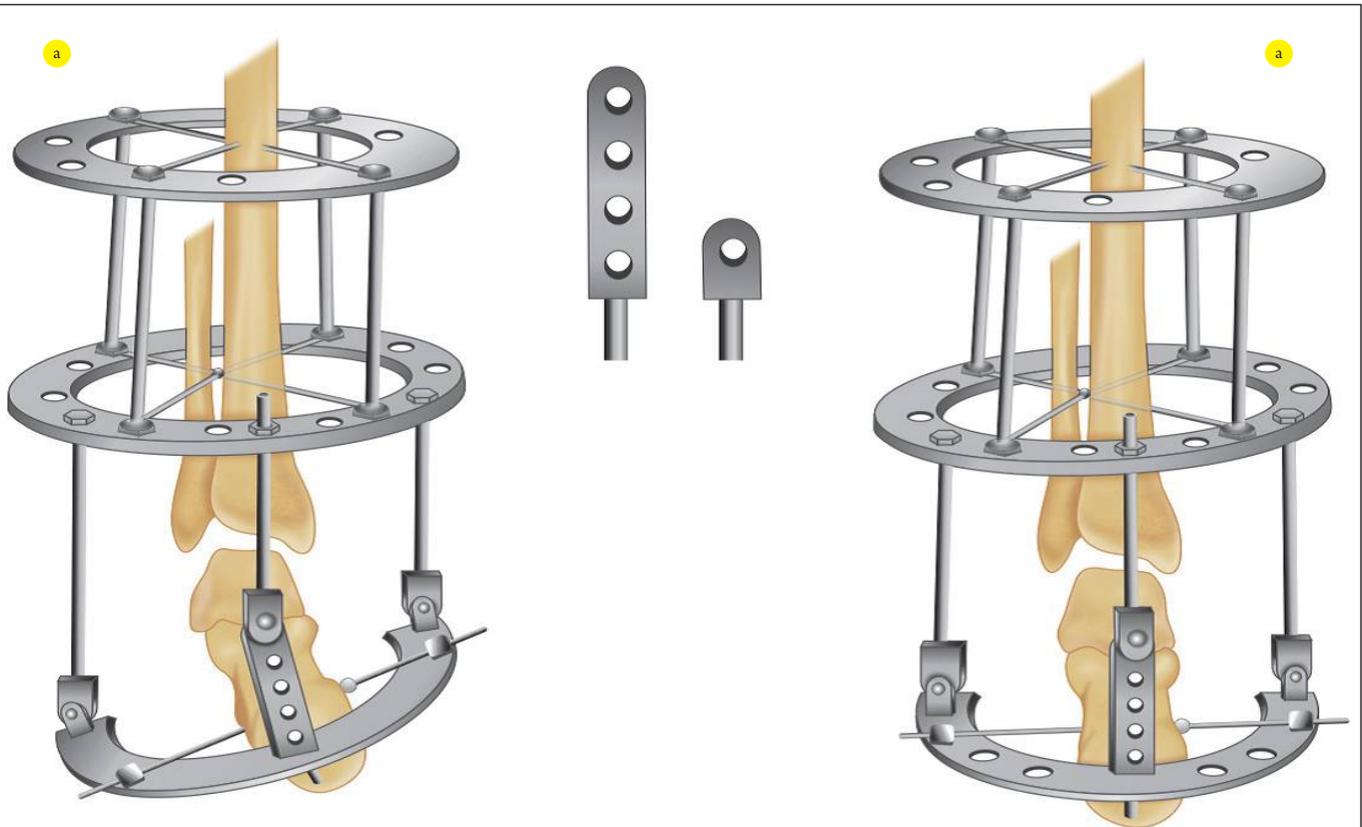


Figure 6 A and B: (A) The drawing of the construct for correction of varus deformity is shown from the posterior view. This construct uses the standard two-ring fixation on the tibia with two wires at each level and one with an olive placed medially. One wire uses one hinge is posterior and uses a three or four hole post (inset) to raise it above the level of the other two so that it is closer to the center of rotation of subtalar joint. The level of this hinge also serves to force the olive on this half-ring against the body of the calcaneus to correct the varus deformity; (B) At the correction, the rings are parallel and the contracture of the subtalar joint is reduced.

According to Grant the constrained system, which is the rule in most other areas of the body, is less applicable to the foot and ankle. When used, it usually corrects a deformity in one plane. The motions of the foot and ankle, however, are usually more complex, most occur through multiple joints and are three dimensional. Thus, a less constrained system has been developed

in which the joints of the foot and ankle become the hinges used for correction. Universal hinges are placed on one side of the deformity, and a pulling or pushing device (the motor) is placed on the opposite side. The correction occurs through the joints between the hinge and the motor. If it is desired that the correction of a particular deformity should occur

through a specific joint or point, constraints are placed in the system. This is done by positioning olive wires to force a motion to occur on one side or the other of the olive, thus, the place that the movement occurs is controlled. The constrained system, on the other hand, has to be very precise, and the hinges must be aligned to the joint axis within a narrow

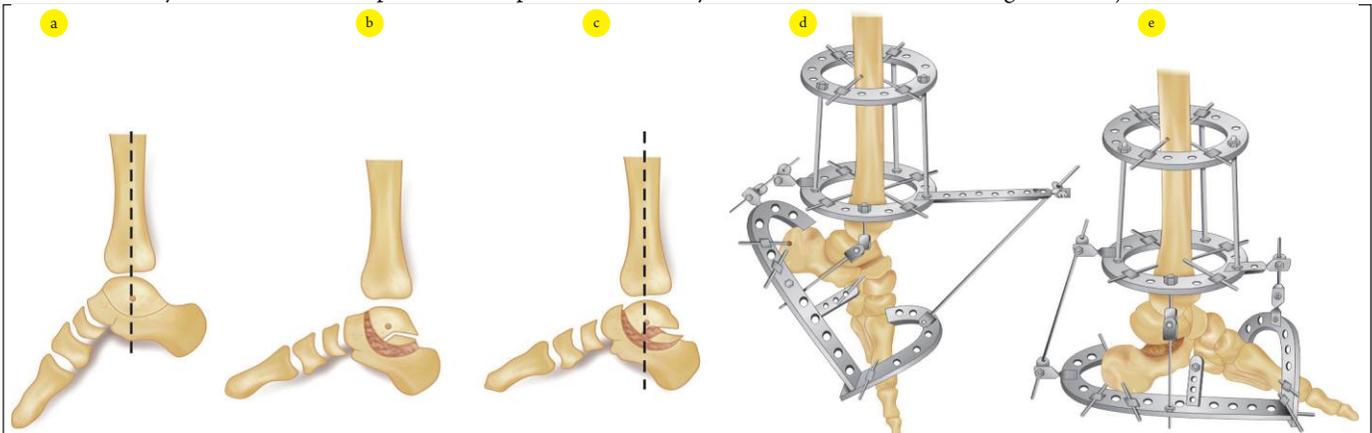


Figure 7 A and B: U-osteotomy: (A) Equinus deformity with flat-top talus. The U-osteotomy passes across the neck of the talus, through the sinus tarsi, and under the subtalar joint to exit posteriorly in the calcaneus; (B) Correction of the equinus is performed by slight distraction followed by rotation around the center of rotation of ankle; (C) For acute corrections through the dome-shaped U-osteotomy, the head of the talus translates proximally in front of the ankle joint; (D) The apparatus at the onset of treatment. Note the location of the hinge. The head of the talus is fixed with a wire. There is a wire through the hinges to fix the body of the talus; (E) At the end of correction (acute), the head of the talus rides proximally.

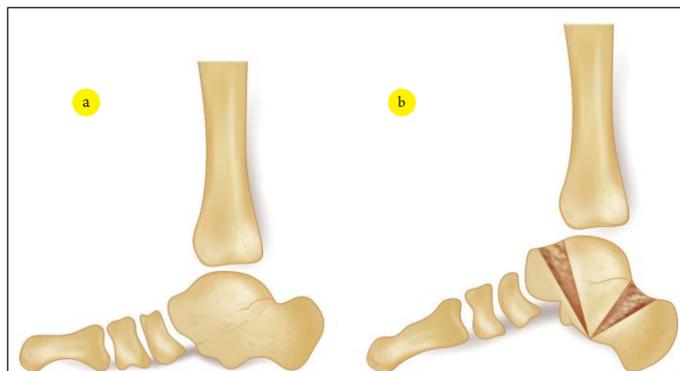


Figure 8 A and B: V-osteotomy: (A) V-osteotomy for rocker-bottom foot; (B) Opening wedge corrections of both the hindfoot and forefoot, recreating the longitudinal arch.

range of tolerance to avoid jumping of the joints. In the unconstrained system, it allows the contracture to correct itself around soft tissue hinges and natural axes of rotation of joints. Incorrect hinge placement can also inadvertently lead to joint compression or subluxation or even dislocation. The unconstrained method is advantageous for the treatment of the multiple foot joints that do not have a known simple single axis of rotation and is less advantageous for the treatment of joints such as the ankle, which do have an easy-to-locate axis.

Unconstrained System (Fig.5)

In the unconstrained system, one allows the contracture to correct itself around soft tissue hinges and natural axes of rotation of joints. The advantage of the unconstrained system is that it is simpler to apply and more forgiving.

Treatment of Equinus Deformity

Equinus deformity can be treated by constrained or unconstrained method. Axis of rotation of the ankle lies approximately at the level of the lateral process of the talus. Its axis extends laterally through the tip of the lateral malleolus, and medially below the tip of the medial malleolus.

Constrained Method

The image intensifier is used to locate the axis of rotation of the ankle. Preoperatively, Mose circles are applied to a true lateral image of the ankle to identify the level of the axis of rotation. The center is usually within the lateral process of the talus. The image intensifier is used to obtain a true lateral image of the ankle such that the lateral malleolus is centered over the midlateral tibia. A wire is used to point to the center of rotation. Once the wire

overlaps the region of the lateral process, this spot is marked on the skin. The same process should be repeated for both the medial and lateral sides. The image intensifier must be perpendicular to the tibia.

Step 1: Apply a preconstructed two-level frame to the tibia. Use four wires to fix the tibial frame to the leg. The author uses one half pin at 90° to the medial face wire.

Step 2: Suspend hinges from threaded rods off the distal tibial ring. Overlap the hinge with the center of rotation of the ankle joint.

Step 3: Apply the foot frame to the hinges. Adjust the foot frame so that it is parallel to the plantar aspect of the foot. This can be done by placing a board on the plantar aspect of the foot and making sure the foot frame is parallel to the board. A distraction rod off two pivot points such as twisted plate is connected posteriorly in the central hole between the two hinges. Wing nuts are

used to connect the posts at either end of the distraction rod. This allows quick application and removal. The patient can combine distraction with removal of the distraction rod for exercise and rehabilitation.

Treatment of Equinus Deformity

Unconstrained Method

(Technique—Paley⁹)

The same tibial base of fixation is used for the unconstrained method as for constrained method, but the foot frame is much simpler. This consists of a half-ring suspended off three threaded rods that are locked by a nut at their proximal end. The maximum posterior tilt of these washers is 7.5°. The half-ring is locked in place at that angle. Two smooth wires are inserted through the heel and fixed and tensioned to the half-ring. Deformity correction is performed by distraction on all three rods in order to pull the heel distally. The reason

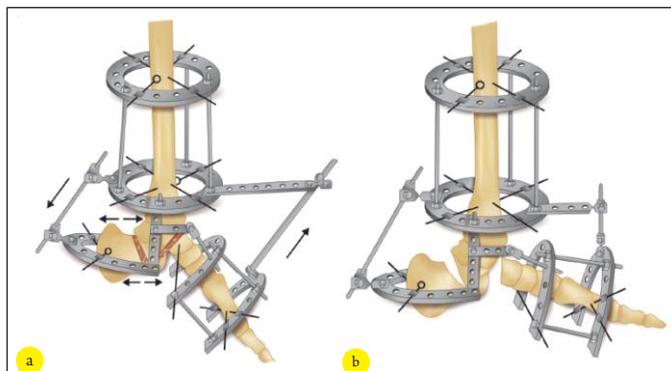


Figure 9 A and B: The apparatus is used for a correction through a V-osteotomy. Note the position of the hinges at the apex of the deformities at the convex end of each osteotomy; (B) The apparatus after distraction of V-osteotomy.

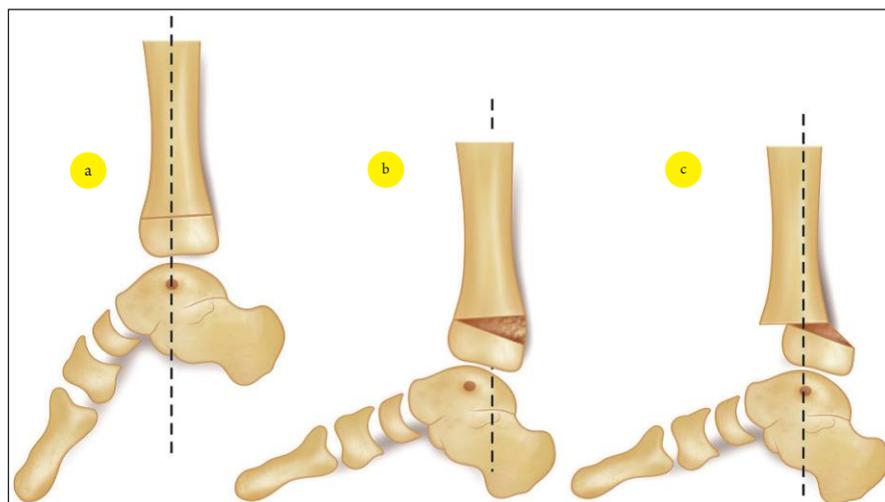


Figure 10 A and C: (A) An equinus deformity with a flat-top talus and stiff ankle. The center of rotation of the talus is marked (point); (B) An opening wedge osteotomy in the supramalleolar region corrects the equinus but translates the foot forward; (C) Combining an opening wedge with posterior translation realines the foot.



Figure 11 : Nine year old girl with left side relapsed clubfoot deformity with callosity over dorsum of foot.

for the posterior tilt of these rods is that the ankle capsule in equinus runs in a straight line from the back of the talus to the posterior lip of the tibia. When the foot is in the plantigrade position, the line of the ankle capsule is tilted 5–7° posteriorly. This is because the posterior lip of the talus protrudes posterior to that of the tibia. If the rods were not tilted back but were

parallel to the tibia, distraction along, that line would pull the ankle capsule directly distally. This would force the talus forward, out of the mortise. When the rods are tilted posteriorly, the talus is pulled back into the mortise.

Varus Deformity: (Technique-Paley)⁹(Fig 6 A & B)

Heel varus deformity is corrected by the same type of construct as that used in an unconstrained correction of equinus deformity. The difference is that an olive is used on the medial side. The threaded rods are connected via hinges. The posterior threaded rods are connected to a two, three, or four-hole hinge so that the hinge point is proximal to the level of the heel wire. In this

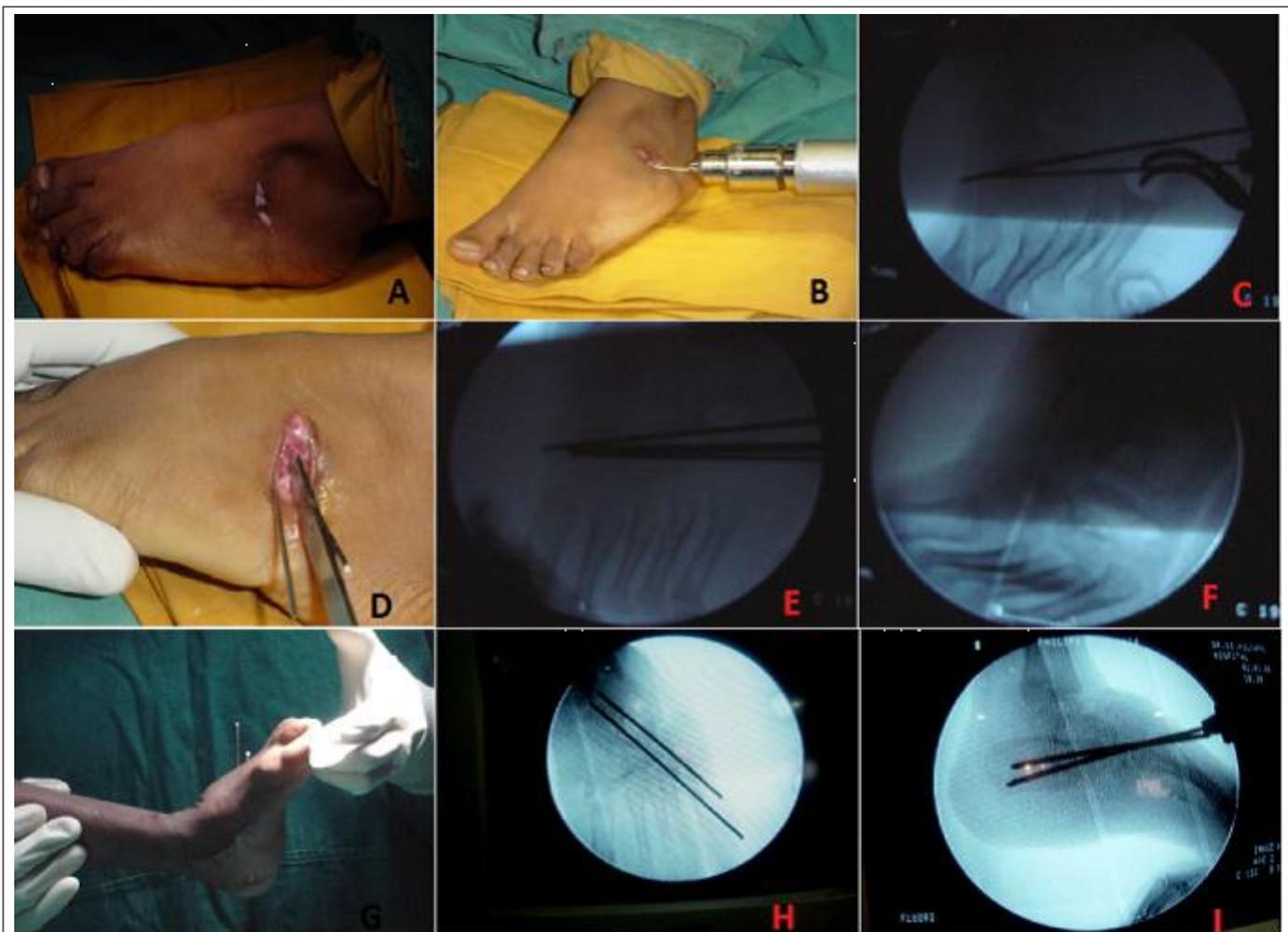


Figure 12: Steps of the surgical technique and intra-operative x-ray images

way, as the medial side is distracted, because it has to pivot around the hinge, it will translate laterally, forcing the heel out of varus. The rods medially and laterally are connected with a hinge distally and conical washers proximally, or with twisted plates that have pivot points at both ends, or with a mixture of the two. The choice depends on the degree of deformity. Conical washers can adapt only to a 7.5° tilt in either direction. The correction is produced by asymmetrical distraction of all three rods. The medial rod is lengthened at five 0.25 mm adjustments per day, the middle rod at three 0.25 mm adjustments per day, and the lateral rod at one 0.25 mm adjustment per day. In this manner, there is no risk of crushing of the joint surface.

Correction of Foot Deformity by Soft Tissue Distraction 10,11

The Standard Frame

The standard foot assembly consists of the tibial component, the calcaneal component and the forefoot component. The tibial assembly usually consists of two rings. When two rings are used, it becomes stronger support assembly. The level of its attachment depends on the size and complexity of the rest of the frame, the more complex the forefoot and hindfoot components, the higher the level of the supporting components is attached. The calcaneal component consists of half-ring surrounding the heel. In most cases, both “legs” of this half-ring must be made longer by the firm attachment of the connecting plates. Two cross wires are inserted through the calcaneus and are connected to the half-ring. Only 50–60 kg tension is given. A half-pin passed in the calcaneus posteriorly adds to the stability. The forefoot ring consists of half-ring across the dorsum of the foot. Two wires are passed through the neck of the metatarsals. There are three ways to pass wires through the metatarsals: (1) usually the 1st and 5th metatarsals are used to keep the metatarsal arch, (2) the wires are passed through all the metatarsal pressing 2nd, 3rd, 4th metatarsals plantarwards, bringing all the metatarsals in one line. This gives better stability, and (3) wires are passed through 2nd or 3rd metatarsals and from lateral 5th, 4th or 3rd metatarsals. This is suggested by BB Joshi in JESS system. To do this the 1st and 5th

metatarsals are squeezed, while the wire is being inserted. When the wire passes through the cortices of the first metatarsal, drilling is stopped as the wire comes out of the far cortex of the 1st metatarsal. The wire is tapped till it reaches the 5th metatarsal. Then again the wire is drilled through the 5th metatarsal neck as decided and is connected to the second or ring and tensed. Another wire may be passed through the 1st or 2nd metatarsal or through the 5th, 4th and 3rd metatarsals and connected to the ring. This wire maintains the metatarsal arch and gives more strength to the forefoot half-ring. The forefoot and hindfoot components are connected to the tibial ring using hinges. In some cases, the forefoot component is connected to the calcaneal component by two long plates or threaded rods. The forefoot and hindfoot component may or may not be connected to each other depending on the situation. The connection between the forefoot and hindfoot assemblies is flexible in most cases by using hinges. In some cases, another wire is passed through the mid-tarsal bones, either through the cuboid and navicular or through the talar head. This wire is connected tibial to the distal ring by rods, alternatively this wire is connected to the posts on a plate which is connected to the forefoot half-ring, according to the situation.

Correction of Foot Deformities by Distraction of Osteotomy

Osteotomies around the foot and ankle for distraction are devised by Ilizarov^{12,13}. Paley has classified Ilizarov osteotomies for foot correction into two groups, osteotomies along the long axis of tibia and those along the long axis of foot.

Osteotomies in the long axis of tibia are:

- Supramalleolar at metaphysis
- Supramalleolar juxta-articular
- U-osteotomy through calcaneus and talar neck.
- Osteotomies in the long axis of foot are:
 - V-osteotomy
 - Posterior calcaneal osteotomy
 - Talocalcaneal osteotomy
 - Through talonavicular and calcaneal cuboid joints
 - Through metatarsals.

Osteotomy in the long axis of tibia will

correct all deformities except the deformities between the hind and forefoot such as cavus or the rocker bottom foot and cannot lengthen foot. Therefore, the anatomic relation of hindfoot and forefoot must be normal. Osteotomy in the long axis of foot corrects all deformities of the hind or forefoot, but will not correct deformity at ankle or above, and limb length discrepancy.

U-osteotomy is made through a lateral approach to the hindfoot. U-osteotomy starts behind the subtalar joint, passes under this joint through superior part of the calcaneus across the sinus tarsi and neck of the talus. This is specially indicated when there is a flat top talus or very long-standing equinus deformity. In this situation, the talus is incongruous in the ankle joint and will not enter the ankle mortise because the anterior broad end will not be accommodated in the joint. This osteotomy is able to correct equinus, calcaneus, varus, valgus, and foot height. It is unable to correct deformities between the hindfoot and forefoot like cavus and rocker bottom foot (Fig.7)

V-osteotomy (Fig.8 & 9)

V-osteotomy is a double osteotomy, one osteotomy across the body of the calcaneus posterior to the subtalar joint and one osteotomy across the neck of the talus. The V-osteotomy is used to correct the relation of the hindfoot, midfoot and forefoot, one to the other. The hindfoot with the tuberosity and the Achilles lies posteriorly and the midfoot and forefoot lies anteriorly. This permits angular and rotational correction of the anterior and posterior segments in relation to the middle segment, the leg, and the ground, i.e. varus, valgus, adduction, supination, and pronation. The V-osteotomy is indicated when there are deformities between the hind and forefoot. A prerequisite for this osteotomy is stiff subtalar joint. Essentially, all foot deformities can be corrected through the V-osteotomy, including hindfoot and forefoot equinus or calcaneus, rocker bottom deformities, cavus deformities, abductus and adductus deformities, and even deformities of length and bony deficiencies of the hindfoot or forefoot.

Supramalleolar Osteotomy (Paley) (Fig.10)

Supramalleolar osteotomies can correct equinus, calcaneus, varus and valgus deformities. The relationship for the hindfoot to the forefoot must be normal if this is to be the sole treatment Indication. Supramalleolar osteotomies are indicated in the following conditions: (1) Deformities of the metaphyseal and juxta-articular region of the distal tibia, (2) deformity at the ankle level. Ankle may have previous arthrodesis. Deformities at the talus or subtalar joint with ankylosis of the ankle joint. Equinus, calcaneus, varus, valgus, tibial torsion, and leg-length discrepancy can be corrected by this osteotomy.

Advantages

- Rotational deformity of the tibia can be corrected.
- If the tibia is short, it can be lengthened by distracting this osteotomy.
- The supramalleolar osteotomy is technically the easiest of the Ilizarov foot osteotomies as this is a cancellous part.

The supramalleolar osteotomy is particularly useful in the multiply operated foot with poor skin, when the deformity is below the level of the ankle joint. One more advantage of the supramalleolar osteotomy is that it does not compromise motion in the hindfoot joints. It avoids operating on a

multiply operated foot in cases where the deformity is below the level of the ankle joint deformity is below the level of the ankle joint.

Disadvantages

It cannot correct the deformity between the hindfoot and forefoot. The most common problem of this osteotomy is the translation of the distal fragment. This is because osteotomy is not done at the true apex of the deformity. This occurs when an angular deformity at one level is corrected at another level. For example, if a distal tibial deformity is at the level of the plafond (juxta-articular) rather than in the metaphysis, a metaphyseal osteotomy leads to a translational deformity. It is necessary to translate the metaphyseal osteotomy in addition to the angular correction. Paley states that, it is preferable to use the supramalleolar osteotomy to correct only malalignment of the distal tibial articular surface. It can be used to correct deformities at the level of the talus when the ankle joint is very stiff. This leads to a tilt of the plafond that is insignificant when the ankle is very stiff. Because the apex of the deformity is distal to the osteotomy, the supramalleolar osteotomy must be translated, as mentioned previously.

Midfoot Osteotomy¹⁴ (Fig. 11 & 12)

Recently since year 2011 we have been doing midfoot and forefoot deformity correction by doing percutaneous midfoot osteotomy. This osteotomy is indicated for complex midfoot and forefoot deformities which are rigid. A percutaneous osteotomy is done at the level of cuboid (midfoot). This osteotomy is a joint sparing osteotomy as it does not pass from any joint. A wedge is planned according to nature of deformity (varus /equines/cavus). A wedge is marked with help of 2 k-wires and osteotomy is done between them. After removing the wedge correction is almost complete. Remaining deformity can be corrected with regular non constrained Ilizarov frame. Lengthening of foot can also be achieved through same osteotomy. If the hind foot varus remains uncorrected then a calcaneus slide osteotomy is also added. This is rarely necessary. We find this joint sparing option easier and better than U or V osteotomy.

Conclusion

Deformity correction in cases of CTEV with ilizarov frame works well if principles of deformity correction are followed well. Dynamic deformity can be stretched out well with soft tissue distraction, while rigid deformity will require bony procedure. With advent of ilizarov Painless, functional plantigrade foot can be achieved.

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