MATERIAL AND METHODS
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This study has been conducted on the patients attending Orthopaedics Department, M.L.B. Medical college Hospital, Jhansi.

FOOT

CTEV

Criteria for selection of patient -

Cases of resistant, inadequately corrected or relapsed congenital talipes equinovarus in age group of 3 months to adult willing for correction of deformity by controlled, differential distraction with Joshi’s talipes external fixator was selected for this study.

Pre-operative clinical and Radiological examination-

- Detailed general & systemic examination.
- Local examination.
  . Calf: Girth & muscle tendon ratio
  . Presence of abnormal skin: Medial plantar & posterior heel creases.
  . Callosites
  . Ankle movements
  . Heel walk
  . Measurement on podogram
  . Medial border length: from medial aspect of heel to tip of great toe.
  . Lateral border length: from lateral aspect of heel to tip of little toe.
  . Heel to II toe length
  . Radiological examination-
    - Talo calcaneal angle (AP)
    - Talo calcaneal angle (LAT)
    - Talo calcaneal index (T.C.I.)
    - Talo lstmetatarsal angle(AP)
Components

Three sets of assembly components are designed to suit the requirements for different age groups.

I) SMALL SET (Suitable for children upto 2 years)
   1. Link joints 30
   2. Connecting rods (2-5 mm)
      Straight Rods 4"
      6"  03
      8"  02
      "Z" Rods 02
      "L" Rods (large) 02
      (small) 02
   3. Distractors (4mm) 02
      4"  02
      6"  02

   4. Foot plate 01
   5. "K" wires
      2mm 6" 02
      1.0 mm 6" 06

II) MEDIUM SET (suitable for children between 2 to 5 years)
   1. Link joints 30
   2. Connecting Rods (3.0) -
      Straight Rods 5"
      6"  02
      10"  02
      "Z" Rods 02
      "L" Rods (large) 02
      (Small) 02
   3. Distractors (4 mm) 02
      4"  02
      6"  02

   4. Foot plate 01
5. "K" wire (2.0 mm)
   5"  03
   6"  02

III) LARGE SET (Suitable for age 7 to adult):
   1. Clamps Aesculp type 09
      12
   2. Connecting Rods (4.0)
      Straight Rods 6" 05
      12"
   3. Distractors (4mm)
      6" 02
      D.C Rods 02
   4. "K" wires -
      2.5 mm, 5" 05
      2.0 mm, 6" 06

Other instruments required are Hand drill, Wire cutter, Allen key, T handle.

Assembly:
   The basic assembly consists of three pin holds and three pairs of connections, on medial and lateral aspects of the limb.
   (a) Pin Holds:
      - Tibial pin hold,
      - Calcaneal pin hold,
      - Metatarsal pin hold,
   (b) Connections:
      - Tibio-calcaneal Distractors
      - Tibio-metatarsal connecting rods
      - Calcaneo-metatarsal Distractors
   (c) Foot plate Attachment.

OPERATIVE TECHNIQUE:

The operation is performed under Ketamine with pneumatic tourniquet control (100-300 mm of Hg.)
1. Pin Insertion:

(a) **Tibial pins**: Two parallel transfixing pins are passed at the junction of the upper & middle third of the tibia, about one and half inches apart.

(b) **Metatarsal pins**: One transfixing pin is passed from the fifth to the first metatarsal at the level of neck or distal shaft. Two separate pins, one from medial & other from lateral aspects are inserted parallel to the transfixing pin, engaging three metatarsals on each side at least.

(c) **Calcaneal pins**: Two transfixing pins are passed in calcaneum parallel to each other in proximo-distal direction 10-12 mm apart. Posteriorly, another pin is passed along the axis of the calcaneum below the insertion of the tendo-achilles, mirroring the deformity.

2. Attachment of "Z" & "L" rods:

(a) **Tibial attachment**: The middle portion of the "Z" rods are attached by link joints to these pins, on medial and lateral aspects. The transfixing pins are pre-stressed for better hold while tightening the joints.

(b) **Metatarsal attachment**: Two small "L" rods are attached to the metatarsal pins on medial & lateral aspects of the foot with one limb projecting plantarwards, to provide connection for the foot plate attachment.

(c) **Calcaneal attachment**: Two large "L" rods are attached to the transfixing pins on either sides of the heel, in the same manner as described above.

3. Connecting the pin holds:

(a) **Calcaneo-metatarsal connection**: A pair of appropriate size distractors are attached to the calcaneal & metatarsal pins on either side of the foot.

(b) **Tibio-calcaneal connection**: The posterior limbs of the "Z" rods are attached to the "L" rods of the calcaneal assembly by another pair of distractors. The distractors are attached near the transfixing pins (lateral and medial aspects) of calcaneum.
4. Stabilization of Assembly & Foot Plate Connection:

(a) Tibial Hold: The anterior & posterior parts of the "Z" rods are connected with transverse bars respectively. These transverse connections provide stability to the assembly against twisting forces & additional sites for link joints.

(b) Calcaneal Hold: The posterior limbs "L" rods & the axial calcaneal pin are connected together with a transverse rod to complete the calcaneal hold.

(c) Foot plate Attachment: The plantar limbs of the metatarsal & calcaneal "L" rods are attached respectively, with straight rods. This connection provides a slot for the transparent acrylic foot plate. This plate prevents the flexion contracture of the toes, which might occur due to tightening of the flexors, during the distraction phase. Both distractors may be distracted slightly.

This takes up to slack in the assembly & puts the soft tissue at the optimal stretch. Care should be taken to prevent skin necrosis and there should be no blanching at the skin. Multiple dermal deep cuts are given on the medial side of the foot if the skin is under tension.

The pin sites are covered with dry gauze and the whole assembly is covered with gamgee roll & cardboard to prevent injury.

POST-OPERATIVE MANAGEMENT

Pin site care

The dressing are performed twice a week with savlon & hydrogen peroxide. Pin sites are covered with dry gauze & protective dressing is re-applied.

Distraction-

Functional distraction at the rate of 0.25 mm/6 hourly or less is the key to success. Differential distraction with medial side at twice the rate of lateral is performed. The lateral aspect is distracted to prevent the crushing of articular cartilages. This method effectively elongates the otherwise shortened foot.

On the third post-operative day distraction is commenced as follows:

(a) The calcaneo-metatarsal distraction-
Corrects forefoot adduction at Tarso-metatarsal joints.
Stretches the socket for the head of talus,
Reduces the calcaneo-cuboid joint.

Medial............................ 0.25 mm every 6 hours,
Lateral............................ 0.25 mm every 12 hours.
End point ......................... (clinical & radiological correction of forefoot adduction, approx. 2-4 wks).

(b) The tibio-calcaneal distraction is carried out in two positions on the calcaneal assembly.

i) Medial & lateral calcaneal bars
Distraction in this position corrects varus & Inversion of the hind foot.
Medial............................ 0.25 mm every 6 hours,
Lateral ............................ 0.25 mm every 12 hours
End point ........................ (judged clinically 7-10 days).

ii) Posterior calcaneal bar close to the axial pin.
Distraction in this position provides thrust force to stretch posterior structures & corrects hind foot equinus.
Both distractors .................... 0.25 mm every 6 hours,
End point ............................ assessed clinically and radiologically, approximately 2-3 weeks of distraction (end at 6th post-operative week).

(c) The tibio-metatarsal connection-
☆ Static, provides tension force
☆ Keeps anterior part of ankle joint open, while the heel equinus is being corrected by thrust force.
☆ Reduce excessive tension by loosening and re-tightening the clamps once a week.
☆ Dorsiflexion of the ankle joint, performed gradually following hind foot correction.

☆ Alternative distraction technique may be used if the parents cannot be educated to perform distraction at home. The distraction is then performed in the OPD two to three times a week. The distractor screw is turned till resistance or pain is felt. The screw is unturned half a turn to relieve any excessive tension.

(20)
Patient's name
Age / Sex
Side: Unilateral (Right / Left) or Bilateral
Severity or deformity: Mobile / Rigid
Previous treatment: None / Stretching & serial casting / operative General &
Systemic Examinations
  Position of heel
  Skin creases-
    Medial planter
    Posterior heel
Measurement on Podogram -
  Medial border
  Lateral border
X-rays -
  Talo calcaneal angle (AP)
  Talo calcaneal angle (Lat.)
  Talo calcaneal index
  Talo 1st Metatarsal angle.
Management -
  Joshi’s talipes fixator for -
    Distraction phase
    Static phase
Post-operative management after fixator removal-
  Bk pop foot
  Walking shoes.
Post-operative assessment -
  Position of heel
  Ankle movements
  Gait
  Measurement on podogram -
    Medial border ,
    Lateral border
X-rays -
  Talo calcaneal angle (AP)
  Talo calcaneal angle (Lat.)
  Talo 1st Metatarsal angle.
Category
Points
1. Ankle dorsiflexion (passive motion) -
   more than 90 15
   90 5
   less than 90 0
2. Subtalar joint motion (Passive motion) -
   more than 10 0
   Less than 10 5
   Stiff 0
3. Position of heel when standing -
   0-5 valgus 10
   More than 5 valgus 5
   Varus 0
4. Forefoot (Appearance) -
   Neutral 10
   Less than 50 5
   Adduction/Abduction
   More than 50 0
   Adduction/Abduction
5. Gait -
   Normal heel/Toe gait 10
   Cannot heel walk 2
   Cannot toe walk 2
   Flat foot gait 4

6. Radiographic Measurement -
   (T-C index)
   40 or more 5
   Less than 40 0
Talo - 1st metatarsal Angle-
10 or less 5
15 or more 10

7. Shoes -
   Regular - No complaints 5
   Regular with complaints 2
   Orthopaedics shoes inserts, braces 0

8. Function -
   No limit 15
   Occasionally limited 0
   Usually limited 0

9. Pain -
   Never 10
   Occasionally 5
   Usually 0

10. Flexor Tendons -
    Full function 5
    Partial function 3
    No function 0
    Excellent : 85 - 100 points
    Good : 70-84 points
    Fair : 60-69 points
    Poor : 60 points

HAND INJURIES
CRITERIA FOR SELECTION OF PATIENT :

Patient of all age both male and female with open and closed fractures of hand were included in this series.

PRE-OPERATIVE ASSESSMENT :
1. History about:
   - Time, place and mode of injury.

General routine investigations

Pre-operative: X-ray of local part at least in two views:
Antero-posterior, 10-30 degree oblique or lateral view.

Classification of bony injuries:
A. 1. Simple,
   2. Compound.

B. 1. Non-comminuted
   2. Comminuted

C. 1. Intra-articular,
   2. Extra-articular.

TREATMENT PROTOCOL

CONSENT OF THE PATIENT:

All the patients who were taken for surgery were told about the external fixators procedure to be done, the operative and post-operative complications and likely results.

ANAESTHESIA:

In most of the cases, fixators had been applied under regional anaesthesia combined with or without deep sedation.

FIXATOR MATERIAL INCLUDE:

- Link joints
- K-wires 1.5mm, 2mm, 2.5mm, 3mm stainless steel 6"/9" long
- Side bars (connecting rods)
- Distractor

In our fixator system, we reduce the cost by following methods:
1. Sometimes not using stainless steel rods,
2. By re-utilizing the link joints.

INSTRUMENTATIONS

Instruments which were used are:

a. Hand Drill (Manual)

b. Pliers
c. Wire cutter

d. Allen Keys 2.5 mm and 3mm.

In closed hand injury the K-wires were passages through safe joints in the phalanges and the metacarpals depending upon the indication and JESS frames were constructed on them. 1.2 to 1.5 mm k-wires were used for phalanges while 2mm 2.5mm k-wires were used for metacarpals.

INSERTION OF KIRSCHNER WIRE -

☆ In the phalange fracture involving the mid shaft two k-wires used proximal and two distal to fracture site. K-wires were inserted dorsolaterally. The site of insertion was slightly dorsal to the junction of palmar thick and dorsal thin skin in order to avoid injury to digital vessels and nerves.

☆ The fractures of metacarpals were stabilized by 2 or 2.5 mm k-wires both proximal and distally and then stabilized on a metacarpal hold.

☆ When there were multiple fractures and dislocations rays of same hand then these were stabilized by constructing standard hand frame.

☆ In thumb fractures or lst carpometacarpal fractures dislocation, position of thumb was maintained by stabilizing the lst metacarpal by putting 2 lateral K-wires and one dorsolateral wire and then connecting them to the main assembly keeping the thumb in full extension, abduction and slight palmar rotation.

☆ In intra-articular fracture, the fracture joints was stabilized on bilateral frame across it.

☆ The vascularity of all fingers checked immediately after the application of JESS by watching the capillary filling or by pricking into the pulp of finger.

All wounds were dressed after cleaning. The pin tracks were cleaned by rectified spirit. These were further covered by gauze pieces soaked in betadine solution. The pointed edges of wires were cut short and small rubber tubing was sleeved over them. The whole assembly was covered by cotton and bandages. Operating time varied from 45 to 120 minutes.
POST-OPERATIVE MANAGEMENT:

☆ Assessment of vascularity status,
☆ Analgesic and anti-inflammatory drugs,
☆ Antibiotics, According to pus culture and sensitivity in compound fracture or dislocation. In closed injury 5 days course of antibiotics is given.
☆ Limb elevation
☆ Active and passive finger movements.
☆ Check radiograph- Immediately after operation, at the time of removal of JESSof and one week after the end fixator removal.
☆ Local dressing of the wound and pin track dressing.

FOLLOW UP:

Patients were followed up at 2 weekly interval till 2 months after removal.

Main Aim of Follow-up:

- Assessment of functions,
- Stability of apparatus,
- Complication if any,
- Advice regarding physiotherapy,
- To see for union.