

**Division of Pediatric Orthopaedics**

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Physical Therapy Protocol: Tibia Lengthening (Ilizarov Method)

**Phase 1 Inpatient PT Post op day 1 through day 5**

**Goals of PT:**

- 1) Independent ambulation on level surface and stairs with lateral supports. Partial weight bearing.
- 2) Instruct patient and family on correct position of the leg.
- 3) Instruct in submaximal ankle pumps, quadriceps sets, gluteal sets and abductor sets.
- 4) Instruct and perform range of motion exercises for knee, ankle and subtalar joint.
- 5) Adjust and teach patient use of static dynamic splint.

**Treatment:**

- 1) Ambulation training on level surface and stairs with bilateral supports (crutches) partial weight bearing. Patients in this stage usually will guard. Weight bearing not critical at this stage.
- 2) Correct positioning: knee fully extended and ankle maximally dorsiflexed. Elevation of

the operated extremity for controlling post-op edema.

- 3) Submaximal isometric exercises of quads, hamstrings, plantarflexors, glutei and hip abductors. Emphasis on patient doing these every couple of hours.
- 4) Perform knee, ankle subtalar and foot active and active/assistive range of motion exercises. Instruct patient to perform these 2-3 times a day.
- 5) Static splint for the foot is a Darby shoe or custom made orthotic attached to frame by velcro straps. Ensure that front two straps are tight and back strap which is for support not as tight as front two straps. Purpose of static foot splint is to achieve maximal dorsiflexion and prevent hindfoot and forefoot equinus. Dynamic splint: Knee extension Dynasplint. At this stage, it is given as a prophylactic measure. Instruct patient and family correct adjustments on the splint and emphasize on using it for at least 10 hours a day.

Frequency: Daily physical therapy

## **Phase 2 Lengthening or Adjustment Phase (Out patient PT Program)**

Frequency of PT: Initially 5 times a week , later may be cut down to 2-3 times a week.

### **Goals of PT and Treatment:**

- 1) Maintain full knee extension and maximal ankle dorsiflexion.
- 2) Encourage more weight bearing through the operated leg. Continue using two lateral supports. Achieve reciprocal ambulation with equal step length.
- 3) Progress from submaximal to maximal isometric sets of quads, hamstrings, plantarflexors and hip abductors.
- 4) Incorporate functional loading activities of the operated extremity.

- 5) Stretching exercises of ankle plantarflexors, toe flexors and knee flexors.
- 6) Active exercises for the knee TKE (terminal knee extension) and hamstring curls in prone position. Electrical Stimulation for augmenting muscle contraction. Active and resistive exercises of the ankle using Theraband.
- 7) Adjust Dynasplint to correct tension level. Do not increase tension unless patient can wear splint for 10 hours at previous tension levels.
- 8) Pain relieving modalities such as ice, heat or TENS may be used.

#### **Common Problems During Lengthening Phase:**

- 1) Gastrocnemius contracture resulting in knee flexion contracture and ankle equinus.
- 2) Pain during day may not be perceived due to physical activity. Pain at night is stronger and may interfere with sleep.
- 3) Decreased appetite and weight loss.
- 4) Pin site infection.
- 5) Distraction related nerve injury. Initially presents as hyperesthesia and pain, which is along dermatome distribution (i.e. Dorsal ankle region for deep peroneal nerve). Later hypoesthesia and reduced muscle strength are seen.

Role of Physical Therapy in lengthening phase is preventative and restorative. Focus in on prevention of joint contractures, maintaining range of motion, improving strength via maximal isometric sets and encouraging functional loading activities.

#### **Phase 3 Consolidation Phase**

In this phase, all lengthening adjustments are over and the external fixator is on till bone mineralization is complete and bone is ready for removal of the fixator.

Frequency of PT treatment: 2-3 times a week

#### **Goals of PT and Treatment:**

- 1) Vigorous stretching to achieve and maintain full knee extension and maximal dorsiflexion.
- 2) Progressively reduce lateral supports for ambulation. Encourage full weight bearing  
Ambulation initially with a cane and later without a cane.

#### **Phase 4 Protection Phase**

Patient out of external fixator, in brace.

In this phase patient is instructed to perform range of motion exercises and isometric exercises. Emphasis is on protection of regenerate bone.

#### **Phase 5**

Out of brace.

Frequency of treatment 2-3 times a week.

- 1) Progressive resistive exercises of quads, hamstrings, and hip abductors and extensors.
- 2) Progressive resistive exercises in closed chain and later in open chain.
- 3) Gradual return to functional activities.
- 4) Ambulation training to ensure no limp and equal step length. (No assistive device).

### **Common Problems in Phase 5**

- 1) Refracture, gradual axial deviation or buckling of bone.
- 2) Persistent knee flexion contracture.
- 3) Loss of knee flexion.
- 4) Persistent weakness in quads and hip abductors.

Physical Therapy in this stage is restorative. All patients to some degree will lose knee flexion and strength in quads and hip abductors. Adequate precautions like good stabilization technique and placement of weight above the level of osteotomy for strengthening exercises will reduce the risk of refracture.