

# SOFT TISSUE SURGERIES

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**TENDON TRANSFER** - A tendon is removed from its normal distal attachment and attached at another site. For example, the extensor indicis proprius (EIP) can be transferred if the EPL has ruptured. A flexor tendon can also be transferred to the dorsal surface of the hand to act as an extensor if multiple extensor tendons have ruptured.

## **PHYSIOTHERAPY-**

### **Pre – operative therapy**

Patient education.

Isolation and strengthening of donor tendon to get a grade of minimum 4

Suppling and ROM exercise for all the joints of involved part

### **Post- operative therapy**

Active ROM of unsplinted digits, and other involved joints

Begin active assisted movement of stabilized joints.

Perform *place and hold* exercises by passively positioning the operated part.

splinting

After 6 weeks

Functional re-education of transferred tendon with and without faradic stimulation

Isometric and dynamic, submaximal resistance exercises to improve functional strength and endurance of the transferred limb.

Gentle passive stretching.

Patient education.

**TENDON REPAIR** - The two ends of the ruptured tendon are re-opposed and sutured together. This option is used only occasionally because the ends of the ruptured tendons are available in patients. Therefore, a considerable portion of the frayed tendon(s) must be resected, which shortens the tendon, making it difficult to suture end-to-end.

Post-operative physiotherapy

0-2 weeks

Pain relief

Oedema control by compression, elevation

Splinting to keep the tendon in relaxed position Post-operative therapy

Active ROM of unsplinted digits, and other involved joints

Begin active assisted movement of stabilized joints.

Perform place and hold exercises by passively positioning the operated part.

2-6 weeks

Early active movement exercises 3 repetitions every 2 hours.

Progressing towards full active movement.

After 6 weeks

Functional re-education of repaired tendon with and without faradic stimulation

Isometric and dynamic, submaximal resistance exercises to improve functional strength and endurance of the transferred limb.

Gentle passive stretching.

Patient education

Functional activities.

## **RECONSTRUCTIVE SURGERIES-**

**Tendon graft reconstruction.** A portion of another tendon that acts as a “bridge” is inserted between and sutured to the two ends of the ruptured tendon. The Palmaris longus tendon is

often selected as the donor tendon. A wrist extensor tendon may be selected if a wrist arthrodesis is performed at the time of the tendon reconstruction.

**Ligament reconstruction-** It is the surgical tissue graft replacement of the ligament, located in the joint, to restore its function after ligament injury. The torn ligament is removed from the knee before the graft is inserted through a hole created by a single hole punch. The surgery is performed arthroscopically. Foreg- Anterior and Posterior cruciate ligament reconstructive surgeries have been performed after ligament tear.

**PHYSIOTHERAPY-ACL Reconstruction Rehabilitation:-** Early: days 1–14 • PRICE: protective bracing, ice, compression, elevation • Gait training: crutches, partial weight bearing to WBAT • PROM/A-AROM (range-limiting braces may or may not be used) • Patellar mobilization (grades I and II) • Muscle setting, isometrics: quadriceps, hamstrings, adductors at multiple angles (may augment with E-stim) • Assisted SLRs—supine • Ankle pumps.

Late : weeks 2-4 • Progress to full weight bearing

begin closed chain squats; heel/toe raises

- SLRs in four planes
  - Low-load PRE: hamstrings
  - Initiate open-chain knee extension (range 90°–40°)
  - Trunk/pelvis stabilization
  - Aerobic conditioning: stationary cycle
- weeks 5–6 • Multiple-angle isometrics
- Advance closed chain strengthening and PRE
  - LE stretching program
  - Endurance training (e.g., bike, pool, ski machine)
  - Proprioceptive training: single-leg stance, tilt board, BAPS board
  - Stabilization exercises, elastic bands, band walking

## **LENGTHENING OR RELEASE SURGERIES AND DECOMPRESSIVE SURGERIES-**

Soft tissues may be incised or sectioned to improve ROM, prevent or minimize progressive deformity, or relieve pain. Procedures include myotomy, tenotomy, or fasciotomy. Surgical release of soft tissues may be indicated for a young patient with severe arthritis and resulting

contractures in whom joint replacement is not advisable or as a preliminary procedure in adults prior to joint replacement.

Releases are also performed in patients with myopathic and neuropathic diseases, such as muscular dystrophy and cerebral palsy, to improve functional mobility.

Release of soft tissues to achieve decompression of tissues and relieve pain may be indicated for a patient with an impingement or compartmental syndrome, such as shoulder impingement or carpal tunnel syndrome.

### **PHYSIOTHERAPY-**

CPM and/or active-assistive ROM is typically initiated within a day or two after surgery. As soft tissue healing progresses, this is followed by active ROM through the gained ranges.

Strengthening of the antagonists of the lengthened muscle and use of the gained ROM during functional activities also are started early to maintain active control of movement within the newly gained range.

Stretching, both passive and active & functional stretching positions are done to maintain the gained length .

### **BONY SURGERIES**

**OSTEOTOMIES-** Osteotomy—the surgical cutting and realignment of bone—is an extra-articular procedure indicated for the management of impairments associated with a number of musculoskeletal disorders. It is most often performed at the knee or hip. Osteotomy is used, for example, to reduce pain and correct deformity in selected patients, such as a young adult with moderate, focal articular degeneration in the medial compartment and a varus deformity of the knee as the result of osteoarthritis or a child with severe hip joint deterioration and pain secondary to congenital dysplasia or Legg-Calvé-Perthes disease.

Osteotomy is also used to correct angular or rotational deformities of bone occurring in congenital or developmental disorders, such as congenital dislocation of the hip, acquired hip dislocation in cerebral palsy, or congenital foot deformities.<sup>58</sup> Osteotomy is also necessary for surgically shortening or lengthening a bone to correct a severe leg length discrepancy.

### **PHYSIOTHERAPY-**

If immobilization in a cast is necessary, the patient can begin active ROM of the joints above and below the site of the osteotomy to prevent joint stiffness and undue

muscle weakness. When motion and weight bearing are allowed, either immediately after surgery or when the cast is removed, active-assistive and active exercise progressing to light resistive exercise are performed to restore joint ROM and strength .

Weight bearing typically is protected for 4 to 6 weeks or more.

**REPLACEMENT ARTHROPLASTY-** Joint replacement arthroplasty includes total joint replacement arthroplasty and hemireplacement arthroplasty. Total joint replacement is a common reconstructive procedure to relieve pain and improve function in patients with severe joint degeneration associated with late-stage arthritis.

Total joint replacement procedures involve resecting both affected articulating surfaces of a joint and replacing them with artificial components, whereas hemireplacement arthroplasty involves resection and replacement of just one of the articulating surfaces of a joint.

#### **PHYSIOTHERAPY-**

**PT After THR-** Selected exercises and functional training begin the day of or after surgery. The frequency of treatment by a therapist is often twice a day until the patient is discharged from the hospital, typically by 3 to 4 days postoperatively.

- Ankle pumping exercise .
- Deep breathing exercise.
- Patient and caregiver education
- Bed mobility and transfer training,
- Ambulation with an assistive device.
- Active-resistive exercises in functional movement patterns.
- Submaximal muscle-setting exercises of the quadriceps, hip extensor, and hip abductor muscles.
- While in bed, active-assistive (A-AROM) exercises of the hip within protected range.
- Active hip exercises in the standing position
- Closed-chain hip flexion and extension

#### **Precautions After THR-**

##### **ROM**

- Avoid hip flexion 80 to 90 and adduction and internal rotation.

##### **ADL**

- Transfer to the sound side from bed to chair or chair to bed.
- Do not cross the legs.
- Keep the knees slightly lower than the hips when sitting.
- Avoid sitting in low, soft chairs.
- Use a raised toilet seat.
- When ascending stairs, lead with the sound leg. When descending, lead with the operated leg.
- Sleep in supine position with an abduction pillow; avoid sleeping or resting in a side-lying position.

## **TOTAL HIP REPLACEMENT**

### Goals

- Guard against dislocation of the implant.
- Gain functional strength.
- Strengthen hip and knee musculature.
- Prevent bedrest hazards (e.g., thrombophlebitis, pulmonary embolism, decubiti, pneumonia).
- Teach independent transfers and ambulation with assistive devices.
- Obtain pain-free ROM within precaution limits.

### Rehabilitation Considerations in Cemented and Cementless Techniques

- Cemented total hip
- Weight-bearing to tolerance (WBTT) with walker immediately after surgery.

### Preoperative Instructions

- Instruct on precautions for hip dislocation (handout).
- Transfer instructions
- In and out of bed.
- Chair
- Depth-of-chair restrictions: avoid deep chairs. We also instruct patients to look at the ceiling as they sit down to minimize trunk flexion.
- Sitting: avoid crossing legs.
- Rising from chair: scoot to edge of the chair, then rise.

- Use of elevated commode seat: elevated seat is placed on commode at a slant, with higher part at the back, to aid in rising. Have elevated seat sent to house prior to surgery for installation.
- Ambulation: instruct on use of anticipated assistive device (walker).
- Exercises: demonstrate day I exercises (see following).

### **Postoperative Regimen**

- Out of bed in stroke chair twice a day with assistance 1 or 2 days postoperative. DO NOT use a low chair.
- Begin ambulation with assistive device twice a day (walker) 1 or 2 days postoperative with assistance from therapist.

#### **Weight-bearing Status**

Cemented prosthesis: weight-bearing as tolerated with walker for at least 6 wk, then use a cane in the contralateral hand for 4-6 mo. Cementless technique: touch-down weight-bearing with walker for 6-8 wk (some authors recommend 12 wk), then use a cane in the contralateral hand for 4-6 mo. A wheelchair may be used for long distances with careful avoidance of excessive hip flexion of more than 80 degrees while in the wheelchair. Therapist must check to ensure that the foot rests are long enough. Place a triangular cushion in the wheelchair seat with the highest cushion point posterior, to avoid excessive hip flexion.

#### **Isometric Exercises**

- SLR (if not contraindicated): tighten knee and lift leg off bed, keeping the knee straight. Flex the opposite knee to aid this exercise. SLRs are more important after total knee arthroplasty than after total hip arthroplasty. Surgeon may desire holding SLR depending on construct.
- Quadriceps sets: tighten quadriceps by pushing knee down and holding for a count of 4.
- Gluteal sets: squeeze buttocks together and hold for count of 4.
- Ankle pumps: pump ankle up and down repeatedly.
- Isometric hip abduction with self-resistance while lying. Later, wrap a Theraband around the knees and perform abduction against the Theraband.
- Four-point exercise
- Bend knee up while standing.
- Straighten knee.
- Bend knee back.
- Return foot to starting position.

- Hip abduction-adduction (hold initially if patient had a trochanteric osteotomy):
- Supine position: abduct (slide the leg out to the side) and back, keeping the toes pointed up. Make sure the leg is not externally rotated or the gluteus medius will not be strengthened.
- Standing position: move the leg out to the side and back. Do not lean over to the side.
- Side-lying position (probably 5-6 wk postoperative): Lying on side, the patient abducts the leg against gravity. The patient should be turned 30 degrees toward prone to utilize the gluteus maximus and medius muscles. Most patients would otherwise tend to rotate toward the supine position, thus abducting with the tensor fascia latae.

#### ROM and Stretching Exercises

- 1 or 2 days postoperative, begin daily Thomas stretch to avoid flexion contracture of the hip. Pull the uninvolved knee up to the chest while lying supine in bed. At the same time, push the postoperative leg into extension against the bed. The hip extension stretches the anterior capsule and hip flexors of the involved hip and aids with previous flexion contracture and avoidance of postoperative contracture. Perform this stretch five to six times per session, six times a day.
- May begin stationary exercise bicycling with a high seat 4-7 days postoperative. To mount the bicycle, the patient stands facing the side of the bicycle and places one hand on the centre of the handle bars and the other on the seat. Place the uninvolved leg over the bar and onto the floor so that the seat is straddled. Protect the involved leg from full weight-bearing by putting pressure on the hands. With both hands on the handle bars and partial weight on the involved leg, place the uninvolved leg on the pedal. Stand on the uninvolved leg to sit on the seat. Then turn the pedals so that the involved leg can be placed on the pedal at the bottom of the arc. Until successful completion of a full arc on the bicycle, the seat should be set as high as possible. Initially, most patients find it easier to pedal backward until they can complete a revolution. The seat may be progressively lowered to increase hip flexion within safe parameters. Initially, the patient should ride the bicycle with minimal tension at 15 mph, two to four times a day. We leave a stationary bicycle on the hospital floor for use in the room. By 6-8 wk, may increase the tension until fatigue occurs after approximately 10-15 min of riding.
- May also perform extension stretching of the anterior capsule (to avoid hip flexion contracture) by extending the involved leg while the uninvolved leg is mildly flexed at the hip and knee, supported by a walker (the therapist stabilizes the walker). Slowly thrust the pelvis forward and the shoulders backward for a sustained stretch of the anterior capsule



- Observe and correct gait faults, because many of these faults involve the patient's avoidance of stretching the anterior structures of the hip secondary to pain.

#### Abduction Pillow

- Keep an abduction pillow between the legs while in bed.

Note: Many surgeons also use a knee immobilizer on the ipsilateral knee during the first week to avoid possible prosthesis dislocation. The knee immobilizer does not allow excessive hip or knee flexion. Use the abductor pillow while asleep or resting in bed for 5- 6 wk; it may then be safely discontinued.

#### Bathroom Rehabilitation

- Permit bathroom privileges with assistance and an elevated commode seat.
- Teach bathroom transfers when the patient is ambulating 10- 20 feet outside of room.
- Use elevated commode seat at all times.

#### Assistive Devices

Occupational therapist brings these and instructs patient on assisted activities of daily living:

- "Reacher" or "grabber" to help retrieve objects on the floor or assist with socks or stockings. Do not bend to put on slippers.
- Shoe horn and loosely fitting shoes or loafers.

#### Transfer Instructions

- Bed to chair
- Avoid leaning forward to get out of chair or off bed.
- Slide hips forward to the edge of the chair first, then come to standing.
- Do not cross legs when pivoting from supine to bed- side position.
- Nurse or therapist assists until able to perform safe, secure transfers.
- Bathroom
- Use elevated toilet seat with assistance.
- Continue assistance until able to perform safe, secure transfers.

#### Transfer to Home

- Instruct patient to travel in the back seat of a four-door sedan, sitting or reclining lengthwise across the seat, leaning on one or two pillows under the head and shoulders to avoid sitting in a deep seat.
- Avoid sitting in conventional fashion (hip flexed more than 90 degrees) to avoid posterior dislocation in the event of a sudden stop.
- Urge those without a four-door sedan to sit on two pillows with the seat reclined (minimize flexion of hip).

- Adhere to these principles for 6 wk until soft tissue stabilization is achieved (Steinberg and associates)
- May begin driving 6 wk postoperative.
- Review hip precautions and instructions with patient

## Rehabilitation Protocol

### Postoperative Total Hip Replacement-Posterior Approach

#### Exercise Progression

• Hip abduction: progress exercises from isometric abduction against self-resistance to Thera-band wrapped around the knees. At 5-6 wk, begin standing hip abduction exercises with pulleys, sports cord, or weights. Also may perform side-stepping with a sports cord around the hips, as well as lateral step-ups with a low step, if clinically safe.

Progress hip abduction exercises until the patient exhibits a normal gait with good abductor strength. Our progression for a postoperative cemented prosthesis with no trochanteric osteotomy generally follows the outline below.

1. Supine isometric abduction against hand or bedrail (2 or 3 days).
2. Supine abduction, sliding the involved leg out and back.
3. Side-lying abduction with the involved leg on top and abduction against gravity.
4. Standing abduction, moving the leg out to the side and back
5. Thera-band exercises, sports cord, and step-ups (5-6 wk).

Perform prone-lying extension exercises of the hip to strengthen the gluteus maximus. These may be performed with the knee flexed (to isolate the hamstrings and gluteus maximus) and with the knee extended to strengthen the hamstrings and gluteus maximus.

Note: This exercise progression is slower in cerwin patients. Initiate general strengthening exercises: develop endurance, perform cardiovascular exercise, and general strengthening of all extremities.

#### Instructions for Home

- Continue previous exercises and ambulation activities.
- Continue to observe hip precautions.
- Install elevated toilet seat in home.
- Supply walker for home.
- Review rehabilitation specific to home situation (e.g., steps, stairwells, narrow doorways).
- Ensure home physical therapy and/or home nursing care has been arranged.

- Orient family to patient's needs, abilities, and limitations, and review hip precautions with family members.
- Reiterate avoidance of driving for 6 wk (most cars have very low seats).
- Give patient a prescription for prophylactic antibiotics that may be needed eventually for dental or urologic procedure.

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- May begin stationary exercise bicycling with a high seat 4-7 days postoperative. To mount the bicycle, the patient stands facing the side of the bicycle and places one hand on the center of the handle bars and the other on the seat. Place the uninvolved leg over the bar and onto the floor so that the seat is straddled. Protect the involved leg from full weight-bearing by

putting pressure on the hands. With both hands on the handle bars and partial weight on the involved leg, place the uninvolved leg on the pedal. Stand on the uninvolved leg to sit on the seat. Then turn the pedals so that the involved leg can be placed on the pedal at the bottom of the arc. Until successful completion of a full arc on the bicycle, the seat should be set as high as possible. Initially, most patients find it easier to pedal backward until they can complete a revolution. The seat may be progressively lowered to increase hip flexion within safe parameters. Initially, the patient should ride the bicycle with minimal tension at 15 mph, two to four times a day. We leave a stationary bicycle on the hospital floor for use in the room. By 6-8 wk, may increase the tension until fatigue occurs after approximately 10-15 min of riding.

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- Observe and correct gait faults, because many of these faults involve the patient's avoidance of stretching the anterior structures of the hip secondary to pain.

### **Abduction Pillow**

- Keep an abduction pillow between the legs while in bed.

Note: Many surgeons also use a knee immobilizer on the ipsilateral knee during the first week to avoid possible prosthesis dislocation. The knee immobilizer does not allow excessive hip or knee flexion. Use the abductor pillow while asleep or resting in bed for 5- 6 wk; it may then be safely discontinued.

### **Bathroom Rehabilitation**

- Permit bathroom privileges with assistance and an elevated commode seat.
- Teach bathroom transfers when the patient is ambulating 10- 20 feet outside of room.
- Use elevated commode seat at all times.

### **Assistive Devices**

Occupational therapist brings these and instructs patient on assisted activities of daily living:

- "Reacher" or "grabber" to help retrieve objects on the floor or assist with socks or stockings. Do not bend top on slippers.

- Shoe horn and loosely fitting shoes or loafers.

### **Transfer Instructions**

- Bed to chair

- Avoid leaning forward to get out of chair or off bed.

- Slide hips forward to the edge of the chair first, then come to standing.

- Do not cross legs when pivoting from supine to bed- side position.

- Nurse or therapist assists until able to perform safe, secure transfers.

- Bathroom

- Use elevated toilet seat with assistance.

- Continue assistance until able to perform safe, secure transfers.

### **Transfer to Home**

- Instruct patient to travel in the back seat of a four-door sedan, sitting or reclining lengthwise across the seat, leaning on one or two pillows under the head and shoulders to avoid sitting in a deep seat.

- Avoid sitting in conventional fashion (hip flexed more than 90 degrees) to avoid posterior dislocation in the event of a sudden stop.

- Urge those without a four-door sedan to sit on two pillows with the seat reclined (minimize flexion of hip).

- Adhere to these principles for 6 wk until soft tissue stabilization is achieved (Steinberg and associates)

- May begin driving 6 wk postoperative.

- Review hip precautions and instructions with patient

## **Rehabilitation Protocol**

### **Postoperative Total Hip Replacement-Posterior Approach**

#### **Exercise Progression**

- Hip abduction: progress exercises from isometric abduction against self-resistance to Thera-band wrapped around the knees. At 5-6 wk, begin standing hip abduction exercises with pulleys, sports

## **TOTAL KNEE ARTHROPLASTY**

### **Day 1**

NOTE: Use knee immobilizer during ambulation until patient is able to perform three SLR in succession out of the immobilizer.

- Initiate isometric exercises
- SLR.
- Cemented prosthesis: Weight-bearing as tolerated
- Quad sets., (WBAT) with walker.
- Ambulate twice a day with knee immobilizer, assistance,
- Non cemented prosthesis: TDWB with walker.
- Transfer out of bed and into chair twice a day with leg in full extension on stool or another chair.
- CPM machine
  - Do not allow more than 40 degrees of flexion on settings until after 3 days.
  - Usually 1 cycle per min.
  - Progress 5- 10 degrees a day as tolerated.
  - Do not record passive ROM measurements from CPM machine, but rather from patient because these may differ 5-10 degrees.
- Initiate active ROM and active-assisted ROM exercises.



- During sleep, replace the knee immobilizer and place a pillow under the ankle to help passive knee extension.

#### 2 Days-2 Weeks

- Continue isometric exercises throughout rehabilitation.
- Use vastus medialis oblique (VMO) biofeedback if patient is having difficulty with quadriceps strengthening or control.
- Begin gentle passive ROM exercises for knee
  - Knee extension
  - Knee flexion.
  - Heel slides.
  - Wall slides.
- Begin patellar mobilization techniques when incision stable (postoperative days 3- 5) to avoid contracture.
  - Perform active hip abduction and adduction exercises.
- Continue active and active-assisted knee ROM exercises.
  - Continue and progress these exercises until 6 wk after surgery. Give home exercises with outpatient physical therapist following patient two to three times per week.
- Provide discharge instructions. Plan discharge when ROM of involved knee is from 0-90 degrees and patient can independently execute transfers and ambulation.

#### 10 Days-3 Weeks

- Continue previous exercises.
- Continue use of walker until otherwise instructed by physician.
  - Ensure that home physical therapy and/or home nursing care has been arranged.
- Prescribe prophylactic antibiotics for possible eventual dental or urologic procedures.
- Do not permit driving for 4-6 wk. Patient must have regained functional ROM, good quad control, and pass physical therapy functional testing.
  - Provide walker for home and equipment and supplies as needed.
- Orient family to patient's needs, abilities, and limitations.
  - Review tub transfers
  - Many patients lack sufficient strength, ROM, or agility to step over tub for showering.
  - Place tub chair as far back in tub as possible, facing the faucets. Patient backs up to the tub, sits on the chair, and then lifts the leg over.

- Tub mats and nonslip stickers for tub floor traction also are recommended.

6 Weeks

- Begin weight-bearing as tolerated with ambulatory aid, if this has not already begun.
- Perform wall slides; progress to lunges.
- Perform quadriceps dips or step-ups
- Begin closed-chain knee exercises on total gym and progress over 4-5 wk
  - Bilateral lower extremities.
  - Single-leg exercises.
  - Incline.
  - Progress stationary bicycling.
  - Perform lap-stool exercises (hamstring strengthening)
  - Cone-walking; progress from 4- to 6- to 8-inch cones. .
  - Use McConnell taping of patella to unload patella femoral stress if patellofemoral symptoms occur with exercise.
- Continue home physical therapy exercises



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  - Use McConnell taping of patella to unload patellofemoral stress if patellofemoral symptoms occur with exercise.
- Continue home physical therapy exercises.

**EXCISION ARTHROPLASTY-** Excision arthroplasty, also known as resection arthroplasty, involves removing periarticular bone from one or both articular surfaces. A space is left where fibrotic (scar) tissue is laid down during the healing process. Excision arthroplasty has been performed in a variety of joints, including the hip, elbow, wrist, and foot, to alleviate pain.

## **PHYSIOTHERAPY-**

Active ROM exercises of unaffected joints.

Maintain mobility of the affected limb- the patient remove the splint several times

daily for self-ROM (passive or active-assisted) of the joint within pain-free ranges.

Submaximal, pain-free, multiple-angle setting exercises.

Low-load, long-duration, dynamic splinting or alternating use of static splints in maximum flexion and extension.

Low-load resistance exercises (maximum 1 to 2 lb), emphasizing high repetitions.

**ARTHRODESIS-** Arthrodesis is surgical fusion of the surfaces of a joint. It is indicated as a primary surgical intervention in cases of severe joint pain associated with late-stage arthritis and joint instability in which mobility of the joint is a lesser concern. Arthrodesis is most frequently used in the cervical or lumbar spine, wrist, thumb, and ankle but has also been used in selected instances in the shoulder and hip. Optimal positions for arthrodesis are –

Shoulder                      15–30° of abduction and flexion and 45° of internal rotation

Elbow                              15–30° of abduction and flexion and 45° of internal rotation

Wrist                                Slight extension

MCP of the thumb    At 20° of flexion

Hip                                      At 10 to 15° of flexion to allow ambulation and comfortable sitting

### **PHYSIOTHERAPY-**

Because no movement is possible in the fused joint, ROM and strength must be maintained above and below the operated joint.

Weight bearing is restricted until there is evidence of bony healing.

**BONE GRAFTING-** Bone graft is the placement of a piece of bone onto or into a damaged or defective bone to help it repair or to replace a missing portion. Eventually most of the graft dies and is replaced by new bone. In the meantime, the graft provides a scaffold on which new bone will grow. Some bone grafts are needed for structural support. A hard bone (cortical bone), such as the tibia or a rib, is used for this purpose. This type of bone can bear weight and will last a long time, even years, before it is replaced by new bone growth. Some bone grafts are needed in

order to grow new bone (osteogenesis). This type of graft requires a spongy bone (cancellous bone), such as the iliac crest. Although not as strong as cortical bone, cancellous bone triggers new bone growth more quickly. It does this either by supplying living cells or by chemically triggering the growth of new cells by the host.

**PHYSIOTHERAPY-**

Individuals will learn range of motion and strengthening exercises for the muscles that surround the graft site and graft removal site .

Finally, individuals will learn mobility techniques for walking and transferring if the graft site is located on the low back or leg.

**AMPUTATION-** Amputation is the removal of injured or diseased body part.

The underlying causative factors that result in amputation are :-

- peripheral vascular disease (arteriosclerosis, gangrene)
- diabetes mellitus
- renal disease
- trauma
- tumour
- congenital limb deficiency
- infection

Principal amputation levels:-

Upper limb	Lower limb
Forequarter	Hindquarter
Shoulder disarticulation	Hip disarticulation
Transhumeral	Transfemoral
Elbow disarticulation	Knee disarticulation
Wrist disarticulation	Transtibial
Transmetacarpal	Symes
Choppat/Lisfranc	
Transmetatarsal	

**PHYSIOTHERAPY-**

Respiratory status – Breathing exercises

Bed mobility exercises

Mobility and strength exercises for the residual limbs and trunk

T/C/D mgmt. by positioning, and active exercises

Neuroma and phantom limb sensation & pain mgmt. by TENS, weight bearing on stump, tapping and sensory stimulation

Assessment for walking aid, transfers

Wheelchair assessment

Balance and posture re-education

Stump care and pain relief

