

Osseointegrated Prosthesis for the Rehabilitation of Amputees (OPRA) Device
Osseointegration (OI) Rehabilitation Guidelines
Unilateral Trans-Femoral Amputation

Note: This document serves as a guideline for post-operative rehabilitation and should be executed in combination with sound clinical judgement and reasoning to ensure patient safety and optimize long term function. If any concerns and/or complications arise regarding the progress of any patient, Physical Therapy and Prosthetics providers must contact the attending Orthopedic Surgeon and/or Physical Medicine & Rehabilitation specialists assigned to the patient's case. Progression to the next phase along the course of rehabilitation care should be determined by the surgical and rehabilitation team's guidance with continual evaluation of clinical criteria to include but not limited to: bone/soft tissue healing status, achievement of functional milestones, pain levels, and/or concurrent medical conditions.

Pre-Operative Guidelines

- Strengthening exercises to improve muscle tone and function
- Strive for full/functional residual limb active/passive range of motion values
- Improve cardiovascular fitness
- Optimize medical management of any existing concurrent medical conditions
- Optimize unilateral balance/proprioceptive training
- Promote wellness, proper nutrition, tobacco cessation, and an optimal body weight
- Educate patient on post-operative rehabilitation requirements to ensure an optimal functional outcome
- Validate behavioral health and family support program is in place
- Facilitate identification of any necessary assistive devices and/or durable medical equipment for procurement, use, and training if clinically indicated prior to surgery
- Implement Vitamin D and Calcium supplementation, as per surgeon's recommendation

Stage 1 (S1) Surgery

Precautions

- Range of motion as tolerated, unless directed otherwise by surgeon
- Non weight bearing status of residual limb x 4-6 weeks post-op
- Once cleared by surgeon and prosthetist, socket wear MAY be initiated
- No DIRECT weight end-bearing of residual limb in the socket
- Avoid shear stress at end of the residual limb and protect incision site
- Monitor symptom responses for 24-48 hours after each exercise session. Pain should settle quickly post exercise with no significant increase in symptoms the next day (see pain monitoring model, page 6).
- Continue Vitamin D and Calcium supplementation

Goals: Pain control, functional mobility, and protection of residual limb. Protect bone graft site at the end of the femur.

Weeks 0-2

- Residual limb active range of motion as tolerated/required
- Bed mobility (roll to non-operative side)
- Transfer and appropriate assistive device training
- Gait training (non-weight bearing on operative side)
- Non-weight bearing aerobic conditioning (ex: arm ergometer/rope climber)
- Core strengthening
- Neuromuscular re-education
- Non-operative limb strengthening
- Wheelchair mobility training

Goals: Patient able to demonstrate and tolerate upright sitting with minimal pain.

Weeks 3-5

- Continue appropriate previous exercises with increased resistance
- Start prone lying on mat with bolster under OI residual limb for hip flexor stretching. Watch for shearing of skin at distal end of femur
- Wound monitoring and assist with dressing changes as needed
- Upon surgeon and prosthetist approval, between Stage 1 & Stage 2 surgical procedures, an adapted socket prosthesis may be used 4-6 weeks after surgery IF skin condition permits and patient was a previous prosthetic user.
- Care must be taken to make sure there is very minimal DIRECT weight end-bearing in the socket to reduce the risk of loading the fixture

Stage 2 (S2) Surgery

Precautions

- NO abduction past neutral x 2 weeks outside of routine transfers
- NO active adduction x 4 weeks outside of routine transfers
- NO weight bearing with full length prosthesis x 11 weeks
- Avoid shear stress at end of residual limb and monitor for soft tissue complications
- No twisting/torque on OPRA abutment
- Abutment should be protected at all times with abutment support (“hockey puck”)
- Continue Vitamin D and Calcium supplementation

Goals: Pain control, functional mobility, and protection of residual limb, including prevention of infection and optimizing healing. Independent with residual limb care, volume management, and abutment hygiene.

Week 1

- Day 0-5: NO hip flexion > 45 degrees: bed rest status unless otherwise directed by surgeon
- Residual limb movement is limited for the first 5 days to achieve critical healing of the skin penetration area and surrounding soft tissues
- Bed mobility skills (rolling to non-operative side)
- Bilateral upper extremities and intact lower limb strengthening while in bed only
- Residual limb care and protection of the abutment site
- Good nutrition, hygiene, and tobacco avoidance education/support

Week 2

- Day 6-14: NO hip flexion > 90 degrees
- Bed to chair/wheelchair transfers
- Sit to stand with assistive device
- Modified gait training, non-weight bearing on operative side
- Light tapping onto the abutment for proprioceptive feedback

Week 3 (until cleared for weight bearing phases by surgeon)

- Prone lying on mat with bolster under thigh for hip flexor stretching; avoid skin shearing at skin penetration site
- Hip flexion, abduction and extension submaximal isometrics contractions in neutral hip positions
- Core strengthening exercises
- Non-operative limb strengthening
- Wound monitoring and assistance with dressing changes as needed

Phase I (no earlier than 4 weeks)

- Initiate partial weight bearing with short training prosthesis when cleared by surgeon and prosthetist
- If bone pain persists past 24-48 hours after a treatment session, hold any program progression -OR- transition back to the previous phase if needed
- Continue appropriate previous exercises with increased resistance as tolerated
- Perform progressive axial weight bearing and gentle weight shifting, start at 40 pounds and perform as tolerated up to 2 x 30 minutes/day
- Increase weight no more than 20 pounds/week as tolerated (recommend use of standardized weight bearing pound/time treatment chart in medical record)
- Avoid twisting/torque motions while weight bearing
- Continue Vitamin D and Calcium supplementation

Milestone: Achieve axial weight bearing at 80 pounds and tolerate wearing short training prosthesis throughout the day to progress to Phase II.

Phase II (no earlier than 7 weeks)

- Continue appropriate previous exercises with increased resistance as tolerated
- Add 2 pounds of weight on short training prosthesis during exercises and progress up to 4 pounds as tolerated
- Perform axial weight bearing, gentle weight shifting, loading and unloading. Perform as tolerated up to 3 x 30 minutes/day
- Increase weight no more than 20 pounds/week as tolerated
- Begin weight shifting in quadruped with short training prostheses and progress to crawling with small steps in quadruped as tolerated
- NOTE: Upon surgeon and prosthetist approval, when patient is able to meet 50% of body mass weight bearing status, patient MAY be cleared for a full length long pylon prosthesis without a microprocessor knee during Phase II for standing (no upright ambulation)
- Continue Vitamin D and Calcium supplementation

Milestones: Achieve axial weight bearing at 50% of body weight, tolerate 15 minutes of 2-4 pound weights on short prosthesis in standing, and cleared to take short prosthesis and/or long pylon without microprocessor knee home by surgeon and rehabilitation providers.

Phase III

- Continue appropriate previous exercises with increased resistance as tolerated
- Increase to 5 pounds of weight on the training prosthesis as tolerated
- Perform axial weight bearing and gentle weight shifting as tolerated up to 4 x 30 minutes/day
- Increase up to 20 pounds/week
- Add resistance with light or medium elastic band on the short training prosthesis as tolerated
- Continue Vitamin D and Calcium supplementation

Milestones: Achieve axial weight bearing at 80% of body weight, stand with 5 pounds on the training prosthesis, and cleared for full length prosthesis with microprocessor knee by surgeon and rehabilitation team providers.

Full Length / Pylon Prosthetic Training Precautions

- If bone pain persists past 24-48 hours after exercise sessions, hold any progressions -OR- transition back to previous phase if needed
- Use bilateral axillary crutches -OR- forearm crutches
- Avoid lifting or carrying heavy items while wearing the prosthesis
- Avoid prosthetic knee joint full extension while cycling by positioning the bike seat low; DO NOT stand up during cycling
- No running, jumping, or climbing

Phase IV (no earlier than 11 weeks post-op unless cleared by surgeon)

- Initiate gait training with full length articulating prosthesis with microprocessor knee in parallel bars once cleared by surgeon and prosthetist
- Continue appropriate previous exercises with increased resistance as tolerated
- Gradually increase prosthesis wear time up to 1 hour/day
- Ambulate with prosthesis indoors and on level ground
- Progress to gait training with support of bilateral axillary or forearm crutches limiting load on the prosthesis up to 50 pounds
- Sit in chairs with different heights
- May begin cycling with minimal resistance
- Continue Vitamin D and Calcium supplementation

Milestones: Achieve axial weight bearing at 100% body weight, able to weight shift on to and off of full length prosthesis without bone pain, don/doff full length prosthesis independently, and ambulate with crutches.

Phase V (no earlier than 14 weeks post-op unless cleared by surgeon)

- Gradually increase time of prosthetic use and walking with bilateral axillary or forearm crutches
- Gradually increase weight bearing on prosthesis as tolerated up to 2 hours/day
- Gait training outdoors on level ground
- May seek surgeon clearance to drive with prosthesis donned
- Floor to stand activities as tolerated
- Continue Vitamin D and Calcium supplementation

Milestones: Sit to stand transfer without assistive device, stand for 1-2 minutes without support, and ambulate 1000 feet with crutches in order to be cleared to take full length prosthesis home.

Phase VI (no earlier than 16 weeks post-op unless cleared by surgeon)

- Gradually increase time of prosthetic use transitioning from bilateral axillary or forearm crutches to single point cane
- May begin stair negotiation with prosthesis and hand rails as tolerated (hand rails and/or other supports should be used when walking downstairs)
- May wear prosthesis as tolerated; initiate gait training on slopes, uneven terrain, and over obstacles
- May add resistance when using exercise bike as tolerated
- Begin pivoting exercises as tolerated
- Return to gym/fitness training with full-length articulating prosthesis as tolerated if able to full weight bear without pain
- Continue Vitamin D and Calcium supplementation

Milestones: Independent and safe ambulation on level, uneven terrain, and stairs with normalized gait pattern with or without an assistive device. Patient able to execute independent exercise program to support long-term functional goals.

LIFETIME PRECAUTIONS AND GUIDANCE

- Always check carefully that the prosthesis is adequately attached to the abutment
- Do not try to fix any problems with the device or use any tools on the device as that may damage the abutment and the fixture. This should only be done by a qualified surgeon or prosthetist
- Protect the abutment when in extreme hot or cold environments
 - In the sauna, wrap a wet towel around the abutment to protect it from heat
- Protect the abutment when not using the prosthesis, using the abutment cover provided by your prosthetist
- If the OPRA Axor is damaged in any way, the patient should contact his or her prosthetist
- Change of the abutment must be considered if there is movement in the connection between the fixture and abutment, despite repeated tightening
- Do not re-engage the fail safe when leg is donned
- Change of abutment must be considered if the abutment is deformed or mechanically faulty. Contact surgeon and prosthetists immediately if this occurs
- Never run or jump
- Avoid allowing your prosthetic knee joint to fully extend while cycling or standing up while cycling
- Do not place excessive torque (twisting) on OPRA device
- Avoid risky activities that can compromise the implant healing for up to at least 2 years
- Swimming requires surgeon's clearance. Best to swim in salt water or private pool with chlorine. Lakes, ponds, public pools, or still water may present greater risk for infection.
- Bone health is important. Although we expect your bone density to improve over time, we recommend continuing Vitamin D and Calcium supplementation for at least one year after Stage 2 (S2) Surgery to help this process. Discuss with your doctor when is the best time to discontinue supplementation.

MONITORING PAIN AND LOAD RESPONSE



Adapted from Thommeé (1997) and Silbernagel (2007)

Monitor symptoms response for 24-48 hours post exercise.
Pain should settle quickly post exercise with no increase in symptoms the next day.

Reference:

Hagberg K, Branemark R. One hundred patients treated with osseointegrated transfemoral amputation prostheses- Rehabilitation perspective. J Rehabil Res Dev. 2009; 46(3):331-44. PubMed PMID: 19675986

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