



**WALTER REED NATIONAL MILITARY MEDICAL CENTER
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**Osseointegrated Prosthesis for the Rehabilitation of Amputees (OPRA) Device
Osseointegration (OI) Rehabilitation Guidelines
Bilateral 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 existing concurrent medical conditions
- 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 programs are 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 limbs x 4-6 weeks post-op (can use limbs for transfer however minimize direct contact at end)
- Once cleared by surgeon and prosthetist socket wear MAY be initiated
- No DIRECT weight end-bearing of residual limbs in the socket (ambulation not recommended)
- Avoid shear stress at end of the residual limbs and protect incision sites
- 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 limbs. Protect bone graft sites at the end of the femurs.

Weeks 0-2

- Residual limbs active range of motion as tolerated/required
- Bed mobility
- Transfer training
- Non-weight bearing aerobic conditioning and strength training (ex: arm ergometer/rope climber)
- Core strengthening
- Neuromuscular re-education
- Wheelchair mobility training

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

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Weeks 3-5

- Continue appropriate previous exercises with increased resistance
- Start prone lying on mat with bolster under OI residual limbs for hip flexor stretching. Watch for shearing of skin at distal end of femurs
- Wound monitoring and assist with dressing changes as needed
- Upon surgeon and prosthetist approval, and between Stage 1 & Stage 2 surgical procedures, adapted socket prostheses 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 sockets to reduce the risk of loading the fixtures

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 prostheses x 11 weeks
- Avoid shear stress at end of residual limbs and monitor for soft tissue complications
- No twisting/torque on OPRA abutments
- Abutments should be protected at all times with abutment supports (“hockey pucks”)
- Continue Vitamin D and Calcium supplementation

Goals: Pain control, functional mobility, and protection of residual limbs, including prevention of infection to 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 site areas and surrounding soft tissues
- Bed mobility skills
- Bilateral upper extremities and lower limb strengthening within precautions while in bed only
- Residual limb care and protection of the abutment sites
- Good nutrition, hygiene, and tobacco avoidance education/support

Week 2

- Day 6-14: NO hip flexion > 90 degrees
- Functional mobility: bed mobility, transfer training
- Light tapping onto the abutments for proprioceptive feedback

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

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

Phase I (no earlier than 6 weeks)

- Initiate partial weight bearing with short training prostheses 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

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- 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 producing motions while weight bearing
- Continue Vitamin D and Calcium supplementation

Milestone: Achieve axial weight bearing at 80 pounds to progress to Phase II.

Phase II (no earlier than 9 weeks)

- Continue appropriate previous exercises with increased resistance as tolerated
- Add 2 pounds of weight on short training prostheses 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 manual locking knees or long pylons 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 prostheses in standing, and cleared to take short prostheses and/or long pylons without microprocessor knees home by surgeon and rehabilitation providers.

Phase III

- Continue appropriate previous exercises with increased resistance as tolerated
- Increase to 5 pounds of weight on training prostheses 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 training prostheses as tolerated
- Gait training on manual locking knees
- Continue Vitamin D and Calcium supplementation

Milestones: Achieve axial weight bearing at 80% of body weight with bilateral upper extremity support, single-leg stance 5-10 seconds with bilateral upper extremity support, ambulate with 2 pounds around manual locking knees x 200 feet, and cleared for full length prostheses with microprocessor knees 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 -OR- forearm crutches
- Avoid lifting or carrying heavy items while wearing prostheses
- 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



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Phase IV (no earlier than 12 weeks post-op unless otherwise cleared by surgeon)

- Initiate gait training with full length articulating prostheses with microprocessor knees in parallel bars once cleared by surgeon and prosthetist
- Continue appropriate previous exercises with increased resistance as tolerated
- Gradually increase prostheses wear time up to 1 hour/day
- Ambulate with prostheses indoors and on level ground
- Progress to gait training with support of bilateral axillary or forearm crutches limiting load on the prostheses 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 and off of full length prostheses without bone pain, don/doff full length prostheses 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 prostheses as tolerated up to 2 hours/day
- Gait training outdoors on level ground
- May seek surgeon clearance to drive with prostheses 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 prostheses 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 prostheses and hand rails as tolerated (hand rails and/or other supports should be used when walking downstairs)
- May wear prostheses 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 prostheses as tolerated if able to fully 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.

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LIFETIME PRECAUTIONS & GUIDANCE

- Always check carefully that the prostheses are adequately attached to the abutments
- Do not try to fix any problems with the devices or use any tools on the devices as that may damage the abutments and the fixtures. This should only be done by a qualified surgeon or prosthetist.
- Protect the abutments when in extreme hot or cold environments
 - In the sauna, wrap wet towels around the abutments to protect them from heat
- Protect the abutments when not using the prostheses, using the abutment covers provided by your prosthetist
- If the OPRA Axors are damaged in any way, the patient should contact his or her prosthetist
- Change of abutments must be considered if there is movement in the connection between fixtures and abutments, despite repeated tightening
- Do not re-engage the fail safes when legs are donned
- Change of abutments must be considered if the abutments are deformed or mechanically faulty. Contact surgeon and prosthetist immediately if this occurs
- Never run or jump
- Avoid allowing your prosthetic knee joints to fully extend while cycling or standing up while cycling
- Do not place excessive torque (twisting) on OPRA devices
- 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.



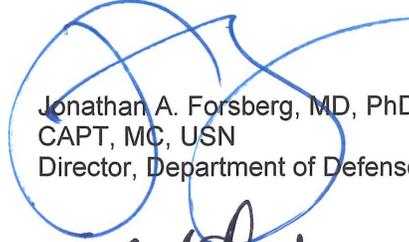
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