Osseointegration

FSARN Orlando

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Agenda

- Selection
- Prehab
- Rehab
- Commitment

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Selection

- Indications:
  - The OPRA device is indicated for patients who have transfemoral amputation due to trauma or cancer and who have rehabilitation problems with, or cannot use, a conventional socket prosthesis.
  - The OPRA device is intended for skeletally mature patients.
  - The patient failed to receive benefit from a socket prostheses due to problems such as:
    - Recurrent skin infections and ulcerations in the socket contact area
    - Pain
    - A short stump preventing the use of socket prosthesis
    - Volume fluctuation in the stump
    - Soft tissue scarring
    - Extensive area of skin grafting
    - Socket retention problems due to excessive perspiration
    - Restricted mobility

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Selection

- Contraindications:
  - The contraindications for the OPRA device follow:
    - The patient's skeletal growth is not complete. Completed skeletal growth is defined through the finding of generally closed epiphyseal zones on X-ray.
    - The patient has atypical skeletal anatomy which may affect treatment with OPRA. Examples of atypical skeletal anatomy:
      - Skeletal dimensions outside defined interval.
      - Development anomalies.
      - Conditions which are not amenable to device insertion such as deformities, fracture, infection.
    - The patient would have less than 2 mm of remaining cortex bone available around the implant, if implanted.
    - The patient has osteoporosis.
    - The patient is older than 65 years or younger than 22 years.

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Selection

- Contraindications (Continued):
  - The contraindications for the OPRA device follow:
    - The patient's body weight is higher than 220 lbs including the prosthesis.
    - Do not treat patients with the following concurrent diseases:
      - Severe peripheral vascular disease.
      - Diabetic mellitus with complications.
      - Skin disorders involving the residual extremity.
      - Neuropathy or neuropathic disease and severe phantom pain.
      - Active infection or dormant bacteria.
    - The patient is pregnant.
    - The patient is not expected to be able to comply with treatment and follow up requirements.

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Limitation of OI Amputees

- No running
- No jumping
- No wrestling
- No deadlifting
- No swimming in lakes
  (Pool and Ocean are OK!)

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OI Protocol

Walter Reed National Military Medical Center

- Half Speed
- Full Speed
- “Heavy” Lifting
- Guidelines
- Progression
- Bone/Soft Tissue Healing
- Achievement of Functional Milestones
- Pain Level
- Concurrent Medical Conditions

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Protocol After Stage 1 Surgery

Half-Speed Unilateral Transfemoral Amputation

Week 0-2

- Residual limb AROM as tolerated
- Bed mobility – roll to non-operative side
- Transfer training
- Gait training – non-weight bearing (NWB) on operative side
- NWB aerobic conditioning
- Core strengthening
- Non-operative limb strengthening
- Wheelchair mobility training

Goal

- Tolerate upright sitting with minimal pain

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Protocol After Stage 1 Surgery

Half-Speed Unilateral Transfemoral Amputation

Week 3-5

- Continue exercises with increases resistance
- Prone lying
- Wound monitoring
- Socket prosthesis*
  - If skin permits and patient was previous prosthesis user
  - No weight bearing
  - Not recommended

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After Stage 2 Surgery

Precautions

- NO abduction past neutral x 2 weeks
- NO active adduction x 4 weeks
- NO weight bearing with full length prosthesis x 16 weeks
- NO shear stress at end of residual limb and monitor soft tissue complications
- NO twisting/torque on OPRA abutment
- Protect abutment with “hockey puck”
- Prevent infection/optimize healing

Goals

- Pain Control
- Manage Volume (Shrinker)

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Protocol After Stage 2 Surgery

Week 1

- NO Hip Flexion > 45°

Week 2

- NO Hip Flexion > 90°
- Sit to stand with assistive device
- Gait Training – NWB operative side
- Light tapping onto abutment for proprioceptive feedback

Week 3

- Prone lying to stretch hip flexor
- Hip Flexion – abduction and extension submaximal isometrics in neutral
- Non-operative limb strengthening
- Wound monitoring

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Phase 1 Rehab

4 Weeks after Stage 2 Surgery

- Begin partial weight bearing with short training prosthesis
  - If cleared by surgeon
- Bone pain is KEY
- Continue prior exercises
- Progressive axial weight bearing & gentle weight shifting
  - Start at 20lbs
  - 2x30 minutes daily
  - Increase no more than 10lbs/week as tolerated
- Avoid twisting/torque while weight bearing

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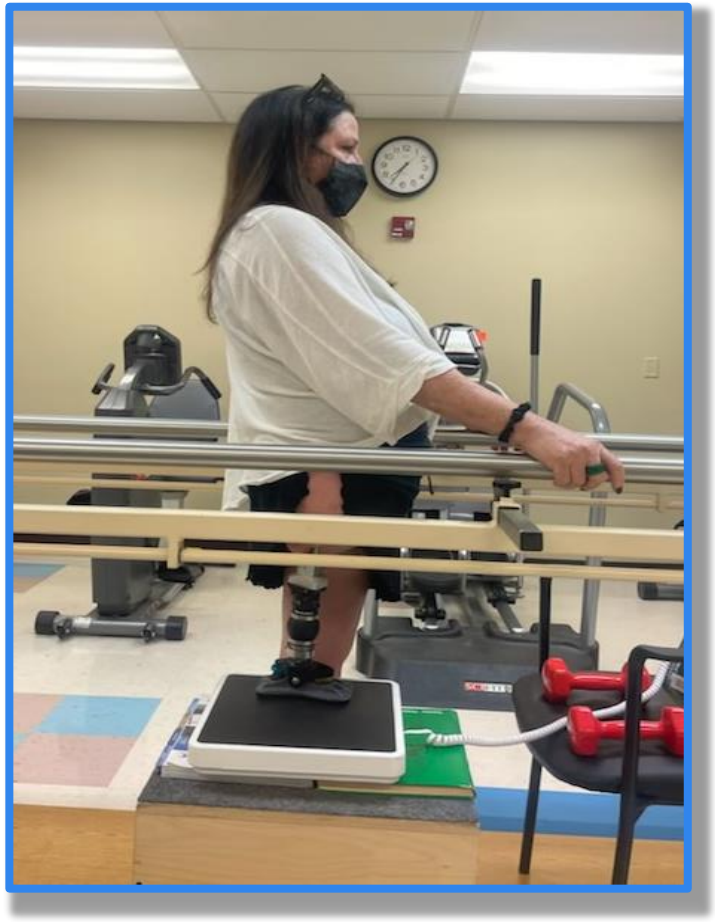
Phase 2 Rehab

No earlier than 11 weeks

- Continue previous exercises with increased resistance
- Add 1 lb of weight on short training prosthesis during exercises
  - Progress up to 2 lbs as tolerated
- Axial weight bearing, gentle weight shifting, loading and unloading
  - 3x30 minutes daily
  - No more than 10 lbs/week as tolerated
- Begin weight shifting in quadruped with short training prosthesis and progress to crawling in small steps in quadruped



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Phase 2 Rehab

- When patient reaches 50% body mass weight bearing, can progress to full length prosthesis without microprocessor knee (MPK) for standing
  - 3 inches short
- NO Ambulation

Milestone

- Tolerate 15 minutes of 1-2 lb weights on short prosthesis in standing and cleared to take short or long prosthesis home without MPK

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Phase 3 Rehab

- Continue previous exer
  with increased resistan
- Increase to 3 lbs of wei
  short training prosthesis
  exercises
- Axial weight bearing &
  weight shifting
  - 4x30 minutes daily
  - Increase up to 10lbs/we
    tolerated
- Add resistance with elastic band on <u>short</u> training prosthesis

<u>Goals</u>

- Axial weight bearing at 80% BW

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★Phase 4 Rehab★

No earlier than 16 weeks

- Gait training with full length articulating prosthesis with MPC knee in parallel bars
  - Once cleared by surgeon
- Continue previous exercises
- Increase prosthesis wear to 1-hour per day
- Gait training indoors on level ground
- Progress to bilateral crutches with up to 50lbs load on prosthesis
- Cycling with minimal resistance
- Sit in chairs of different heights

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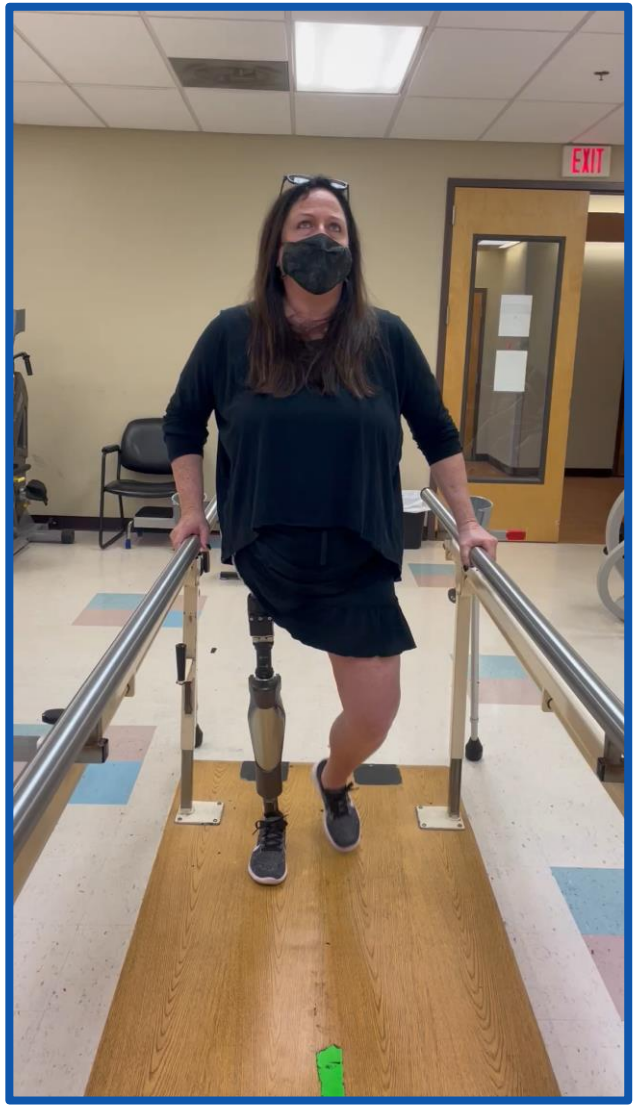
★Phase 4 Rehab★

No earlier than 16 weeks post-op



"This is just so cool!"

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Phase 4 Precautions

- Monitor bone pain > 24-48 hours
  - Hold or go back with pain
- Use bilateral axillary or forearm crutches
- Avoid lifting or carrying heavy objects while wearing prosthesis
- Avoid prosthesis being in full extension while cycling
  - Keep resistance low
  - No standing while cycling
- NO RUNNING, JUMPING, CLIMBING

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Phase 4 Goals

1. Achieve axial weight bearing at 100% body weight
2. Able to weight shift on to and off of full-length prosthesis without bone pain
3. Ambulate with crutches

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Phase 5 Rehab

No earlier than 18 weeks post-op

- Increase prosthesis use and walking with bilateral axillary or forearm crutches
- Gradually increase weight bearing on prosthesis up to 2-hours/day
- Gait training outdoors on level ground
- Floor to stand activities, as tolerated

Phase 6 Rehab

No earlier than 20 weeks post-op

- Transition to single point cane
- Stair negotiation with prosthesis and handrails
- Wear prosthesis, as tolerated
- Gait training on slopes, uneven surfaces, or obstacles
- Bike with additional resistance
- Begin pivoting exercises
- Gym/fitness training with full-length prosthesis if able to full weight bear <u>without</u> pain

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What We've Learned in 3 Years

- 20 Patients are in/have completed our program

1. Follow and delineate the pain (Muscle/Tendon/Bone)
   - Suture pain on the bone
2. Pay attention to signs of infection
3. When in doubt, GO SLOW!
4. Be mindful of lack of muscle development
5. Consider risks of osteopenia (bone fracture)
6. Bone spurs can occur
   - 1 revision surgery in our group

What We've Learned in 3 Years

7. Treat contractures
8. Stretching program (BE CAREFUL)
9. Hygiene of OI aperture (follow given guidelines)
10. Loosening buttress (retighten each visit)
11. Skin sagging
    - 1 revision pending

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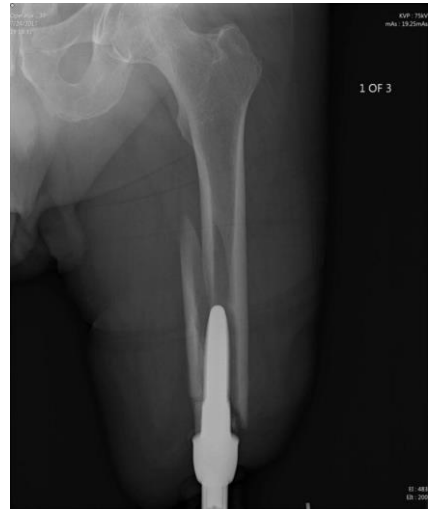
Complications

- Statistically, 10% Risk of infection
  - Most are local infection
  - 1/20 patients had infection at aperture
- No osteomyelitis in our group
- No removal of hardware
- 1 broken buttress
  - Patient had revision and is now walking/working



Prosthetic Pearls of OI

- Vertical shock absorbers
- Hydraulic feet

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Results and Benefits

- Improved walking capacity with less fatigue than socket prosthesis
- Improved proprioception (osseoperception)
- Decreased risk of falls (improved prosthetic control)
- No complications from sweat
- Better connection of prosthesis
- Increased prosthetic wear time

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Mary's Goal

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Questions?