

Pre- and Post-Prosthetic Physical Therapy Management for a Patient Following External Hemipelvectomy due to Spindle-cell Sarcoma: A Case Report

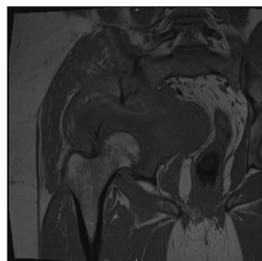
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Introduction

- External hemipelvectomy (EHP) is a rare surgical procedure that is most commonly indicated for bone and soft tissue sarcomas of the pelvis, which results in resection of the affected innominate, sacrum, and entire limb
- A high percentage of individuals with EHP ambulate with the use of bilateral crutches and no prosthesis due to the required energy needed to ambulate with a prosthesis.^{1,2} Modern prosthetic design has decreased this burden, making prosthesis use a viable option for individuals following EHP
- The purpose of this case report is to describe the outpatient pre- and post-prosthetic physical therapy (PT) management and outcomes for a patient following EHP due to resection of undifferentiated spindle cell sarcoma of the pelvis



Patient History/Systems Review

- 36 year-old male following EHP due to spindle cell sarcoma of the pelvis
- PMH: BMI 36.6, schizoaffective schizophrenia
- Chief complaints included pain and soreness in his residuum with change in positions and during crutch ambulation
- Patient was referred to outpatient PT by his physician to begin progression toward use of a prosthesis
- Patient presented with c/o low back pain, restrictions in movement of his unaffected lower extremity, and hypersensitivity on his residuum

Examination

- Pain in his residuum was rated 4-5/10 on a numeric pain rating scale
- Strength testing (MMT) and muscle length testing incurred pain in his left popliteal fossa and groin
- Core weakness was demonstrated by an inability to perform the unilateral hip bridge endurance test and performance of the plank static core test for 30 seconds
- Patient was unable to tolerate right side lying and was hypersensitive along lateral trunk and distal-lateral residuum
- Completed Boston AM-PAC Basic Mobility Outpatient Short Form with a score of 51.68 indicating 56.24% impairment
- On 20th visit, patient was able to ambulate for 5 feet without an assistive device

Clinical Impression

- Primary impairments limiting the patient's potential prosthesis use, ability to perform functional mobility, and activities of daily living (ADLs) included impaired sensation, pain, decreased core stability, decreased endurance, decreased muscle length, and impaired balance
- The patient had significant residuum pain, phantom limb pain, low back pain, hypersensitivity, and daily fluctuations in the volume of his residuum that were expected to limit his ability to use a prosthesis in addition to limiting his activity tolerance, endurance, and functional mobility
- Bio-behavioral comorbidities including fear avoidance beliefs, depression, and schizoaffective schizophrenia were expected to negatively influence patient success

Intervention

A six week pre-prosthetic phase, followed by a year of post-prosthetic training was performed with the patient. A progressive core strengthening, flexibility, lower extremity strengthening, and upper extremity strengthening program occurred in the first six weeks following initial evaluation. After the patient received his definitive prosthesis, interventions included transfer training, therapeutic exercise, standing balance training, gait training, stair training, and obstacle navigation.

Pre-prosthetic rehabilitation

Core stability exercises

- Abdominal crunches
- Bilateral oblique crunches
- Oblique sit-up reaching elbow to knee
- Forearm plank on left knee and on toes
- Seated trunk rotation
- Diagonal sit ups
- Side crunches with med ball
- Cable upper trunk rotation
- Single leg bridge, L foot on stability ball
- TA activation with 3 second hold
- TA activation with LLE marching

Upper extremity exercises

- Prone shoulder horizontal abduction
- Prone shoulder extension
- Prone Ws
- Seated t-band rhythmic stabilization (arms at 90°shoulder flexion)
- Triceps dips and extension
- Seated shoulder horizontal abduction
- Seated pull downs
- Seated rows (narrow grip)
- Seated rows (wide grip)

Stretches

- Manual hip flexor stretch (prone)
- Manual hamstring stretch (supine)
- Supine hamstring stretch with strap

med ball=medicine ball, TA=transversus abdominus, L=left, LLE=left lower extremity, t-band=theraband

Post-prosthetic rehabilitation

Interventions

- Visit 12***
 - Transfer training
 - Standing weight shifts
 - SLS
 - Static/dynamic balance in // bars
 - Preparations for gait in // bars
- Visit 20**
 - Sit-stands
 - Stair negotiation with crutches
 - // bars exercises
 - FW/BW weight shifts
 - SLS (10 x 1 second)
 - Static/dynamic balance activities
 - Gait training
 - Side stepping
 - FW/BW stepping
 - Gait training
 - With walker x 25 minutes
 - Trial Iofstrand crutches
- Visit 30**
 - + Progression of dynamic balance activities
 - + Standing strengthening exercises
 - Rows, shoulder extension, standing presses alternating/bilateral 35# 2x10 each
 - Standing ball toss
 - Trunk rotation with 8# med ball
 - Diagonals with 8# med ball
 - Ball toss to rebounder
 - + Gait training with no AD
 - + Stair negotiation (step-to pattern with hand rails)
 - Focus on C-Leg eccentric lowering
- Visit 40**
 - + Progression of dynamic balance activities
 - Cable column push/pull, together/alternating LE 85#
 - Obstacle navigation

*Patient received definitive prosthesis before the 12th visit.
// bars=parallel bars, +=added, SLS=single limb stance, +=added, FW/BW=forward and backwards, #=pounds, AD=assistive device

Outcomes

After 40 visits of outpatient PT the patient had significant improvements in functional mobility as assessed by the Boston AM-PAC Outpatient Short Form and was able to ambulate 430 feet with no assistive device

Summary of findings from tests and measures over 40 visits

| Impairments | Tests and Measures | Relevant findings on initial evaluation | Visits 10 and 12* | Visit 20 | Visit 30 | Visit 40 |
|--|--|--|---|----------|-----------------------|----------|
| Pain | Residual limb pain NPRS (current) | 5/10 | 5/10 | 6/10 | 7/10 | 4/10 |
| | R "hip" pain NPRS (current) | 4/10 | 5/10 | 6/10 | 6/10 | 3/10 |
| Circulation | Blood pressure (mmHg) | 122/64 | | | | 135/77 |
| | Pulse (bpm) | 67 | | | | 92 |
| Sensory function | Sensation to light touch | Hypersensitivity on lateral trunk and distal-lateral residuum. The patient is unable to tolerate right side lying | Patient had decreased sensitivity and was able to tolerate right side lying | | | |
| Strength | MMT (0-5) | 5/5 in BUE and LLE with c/o pain in the left popliteal fossa during knee flexion and pain in the left groin with hip flexion and adduction | | | 5/5 in LLE, pain free | |
| Muscle length | Passive knee extension test (hamstring) | + (-40°) with c/o pain in popliteal fossa | + (-30°), pain free | | | |
| | Thomas test (hip flexor) | + for decreased iliopsoas length | + for decreased iliopsoas length | | | |
| Core stability and endurance | Unilateral hip bridge endurance test | Unable to perform | | | | |
| Balance | Plank static core test | 30 seconds | 60 sec | | | |
| Activity tolerance | Single limb stance time on prosthetic limb | | < 1 sec* | | | 3 sec |
| Ambulation endurance (with prosthesis) | Time to fatigue during standing activity | | 5 min* | 25 min | | |
| | Distance ambulated with AD | | | 100 ft | 320 ft | |
| Functional mobility | Distance ambulated without AD | | | 5 ft | 200 ft | 430 ft |
| | Boston AM-PAC basic mobility outpatient short form (t-scale score) | | | 51.68 | 53.70 | 55.57 |

Clinical Implications

- High-level amputation has both a complex physical and psychological impact on individuals with lower limb amputation
- Increased prosthesis use is associated with increased quality of life³, lower levels of general psychiatric symptoms⁴, and improved health outcomes⁵ in individuals with amputation
- High quality and intensive rehabilitation has been shown to improve health outcomes for individuals post-amputation in both the acute and sub-acute settings⁶
- This patient received an extensive amount of physical therapy, including 12 visits of pre-prosthetic rehabilitation and 28 visits of post-prosthetic rehabilitation that spanned over one year
- The patient provides an interesting case given his bio-behavioral comorbidities and established good prognosis for successful prosthesis use following a high-level amputation
- The patient presented with unique challenges including significant post-amputation pain and issues with prosthetic fit in addition to his psychosocial comorbidities.
- More research is needed in this population to:
 - Provide support for the use of extended PT management past that of normal orthopedic and post-surgical conditions
 - Look at the long-term effects of PT on functional mobility
 - Indicate the most effective interventions for pre- and post-prosthetic training