

HAMSTRING LENGTHENING POST-OPERATIVE GUIDELINES

The following hamstring lengthening guidelines were developed by HSS Rehabilitation. Progression is both criteria-based and patient specific. Phases and time frames are designed to give the clinician a general sense of progression and will be dependent on the patient's prior level of function, surgeon specific parameters, concomitant surgeries, and the patient's response to physical therapy (PT) intervention. Tendon lengthening(s) are often part of a multilevel surgery, which includes multiple soft tissue and/or skeletal procedures that occur during one anesthetic event. **It is important to review the guidelines for each individual procedure.**

As part of a comprehensive PT evaluation and plan of care development for an individual with cerebral palsy, the clinician may also need to assess for additional pathology, such as spasticity or selective motor control impairment, that may alter the postoperative PT timeline and overall outcomes. The assessment parameters within these guidelines are recommended for the post-operative phase of this specific surgical procedure and may need to be modified on a case by case basis. In addition, the clinician must take patient/caregiver goals, access to care and equipment, and barriers to learning into consideration when developing a postoperative plan of care. Cardiovascular endurance, postural control activities, and upper body, lower body and trunk strengthening should be addressed throughout the patient's rehabilitation course as appropriate. Criteria for discharge following the final phase is characterized by the completion of the **post-operative** PT plan of care. Some individuals may transition to episodic care based upon functional goals of the patient/caregiver(s).

A hamstring lengthening is indicated for individuals with cerebral palsy who are ambulatory and non-ambulatory. Hamstring tightness may contribute to gait abnormalities such as a flexed-knee gait, a 'crouch' position (hip and knee flexion and ankle dorsiflexion throughout the gait cycle) or decreased knee extension at terminal swing of gait (Cooney et al., 2006). These alterations in gait may contribute to increased energy expenditure when standing and ambulating (Steele et al., 2017). Because the hamstrings may function as hip extensors in addition to knee flexors, there are concerns that hamstring lengthening procedures may lead to increased anterior pelvic tilt, increased hip flexion and increased lumbar lordosis in the setting of decreased hip extensor strength, leading to eventual worsening of crouch gait (Morais Filho et al., 2020). Hamstring lengthening can also lead to genu recurvatum, causing impairments in stance stability and increasing energy expenditure. For these reasons, the decision to proceed with hamstring lengthening is always made cautiously. In non-ambulatory individuals, hamstring tightness may contribute to positioning difficulties in a wheelchair, stander, or bed.

Italicized information is not intended to be all inclusive and is designed to suggest examples of functional activities or therapeutic exercises that can be performed during each phase.

Follow physician's modifications as prescribed.

HAMSTRING LENGTHENING POST-OPERATIVE GUIDELINES

Acute Care Phase: Post-Operative Day 1 to Hospital Discharge

EMPHASIZE

- Use of knee immobilizer(s) during waking and sleeping hours
- Early range of motion (ROM) and positioning
- Parent/caregiver independence with home exercise program (HEP)

PRECAUTIONS

- Avoid prolonged periods with knee(s) in flexion in all positions
- Avoid increased pain with therapeutic exercise and functional activities
- Monitor incision site(s) for color changes, swelling, discharge or drainage
- Weight bearing status: weight bearing as tolerated (WBAT)

ASSESSMENT

- Preoperative functional and cognitive status
 - Gross Motor Function Classification System (GMFCS)
- Pain
 - Face, Legs, Activity, Cry, Consolability scale (FLACC); Wong Baker FACES (FACES); Numeric Rating Scale (NRS)
- Muscle spasms
- Integumentary status
- Sensation
- Use and fit of knee immobilizer(s)
- ROM and flexibility
- Positioning in wheelchair (pelvic and trunk alignment)
- Post-operative functional mobility (bed mobility, transfers, ambulation, stair negotiation)
- Home environment (stairs, time with direct caregiver support/supervision)
- Equipment needs for discharge (reclining wheelchair, assistive device, knee immobilizer(s))

TREATMENT RECOMMENDATIONS

- Positioning
 - Avoid placing pillows underneath legs/knees
 - Place towel roll under ankles to elevate the heels in supine and in wheelchair to:
 - Promote pressure relief of heels
 - Encourage passive knee extension

- ROM and flexibility
 - Gentle straight leg raise (SLR) passive stretch to promote hip flexion with knee extension
 - Gentle active, active assisted, and passive ROM (A/AA/PROM) of the lower extremities, including ankle dorsiflexion
- Functional activities
 - Bed mobility, transfers (sit to stand, bed to chair) with assistive device and assistance, as needed
 - Ambulation while donning knee immobilizer(s) and with assistive device
 - Stair training with assistance as needed
- Other
 - Cryotherapy for comfort
 - Knee immobilizer(s) during waking and sleeping hours

CAREGIVER EDUCATION

- HEP
 - Gentle SLR passive stretch
 - A/AA/PROM knee flexion
 - Ankle plantarflexor stretch
- Positioning
 - Avoid placing pillows underneath legs/knees
 - Place towel roll under ankles to elevate the heels in supine and in wheelchair
- Functional mobility
 - Transfers and ambulation with knee immobilizer(s) donned, assistive device and assistance, as needed
- Other
 - Equipment safety and management
 - Cryotherapy for comfort
 - Monitor incision site(s)
 - Donning and doffing of knee immobilizer(s)
 - Typically worn during waking and sleeping hours
 - May be removed for bathing and ROM exercises
 - Removed intermittently throughout the day to check skin integrity and perform ROM
 - 2-3 times/day for 30-60 minutes at a time, or as needed according to individualized post-operative plan of care

CRITERIA FOR ADVANCEMENT

- Equipment needs met for safe discharge home
- Postoperative spasms, pain, and swelling are controlled
- Tolerance to knee immobilizer(s)
- Patient/caregiver is independent with positioning, transfers, ambulation, and HEP

HAMSTRING LENGTHENING POST-OPERATIVE GUIDELINES

Post-Operative Phase 1: Hospital Discharge to 2 Weeks

EMPHASIZE

- Hamstring flexibility
- Upright sitting tolerance
- Use of knee immobilizer(s) during waking and sleeping hours, as needed according to individualized post-operative plan of care

PRECAUTIONS

- Avoid prolonged periods with knee(s) in flexion in all positions
- Avoid increased pain with therapeutic exercises and functional activities
- Monitor incision site(s) for color changes, swelling, discharge or drainage
- Weight bearing status: WBAT

ASSESSMENT *to be completed with and without knee immobilizer(s) donned*

- Pain (FLACC, Faces, NRS)
- Muscle spasms
- Integumentary status
- Use and fit of knee immobilizer(s)
- Available equipment (activity chair, stander, posterior rolling walker)
- Positioning in wheelchair (pelvic and trunk alignment)
- ROM and flexibility
 - Hamstring flexibility (popliteal angle, maximum knee extension)
 - A/AA/PROM of lower extremities, with emphasis on knee extension/flexion and ankle dorsiflexion
 - Hip flexor flexibility
- Strength
 - Extensor lag
 - Short arc quad (SAQ) – difference between active and passive knee extension ROM
 - Knee flexors
 - *Heel slide in supine, prone active knee flexion*
 - Functional strength assessment
 - Sit to stand/stand to sit with graded control

- Functional mobility
 - Independence with bed mobility, transfers, and ambulation
 - Tolerance for weight bearing activities with and without knee immobilizer(s)

TREATMENT RECOMMENDATIONS

- ROM and flexibility
 - Hamstring stretching
 - Gentle SLR passive stretch to promote hip flexion with knee extension
 - Hip flexor stretching
 - A/AA/PROM of lower extremities, including ankle dorsiflexion
- Strengthening
 - Knee extensors
 - *Quad sets, SAQ*
 - Knee flexors
 - *Heels slides*
 - Hip extensors
 - *Gluteal sets, pelvic bridges (modified lower extremity support, as needed)*
 - Trunk strengthening
 - *Activities to promote trunk rotation, prone over bolster*
- Functional Activities
 - Sit to stand/stand to sit transfers with emphasis on graded control
 - Standing with optimal alignment
 - *Against posterior support surface*
 - Progress ambulation (distance, level of assistance) with assistive device, knee immobilizer(s), and assistance, as needed

CAREGIVER EDUCATION

- HEP
 - Hamstring stretching
 - Gentle SLR passive
 - A/AA/PROM of lower extremities with emphasis on knee extension
 - Therapeutic exercises *such as quad sets, gluteal sets, bridges, prone active knee flexion*
- Positioning
 - Avoid placing pillows underneath legs/knees
 - Place towel roll under ankles to elevate the heel in supine and in wheelchair
 - Prone with goal of a total of ~90 minutes per day
- Functional mobility
 - Transfers, standing, and ambulation with knee immobilizer(s) donned, assistive device and assistance as needed
 - Use of wheeled mobility for longer distances

- Other
 - Cryotherapy for comfort
 - Monitoring of incision site(s)
 - Donning and doffing of knee immobilizer(s)
 - Worn during waking and sleeping hours, as needed according to individualized post-operative plan of care
 - Equipment safety and management

CRITERIA FOR ADVANCEMENT

- Able to stand without knee immobilizer(s) with appropriate assistive device

HAMSTRING LENGTHENING POST-OPERATIVE GUIDELINES

Post-Operative Phase 2: 2 to 6 Weeks

EMPHASIZE

- Knee extension ROM
- Progression of standing functional mobility without knee immobilizer(s)

PRECAUTIONS

- Avoid prolonged periods with knee(s) in flexion in all positions
- Avoid increased pain with therapeutic exercises and functional activities
- Monitor incision site(s) for color changes, swelling, discharge or drainage
- Weight bearing status: WBAT

ASSESSMENT *to be completed with and without knee immobilizer(s) donned*

- Pain (FLACC, Faces, NRS)
- Muscle spasms
- Integumentary status
- Use and fit of knee immobilizer(s)
- Postural alignment in sitting (pelvic and trunk alignment)
- ROM and flexibility
 - Hamstring flexibility (popliteal angle, maximum knee extension)
 - SLR, popliteal angle (90/90 position)
 - A/AA/PROM of lower extremities, with emphasis on knee extension/flexion and ankle dorsiflexion
- Strength
 - Extensor lag
 - SAQ – difference between active and passive knee extension ROM
 - Knee flexors
 - Prone active knee flexion
 - Functional strength assessment
 - Sit to stand/stand to sit with graded control
 - Upright standing without knee immobilizer(s)
- Functional mobility
 - Independence with bed mobility, transfers, ambulation (without knee immobilizer(s)), and stair negotiation
 - Tolerance for weight bearing activities without knee immobilizer(s)

TREATMENT RECOMMENDATIONS

- ROM and flexibility
 - Hamstring stretching
 - Gentle SLR passive stretch
 - 90/90 stretch
 - Hip flexor stretching
 - A/AA/PROM of lower extremities, including ankle dorsiflexion
- Scar massage if appropriate
- Strengthening
 - Knee extensors
 - *Step up, standing with overhead reach*
 - Knee flexors
 - *Prone active knee flexion, standing active knee flexion*
 - Hip stabilizers
 - *Side stepping, retro-ambulation, standing with overhead reach*
 - Trunk strengthening
 - *Activities to promote trunk rotation, prone over bolster*
- Functional Activities
 - Sit to stand/stand to sit transfers with emphasis on graded control
 - Standing with optimal alignment
 - *Against posterior support surface*
 - Progress ambulation (distance, level of assistance) with assistive device and assistance, as needed
- Gait specific activities
 - Activities to promote increased step length
 - *Stepping over obstacles, visual targets*

CAREGIVER EDUCATION

- HEP
 - Hamstring stretching
 - Gentle SLR passive
 - A/AA/PROM of lower extremities with emphasis on knee extension
 - Therapeutic exercises *such bridges, active knee flexion in standing and/or in prone, stepping up, stepping over*
- Positioning
 - Prone with goal of a total of ~90 minutes per day
- Functional mobility
 - Transfers, standing, and ambulation without knee immobilizer(s) assistive device and assistance, as needed

CRITERIA FOR ADVANCEMENT

- Able to ambulate household distances without use of knee immobilizer(s), using pre-operative assistive device(s) as needed

HAMSTRING LENGTHENING POST-OPERATIVE GUIDELINES

Post-Operative Phase 3: 6 to 16 Weeks

EMPHASIZE

- Knee extension ROM
- Hip extensor strength
- Quality and efficiency of gait

PRECAUTIONS

- Avoid prolonged periods with knee(s) in flexion in all positions
- Weight bearing status: WBAT

ASSESSMENT

- Postural alignment in sitting and standing (pelvic and trunk alignment)
- ROM and flexibility
 - Hamstring flexibility
 - SLR, popliteal angle (90/90 position)
 - A/AA/PROM of lower extremities, with emphasis on knee extension
- Strength
 - Extensor lag
 - SAQ
 - Knee flexors
 - Prone active knee flexion, standing knee flexion
 - Functional strength assessment
 - Squat, floor to stand transfer, step-up/-down
- Observational gait
 - With and without orthotic device(s) and assistive device, as needed
 - Procedure-specific observations
 - Presence/absence of knee extension during terminal swing
 - Presence/absence of knee extension in midstance
 - *Edinburgh Visual Gait Score*
- Postural control
 - Steady state and dynamic (anticipatory and reactive postural control) in sitting and standing
 - *Pediatric Balance Scale, functional reach*

TREATMENT RECOMMENDATIONS

- ROM and flexibility
 - Hamstring stretching
 - Gentle SLR passive stretch to promote hip flexion with knee extension
 - 90/90 stretch
 - Hip flexor stretching
 - A/AA/PROM of lower extremities, including ankle dorsiflexion
 - *Mat-based ROM, stationary bicycle*
- Scar massage if appropriate
- Strengthening activities
 - Knee extensors
 - *Step up, standing with overhead reach, leg press*
 - Hip stabilizers
 - *Side stepping, retro-ambulation, resistive bands*
- Functional activities
 - Sit to stand/stand to sit transfers with emphasis on graded control
 - Progress ambulation (distance, level of assistance) and stair negotiation with assistive device and assistance, as needed
- Postural control activities
 - Steady state and dynamic (anticipatory and reactive postural control) in sitting and standing
 - *Reaching without support, throwing/catching without support, stop and go while walking, direction changes*
 - Progression from static to dynamic activities as appropriate
- Gait specific activities
 - Activities to promote increased step length
 - *Stepping over obstacles, visual targets*

CAREGIVER EDUCATION

- HEP
 - Hamstring stretching
 - Gentle SLR passive
 - 90/90 stretch
 - A/AA/PROM of lower extremities with emphasis on knee extension
- Functional mobility
 - Transfers, standing, ambulation, and stair negotiation with progression toward preoperative level of assistance and use of assistive device as needed

CRITERIA FOR DISCHARGE *defined as completion of post-operative PT episode of care

- Able to ambulate pre-operative distances with preoperative level of assistance and use of assistive device as needed
- Able to discontinue use of wheeled mobility for longer distances if not used preoperatively

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