The physical therapy treatment of children with rotationplasty: BCCH's experience

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Objectives:

1. Understand the types of rotationplasty
   a. benefits of procedure
   b. potential complications of procedure
   c. physical therapy treatment techniques used during rehab
2. Understand the role of physical therapy throughout continuum of care of a child with rotationplasty
3. Identify potential coping tools for children and adolescents with rotationplasty
Types of rotationplasty

- Rotationplasty procedure dependent on tumor location (Winkleman 1988; Fuchs and Sims 2004)
- Ankle acts as the knee e.g., plantar flexion = knee extension
- 3 types:
  - A1 (distal femur)
  - A2 (proximal tibia)
  - BII (proximal femur)

Types of rotationplasty cont.

- Type of rotationplasty helps determine muscles action
  - Gastroc versus quadriceps dominant
- The long adductors are removed during surgery
- Peronei act as proprioceptors (?)

- PT meets with patients at time of diagnosis (regardless of procedure)
Benefits of rotationplasty

- allows for growth in younger child/adolescent
- foot remains as a weight bearing surface
- phantom pain does not occur*
- single surgical procedure

- benefits

- durable reconstruction with proprioceptive input from foot (Fuchs et al 2003)
- high level of function and excellent quality of life is achievable e.g. sports, normal gait pattern (Veenstra et al 2000; Hillmann et al 2007; Hillmann et al 2000)
Early Complications  (Brown 2001)

- Vascular compromise
  - ROM restrictions for first 3-5 days
  - hip flexion < 60 degrees (for Day 1); < 80 (Day 2-7)
  - Doppler monitoring q 15-30' for first night post op and then depending on circulation

- Skin breakdown
  - Toes/dorsum of foot

- Nerve injury

Immediate post operative care  (Brown 2001)

- egg crate or appropriate mattress
- patient positioning with toes elevated off of bed
- first 24 hours = day of rest
- active pumping of foot, +/- AAROM hip Abd/Add
Seating

- Wheelchair: adaptation requires longer support and adequate cushioning on affected side
- ADL assessed and adaptations provided as required to improve independence
  - e.g. bath bench, reacher
- Forearm crutches

Post-operative Physical Therapy

- Mobilization begins day 2, initially with movement restrictions
  - Hip flexion < 80°
- Up to dangle at edge of bed, mobility progressed
- ACTIVE ROM of ankle only; AAROM hip
- Patient safe on flat and stairs prior to discharge home
Post-operative Physical Therapy

- "my leg doesn't feel backwards"
- glut strengthening begins; prone lying
- neuromuscular retraining begins
  - visual confusion eliminated
  - alphabet range of motion
  - lots of repetition

Physical Therapy Rehabilitation

- mobilization of patient e.g. ADL, curbs, floor to standing
- strengthening, muscle activation, balance (de Visser et al 2001) and gait retraining
- coordination home therapy
Physical Therapy Rehabilitation

- core strengthening!
  - focus on core stability with all ex.
    - hip extension with abduction without posterior pelvic sway
  - stimulate anterior thrust on affected side pelvis (*tail wagging the dog)

Prosthetic fitting

- fitting of prosthetic device occurs ~ 6 weeks post op
- Prosthetist should be familiar with rotationplasty
- prosthetic socket type dependent on shape of leg, plantar flexion available, age of child
- receiving prosthesis is important milestone (Forni et al 2012)
Physical Therapy Rehabilitation

- gradual increase in wear time
- gait training with locked knee begins
  - protect soft tissue anastomosis
- hip hiking rather than circumduction to clear foot
- turning, stairs reviewed

Physical Therapy Rehabilitation

- even weight bearing in stance
- knee unlocked at 1-2 weeks after completion of chemo
- gradual progression of skill acquisition
- eliminate hip hike with emphasis on even stride
Physical Therapy Rehabilitation

- assessed for prosthetic changes as required (height/weight gain)
- patient seen once every 1-2 weeks initially
  - emphasis on strengthening of gluts, ankle musculature, gait and balance retraining, cardiovascular reconditioning, skill acquisition
- normalization of gait takes ~ 2 years children followed through the Sunny Hill Gait Lab (*Curtze, Otten and Postema 2010)

**Normal Gait Cycle**

- Tibialis Anterior
- Soleus
- Gastrocnemius
- Semimembrinosis
- Semitendinosis
- Vastus Intermedius
- Rectus Femoris

**EMG during Gait**
Re-formation of body image

- integration of new body image takes place in stages (Medcalf 1987)
  - initially post op don’t want to look at new leg
  - control over movement, acquisition of independent mobility and new skills
  - fitting of prosthesis/first steps
- unlocking of knee and beginning of “normal” walking and integration of sensation (*Curtze, Otten and Postema 2010)

Self esteem

- offer support if from out of town utilizing social media, email etc.
- mentors for new “club members”
- patient to patient advice appears to be more valued
- teen group - provision of age appropriate opportunities to socialize e.g. movies, makeup nights, hockey games
- initially in protective environment (away from home or friends for medical reasons)
Return to “life on the outside”- school

- child/family may request community education regarding child’s return to class
- parent/school package provided with explanation of: fatigue; potential accommodations (e.g. 2 sets of texts/lockers; ½ days to start; minimizing trip hazards)

-school

- arrange for classes to be grouped into one area/level of school if possible
- at time of return to school prosthetic wear is full time
  - have outward “normal” appearance
- individual education programs (IEP) can include a credit for rehabilitation (PE) during chemotherapy
- PE focus on reintegration
- begin integration of community sports depending on skill level and interest of child
- FATIGUE!!!
Return to life on the outside
-being “me”

- “Teen Adventures” sponsored by “Balding for Dollars”
  - variety of outdoor activities (4-6 days long)
  - e.g. horseback riding; white water rafting; kayaking; surfing; dog sledding; tall ship sailing
- teens complete application form reviewed by committee
- sibs are able to attend
- places teen in safe/ challenging situations with new peer group

-being “me”

- participants required to help cook, clean etc. helping them to attain independence and confidence
- often first time away from home by themselves
- emphasis is NOT group soul searching but outdoor fun
Long term - activity

- when boney union achieved activity level is elevated to match patient desire
- finessing gait/stair climbing/strengthening to meet demands of patients lifestyle allows patient to "blend in"
- high level activity can be achieved (Hillmann et al 2007; Akahane et al 2007;)

-activity: sport choice

- prosthetic adjustment may include knee hinge brakes to limit hyper ankle flexion
- female patients may require different prosthetic feet to accommodate different heel heights
- snowboarding, skating, cycling, skiing (downhill and cross country), rock climbing, golf, kayaking (Hillman et al 2007; Hopyan et al 2006; Owens et al 2011)
Late effects of treatment

- reduced bone mineral density (Pirker-Fruharf et al 2012)
  - stress fractures not uncommon initially
- minimal degenerative X-ray changes in ankle
- skin callus and blisters on main loading areas of foot (Gebert et al 2006)
- ingrown toe nails

Long term - quality of life

- numerous studies indicate superior QOL for patients with rotationplasty when compared to limb sparing surgery or amputation (above or below knee) (Potsma et al 1992; Zahlten-Hingurange et al 2004)

- job satisfaction and ability to marry are all equal to other forms of reconstruction
- quality of life: Sexuality

Sexuality:
- 1/3-1/2 reported negative effects on initiating social and/or intimate contacts, body image and sexuality (Veenstra et al 2000)
- survivors with rotationplasty and amputation have less depressive symptoms, better self-perception and sexual function when compared to other types of limb salvage (Barrera et al 2010)

Thank you!

- To the kids
- To the families
- To the TEAM
- To you for your interest!!!
References:


References:

