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ijmrset@gmail.com



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Gait Training and Prosthetic Rehabilitation for a Child with Bilateral Symes Amputation: A Case Study

Sneha Hiren Bhalala

Assistant Professor, SPB Physiotherapy College, Surat, India

ABSTRACT: Rahil is a 3-year old boy who underwent bilateral Symes amputation secondary to fibular hemimelia. He is being seen at a Paediatric Rehabilitation Hospital in Surat for fitting of below-knee prostheses. Rahil presents with impaired gait and stair climbing patterns, gross motor skills below age-expected milestones, and impaired balance. A home exercise program was provided to address the above impairments, and Rahil was referred to a local Physiotherapy treatment centre for follow-up. Rahil will be seen routinely by the PT in the Prosthetics Department to monitor his gross motor development.

KEY WORDS: Amputation, paediatric, Symes amputation, limb deficiency, fibular hemimelia, Canada

I. PATIENT CHARACTERISTICS

Rahil is a 3-year old boy living near a large urban centre in Surat. Rahil was born in Surat and was adopted by a Hindu family when he was 2 years old. Rahil's diagnosis is bilateral fibular hemimelia (longitudinal fibular deficiency). He underwent bilateral Symes amputation at a pediatric acute care hospital two months ago to create bilateral end-bearing stumps that will allow him to be highly mobile with the use of bilateral below-knee prostheses.^[1] Rahil was discharged home under the care of his parents following his amputation surgery, and was seen in the Prosthetics Department of the regional Paediatric Rehabilitation Hospital for casting of his bilateral below-knee prostheses four weeks later. Rahil subsequently returned to the Prosthetics Department for socket check and assembling of the prostheses. Rahil trialed his assembled prostheses at home, then returned to the Department for an alignment check with his Prosthetist and Physiotherapist. Rahil is an otherwise healthy young boy who does not demonstrate developmental delays in cognitive or motor skills. Rahil is a social and bright young boy with a supportive family who is expected to learn and adapt quickly to his new prostheses and new home in Surat. Rahil's older sister is also adoptive and has a unilateral amputation, thus the family has experience navigating the health care system and raising a child with a disability.

II. EXAMINATION FINDINGS

Subjective:

- Patient Hx: Ambulating independently with a paediatric rear-walker and crawling independently indoors.
- Medical Hx: No complications following surgery. Wound care and dressings were managed by mom.
- Goals: For Rahil to be independent with his ambulation and gross motor skills without the use of a gait aid in time for starting daycare in September.

Objective findings:

- ROM: AROM and PROM of the hip and knee joints within normal limits.
- Muscle strength: Assessed through functional measures. Client had sufficient strength to perform sit-to-stand and stair climbing activities.
- Balance: Good seated static and dynamic balance as demonstrated by ability to maintain balance while reaching outside base of support. Poor static and dynamic standing balance as demonstrated by need to use upper extremity support to maintain standing balance.
- Gross motor:
 - Rolling: independent
 - Lie-sit: independent



- Sit-stand: independent, with use of hands for support
- Floor>stand: moderate assist x1
- Standing>floor: dependent
- Skin integrity: Surgical incisions healing well. No significant oedema.
- Ambulation: At least 10m independently with paediatric rear walkerWide base of support, hips abducted, decreased knee flexion in swing.

ICF Findings:

- BF&S: muscle power, gait pattern, protective functions of skin, lower extremity structures
- AL: changing basic body position, transferring oneself, lifting and carrying objects, walking
- PR: community life, recreation and leisure

III. CLINICAL HYPOTHESIS

Rahil presents with impaired mobility and gross motor function secondary to decreased balance, impaired coordination, and poor gross motor patterning. As a result, Rahil currently requires the use of a paediatric rear walker for ambulation, and requires assistance for many gross motor transitional movements such as transferring from the floor to standing. As a paediatric prosthetic user, Rahil is undergoing developmental progression as he trains to use his prostheses effectively. This adds to the complexity and longitudinal outlook of his course of rehabilitation.^[2]

IV. INTERVENTION

During his Physiotherapy session, Rahil engaged in balance, gross motor, and ambulation activities to address his physical impairments and activity limitations.

Interventions included:

- Balance activities: reaching for toys outside base of support and crouching to pick up objects off floor
- Gross motor skill practice: practicing transitional movements such as getting up from floor using a low bench for assistance
- Ambulation activities: Ambulation with walker, ambulation with assistance (holding 1 or 2 hands for support); activities such as racing his sister in the hallway, collecting toys spread out on the floor
- Education to family: provided verbal and written instruction to mom on how to carry out the exercises described above as part of a home exercise program; provided instruction to mom on how to progress the above exercises depending on client's attainment of gross motor and mobility skills (e.g. standing from floor without using the bench)
- Referral to local children's treatment centre: As client lives a significant distance from the paediatric rehabilitation hospital, referral was made for Physiotherapy follow up at a local children's treatment centre.

V. OUTCOME

Rahil tolerated wearing his bilateral below-knee prostheses well during the treatment session. The skin was checked following treatment and no lesions were observed. Rahil demonstrated rapid gains in his gross motor function following treatment. By the end of the treatment session, Rahil could ambulate 10-20 steps with one-hand support. He continued to demonstrate a wide base of support in gait but began to exhibit greater knee flexion in swing following repeated squatting practice to pick up toys. Following balance training exercises, Rahil presented with increased self-confidence during static and dynamic balance challenges, as demonstrated by his willingness to begin to stand without upper extremity support and reach for object outside his base of support. Rahil also learned how to stand up from the floor using a bench for assistance, and practiced ambulating up and down the training stairs with assistance. Rahil is progressing well in his gross motor development with the use of his prostheses, but would benefit from further follow-up with a paediatric Physiotherapist in his community. This would ensure that Rahil continues to meet and progress in his attainment of gross motor milestones and is ready for the transition to daycare in the fall.



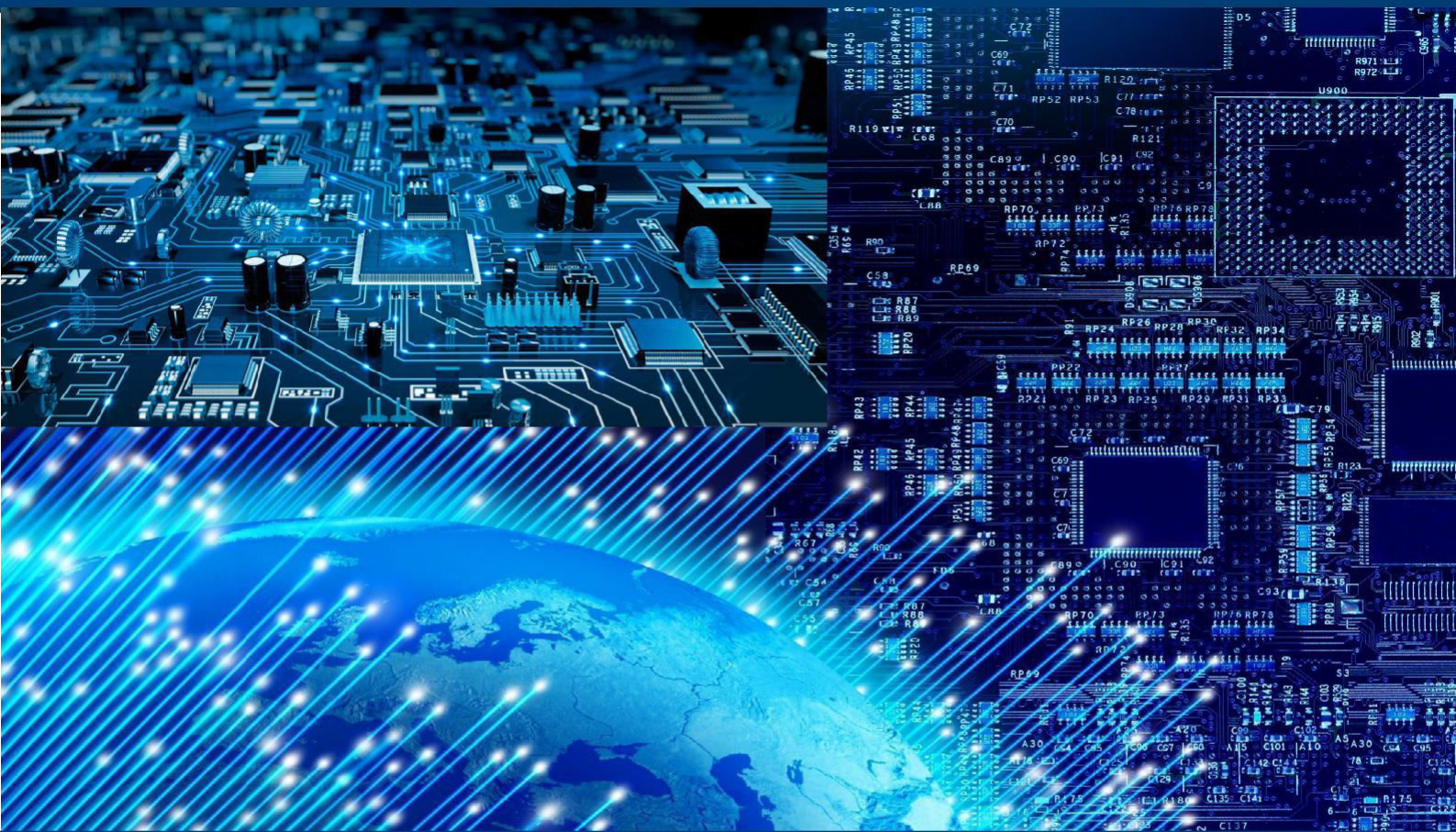
VI. DISCUSSION

Rahil's case demonstrates the complexity of Physiotherapy management for paediatric amputees, as the client's gross motor development must be addressed alongside the development of new, prosthetic-related skills. In the specialized field of paediatric amputee treatment, clients from a large geographic catchment are often seen in Prosthetic clinic, and then require further follow-up in local treatment centres. A multi-disciplinary team approach in which specialist professionals work closely with the family to set and attain clear goals is critical to optimizing patient outcomes for this population.^[3]

It is important that the attainment of gross motor milestones is closely monitored, as the choice of prosthetic will be determined in part based on the patient's level of function. Regular follow-up with the multidisciplinary team and ongoing education to the patient and family on prosthetic options is therefore an important part of the process. The Physiotherapist should take an active role in connecting the patient with recreation and sport activities in their community. This has been shown to be a factor that further facilitates development of long term active living habits in children with disabilities^[4]. Literature exploring functional outcomes of adult amputees who underwent Symes amputation for treatment of fibular hemimelia at a young age reports that these adults are typically functioning without activity restrictions and are involved in sports and recreation as adults.^[5]

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