

ACADEMY OF SPINAL CORD INJURY PROFESSIONALS

Equipment Barriers When Treating a Patient with Achondroplasia and Spinal Cord Injury: A Case Study

Madeline Hayward, OTD, OTR/L, Dominic Corpus, PT, DPT, Mallory Chick, PT, DPT

Background and Purpose

Patients with achondroplasia, a hereditary short-limbed dwarfism, have a high prevalence of medical complications including spinal canal stenosis. A barrier to the progression of independence achieved in an inpatient rehabilitation setting, is the lack of standardized adaptive equipment for treatment of patients with SCI and achondroplasia. The goal of this case report is to provide an example of equipment innovation and challenges experienced when treating a patient with SCI secondary to achondroplasia.

Case Description

The patient is a 50 year old female with a history of achondroplasia leading to congenital narrowing of the spinal canal. The patient presented to inpatient acute rehabilitation with incomplete paraplegia following T8-10 laminectomy for decompression. Upon evaluation, patient required total assist (2-person) for bed mobility and transfers, and she was unable to ambulate or functionally propel a standard manual wheelchair.

Objectives

- To recognize the lack of standardized equipment options available for patients with achondroplasia and SCI
- Identify barriers experienced with treating patients with achondroplasia and SCI in inpatient rehabilitation
- Demonstrate equipment used and modifications made to standard therapeutic equipment during this patient's rehabilitation stay

Findings

To maximize the patient's functional progress in her 8-week length of stay, therapists extensively modified gait equipment, bathroom DME, and standard rehab equipment. The therapists also faced increased challenge customizing an ultra lightweight manual wheelchair for this patient's needs due to her disproportionate short stature. The best current available option for increased efficiency with functional wheelchair propulsion was the addition of power assist to her manual wheelchair. This addition increased independence with mobility, decreased caregiver burden, and reduced the risk of shoulder overuse injury. To maximize patient independence, therapists trialed and modified standard rehabilitation equipment. Below are examples of equipment utilized during her stay:

- Step stools of multiple heights (Figures 1 and 3)
- Pediatric and adult commodes (Figure 2)
- Knee pads for therapist during therapeutic activities
- Adjustable push-up grip handles for transfers and bed mobility (Figure 1 and 4)
- Hospital bed functions
- Custom manual wheelchair with power assist
- Added backrest padding to wheelchair for seat depth (Figure 5)

Discussion and Conclusion

This case study highlights the innovation needed for spinal cord injury adaptive equipment specific to patients with achondroplasia as demonstrated by the treatment barriers experienced in the inpatient rehabilitation setting. With the high prevalence of patients with achondroplasia developing spinal stenosis, these authors feel that the benefits of having therapeutic adaptive equipment designed for patients with achondroplasia is paramount. With improved equipment design and availability, patients may achieve a higher level of independence in a shorter length of stay, decreasing burden and cost of care. Furthermore, appropriate and accessible equipment would promote proper body mechanics and reduce risk of injuries for patients, healthcare providers, and caregivers. These authors also specifically recognized the opportunity for redesigned manual wheelchair mechanics to promote efficiency of propulsion without the addition of power assist. There is limited literature discussing the rehabilitation needs for patients with achondroplasia and SCI. Further research is needed to optimize and standardize equipment for this population. These findings present an opportunity to advance patient centered care and promote increased quality of care.



Figure 1. Transfer board board transfer to drop arm commode. Upon evaluation, patient required 2-person total assist (therapist providing max A, 2nd assist providing min A and equipment stabilization), push-up handles, 6" step stool, transfer board.



Figure 2. Commodes trialed during patient's stay (left to right)
1. Modified padded rolling commode/shower chair with low seat-to-floor height
2. Pediatric commode
3. Standard commode
4. Drop arm padded commode



Figure 3. Example of a modified, height-adjusted rolling commode/shower chair to wheelchair transfer. Deemed unsafe and unsuccessful due to significant difference in surface height between transfer surfaces, and the high risk of injury and physical overexertion required by the healthcare worker to safely transfer the patient.



Figure 4. Sequence of stand-to-sit transition from standard K1 wheelchair with pressure relieving cushion



Figure 5. Custom ordered folding ultra-lightweight wheelchair

References

1. Bodensteiner JB. Neurological manifestations of Achondroplasia. *Current Neurology and Neuroscience Reports.* 2019;19(12). doi:10.1007/s11910-019-1008-x
2. Fredwall SO, Steen U, de Vries O, et al. High prevalence of symptomatic spinal stenosis in Norwegian adults with achondroplasia: A population-based study. *Orphanet Journal of Rare Diseases.* 2020;15(1). doi:10.1186/s13023-020-01397-6
3. Hoover-Fong J, Cheung MS, Fano V, et al. Lifetime impact of achondroplasia: Current evidence and perspectives on the natural history. *Bone.* 2021;146:115872. doi:10.1016/j.bone.2021.115872
4. Kitoh, H., Matsushita, M., Mishima, K., Kamiya, Y., & Sawamura, K. (2022, January 14). *Disease-specific complications and multidisciplinary interventions in Achondroplasia - Journal of bone and mineral metabolism.* SpringerLink. <https://link.springer.com/article/10.1007/s00774-021-01298-z>
5. Pauli, R.M. Achondroplasia: a comprehensive clinical review. *Orphanet J Rare Dis* 14, 1 (2019). <https://doi.org/10.1186/s13023-018-0972-6>