Case Report

Gutter Crutches: An Unconventional Walking Aid for Incomplete Tetraplegics – A Case Report

Senthilvelkumar T[1], Raji Thomas[2]

Abstract

The goal of the therapists and patient while selecting an ambulatory aid is to maximise walking ability, manoeuverability and independence, while maintaining safety and stability. Unlike elbow crutches or walker, gutter crutches are not a familiar and well established walking aid in the rehabilitation of persons with incomplete spinal cord injury. In this case report we highlight enhanced ambulation achieved by a 53-year-old man with chronic, incomplete tetraplegia with the use of gutter crutches.

Key words: **Gutter crutch, tetraplegia, walking aid, ambulation.**

Introduction:

The walking outcome of a person with chronic incomplete tetraplegia could be impacted by factors such as potentially poor hand grip, trunk weakness, lower extremity weakness and the consequential effects on balance, to name a few. Inappropriate walking aid prescription and inadequate user training could exacerbate the problem[1-4]. For persons with chronic incomplete tetraplegia, it is hence important to have an aid that fits into the available hand function and ensure weight transmission through the forearm, as hand deformity will be an issue. Selection of an appropriate walking aid can help enhance confidence, feeling of safety and lead to a more meaningful walking outcome, which in turn, can help raise the level of activity and degree of independence.

Author's affiliations:
1 Lecturer- Physiotherapy
2 MD (PMR), Professor
Department of Physical Medicine & Rehabilitation, Christian Medical College, Vellore-632002, Tamil Nadu, India

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Correspondence:
Dr. Raji Thomas MD (PMR), Professor
Department of Physical Medicine & Rehabilitation, Christian Medical College, Vellore-632002, Tamil Nadu, India
Phone +91 416 2282158
Email: rajithomas@cmcvellore.ac.in

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Gutter crutches were basically designed for patients with rheumatoid arthritis for whom poor hand grip and difficulty in weight bearing through inflammed joints is a common constraint[5,6]. As persons with incomplete tetraplegia may also have poor hand grip similar to those with rheumatoid arthritis, it was thought that this group of patients may also be benefited from using gutter crutches. In this case study, we report enhanced walking achieved by a patient with chronic incomplete tetraplegia with the use of gutter crutches.

Case Report:

A 53-year-old man, who was employed in a public transport corporation developed C5 incomplete tetraplegia in the C category according to the American Spinal Injury Association (ASIA) impairment scale following an alleged history of fall. Magnetic resonance imaging showed C4-C5 cord changes and central disc herniation which was managed by laminectomy.

He was initially treated elsewhere and was then transferred to our institution for rehabilitation. He was started on conventional programme which included flexibility and strengthening exercises for the key muscles of upper and lower limbs, balance, ADL and functional training. He was tilted and progressed to standing and walking in the parallel bars. His improvement in the self care activities is displayed in Table 1.

Progression in gait training was slow due to difficulty in gripping the walking aid due to poor hand function. At

discharge, he was able to walk 50 metres in 25 minutes with a right knee brace and a walker; he used the hook grasp to progress the walker. This walking aid was chosen as he was incapable of using other conventional options. He was on level 9 in Walking Index for Spinal Cord Injury scale (WISCI II).

During the 19 months at home after the rehabilitation, there was no significant improvement in the ambulatory status. Ambulation was confined to home, as he found it difficult to attain functional mobility outdoors in rough terrains with the walker. Moreover, the walker needs more space for manoeuvering, which is usually not available in the community in rural India and is unsuitable for negotiation of ramps, stairs and obstacles.

He was readmitted with the aim of improving his outdoor mobility. His upper extremity muscle score was 28.50/50 and his lower extremity muscle score was 25.75/50 as measured by manual muscle testing. He had grade 1 spasticity in all four limbs as measured by modified Ashworth scale. He had mass grasp and hook grip in the hands bilaterally. He was independent in bed mobility and was able to come to a sitting position by himself. Without any appliances he was able to walk for 80 metres with the help of a walker.

Due to poor hand grip, wrist flexion contracture and weakness of crutch muscles, he was not able to use elbow crutches, canes or axillary crutches. We considered various options to choose a different walking aid that could overcome the limitations caused by muscle weakness and deformities. This is how gutter crutches came into the radar as a possible option. Gutter crutches could fit his hand function and also allow weight transmission through the forearm (Fig 1).

Initially he found it difficult to adjust to the new walking aid and felt unsafe using it. With proper instruction (Table 2) and reassurance, he started gripping the crutches well enough to lift and place them forward safely. After the end of first week, he was made to walk outside the parallel bars using two gutter crutches with the help of one person, whose principle role was to help maintain balance. His walking endurance was worked on in a gradual manner. At the end of third week he achieved 100 metres with gutter crutches. Advanced walking skills such as negotiating ramps, rough terrain and stairs was introduced into his daily regimen in the later stages. At the end of the training, he was able to walk 150 metres in half an hour under supervision.

A follow-up visit was done after three months to review his ambulatory status in his given environment. He was able to move around better at home as well as in the community than before. He did not report any fall in the first three months of experience at home and in the community.

Fig 1- *Illustration Shows the Gutter Crutches Used in the Study*

Discussion:

The goal of rehabilitation (Table 3) for persons with spinal cord injury is to help them adjust to life by equipping them and their families with the skills and resources required for living in the community[7]. In the selection of an ambulatory aid, the goal of the therapists and patient is to maximise walking ability, manoeuverability and independence, while maintaining safety and stability.

Unlike elbow crutches or walker, gutter crutches are not a familiar and well established walking aid in the rehabilitation of patients with spinal cord injury, especially those with chronic tetraplegia. Even the WISCI II scale does not have a level describing the use of gutter crutches. The absence of literature exploring the potential use of gutter crutches for persons with

incomplete tetraplegia may also have been a factor leading to the non-consideration of this option as a walking aid in the initial rehabilitation.

For the incomplete tetraplegic in this study, progress from home ambulation to community ambulation was a transition that made a major difference in his day-to-

Table 1: *Pros and Cons of Conventional Walking Aids*

Aid	Pros	Cons
Walker	• Provides more stability • Maximises safety aspect • Suitable for severely compromised balance	• Anterior tipping risk more • Requires more space to maneuver • Not suitable for walking in Indian community environment • Stair climbing not possible
Axillary crutches	• Best suited for musculoskeletal problems • Indicated when non-weight bearing on one lower limb needed • More accessible than walker • Stair claiming possible	• Possibility of crutch palsy • Crutch muscle strain possible • Slipping common
Elbow crutches	• Easy to maneuver in small spaces • Stair climbing possible • More accessible than walker • Enables paraplegics to perform swing to or swing through walking pattern	• Not as stable as walker • Crutch muscle strain possible • Not suitable for people with weak crutch muscles
Canes	• More accessible than any other aid • Appearance gives greater sense of psychological comfort • Suitable for minimally compromised balance • Stair claiming possible	• Less stable than crutches • Chances of slipping

Table 2: *Weekwise Training Programme*

Week	Gait training	Support activities
1	• Stepping activities in parallel bar • Identification of gutter crutches as a possible walking aid • Discussion with patient of the pros and cons of the proposed walking aid • Securing his consent after making it clear that this strategy may not work • Customisation of gutter crutches	• Sit to stands • Range of motion exercises for hip and shoulder • Hand function training • Sitting balance over Swiss ball • Reaching activities • Lower limb key muscles strength and endurance training • Easy adoption to this conventional training as the patient had prior experience
2	• Started walking outside the parallel bar with support of one person • Distance gradually increased over the course of the week • Walking endurance improved to 60 metres	• Transfers practice using gutter crutches • Strengthening programme continued • Range of motion exercises for hip and shoulder • Bridging exercise • Swiss ball training
3	• Progressed to training on rough terrain • Ramp practice • Step climbing practice on four inches elevated surface • Walking endurance improved to 100 metres	• Transfer practice using gutter crutches • One leg and tandem standing balance • Strengthening programme and flexibility training
4	• Stair case practice on six inches elevation • Obstacle crossing • Community outing • Walking endurance improved to 150 metres	• Standing balance training continued • Strengthening programme and flexibility training

Table 3: *Strength and Mobility Variables at Different Stages of Rehabilitation Process*

	At the end of initial rehabilitation	At the time of admission for second round	At the time of discharge
UEMS	27.75/50	28.50/50	28.50/50
LEMS	25.25/50	25.75/50	25.75/50
Ambulatory status	Limited household	Limited household	Limited community
Aid	Walker	Walker	Gutter crutches
Appliance	Right knee brace	Nil	Nil

UEMS - Upper extremity muscle score; LEMS - Lower extremity muscle score

day life. The outcome in the initial stages was encouraging enough for the patient and us to go the distance with gutter crutches.

In rural communities in developing countries such as India, the physical environment is a major barrier for people with physical challenges. In this context, any form of walking is a superior option to wheelchair-based mobility and this aspect is emphasised in our rehabilitation process. Our evaluation and interaction with the patient clearly pointed to the need for enhanced ambulation, an opportunity to re-integrate in his community, and, most importantly, a way to resume his occupation to ensure a sustainable livelihood. These aspects forced us to look hard at possible options to explore the maximum potential of this individual with incomplete tetraplegia.

Conclusion:

Gutter crutches must be considered as a possible option for persons with incomplete tetraplegia whose hand function usually does not allow the use of conventional walking aids.

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Learning from the article

- Incomplete tetraplegics may be less capable of using the usual assistive devices that rely largely on upper extremity integrity.
- Gutter crutches fit their hand functions, and hence must be considered as an option for persons with almost similar profiles.

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