

## Optimal Positioning for an Adult Athetoid Cerebral Palsy Patient in a Wheelchair

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### ABSTRACT

The purpose of this case study was specifically to reinforce the necessity for proper positioning in a wheelchair for an adult athetoid cerebral palsy patient. A 36-year old female with cerebral palsy sat in the wheelchair with pelvic sliding, uneven weight distribution on the hips, hip adduction, and right lateral trunk tilt and rotation. The abnormal posture observed was first corrected by seating the patient well back in the wheelchair with the patient's weight evenly distributed between both hips. A seat belt, abduction pommel, trunk belt, seat cushion, and foot pad were inserted to help the patient maintain the corrected posture.

Points to consider when ordering a wheelchair and adaptive equipment are reviewed. The optimal sitting position and positioning objectives and considerations, as well as the selection process are also presented. Participation of the patient and the caregivers in the selection and decision-making processes helps lead to successful results. A thorough assessment of the patient's prognosis and environment is important to prevent harmful, expensive, and disappointing results. On-going reviews of the patient and use of the equipment are helpful in preventing deformities and other problems. As we already know, increasing the patient's function and ability to move around and explore the environment can affect his/her attitude toward daily living as well as quality of life.

**Key words:** *Wheelchair positioning, Seating, Adult athetoid cerebral palsy, Adaptive equipment*

A properly fitting and appropriately sized chair is a very important part of the treatment of physically disabled patients. Once a wheelchair has been provided, the treatment does not end there. A patient properly seated in the wheelchair can avoid deformities of the extremities or trunk, improve body alignment, increase stability, and enhance function and independence.

This article will review the present state of the art in wheelchair positioning for the physically handicapped patient. Transporting the disabled is a challenge, as comfort must be provided while maximum function must be maintained. There is a wide variety of wheelchairs and accessories available in Japan to choose from: Making the proper choices can be a long and difficult process that needs ongoing attention and reattention by the medical staff, the patient and the caregivers involved.

### MATERIALS AND METHODS

Two years prior to this study, the subject was provided with an S type 43, folding back, aluminum wheelchair made by the Sanyo Wheelchair Company. This wheelchair was used during the

study. The size of the wheelchair is as follows:

rear wheels:	22cm
casters:	6cm
seat width:	360cm (narrowed for patient)
seat depth:	400cm
seat height:	405cm (back of seat) 435cm (front of seat)
arm rest height:	200cm
back rest height:	460cm (lengthened for patient)
total chair width:	600cm
total chair height:	850cm
total chair length:	935cm
width when folded:	290cm.

Seat belts for the pelvis and the trunk were added. A cushion, abduction pommel, and foot pad were used to adjust the wheelchair to the patient for better positioning.

### RESULTS

#### Case Report

An adult athetoid cerebral palsy patient, K.K. (36 year-old female), was admitted to the Rehabi-

litation Center for treatment of a decubitus resulting from lying in bed for several days due to a high fever. During her hospitalization, the patient complained of bilateral hip pain due to bilateral hip dislocations. An inner hamstring release was performed. Prior to the operation, the patient could not tolerate the prone position, but after surgery, lying prone became possible. One month after surgery, wheelchair sitting was started. A flotation pad, lap tray, and upper trunk belt were ordered to provide the patient some comfort and support.

The patient has no severe range of motion limitations that would interfere with sitting, but total care is needed for activities of daily living. She can read and watch television, but she cannot turn the page or change channels.

Problems in her sitting posture included sliding forward of the hips in the chair, and uneven weight distribution, with more weight on the left than on the right. Her trunk rotated and tilted to the right. The hips adducted (Figs. 1, 2). Treatment began with the patient being sat well back in the wheelchair, so that weight distribution was evenly placed and no pelvic obliquity was noticeable. A belt was placed at a 45° angle to the hips to prevent sliding forward. A pad was applied under the feet to achieve 90° of hip flexion. An abduction pommel was added to decrease hip adduction. A trunk belt and lap board were applied to improve trunk stability. A cushion was added for comfort (Figs. 3, 4).

At first, the patient had some difficulty in adjusting to this new posture, but once she adapted to it, good postural alignment, better seating comfort, and less chance of a decubitus recurrence resulted. Participation in the decision-making seemed to help her accept new changes more easily.

## DISCUSSION

A program of evaluating and adapting the positioning in a wheelchair provided an adult patient with athetoid cerebral palsy a better postural alignment and increased seating comfort. Careful attention to pelvic position while placing the patient in a wheelchair is the first and most important step in good wheelchair positioning. Once this step is attained, the necessary adaptations and/or equipment can be determined<sup>6,11</sup>.

Wheelchairs are intended to support the patient in as upright a posture as possible, with adaptations used to compensate for inability to maintain the upright position<sup>4</sup>. In selecting a wheelchair, the patient's level of awareness, physical and psychological needs, functional abilities or disabilities, and quality of life must all be considered. When possible, the patient and/or caregivers should play an important part in the selection of the wheelchair and its adaptations.

The optimal sitting position is hips, knees, and ankles at 90°, with support evenly distributed under the thighs, under the feet and under the forearms at elbow height. The back and seat angle is preferably about 95° to compensate for kyphosis. When positioning handicapped patients, we often have to deviate from this optimal position to accommodate contractures and abnormal postural tone, but we retain the basic principles of good positioning: even weight distribution and adequate support for stability and comfort.

In positioning, we also try to normalize postural tone, control abnormal movement, promote normal neuromuscular development, increase functions, and prevent the development or increment of deformities<sup>7</sup>. Increasing the patient's ability to move around and explore the environment can affect his/her toward daily living and quality of life<sup>2</sup>. Comfort and a feeling of security are essential aspects to be considered. Respiration and prevention of decubiti are important factors as well. We should also be aware of the importance of the cosmetic effect of wheelchair use: people respond in a more accepting manner to a patient sitting in a wheelchair than to one lying in bed. And, an extremely important point is that of maintaining safety at all times.

A very careful and thorough assessment of the patient, the prognosis, and the environment is important to prevent harmful, expensive, and disappointing outcomes<sup>3</sup>. The patient and the caregivers should present their goals and opinions. The wheelchair and adaptations can then be selected. If possible, a seating team can usually provide the necessary advice at this point. Often a team consists of a physical therapist, occupational therapist, medical physician, biomedical engineer, and equipment sales representatives. Again, the seating team can be of great help with on-going evaluation of the patient and use of the equipment. Regular meetings are helpful to assess the value of the equipment and to discuss whether changes are necessary.

There are many types of wheelchairs and adaptive equipment to choose from<sup>1</sup>. Important accessories include footrests, safety belts, lap boards, removable armrests, high backs, brakes, tires, cushions, and various pads. Often forgotten is that wheelchairs need to be checked and maintained, including spokes, tires, bolts, and upholstery. Oiling and tightening of bolts should be carried out routinely. Cleaning and keeping the wheelchair dry will also help lengthen the utility of the chair.

Correct posture is very important and the patient's physical problems must be considered as well as positioning to enable the patient to use the least amount of energy in maintaining a seated posture<sup>10</sup>. Usually, the best posture is similar to a normal sitting position, but the pos-



**Fig. 1.** Before treatment



**Fig. 3.** After treatment



**Fig. 2.** Before treatment



**Fig. 4.** After treatment

ture may change according to particular activities. Enough stabilization in one area, such as the pelvis, often promotes mobility in another area, such as the head and arms.

As the pelvis is the major base of support in the sitting position, stabilizing the pelvis is of utmost importance. It is also necessary to observe any obliquity, anterior or posterior tilt, hip abduction or adduction, fixation, or joint dislocation. The use of hip pads, adjusted seat angle, or chair reclining may help to support the pelvis. An abduction wedge is often used. The angle of the seat belt to the chair seat should be 45°, and the belt should cross over the pelvic anterior superior iliac spine. But most important and often forgotten is to be sure the patient is positioned well back in the chair with the pelvis and hips in the best alignment obtainable.

Trunk support, such as a strap, scoliosis pad, cushion, contoured or molded back support, may be necessary. A lap board can help maintain the trunk erect, as well as a reclined chair. The patient needs to be continually checked for discomfort or pressure areas while using any form of equipment<sup>9</sup>.

It should be remembered that the wheelchair seat width should be 5 cm wider than the width of the patient's buttocks. The wheelchair seat depth should be at least 2.5 cm less than the patient's seat length<sup>8</sup>.

Further studies are recommended in the following areas: measurement of the range of motion in the wheelchair before and after changes; evaluation and measurement of changes in performance, comfort, and the scope of activities daily living with proper positioning; objective measurements (e.g. electromyographic studies, etc.) of the benefits for the patients.

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