BALANCING PRESSURE RELIEF AND POSTURAL SUPPORT

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For individuals with spinal cord injury, proper postural support is the foundation for participation in functional activity. Pressure relief and distribution is imperative as well, due to the limited mobility and sensation that often accompanies a spinal cord injury. With an annual pressure ulcer incidence of up to 30 percent[1] and up to 85 percent of individuals with SCI experiencing pressure ulcers at some point in their lives[2], the importance of adequate pressure relief is clear. There has been much research conducted on the use of powered seating functions for performing pressure relief when an individual is unable to do his or her own weight shifts. Use of a tilt and/or recline[3, 4, 5], as well as the frequency and duration of weight shifts[6] must be addressed. Despite knowing how weight shifts should be performed, research indicates individuals do not often complete weight shifts to the appropriate degree of tilt/recline nor at the appropriate frequency and duration[7]. This supports the need for, and importance of, comprehensive client education. The following case study highlights the balancing act of achieving postural alignment and pressure relief in an individual with tetraplegia.

Background

Ms. T. is a 60-year-old female who was referred to the Wheelchair Seating and Mobility Clinic by her primary in-patient occupational therapist. She had been injured approximately two months prior, resulting in motor complete, sensory incomplete C4 tetraplegia. She presented consistent with her level of injury with good head/neck control and shoulder shrug, but no other active movement. She did have some preserved sensation throughout her body. She was initially mobilized in a rear wheel drive power wheelchair with a sip and puff alternative drive control (utilizing hard and soft sips and puffs to control the power wheelchair and seating system), power tilt, and a seating system with necessary primary and secondary postural supports, including a combination gel/foam cushion.

Evaluation

At her initial evaluation, she was found to have a mild left pelvic obliquity with flexibility past midline; a tendency of a left thoracic convexity/right lateral trunk flexion, also with flexibility; and a tendency of posterior pelvic tilt. Her lower extremity range of motion was within functional limits for the seated position, although she was able to achieve only neutral dorsiflexion in her ankles. In evaluating the seating system in which she was initially mobilized, it was found that her cushion was too long, resulting in her calves hitting the front of the cushion and preventing achievement of a neutral pelvic tilt. In addition, an 18 inch wide seat was required due to her overall hip width, but she was much narrower in her trunk. The 18 inch wide back support that was utilized made it difficult to place the lateral trunk supports close enough to achieve correction of her right lateral trunk flexion. The wider back support also made it difficult to bring the arm supports in close enough for optimal upper extremity support and alignment.

In discussing her goals for mobility, she stated she would like a chair that maneuvers well indoors. While she enjoyed spending time outdoors, she felt it important that the base was intuitive to drive and would handle well in her living space. She reported she did not like the sip and puff drive system and inquired about other alternative drive control options. After being educated on power wheelchair base options (front-, rear- and mid-wheel drives), she requested to trial other rear

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> One of his parents' main concerns, however, was the position of his head. Brian kept his head forward most of the time and would actively pull forward when tilted.

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wheel drive options as well as mid wheel drive options due to her indoor living space. Education was also completed on alternative drive options, and she requested a trial of a head array alternative drive control (tripad head support with embedded drive switches and a mode switch).

During the equipment evaluation, she trialed both a mid-wheel drive base and a rear-wheel drive base set-up with a head array drive control and a power tilt. Initially, it was difficult for her to activate a mode switch placed at her left cheek due to her tendency of right lateral trunk flexion, so a mode switch at her left shoulder was utilized.

While not ideal, as this increased activation of her already very active upper trapezius muscle, it was a temporary solution that improved her independence in accessing the drive features and power tilt. Several days later, more time was spent addressing her postural needs, and the following changes were made. Her back rest was switched to 16 inches wide with gel lateral trunk supports (to reduce pressure, particularly at her left apex and to improve comfort due to her intact sensation) set low on the left and high on the right. This allowed for better correction of her tendency of a left thoracic convexity. The back angle was adjusted to maximize balance and reduce tendency of her kyphotic/forward head posture. In addition to the narrower back support and laterals, a Y-style belt was installed for use over her left shoulder to further reduce her tendency of right lateral

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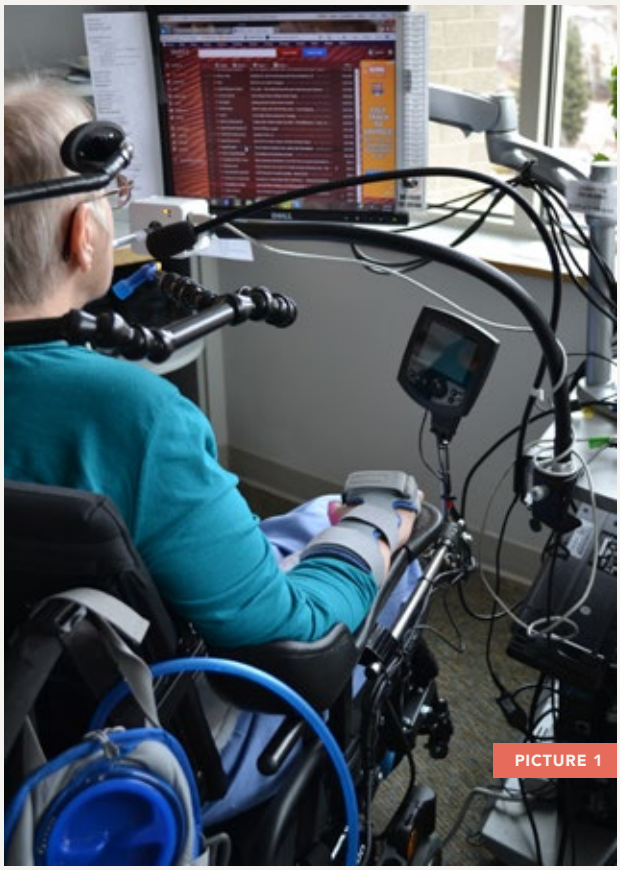

PICTURE 1

PICTURE 3

PICTURE 2

PICTURE 1: *USE OF HEAD ARRAY DRIVE SYSTEM VERSUS CHIN DRIVE OR SIP AND PUFF ALLOWED FOR INDEPENDENCE IN PULLING INTO COMPUTER STATION.*

PICTURE 2: THE Y-BELT AND LATERAL TRUNK SUPPORTS PROVIDE SUPPORT AND CORRECTION OF LEFT THORACIC CONVEXITY AND RIGHT LATERAL TRUNK FLEXION.

PICTURE 3: HEAD ARRAY DRIVE SYSTEM WITH TILT SEATING SYSTEM AND NECESSARY PRIMARY AND SECONDARY POSTURAL SUPPORTS FOR SYMMETRICAL SITTING POSTURE AND ADEQUATE SUPPORT. GOOSE NECK DRINKING SYSTEM MOUNTED TO CHAIR TO ALLOW FOR INDEPENDENT ACCESS TO WATER.

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trunk flexion. With these secondary postural supports in place, the use of a lateral pelvic support on the right as a third point of control and a shorter cushion, she was able to maintain a neutral pelvic and trunk alignment. Her improved posture resulted in an ability to more consistently and successfully utilize the head array, as well as use the mode switch by her left cheek. She had difficulty depressing an egg switch mounted at her left cheek, so a micro light switch was selected to ease her ability to consistently activate the mode switch.

With the use of appropriate depth, she was able to sit within the well of the cushion. The correct cushion size in conjunction with a right lateral pelvic support resulted in the ability to maintain a more neutral pelvic alignment with reduction of her pelvis going into a left obliquity (left side of pelvis sitting lower than right) and shifting right. A posterior base wedge was also utilized, and foot supports adjusted accordingly, in order to maintain a neutral pelvic tilt, improve thigh support/loading, and increase overall stability within the chair.

Recommendations

After the power wheelchair base and postural evaluation, a prescription was completed for a mid-wheel drive base with tracking technology (to maximize efficiency with the alternative drive use), a head array drive system with display and attendant drive control should a care giver need to operate the power wheelchair, and a power tilt. In addition, the necessary primary and secondary support surfaces were prescribed including: a back support mounted approximately six inches above the seat pan to allow space for soft tissue (posterior to pelvis) which contributed to achievement of a more neutral pelvic alignment, lumbar support, adjustable lateral trunk supports with gel, Jay 2 Deep Contour cushion for pressure relief/postural correction, trough arm supports with built in elbow support for maintenance of glenohumeral alignment when in tilted position, individual foot supports with angle adjustable foot plates to address limited dorsiflexion, and positioning belts including the Y-style belt for use over left shoulder. To maximize independence, an electric leg bag drainer, which is controlled through the power wheelchair's output module, was also prescribed. This, along with independence in accessing her cell phone, door opening (both being addressed in conjunction with the occupational therapists who work in the technology lab), and having access to water, will allow her increased independence and the ability to be left at home alone for short periods of time.

In assessing the type of seating system that would be most appropriate, it was determined that a tilt system would allow for good pressure relief while assuring access to her drive control throughout her pressure relief. Because she selected a head array drive control, it was imperative that she was able to access the switches for operation of her power tilt throughout the weight shift cycle. The chair was ordered with a 50 degree tilt.

As mentioned previously, assuring consistent and full use of the powered seating function is imperative in preventing skin breakdown. Ms. T.'s education on the importance of utilizing the full 50 degrees for adequate pressure relief, as well as the proper frequency (initially every 15 minutes, building up to every 30 minutes) and duration (two to three minutes) began from day one of her rehabilitation program[6]. At initial mobilization, she was issued a timer that automatically alarms to serve as a reminder for frequency of pressure relief, as well as to cue her when the target duration has been achieved (Gymboss Interval Timer). This was utilized throughout her in-patient rehabilitation program and use was encouraged after discharge from the hospital as well. She also participated in a patient education module with nursing staff regarding prevention of pressure ulcers.

Conclusion

Through configuring primary and secondary support surfaces to achieve ideal postural alignment, the footprint of Ms. T.'s body was optimized prevent peak pressures and reduce risk of skin breakdown. Education on the importance of pressure relief and training in effective use of the power tilt system will assure protection of her skin well into the future. In addition to achieving pressure distribution and relief, the configuration of the seating system optimized functional use of her head/neck for drive control and use of assistive technology for independence in environmental, computer and phone access.

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References

1. *Young JS, Burns PE. Pressure sores and the spinal cord injured: part II. Model Systems'. SCI Digest, 1981; 3: 11--26, 48.*

2. *Fuhrer MJ et al. Pressure ulcers in community-resident persons with spinal cord injury: prevalence and risk factors. Arch Phys Med Rehabil, 1993; 74: 1172 -1177.*

3. *Giesbrecht EM, Ethans KD, Staley, D. Measuring the effect of incremental angles of wheelchair tilt on interface pressure among individuals with spinal cord injury. Spinal Cord, 2011; 49(7): 827-31.*

4. *Sonenblum SE, Sprigle SH. The impact of tilting on blood flow and localized tissue loading. Journal of Tissue Viability, 2011; 20(1):3-13.*

5. *Jan YK, Jones MA, Rabadi MH, Foreman RD, Thiessen A. Effects of wheelchair tilt-in-space and recline angles on skin perfusion over the ischial tuberosity in people with spinal cord injury. Arch Phys Med Rehabil, 2010: 91(11): 1758-64.*

6. *Jan YK, Liao F, Jones MA, Rice LA, Tisdell T. Effect of durations of wheelchair tilt-in-space and recline on skin perfusion over the ischial tuberosity in people with spinal cord injury. Arch Phys Med Rehabil, 2013; 94(4): 667-72.*

7. *Sonenblum SE, Sprigle S. Distinctive tilting behaviors with power tilt-in-space systems. Disability and Rehabilitation: Assistive Technology, 2011; 6(6):526-35.*

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