WHAT TO DO WITH THE ANTERIOR PELVIC TILT

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Introduction

Many people who use wheelchairs have a preference for the anterior pelvic tilt and upright to slightly forward oriented sitting, as this allows them to function. If these individuals do not receive proper training, education, and seating intervention, this persistent tendency can lead to adaptive shortening of both muscle and non-contractile tissues that limit the potential for postural correction. This workshop addresses biomechanics, evaluation, and treatment of the anterior pelvic tilt in sitting.

The Hip in Standing

The most common tendency for pelvic rotation in the seated posture is the posterior pelvic tilt. Why do people stand most commonly with an anterior pelvic tilt, yet sit with a posterior pelvic tilt? Why, with the exception of pathology typically related to the spine or hip, do people rarely stand with a posterior pelvic tilt? Why is it that some people sit with a tendency for anterior pelvic rotation?

The hip joint has greater stability in standing than it does in sitting. The hip capsule and hip flexors influence this greatly. Because hip extension is the closed pack position for the hip, standing with hip extension winds up the hip joint capsule for greater stability. One can, in fact, stand with the hip at end range of extension, relax the musculature about the hip, and not fall, as the hip capsule reaches end range and blocks further extension. The hip flexors' (iliopsoas) role further adds to the stability of the hip in standing. Originating at the iliac fossa and anterior surfaces of the lumbar vertebral bodies, and inserting on the lesser trochanter of the femur, the hip flexors' reverse muscle action is lumbar extension. Again, when standing with the hip at end range of motion of the hip flexors, the iliopsoas passively holds the pelvis anterior, and pulls the lumbar spinal segments forward to create a lumbar lordosis. The result of both actions of the hip capsule and hip flexors in hip extension is a stable hip and anterior pelvic tilt. This is why people tend to stand with anterior pelvic tilts.

The Hip in Sitting

All of the wonderful mechanics of the hip that provide stability in standing are absent in sitting. As soon as one moves into hip flexion all passive stability is lost. The hip capsule unwinds, and the hip flexors are no longer at end range. The hip, at this point, requires muscle activity to create stability. One cannot sit unsupported without muscle activity about the hip, and the most prevalent direction of pelvic rotation when attempting this is posterior. This is why people tend to sit in a posterior pelvic tilt, and why people with weakness or paralysis of the hip musculature have little choice but to sit posteriorly.

Why then do some folks sit with an anterior pelvic tilt? This is more difficult to explain, but observation of sitters for a great length of time has led this author to speculate that, in many cases, it may be secondary to disease progression. As a category, people with slow progressive neuromuscular diseases seem to have a greater propensity for an anterior pelvic tilt in sitting. It is possible that people who have experienced normal development, and then experience the slow debilitating process of a progressive neuromuscular disease, maintain a preference for the anterior pelvic tilt, and upright to slightly forward oriented sitting. This allows them to function. As the muscles that allow the person to sit actively in this position weaken, the tendency to collapse passively into an anterior pelvic tilt and exaggerated lumbar lordosis strengthens. A common exception to this theory are children with Spina Bifida, but many of them do ambulate, often with bracing, early in life, but abandon ambulation later for more efficient wheeled mobility. Having had the experience and developmental benefits of weight bearing through ambulation, they share the preference of anterior tilt in sitting with people who experience normal development prior to onset of disability such as muscular dystrophy and multiple sclerosis. If these individuals do not receive proper training, education, and seating intervention, this persistent tendency can lead to adaptive shortening of both muscle and non-contractile tissues which limits the potential for postural correction.

The Process of Assessment and Intervention

Although this course focuses primarily on seating intervention, it is very important that clinicians and suppliers conduct a thorough evaluation to determine all factors influencing their clients' ability to sit safely and function in their wheelchairs. Intervention is directed towards optimal postural alignment for nondestructive resting postures and preparation for and support of mobility and function. Intervention must be mindful of what people need to do in their wheelchairs, how long they must do "it", and in what environments. People must be supported in a fashion that promotes maximal independence in mobility and function, yet protects them from skin breakdown.

Intervention

In a most simplistic interpretation of a wheelchair seating assessment, virtually any finding will have an implication for intervention in at least one of the four following categories:

1. Angles. Any limitation of postural flexibility will have an impact on the angular relationships of seating supports.
2. Shape. Although many people may have the ability to sit at roughly the same angular relationships, everyone has a unique shape. Each individual's unique shape will determine the contours of the supports chosen.
3. Orientation. Once angles and shapes are determined, the orientation of the seating relative to gravity, method of mobility, and environments of use must be determined.
4. Materials. The choice of materials is tied to many factors including skin care, postural control, breathability and maintenance.

Interventions for the sitter with an anterior pelvic tendency versus the posterior pelvic tendency are very different. Location of support surfaces and orientation of supports relative to gravity are nearly opposite. Lack of attention to these differences often results in people with posterior tendencies sliding out of their chairs, and people with anterior tendencies falling forward away from their back supports. A basic understanding of these principles will lead to more effective seating intervention for the long term.

The anterior pelvic tilt and forward orientation of trunk relative to pelvis is a very functional posture. When actively controlled, this posture provides access to all kinds of functional activities. Almost everything an able-bodied person does functionally is preceded by an active anterior and lateral weight shift, so it should be of no surprise that a person with a disability desires the same. The problem experienced by a person with a disability occurs when the ability to sustain active control in an anterior orientation diminishes, but the desire to be forward does not.
This leads to a passive collapse into the anterior posture, and becomes a destructive resting posture. Over time the hip flexors adaptively shorten and the hip capsule may lose flexibility. As the tendency persists, the lumbar lordosis increases, and the thoracic spinal curve may reverse from a normal kyphosis to a lordotic curve. The cervical curve may increase or decrease depending on the degree of forward rotation at the hips.

Try sitting upright maintaining your shoulders in alignment over your hips while slowly exaggerating your lumbar and thoracic extension to the extent that you can. What happens in your cervical spine as your thoraco-lumbar lordosis increases? You experience a flattening or reduction of the cervical lordosis, i.e. flexion of the cervical spine as a compensatory measure to maintain visual orientation. Now attempt to "lock" your spinal curves and rotate forward at the hip about 45 degrees. You must now extend the cervical spine and use capital extension to restore visual orientation. Continue to rotate forward at the hips, but maintain forward gaze, until you can prop your elbows on your knees. Has your cervical and capital extension increased? Now completely relax everything except your head and neck. You are now experiencing the latent result of prolonged forward orientation with the progression of disability. You can move out of this posture, but imagine a person experiencing this progression over a period of years, rather than minutes, with limited ability to actively move out of this tendency. Simulate this long-term consequence by actively locking your entire hip, spine, and head alignment. Now "tilt" yourself posteriorly until your shoulders are once again above or slightly behind your hips, but don't let your head and neck flex. You are now looking at the ceiling and experiencing one reason why tilt as an intervention this late in the game is not possible because of contractures of the cervical and capital extensors. The person can no longer flex at the head and neck to restore visual orientation.

What can be done to reverse this scenario? Early and aggressive intervention and education is the key. Once this tendency is identified, the person and caregivers must be instructed in the potential consequence of persistent forward orientation. Taking them through the exercise above is a powerful tool. Once you have gained understanding of the scenario, you can then begin intervention.

Early Intervention

The goal of early intervention is not to block a person's ability to transition forward, but to influence how they move forward for function and to create support for a non-destructive resting posture. A posterior slope of the seat will promote a posterior tendency of the pelvis, yet observation of most seating interventions for "anterior tilters" reveals level to minimal posterior slope. A posterior slope of the seat will help keep the pelvis and lumbar spine stabilized into a back support during rest, and promote use of trunk flexion, rather than hip flexion, to transition forward for function. The choice for seating and manual wheelchair options that allow for adjustment of seat and back angle over time to maintain postural flexibility and optimal function is essential. Once the sitter loses the ability to actively restore a resting posture with good spinal alignment and pelvis and lumbar spine stabilized into a back support, progression of contractions may rapidly ensue.

If a manual wheelchair continues to be the choice for mobility, then passive stabilization of the pelvis and lumbar spine into the back support may be an option. You may try a well padded 4-point mount pelvic positioning belt capturing the ASIS with a horizontal direction of pull towards the back canes with the additional strap directed vertically to the seat-rails to prevent upward movement of the belt into the abdomen. If the tendency for collapse is too strong, this intervention may result in skin irritation or breakdown at the ASIS. In this case, an abdominal panel capturing the ASIS and abdomen may be necessary. If left untreated the anterior collapse may result in loading of the ASIS directly on to the femurs leading to skin breakdown and numerous other complications.

If power mobility is chosen, then power tilt, along with a very generous dose of education, is essential. Often times a person with the desire to be forward for function may be unaware of the need to reverse the tendency during rest, and will instead prop forward on their elbows to relax. Persistence in this habit results in the debilitating progression outlined above. Educating a sitter to use the tilt function to restore the support of his/her trunk into a back support during rest is critical. Doing this early and often is key in maintaining hip and spinal flexibility, and warding off the need for anterior trunk supports. Instruct the client to tilt forward for functional activities, and tilt back for rest. The earlier the intervention, the lesser amount of tilt will be needed to restore the trunk into a back support. Tilt will most likely be needed for regular pressure relief as well, and the person needs to be educated to tilt the system fully for an effective weight shift.

A word about the environment and out-of-wheelchair positioning.

Don't assign all responsibility for long term postural care and functional sitting postures to the wheelchair. Ensure that work, home, recreational and educational environments are evaluated and modified to reduce the need for anterior trunk orientation. Assess sleeping postures, as well as all other out-of-wheelchair positions and supports. It is not uncommon to discover that these out of wheelchair positions and activities are feeding into the overall scenario of deterioration. It is also possible to restore or maintain a person's ability to sit by addressing out-of-wheelchair support and activities.

Summary

Pelvic tendencies in standing versus sitting are different. Understanding why is essential for a wheelchair seating practitioner. Assessment of people relative to their predominant pelvic tendency in sitting is a necessary step in determining appropriate seating intervention. Accurate assessment will lead to definition of clear goals and successful interventions. Effective wheelchair seating will help secure long-term optimal postural alignment for nondestructive resting postures and preparation for and support of mobility and function.

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