



TONE MANAGEMENT

MEDICAL FOCUS

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Tone management encompasses medical interventions designed to reduce increased muscle tone. Reducing tone may result in increased function, improved postural control, improved range of motion, and increased strength in opposing muscle groups. These interventions may directly impact the seated posture of a client, as well as the postural support required in a wheelchair seating system.

What is muscle tone? Our muscles remain in a steady partially contracted state caused by a flow of nerve impulses. Tone is measured by the amount of resistance to movement. Muscle tone is controlled by two factors. First, inhibitory signals from the brain to the spinal cord release GABA to make muscles relax. Second, excitatory stimulating signals from the muscles to the spinal cord tell the muscle to contract. If this balance is normal, muscle tone is normal. In increased muscle tone, a lack of inhibition from the central nervous system (CNS) results in excessive contraction of the muscles and is generally due to damage in the brain or spinal cord.

Muscle tone can be decreased (hypotonia) or increased (hypertonia). Rigidity, often seen in clients with brain injury, occurs when tone is increased in both the flexors and extensors and is non-velocity dependent. Velocity dependent tone, often seen in clients with cerebral palsy, is an increase in tone in response to a quick movement of the limb which elicits a stretch reflex. Spasticity typically refers to muscle spasms which are increased with movement.

Specific tone management strategies include oral medications, injections, intrathecal Baclofen infusion and surgeries.

REDUCING TONE MAY RESULT IN INCREASED FUNCTION, IMPROVED POSTURAL CONTROL, IMPROVED RANGE OF MOTION, AND INCREASED STRENGTH IN OPPOSING MUSCLE GROUPS.

ORAL MEDICATIONS

Oral medications used for reduction of muscle tone include Dantrolene, Baclofen, Diazepam (Valium) and Tizanidine. The primary use of these medications may not be for tone reduction, but this may be one of the effects. These medications have a global impact on muscle tone. As such, if a client has high tone in the extremities, but low tone in the trunk and neck, these medications will reduce all tone and can lead to decreased trunk and head control. These medications, like most medications, also have side effects. A common side effect is fatigue. Some medications are also used to reduce extraneous movements commonly seen in clients with increased tone and include Artane and Modafinil.

INJECTIONS

Two primary injections are used to manage muscle tone – Phenol and Botox. A key advantage of injections over oral medications is a targeted reduction in tone, rather than a global impact. Many clients may take oral medications and still receive injections in specific muscle groups. Phenol injections destroy part of the motor nerve leading to a muscle belly. This reduces the flow of information between the muscle and CNS resulting in reduced tone. The motor nerve regrows and so the effects are temporary. Botox, or Botulinum toxin A, injections destroy some of the motor receptors in the muscle belly. Less of the muscle is able to contract, reducing tone. These receptors also grow back and so the effects are temporary. Phenol injections typically last longer than Botox, but are used in larger muscles and away from sensory nerves (as Phenol could cause damage to these nerves). The amount of Botox that can be used is determined by the weight of the client. The physician may be limited in how many areas can be injected by the total amount of Botox that can be safely used.

INTRATHECAL BACLOFEN INFUSION

One of the main side effects of oral Baclofen is fatigue. This same medication can be used in much smaller doses when administered intrathecally, reducing side effects. Intrathecal Baclofen Infusion (ITB) administers the medicine via a catheter from a pump placed in the abdomen to the intrathecal space, next

(CONTINUED ON PAGE 42)



TONE MANAGEMENT*(CONTINUED FROM PAGE 40)*

to the spinal cord. One advantage of ITB is more consistent delivery and resultant levels of Baclofen as compared to oral medication.

SURGERIES

The most common surgical procedure to reduce muscle tone is Selective Dorsal Rhizotomy (SDR). In this surgery, approximately 50 percent of the dorsal sensory roots from the spinal cord are cut, decreasing signals between the CNS and the muscles and resulting in decreased tone in the lower extremities. Reduction in tone in the lower extremities sometimes leads to a reduction seen elsewhere as overflow is reduced. This surgery is often performed in clients for whom the procedure may improve ambulation.

The wheelchair seating specialist often works closely with the medical team in determining the optimal tone

management to meet positional and functional needs. The seating evaluation team may refer to the tone management team if increased muscle tone is negatively impacting posture and function. If the client experiences side effects such as decreased head and trunk control, this needs to be communicated back to the rehab physician.

For further information:

Spasticity Treatment & Management. Medscape. <http://emedicine.medscape.com/article/2207448-treatment>

What are some Muscle Tone Management Options for Cerebral Palsy? My Child Without Limits. United Cerebral Palsy.

<http://www.mychildwithoutlimits.org/understand/cerebral-palsy/cerebral-palsy-treatment/cerebral-palsy-muscle-tone-management/>

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RESOURCES:

UNITED SPINAL ASSOCIATION
[HTTP://WWW.SPINALCORD.ORG](http://www.spinalcord.org)

NATIONAL INSTITUTE OF NEUROLOGICAL DISORDERS AND STROKE (NINDS) SPINAL CORD INJURY INFORMATION PAGE
[HTTP://WWW.NINDS.NIH.GOV/DISORDERS/SCI/SCI.HTM](http://www.ninds.nih.gov/disorders/sci/sci.htm)

PARALYZED VETERANS OF AMERICA (PVA)
[HTTP://WWW.PVA.ORG](http://www.pva.org)