

NEUROLOGICAL DIVISION

Stretch Beyond Your Expectations.[™]

Central Nervous System

Comprehensive Training 1



Brain Spinal Cord

Nervous System











The Brain and its functions

Based on Diagrams from Head injury - A Practical Guide By Trevor Powel



Spinal Cord





Autonomic Nervous





Neurological Statistics to Take to the Bank!



-- IN THE UNITED STATES ALONE THERE ARE -

- 1.5 million Brain Injuries per year, multiplied by 5 years = 7.5 Million People!
- Rehab Time is 2 Years Minimum for the average injury and many will go through rehabilitation programs for their entire lifetime.

The Common Causes of Brain Injuries by percentages are as follows:

41% Auto Accidents 15% Pedestrian Accidents 15% Jump/Fall 14% Violence/Guns 6% Bicycle Accidents 4% Motorcycle 5% other

Additional Statistics by Percentages:

72% Male 28% Female 40% under the age of 25

Top 5 Diagnosis Occurring Annually



- TBI:
- CVA:
- CP:
- MS:
- <u>SCI:</u>
- Total:

1,500,000 700,000 800,000 10,000 (200 weekly) <u>11,000</u> 3,021,000



- # Neurologists 12,879
- # Physiatrists 7,817

• Total: 20,696



A neurological diagnosis can be defined as a disruption of the upper motor neuron inhibitory pathways proximal to the anterior horn cell in the spinal column.

Anything distal of the anterior horn cell is considered the Peripheral Nervous System and will be classified as an orthopedic diagnosis.

Please see the attached list of diagnosis which will include some of these specific diagnosis, as well as, some exceptions to the previously stated definition. Please note that this is not an all inclusive list of diagnosis.



Brain Injury

TBI- Traumatic Brian Injury
CHI- Closed-Head Injury
CVA- Cerebral Vascular Accident (Stroke)
Cerebral Thrombosis-Cerebral Embolism-Cerebral & Subarachnoid Hemorrhages
OBS- Organic Brain Syndrome
Brain Tumor (Encephaloma)
Shaken Baby Syndrome

Anoxic Brain Injuries (Lack of oxygen to Brain) Near Drowning MI (Myocardial Infarction)- Heart Attack Strangulation Smoke Inhalation Choking-Blocked Airway Crush Injury to chest or throat



Brain Injury cont...

CP- Cerebral Palsy

Types-

Spastic Cerebral Palsy Athetoid Cerebral Palsy Ataxic Cerebral Palsy Rigidity Cerebral Palsy Tremor Cerebral Palsy

Affected Limbs

Diplegia-Limbs on both sides affected Hemiplegia or Hemiparesis-arm/leg one side affected Quadriplegia or Quadriparesis-4 limbs affected (Bil arms; Bil legs)



Spinal Cord Injury/Abnormality

- SCI-Spinal cord injury (injury can be incomplete/complete)
- Para-paraplegia (Paralysis waist down)
- Quad- quadraplegia (paralysis neck down)
- Spinal Ischemia
- Degenerative Myelopathy
- Transverse Myelitis
- Spinal Tumor
- Cervical Spondylosis



Disease and Abnormality of CNS

Spina Bifida (congenital or Birth) Tumors or Neoplasms of spinal column MS-Multiple Sclerosis MD-Muscular Dystrophy* Duchenne's Disease (Pseudohypertrophic) Becker's Disease Pompe's Disease Emery-Dreifuss ALS-Amyotropic Lateral Sclerosis (Lou Gehrig's Disease) CMT-Charcot-Marie Tooth Disease GBS-Gullian-Barre Syndrome *All other DX under MD blanket



Disease and Abnormality of CNS cont...

Dystonia PD-Parkinson's Disease AD-Alzheimer's Disease Epilepsy Meningitis (Encephalomeningitis) Polio Mental or Psychiatric Health Disorders Depression Schizophrenia Dementia Anxiety Developmental Delay* Idiopathic Toe Walker* *If Linked to a primary Neuro Diagnosis



Neuropathies due to Peripheral Nerve Damage: (Compression i.e., Impingement, Entrapment or Crush Injury)

Erb's Palsy (Brachial Plexus injury caused during birth)

RPS – Regional Pain Syndrome* RSD – Reflex Sympathic Dystrophy* *If Linked to a primary Neuro Diagnosis

ATTENTION: All orders based on Primary & Secondary Diagnosis.

DSI in Conjunction with other Treatments

Status Post Anti-Spasticity Drugs and Nerve Blocks

Botox or Myobloc Injection

Baclofen (Pump Implant or Oral Pills)

Phenol Nerve Block (Injections) Etc. (Muscle Relaxers)

Status Post Surgery

Tendon release or Lengthening

Tone & Spasticity



- Disruption of the upper motor neuron inhibitory pathways by stroke, brain trauma, or spinal cord injury leads to muscle spasticity. Spasticity is characterized by increased muscle tone, hyperactive reflexes, and possible clonus or rigidity. The increased muscle tone may result in loss of joint motion, leading to contractures. Treatment of established contractures is difficult. Prevention of contractures by joint mobilization is emphasized as a goal in the management of patients with spasticity.
- The increased muscle tone may be mild to severe; muscle clonus, "clasp-knife" phenomenon, and rigidity. In addition, muscle weakness and loss of dexterity are often present. A more complete understanding of these entities requires a review of the pertinent aspects of neurophysiology and anatomy. These aspects include the spinal reflexes, methods of muscle tone regulation, and the functions of the descending pathways of the central nervous system.

-Passage taken from "Spasticity and Contracture" by Michael J. Botte, M.D., Vernon L. Nickel, M.D., and Wayne H. Akeson, M.D.

Important Message...



 "Contracture prevention is one of the most significant goals in the management of the patient with spasticity."

 Botte MJ, Nickel VL, Akeson WH: Spasticity and Contracture, Physiologic Aspects of Formation; Clinical Orthopaedics and Related Research, No 233: 7-18, Aug. 1988.

Dynasplint[®] and the Neurological Patient

The neurological patient is an excellent candidate for dynamic splinting and Dynasplint® Systems. The springloaded tension system safety accommodates the patient's tone by moving with the patient during episodes of resistance or spasms. When the tone is challenged with a consistent even force that will fatigue the muscle and mentally relax and balance the patient to accept the Dynasplint®, the spring tension systems will then bring the patient back to their endrange to continue a low-load prolonged duration stretch (LLPS).

Dynasplint[®] and the Neurological Patient

Obviously, Dynasplint® Systems can be beneficial for existing contracture patients, as well as, those new patients who need early intervention to prevent contractures from forming by normalizing the tone and maintaining ROM for the future. A longterm wearing schedule is always recommended for both management and prevention by delivering a daily program of ROM with Tone Inhibiting Therapy at home while the patient is resting.

Some of the problems that can occur without early tone and contracture management are as follows: pain, skin breakdown, problems with hygiene, difficulty with dressing, transfers and positioning in bed and while sitting. Overall, the Dynasplint® Systems Home Program for the neurological patient can greatly reduce the cost of rehabilitation by maintaining functional gains, lessening the possibility of surgical intervention and improving quality of life.

Benefits of Using Dynasplint® Systems With the Neurological Patient



- Increase ROM by Inhibiting the Tone
- Remodel Soft Tissue and Resolve Joint Contractures
- Prevent New Contractures by Normalizing the Tone
- Maintain ROM once Functional Goals are Reached
- Reduce Wound Care
- Minimize the Number of Costly Surgeries
- Prevent Pain Associated with ROM Deficits
- Improve Quality of Life
- Adjunct to the Therapy Program
- Adjunct to Botox[®], Intrathecal Baclofen[™], or Phenol Motor Point Nerve Blocks
- Adjunct to a Serial Casting Program
- Adjunct to a Tendon Release or Lengthening
- Lifetime ROM Modality to Continue
 Therapeutic Progress





Your Questions Answered:

I. What is Botox[®]?

Botox[®] is a therapeutic muscle relaxing product that works on nerve signals from the brain that leads to the muscles. It is in a class of drugs called neuro toxins. It is derived from the bacterium clostridium botulinum, also known as Botulinum Toxin Type A or the brand name we know as, Botox[®] produced by the Pharmaceutical Company, Allergan[®], who holds the registered trademark.

II. How does Botox[®] work?

Normally, the brain sends signals to our muscles to contract and move by way of a substance in the brain called acetylcholine. Botox[®] works to block this chemical sent by the brain to the muscle; thus, the muscle does not receive the message to contract. This means that the muscle contractions with spasms in our neurological patients will stop or be greatly reduced depending on the effectiveness of the drug.





III. How is Botox[®] administered?

Botox[®] is injected with a very fine needle into a muscle or muscle group. Usually, 1-3 injections are given per muscle. Discomfort is usually minor, but not always. Sometimes patients complain of pain during the procedure.

IV. How long before it begins to take effect and how long does it last?

Usually 3-7 days to begin to see the effect of the drug. The drug can last approximately 3 months or longer with peak benefits in two weeks post injection. A gradual fading will occur and at that time, the doctor may recommend a follow-up treatment. Changes in response may require dose adjustments with follow-up injections. Antibody formation may be a problem for long-term use. Usually no more than three repeat injections are recommended in 1 year.





V. When is the Dynasplint[®] applied?

The Doctor may dictate the time of application. Usually 7-10 days after the injection when the drug has taken affect is ideal.

VI. Is Botox[®] a new treatment?

This drug has been available for over 15 years. It has been used on thousands of patients worldwide.

Botox[®]



Phase I



Phase II



B. MYOBLOC[™] (Botulinum Toxin Type B)

(Same principle as Botox[®] (Used primarily for cervical dystonia)

C. Baclofen Oral

(This is assimilated via the digestive system into the blood stream)

D. ITB[™] Therapy

A treatment option that delivers an injectable form of baclofen, Lioresal® Intrathecal (baclofen injection), directly to the fluid surrounding the spinal cord using a programmable pump and catheter that are surgically placed in the body. The medicine is delivered continuously based on the prescription programmed by your doctor. This method is called intrathecal infusion. The system delivers medication in small, controlled doses throughout the day. The difference between ITB therapy and oral medications is the delivery of the drug baclofen to the site where it is used-the fluidfilled area surrounding the spinal cord. This relieves severe spasticity with only tiny amounts of medication. This minimizes side effects (weakness, drowsiness, nausea, or other negative effects).

> Lioresal[®] is a registered trademark of Novartis Pharmaceuticals Corp.

ITB™ Therapy Set-Up

SynchroMed Pump:

The pump is an implantable, battery-powered device that stores and dispenses medicine according to instructions provided by your doctor.

• Catheter:

A flexible, silicone tube that connects to your pump and delivers medication from the pump to a specific site in your body.

• **Programmer**:

Your doctor/nurse will use a programmer during your refill and checkup sessions. The Medtronic programmer is the external component of the SynchroMed Infusion System. The programmers allows the doctor/nurse to communicate with and program your pump to deliver the right amount of medicine.

E. Nerve Block (Phenol injection)

F. Rhizotomy

(removal of nerve)

 Dynasplint[®] is a winning combination with these medications, allowing us to have a window of opportunity to achieve end range stretch while the tone is temporarily modified. After our goals are reached, we can then maintain the gain in range of motion for the future by continuing to manage the tone; thus helping to eliminate the potential for new contractures.

DSI and Serial Casting

Dynasplint can be an adjunct to a serial casting program. After a series of casting or at the end of the casting procedure, DSI can be applied for a long-term home management program. Unlike casting, DSI is easy to apply and easy to adjust. This will allow more valuable time for you to give to your patients during their therapy sessions. DSI can be safely worn for 6-8 continuous hours during the course of the day or night maintaining ROM between therapy sessions.

Dynamic Splinting:

 Dynasplint[®] System's LLPS technology promotes permanent soft tissue range of motion gains, functional improvement and tone management with regular use.² Serial Casting:

 Increased tone and spasticity, or contracture can return when casting procedure has ended.
 Possible loss of functional gain.

2-MacKay-Lyons M: Low-Load, Prolonged Stretch in Treatment of elbow Flexion Contractures Secondary to Head Trauma: A Case Report. Physical Therapy, Vol 69, No 4: 292-296, Apr. 1989.

Dynamic Splinting:

 Very few contraindications-safe and appropriate for most neurological diagnosis, as well as burns, hemophilia and diabetes (not appropriate for DVT or unstable fractures).

- Many contraindications and inappropriate for many peoplediabetics, broken or healing skin, hot and swollen joints, vascular disease, sensory loss and excessive sweating.^{3,4}
- 3-Botte MJ, et al: Spasticity and Contracture, Physiologic Aspects of Formation. Clinical Orthopaedics and Related Research, No. 233: 7-18, Aug. 1988.
- 4- Lebmkubl LD,et al: Multimodality Treatment of Joint Contractures in Patients with Severe Brain Injury: Cost, Effectiveness, and Integration of Therapies in the Application of Serial/Inhibitive Casts. Journal of Head Trauma Rehabilitation, pp 23-42, Dec. 1990.

Dynamic Splinting:

- Individualized wearing schedules based upon patient needs and tolerance. Worn up to a maximum of 6-8 continuous hours per day/night.
- Usually worn 24 hours per day until casting procedure ends.

Dynamic Splinting:

 All Dynasplint[®] Systems are easily removablelined with lambs wool and foam to protect skin integrity, and to prevent skin breakdown or nerve impingement.

- Complications can include nerve impingement and skin breakdown-possibly leading to hospitalization, wound care, skin grafts and/or amputation.⁴
- 4- Lebmkubl LD,et al: Multimodality Treatment of Joint Contractures in Patients with Severe Brain Injury: Cost, Effectiveness, and Integration of Therapies in the Application of Serial/Inhibitive Casts. Journal of Head Trauma Rehabilitation, pp 23-42, Dec. 1990.

Dynamic Splinting:

 Easy application. Practical and cost effective. One fitting by a Dynasplint[®] Systems sales consultant with occasional followup visits for minor adjustments when necessary.

- Can be labor intensive and time consuming.⁴
 Requires high degree of skill with material readily available.
 Can be expensive due to repetitive efforts over many years.
- 4- Lebmkubl LD,et al: Multimodality Treatment of Joint Contractures in Patients with Severe Brain Injury: Cost, Effectiveness, and Integration of Therapies in the Application of Serial/Inhibitive Casts. Journal of Head Trauma Rehabilitation, pp 23-42, Dec. 1990.