Clinical Treatments I

HYPOTONUS, DISUSE AND TRUE ATROPHY

Definitions:

Hypotonus: abnormally decreased or deficient muscle tone

Atonic: without normal tension or tone

Muscle Atrophy: a decrease in the size of muscle cells and therefore size of the muscle affected. Atrophy causes a severe degree of hypotonicity and wasting of muscle tissue. There are two types of muscle atrophy, disuse and true

Disuse Atrophy: atrophy secondary to any primary lesion causing immobility, or due to failure to exercise part or all of the body.

True Atrophy: loss of function due to de-enervation of muscle, through pathology or trauma, or degeneration of muscle tissue itself, through disease process (ex. Muscular Dystrophy)

Etiology:

- Loss of function and/or immobility due to any pathology or trauma
- Secondary to central or peripheral nervous system disorder with reduced or absent neural input to the musculature
- Muscle wasting usually becomes obvious after 4-6 weeks and progresses to its maximum by 12 weeks (Magee).
- Circulatory changes due to neural injury take approximately 3 weeks to become significant (Magee)

Physiological and Pathological Changes:

Hypotonus:

- Innervation intact
- Cell number, no change
- Cell size, reduced
- Muscular tone decreased
- Fibrosis unlikely but may be present
- Contractures unlikely but may be present
- AROM normal
- PROM may be normal, or reduced in the presence of contractures, joint dysfunction, or other pathology
- RROM may be reduced or weak.

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Disuse Atrophy:

- Innervation intact
- Cell number and size: no change or reduced (time factor)
- Muscular tone decreased
- Contractures less common, but may be present
- AROM may be reduced, rarely absent
- PROM as per hypotonus
- RROM usually reduced, but not absent

True Atrophy:

- Innervation disrupted
- Cell number and size reduced
- Muscular tone decreased
- Fibrosis may be present
- Contractures may be present
- AROM absent
- PROM as per hypotonus
- RROM absent

Signs and Symptoms:

- Muscle weakness or paralysis, usually specific and localized
- Some degree of muscle wasting, decreased girth
- Possible presence of adhesions, fibrous or myofibrositic nodules
- Possible presence of contracture
- Tissue may feel cool or boggy

Assessment:

History:

- Systemic dysfunctions, pathologies seriously affecting the neuromuscular system
- Type/position of immobilization, and/or immobilization device
- Length of time immobilized

Observation:

- Posture, compensations, tissue colour, scarring

Palpation:

- Note presence/absence and location of fibrosis, contracture, adhesions

Movement:

- AROM/PROM/RROM
- MMT for specific muscular involvement

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Neurological:

- Essential to include dermatome, myotome testing in true atrophy, as well as sensation testing where the atrophy is secondary to a central nervous system disorder. Reflex testing may also be of assistance.

Pain Referral:

- Pain may be secondary to nerve regeneration processes
- Pain may be of muscular origin (connective tissue resistance, muscular loss of flexibility or fatigue)

Special Tests:

- Girth measurement
- As per specific primary or related dysfunction(s) indicated

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HYPERTONUS, MUSCLE SPASM

Hypertonicity can result in pain and tenderness, secondary to ischemia and/or the formation of active trigger points and muscle spasm. Abnormalities of posture, position and movement result and over time can lead to abnormal lengthening or shortening of structures (fibrosis and contracture).

Definitions:
Tonus: normal or non-pathological tone

Hypertonus: abnormally increased or excessive muscle tone often with increased resistance to stretch, but possibly with a normal resting length (H&K)

Hypertrophy: enlargement of existing muscle fibers (T&D)

Hyperplasia: increase in number of muscle fibers

Spasm: a type of hypertonicity, often sudden and uncontrolled involuntary contraction of muscle fibers involving all or part of muscle. May be tonic (sustained) or clonic (alternation spasm and relaxation).

Intrinsic Spasm: due to trauma, inflammation, increased SNS firing, or related to alteration in circulatory or biochemical imbalance (electrolyte imbalances) of the muscle ex. Post athletic event fatigue, cold and immobilization. Short duration, intrinsic muscle spasm also sometimes called “cramp” or “stitch”.

Reflex Muscle Guarding/ Extrinsic Spasm: protective mechanism to immobilize a part of the body having sustained an injury. The pain causing the spasm may be in underlying tissues, or referred from another area. This may create involuntary or voluntary muscle guarding.

Cramp: lay term for prolonged muscle spasm. Painful spasmodic contraction caused by decreased circulation, overuse, injury, dehydration, decreased electrolytes (T&D)

Misnomers:
“Charley Horse” hematoma, contusion

Spasticity: state of sustained, involuntary hypertonicity, secondary to central nervous system pathology.

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Etiology:

Muscle Spasm:

1. Primary Lesions:
   - Reaction to direct trauma, cold, or immobilization
   - Response to weakness in opposing muscle (agonist-antagonist imbalance)

2. Secondary Lesion:
   - Reaction to trauma in other tissues, structures, providing protective guarding, compensation for movement, ADLs.

Physiological and Pathological Changes:

- Potential for cycle of restricted movement, ischemia, retained metabolites, circulatory stasis, pain, and increased muscle spasm
- Often accompanied by trigger point syndrome
- May result in continuation of joint dysfunction despite efforts to treat the joint

Signs and Symptoms:

- Pain, severe and local, or dull, aching and referred – as in trigger point syndrome
- Unilateral and/or segmental contraction, approximation of associated bony segments
- Loss of resilience and pliability
- Potential presence of T.P.'s

Assessment:

History:

- Associated focal trauma vs. compensatory mechanism or guarding response
- Timing and severity of swelling; potential of hematoma
- Mechanism and severity of injury; potential of undetected underlying dysfunction (ex. Fracture, dislocation)
- Systemic dysfunction, disease (ex appendicitis, gall stones)

Observation:

- Postural, gait compensation
- Girth size (approximate)
- Pallor (ischemia)

Palpation:

- Texture, Tone, Temperature, loss of resilience and pliability
- Pain on light-deep palpation, with possible referral
- Location of TPs

Movement:

- May affect both AROM, PROM and end feel
- May prevent assessment of joint play
- May affect gait and ADLs

Neurological:
- May compress underlying neurological structures, assess for numbness, tingling, weakness.

Referred Pain:
- Possible TPs in affected muscle and associated muscles
- Potential response to trauma/dysfunction by distant structures, ex joint, viscera, dura
- May compress neurological structures
- May aggravate existing myofascial strain/restriction pattern

Special Test:
- As indicated for region(s) involved.
- Pain on AROM, Pain on PROM, Pain on RROM

Treatment of Hypertonus

Postural /Positional:
Trigger Point Release
Stretching
Point pressure/C-bowing/S-bowing
X-Fiber Frictions/ mm stripping
Origin-insertion approximation (reset mm. Spindle)
Pin and stretch

CNS Lesion
ROOD Techniques
Sedating/Inhibitory tech

Hydro:
Heat or neutral warmth

Remex:
Active movement/stretching
Postural correction
Relaxation training

Acute vs. Sub Acute Muscle Spasm

Acute	Sub Acute
Treatment Goal:	Treatment Goal:
Remove the cause	Remove the cause (Posture/Activities/Etc.)
Address metabolic function	Correct Joint function
Warm tissue/Cool Tissue	Decrease mm guarding
Reset mm/pt education	Restore mm balance

Acute	Sub Acute
Treatment Techniques:	Treatment Techniques:
Rehydrate if post event	Deep Breathing/ Visualization

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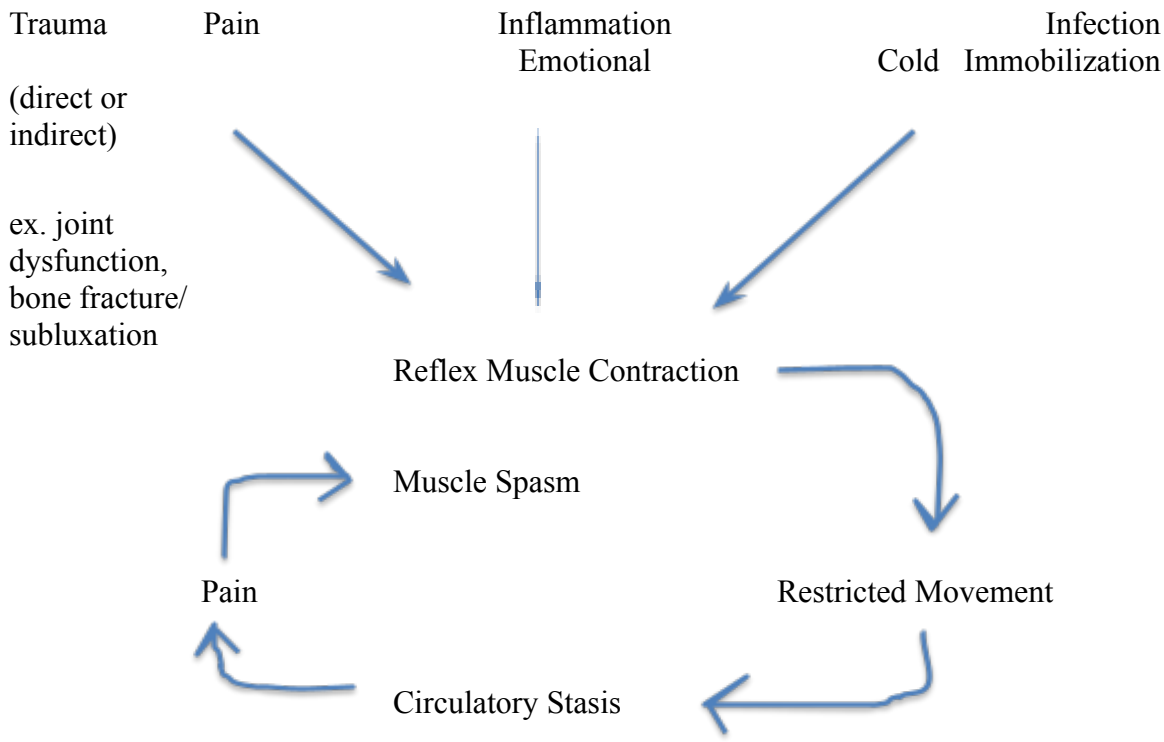
Deep Breathing/ Neural Stroke	Tx. Proximal and Bilateral Structures
Agonist Contract Stretch/AROM/PROM	Mm Stripping/ Deep Circulatory work
Effleurage/Flushing/Petrissage	Flushing/ Petrissage
GTO/MTAR Release	Hold Relax Stretching
Hold Relax/ Ag. Contract	Joint Mobs
Tissue approximation	MFTPs/MTAR/ Fascial Release
Joint Play (GR 1&2 Oscillation-H&K316)	
RESET MUSCLES	**RESET MUSCLE**

Schematic of the self perpetuating Cycle of Muscle Spasm



Contracture: Fibrosis of connective tissue in skin, fascia, muscle, or joint capsule. Prevents normal mobility of related joint or tissue. Fibrotic contracture is the contracture in a muscle in which the muscle tissue has been replaced by fibrotic tissue due to injury.

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Fibrosis: Abnormal formation of fibrotic tissue (eg. A scar)

Adhesion: A holding together, or uniting of two surfaces or parts, as in wound healing.