

**HYPOTONUS
DISUSE
TRUE ATROPHY**



DEFINITIONS

HYPOTONUS: abnormally decreased or deficient mm tone

ATONIC: w/o normal tension or tone

MUSCLE ATROPHY: a decrease in the size of the mm cells and therefore size of the mm affected. Atrophy causes a severe degree of hypotonicity and wasting of mm tissue. There are two types of mm 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 MM,
THROUGH PATHOLOGY, TRAUMA, OR DEGENERATION
OF MM TISSUE ITSELF, THROUGH DISEASE PROCESS
(EX: MUSCULAR DYSTROPHY)

ETIOLOGY:

- ❑ LOSS OF FUNCTION AND/OR IMMOBILITY DUE TO ANY PATHOLOGY/TRAUMA
- ❑ SECONDARY TO CENTRAL/PERIPHERAL NN SYSTEM DISORDER WITH REDUCED/ABSENT NEURAL INPUT TO THE MUSCULATURE
- ❑ MM WASTING USUALLY BECOMES OBVIOUS AFTER 4-6 WKS AND PROGRESSES TO IT'S MAX BY 12 WKS (MAGEE)
- ❑ CIRCULATORY CHANGES DUE TO NEURAL INJURY TAKE APPROXIMATELY 3 WKS TO BECOME SIGNIFICANT. (MAGEE)

PHYSIOLOGICAL AND PATHOLOGICAL CHANGES

HYPOTONUS:

- ☐ INNERVATION INTACT
- ☐ CELL NUMBER, NO CHANGE
- ☐ CELL SIZE, REDUCED
- ☐ MM 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

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/PARALYSIS, USUALLY SPECIFIC AND LOCALIZED
- ❑ SOME DEGREE OF MUSCLE WASTING, DECREASED GIRTH
- ❑ POSSIBLE PRESENCE OF ADHESIONS, FIBROUS OR MYOFIBROSTIC NODULES
- ❑ POSSIBLE PRESENCE OF CONTRACTURE
- ❑ TISSUE MAY FEEL COOL OR BOGGY

ASSESSMENT

HISTORY:

- ❑ SYSTEMIC DYSFUNCTION, 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, AND ADHESIONS

MOVEMENT:

- ❑ AROM
- ❑ PROM
- ❑ RROM
- ❑ NMT FOR SPECIFIC MUSCULAR INVOLVEMENT



NEUROLOGICAL:

- ❑ ESSENTIAL TO INCLUDE DERMATOME/MYOTOME TESTING IN TRUE ATROPHY, AS WELL AS SENSATION TESTING WHERE THE ATROPHY IS SECONDARY TO A CENTRAL NN SYSTEM DISORDER.
- ❑ REFLEX TESTING MAY ALSO BE OF ASSISTANCE

PAIN REFERRAL:

- ❑ PAIN MAY BE SECONDARY TO NN REGENERATION PROCESSES
- ❑ PAIN MAY BE OF MUSCULAR ORIGIN
 - ❑ CONNECTIVE TISSUE RESISTANCE
 - ❑ MUSCULAR LOSS OF FLEXIBILITY
 - ❑ FATIGUE

SPECIAL TESTS:

- ❑ GIRTH MEASUREMENT
- ❑ AS PER SPECIFIC PRIMARY OR RELATED DYSFUNCTION(S) INDICATED

HYPERTONUS AND MUSCLE SPASMS

- ❑ HYPERTONICITY CAN RESULT IN PAIN AND TENDERNESS, SECONDARY TO ISCHEMIA AND/OR THE FORMATION OF ACTIVE TPS, AND MM SPASMS.
- ❑ ABNORMALITIES OF POSTURE, POSITION AND MOVEMENT RESULT AND OVER TIME CAN LEAD TO ABNORMAL LENGTHENING OR SHORTENING OF STRUCTURES (FIBROSIS/CONTRACTURE)

DEFINITIONS:

- ❑ TONUS: NORMAL OR NON PATHOLOGICAL TONE
- ❑ HYPERTONUS: ABNORMALLY INCREASED/EXCESSIVE MM TONE OFTEN WITH INCREASED RESISTANCE TO STRETCH, BUT WITH POSSIBLE NORMAL RESTING LENGTH
- ❑ HYPERTROPHY: ENLARGEMENT OF EXISTING MUSCLE FIBERS
- ❑ HYPERPLASIA: INCREASE IN NUMBER OF MM FIBERS
- ❑ SPASM: A TYPE OF HYPERTONICITY, OFTEN SUDDEN AND UNCONTROLLED INVOLUNTARY CONTRACTION OF MM FIBERS INVOLVING ALL OR PART OF MM. MAY BE TONIC (SUSTAINED) OR CLONIC (ALTERNATION SPASM AND RELAXATION)

DEFINITIONS:

- ❑ INTRINSIC SPASMS: DUE TO TRAUMA, INFLAMMATION, INCREASED SNS FIRING, OR RELATED TO ALTERATION IN CIRCULATORY OR BIOCHEMICAL IMBALANCE (ELECTROLYTE IMBALANCES) OF THE MM. EX: POST ATHLETIC EVENT FATIGUE, COLD AND IMMOBILIZATION. SHORT DURATION, INTRINSIC MM 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 MM GUARDING

DEFINITION:

- ❑ CRAMP:
 - ❑ A TERM FOR PROLONGED MM SPASM.
 - ❑ PAINFUL SPASMODIC CONTRACTION CAUSED BY DECREASED CIRCULATION, OVER USE, DEHYDRATION, DECREASED ELECTROLYTES

MISNOMERS:

- ❑ “CHARLEY HORSE”
- ❑ SPASTICITY
 - ❑ STATE OF SUSTAINED, INVOLUNTARY HYPERTONICITY, SECONDARY TO CNS PATHOLOGY

ETIOLOGY:

1. MUSCLE SPASM
 - 1.1. PRIMARY LESION:
 - 1.1.1. REACTION TO DIRECT TRAUMA, COLD, IMMOBILIZATION
 - 1.1.2. RESPONSE TO WEAKNESS IN OPPOSING MM (AGONIST/ANTAGONIST IMBALANCE)
2. SECONDARY LESION:
 - 2.1. REACTION TO TRAUMA IN OTHER TISSUES, STRUCTURES, PROVIDING PROTECTIVE GUARDING, COMPENSATION FOR MOVEMENT AND ADLs

PHYSIOLOGICAL AND PATHOLOGICAL CHANGES:

- ❑ POTENTIAL FOR CYCLE OF RESTRICTED MOVEMENT
- ❑ ISCHEMIA
- ❑ RETAINED METABOLITES
- ❑ CIRCULATORY STASIS
- ❑ PAIN
- ❑ INCREASED MM SPASM
- ❑ OFTEN ACCOMPANIED BY TP SYNDROME
- ❑ MAY RESULT IN CONTINUATION OF JOINT DYSFUNCTION DESPITE EFFORTS TO TREAT THE JOINT

SIGNS AND SYMPTOMS:

- ❑ PAIN: SEVERE, LOCAL, DULL, ACHING AND REFERRED - AS IN TP SYNDROME
- ❑ UNILATERAL AND/OR SEGMENTAL CONTRACTION, APPROXIMATION OF ASSOCIATED BONY SEGMENTS
- ❑ LOSS OF RESILIENCE AND PLIABILITY
- ❑ POTENTIAL PRESENCE OF TP_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)

ASSESSMENT:

- ❑ OBSERVATION:
 - ❑ POSTURAL: GAIT COMPENSATION
 - ❑ GIRTH SIZE (APPROXIMATE)
 - ❑ PALLOR (ISCHEMIA)

ASSESSMENT:

- ❑ PALPATION:
 - ❑ TEXTURE
 - ❑ TONE
 - ❑ TEMPERATURE
 - ❑ LOSS OF RESILIENCE AND PLIABILITY
 - ❑ PAIN ON LIGHT/DEEP PALPATION, WITH POSSIBLE REFERRAL
 - ❑ LOCATION OF TPs



ASSESSMENT:

- ❑ MOVEMENT:
 - ❑ MAY AFFECT BOTH AROM, PROM, AND END FEEL
 - ❑ MAY PREVENT ASSESSMENT OF JOINT PLAY
 - ❑ MAY AFFECT GAIT AND ADLs

ASSESSMENT:

- ❑ NEUROLOGICAL:
 - ❑ MAY COMPRESS UNDERLYING NEUROLOGICAL STRUCTURES
 - ❑ ASSESS FOR NUMBNESS, TINGLING, WEAKNESS

ASSESSMENT:

- ❑ REFERRED PAIN:
 - ❑ POSSIBLE TP_s IN AFFECTED MM AND ASSOCIATED MM
 - ❑ POTENTIAL RESPONSE TO TRAUMA/DYSFUNCTION BY DISTANT STRUCTURES (EX. JT, VISCERA, DURA)
 - ❑ MAY COMPRESS NEUROLOGICAL STRUCTURES
 - ❑ MAY AGGRAVATE EXISTING MYOFASCIAL STRAIN/RESTRICTION PATTERN

ASSESSMENT:

- ❑ SPECIAL TESTS:
 - ❑ AS INDICATED FOR REGION(S) INVOLVED
 - ❑ PAIN ON AROM
 - ❑ PAIN ON PROM
 - ❑ PAIN ON RROM

TREATMENT OF HYPERTONUS:

- ❑ POSTURAL/POSITIONAL
 - ❑ TP RELEASE
 - ❑ STRETCHING
 - ❑ POINT PRESSURE
 - ❑ C-BOWING
 - ❑ S-BOWING
 - ❑ X-FIBER FRICTIONS
 - ❑ MM STRIPPING
 - ❑ O & I APPROXIMATION (RESET MM SPINDLE)
 - ❑ PIN & STRETCH

HYDROTHERAPY:

HEAT OR NEUTRAL WARMTH



CNS LESION:

- ❑ SEDATING/INHIBITORY TECHNIQUES
- ❑ ROOD TECHNIQUES:

- ❑ neurophysiological and developmental treatment approach that was developed by Margret Rood to improve the tone of muscles (both flaccidity and [Spasticity](#)).

REMEX:

- ❑ ACTIVE MOVEMENT
- ❑ STRETCHING
- ❑ POSTURAL CORRECTION
- ❑ RELAXATION TRAINING

ACUTE VS. SUBACUTE 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 VS. SUBACUTE MM SPASM

ACUTE	SUBACUTE
TREATMENT TECHNIQUES:	TREATMENT TECHNIQUES:
REHYDRATE IF POST EVENT	DEEP BREATHING/VISUALIZATION
DEEP BREATHING/NEURAL STROKE	TX.PROXIMAL/BILATERAL STRUCTURES
AGONIST CONTRACT STRETCH/AROM/PROM	MM STRIPPING/DEEP CIRCULATORY WORK
EFFLEURAGE/FLUSHING/PETRISSAGE	FLUSHING/PETRISSAGE
GTO/MTAR RELEASE	HOLD RELAX STRETCHING
TISSUE APPROXIMATION	JOINT MOBS
JOINT PLAY (GR 1&2, OSCILLATION-H&K316)	
REST MUSCLES	REST MUSCLES

Schematic of the self perpetuating Cycle of Muscle Spasm



Trauma
(direct or indirect)

ex. joint dysfunction,
bone fracture/
subluxation

Pain
Emotional

Inflammation
Cold Immobilization

Infection

Reflex Muscle Contraction

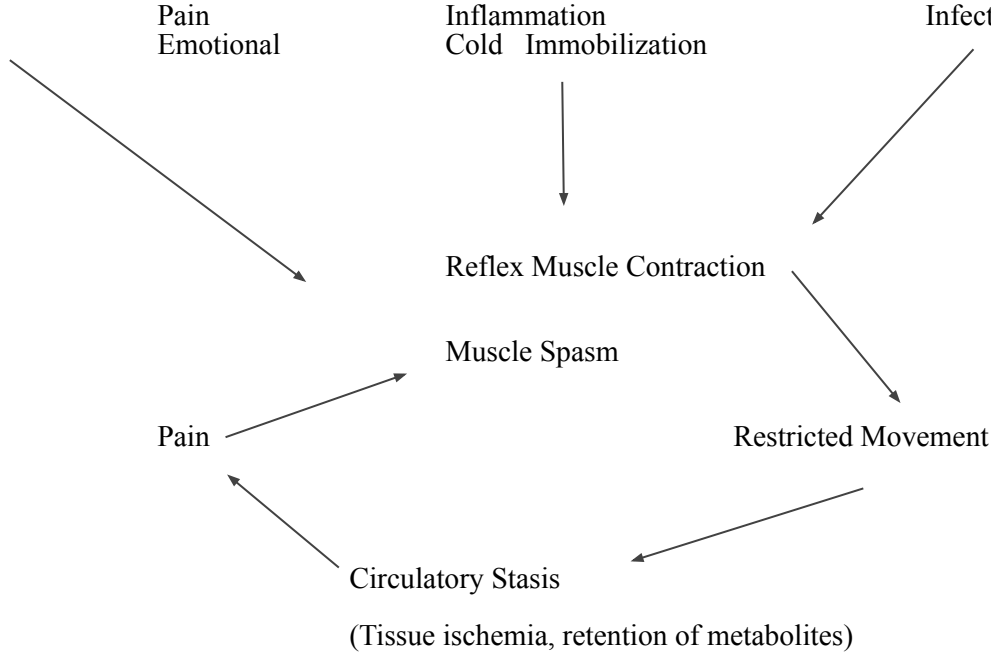
Muscle Spasm

Pain

Restricted Movement

Circulatory Stasis

(Tissue ischemia, retention of metabolites)



CONTRACTURE:

- ❑ FIBROSIS OF CONNECTIVE TISSUE IN SKIN, FASCIA, MM, OR JOINT CAPSULE.
- ❑ PREVENTS NORMAL MOBILITY OF RELATED JOINT OR TISSUE
- ❑ FIBROTIC CONTRACTURE IS THE CONTRACTURE IN A MM IN WHICH THE MM TISSUE HAS BEEN REPLACED BY FIBROTIC TISSUE DUE TO INJURY

FIBROSIS:

ABNORMAL FORMATION OF
FIBROTIC TISSUE (EX. A SCAR)



ADHESION:

A HOLDING TOGETHER, OR UNITING OF
TWO SURFACES OR PARTS, AS IN
WOUND HEALING

