

## MUSCLE TONE/TENSION: INFLUENCING FACTORS

### Psychological stress

- Chronic pain sufferers, (LBP, TMJ) experience increased muscle tension only in the painful muscles in response to personally stressful experience (not generalized to other muscle groups!).
- Also demonstrate increased guarding of the painful area in the presence of painful stimulus elsewhere (hand).

### Lack of sleep

- Reduction in normal levels of growth hormone
- Responsible for failure of muscle to repair
- Resulting in observable muscle micro-damage, subsequent pain

### Nutritional & Metabolic Factors

#### Deficiency

- Value outside the normal range
- Easily recognized
- Often associated with a clinical syndrome

#### Insufficiency

- Within the normal range
- Suboptimal for an individual
- Associated with symptoms but challenging to recognize

Adequate nutrition is a fundamental requirement for the maintenance of health and the treatment of disease. The human body needs at least minimum amounts of 40 essential nutrients to sustain life including water- and fat-soluble vitamins, minerals, essential amino acids, essential fatty acids, nitrogen, carbohydrates, fats, and protein.

The body operates as an integrated biochemical system in which there is simultaneous requirement for all the essential nutrients. Biochemical pathways consist of sequences of individual reactions where various nutrients are needed for specific reactions within a pathway. If all the needed nutrients are available in adequate supply except one, the entire pathway function is blocked!

## Hypothyroid

### Thyroid Stimulating Hormone (TSH)

- Norm = 0.5-5.5 ISU
- Individual optimal range quite narrow
  - >3.5 ISU associated with muscle pain
    - Also, coldness, dry skin/hair, fatigue, constipation
    - Medication that lowers to 2.25 leads in marked decrease in muscle pain, improved endurance

### TSH

Essential role in regulation of Na<sup>+</sup>/K<sup>+</sup>-ATPase pumping, ion cycling Chronic stress leads to hypo-activation of H-P-A axis leading to decreased levels of T3

## Iron insufficiency

Common condition: occurs when muscle ferritin is depleted.

Symptoms: muscle aching, tiredness, unusual fatigue with exercise, sense of coldness

Seen in

- 9-16% females
- 19-22% Hispanic & African American females
- Vegans
- Chronic intake of NSAIDs

Initial stage of deficiency: 15ng/ml Anemia: 10ng/ml

Restless leg syndrome: <50ng/ml Disturbed sleep AD/HD: <45ng/ml

Iron insufficiency: iron requiring enzymatic reactions are limited, leading to local energy crisis when muscles are exposed to excessive mechanical stress.

Upper limit in men & premenopausal women: 150ng/ml Postmenopausal women: 300ng/ml

## Statin-class drugs

- Associated with myopathy in 2/3rd of subject group (n=<36,000)

- Impair mitochondria leading to mitochondrial calcium leak and an altered regulation of the sarcoplasmic reticulum

### **Vitamin d insufficiency**

Commonly associated with chronic nonspecific musculoskeletal pain

- Muscle weakness
- Myofibrillar protein degradation
- Reduced muscle mass
- Osteoporosis

Serum 25(OH)D levels

- 25ng/ml = optimal
- 20-30ng/ml = insufficiency

Study, n=150 patients

- 90% < 20ng/ml, 28% < 8ng/ml

### **Vitamin b12 insufficiency**

Common, affecting 15-20% of individuals with chronic myofascial pain Norm = 200-1200 pg/ml

Symptoms can occur < 350 pg/ml

- Cognitive dysfunction
- Degeneration of spinal cord
- Peripheral neuropathy
- Widespread myalgia

Summarized from:

Dommerholt J, Gerwin R. Nutritional and Metabolic Perpetuating Factors in Myofascial Pain. In: Myofascial Trigger Points, Dommerholt J, Huijbregts P, eds. Jones and Bartlett Publishers; Sudberry, Massachusetts. 2011; 25-29.