

The Psychophysiologic Effects of Stress
on the Myofascial Pain
Syndrome: A Literature Review

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ABSTRACT:

Objective: To review the current literature of the psychophysiologic relationship between stress and myofascial pain syndrome (MPS).

Data Source: Reference Texts, journal articles, and case studies found at Logan College of Chiropractic Library.

Data Collection: The resources utilized included standard texts as well as recent research information and case studies. Some older information was used because it provided information which newer material did not cover.

Conclusion: Myofascial pain is experienced by almost everyone at some point in life. It is becoming an epidemic in today's society. Recent research demonstrates a relationship connecting stress and the psychological aspect of myofascial pain. It has also been shown that depression can also be a cause of MPS. New light is being shed on the cause and the many new treatment options available to patients with this syndrome.

Key Indexing Terms: Myofascial Pain, psychophysiologic pain, stress, psychological pain, chronic pain, psychosocial stress.

INTRODUCTION

According to Alvarez and Rockwell, in their article Trigger Points: Diagnosis and Management, chronic musculoskeletal pain disorders affect about ten percent of the population of the United States¹. One of these musculoskeletal disorders is myofascial pain syndrome (MPS). According to Travell and Simons, myofascial pain is pain that results from myofascial trigger points found in skeletal muscle. These trigger points can cause sensory, motor, and autonomic symptoms². Trigger points are discrete, focal, hyperirritable spots, which are located in taut bands of skeletal muscle. MPS is a very common and painful part of almost everyone's life at one point or another. Myofascial pain can be caused by mechanical stresses, nutritional inadequacies, metabolic and endocrine inadequacies, psychological factors, and chronic infections among other etiologies².

Psychological factors play a large role in causing myofascial pain. These factors are stress related. Stress causes an array of physiologic effects resulting in pain. In today's society stress is a major issue many individuals face. As stated by Sandman and Backstrom³, stress is defined as the human bodies' response to a demand placed upon it

that can result in negative impact on the body, such as MPS.

Stress causes the body to develop pain, which distracts the body from the stress at hand. According to John Sarno, author of The Mind Body Prescription, this is referred to as a psychosomatic or mind body disorder, which may result in many painful states including: headaches, stomachaches, allergies, skin conditions and muscle aches⁴. Every person experiences one of these mind body disorders during their lifetime.

Psychosomatic disorders cause many pain syndromes. These syndromes are widespread, often reaching epidemic proportions and include back, neck, shoulder, and limb pain. Stress causes chemical changes in the brain, which result in an increase in the release of epinephrine, nor-epinephrine, serotonin, acetylcholine and dopamine⁵. These neurotransmitters cause the nerve cells in muscles to become increasingly excited leading to the development of myofascial trigger points thereby resulting in pain. Stress also leads to increased muscle tension leading to decreases in local blood flow resulting in low oxygen, low adenine tri-phosphate (ATP) reserves, and decreased calcium pump action. The combinations of these factors lead to the development of trigger points. Imbalances of these

chemicals have also been shown to have a strong link with depression. Depression has also been shown to have a link with many pain syndromes such as MPS, which will be discussed in this review.

Many treatment options are available to the patient suffering from myofascial pain. It is important that the clinician be able to identify what factors are involved with the myofascial pain syndrome in order to contribute to a successful treatment outcome. Many treatment options will be outlined in this paper.

DISCUSSION:

Pathophysiology of pain and stress

Myofascial pain syndrome (MPS) is an ongoing problem in today's society. MPS is now recognized by physicians as a psychophysiologic problem. Many studies have shown a relationship between psychological stress and MPS.

The purpose of this paper is to demonstrate how MPS has a psychophysiologic connection with stress and depression. Stress responses produce pain through an interaction between cognitive, emotional, behavioral, physiological and environmental inputs.

Stress causes the autonomic nervous system to function improperly, with changes occurring in sympathetic and parasympathetic systems. Studies show that patients with acute pain syndromes have hyperactivity of the sympathetic nervous system. The sympathetic nervous system is associated with the flight or fight response to a situation which prepares the body to engage in action by speeding up heart rate, increasing blood pressure, sweat production, and releasing hormones such as adrenalin, thyroxin, and adreno-cortical steroids. The parasympathetic system is complementary to the sympathetic system in that it

decreases heart rate, blood pressure and sweating. The parasympathetic system works in conjunction with the sympathetic system to maintain homeostasis, or balance. When the sympathetic system is activated for prolonged periods from stressful situations, this throws off that balance resulting in tissue damage and the breakdown of bodily functions. This lack of balance leaves a person more disposed to a pain state, such as MPS.

The activation of the sympathetic nervous system decreases the local blood supply to muscles leading to psychogenic muscle tension and therefore MPS. Studies have shown that tender points possess decreased levels of ATP and phosphocreatine, which are an indication of a decreased aerobic capacity. When the parasympathetic system is in prolonged activation this can predispose a person to depression and anxiety, again leading to pain causing states such as MPS^{2,5}.

When a person is under emotional stress there is an increase in the release of hormones such as epinephrine, adrenaline, and cortisol from the activation of the sympathetic system. The hypothalamo-pituitary-adrenal (HPA) system coordinates this reaction. The HPA system receives and integrates stress-related inputs⁶. The hypothalamus is part of the emotional portion of the brain,

also known as the limbic system. The limbic system is linked to the pituitary gland, which releases a substance called cortisol releasing factor (CRH). CRH is produced by the neurons of the hypothalamus. CRH is responsible for the production of ACTH which is released from the pituitary gland and travels via the blood stream to the adrenal glands. The adrenal glands produce both adrenaline and cortisol. During chronic stress the HPA system is deregulated causing physiologic changes in the body. These changes lead to problems such as anxiety and depression that perpetuate MPS.

Cortisol is responsible for maintaining high levels of glucose. Prolonged output of cortisol from ongoing stress can be destructive to muscle tissue. Cortisol in excess amount breaks down proteins in muscle cells resulting in the development of MPS⁷. Stress causes people to have high levels of anxiety and tension, which also lead to myofascial pain. Skeletal muscle plays a large role in the expression of emotions, which is why psychogenic muscle tension is a component in myofascial pain⁸. As stress becomes more and more chronic there is a sharp decrease in the amount of serotonin available for use in the nervous system facilitating increased pain transmission⁹. This

further leads to MPS becoming more of a problem for the patient.

Anxiety causes an increase in muscle tension. This leads to an overload of the tense muscle, which cuts off the microcirculation of blood resulting in a decrease in the delivery of oxygen to the muscle cells². As stated earlier this leads to decreases of ATP and phosphocreatine, which leads to the development of myofascial trigger points. Such tension is found in people who work at desk jobs and are consistently in neck flexion. These people often have myofascial trigger points in their trapezius muscles¹⁰. Kirkaldy and Willis propose that factors such as tension and anxiety can affect the autonomic nervous system by causing it to cut off the blood supply in local areas of muscle, which lead to muscle injury and pain¹¹. Anxiety may also affect a part of the brain called the reticular activating system, which facilitate increased pain transmission to the brain according to an article by Seaman and Cleveland¹².

Other factors such as behavioral stresses including smoking, alcohol, and caffeine use can perpetuate myofascial trigger points. Individuals who are under large amounts of stress may use these substances to help relax them^{2,5}. However, these substances especially nicotine and

caffeine are actually causing more harm than good. Nicotine causes nicotinic acetylcholine receptors to become activated in the motor end plates, which can cause myofascial trigger points. Caffeine causes activity at motor end plates by acting on both ryanodine and adenosine A2A receptors, which can also potentially cause myofascial trigger points⁵.

Psychological factors of stress and myofascial pain

Psychological stress is experienced by almost every person at some point of their life; this could be from difficulties at work, marital difficulties, schoolwork, sickness, or money problems. Psychological stressors can also lead to anxiety or even depression. When people undergo large amounts of emotional stress and depressed states, the body unconsciously expresses this stress as physical symptoms, called psychosomatic pain this tends to distract persons from the high levels of stress at hand.

In a study done by Friction of 164 patients with MPS of the neck and head, twenty to twenty-five percent of the patients noted they had some degree of anxiety, depression, or anger¹³. When patients cannot find any relief of their pain, or a specific cause of the pain, over an extended

time period, they lose hope. This in turn leads to the person becoming more depressed. This causes a vicious loop of being depressed and in pain. Studies have shown that a depressive syndrome can cause an onset of chronic pain; this then causes the patient to psychologically amplify their pain⁵.

According to an article by Seaman and Cleveland, a clinically oriented experiment has shown that psychogenic/mental distress can promote low-back pain. This study was conducted with a group of 1,638 subjects who did not have low-back pain. This group was observed to determine the relationship between psychological distress and low-back pain. The results showed that symptoms of psychological distress can predict new onsets of low-back pain. It was stated that sixteen percent of new episodes of low back pain are related to anxiety and depression. However, there is still no answer to explain what the mechanism is which causes anxiety and depression to generate pain states.

There is a gender factor with stress and myofascial pain. Females have been shown to have more hormonal, behavioral, and psychosocial problems than males. Research has reported that women often have more chronic pain and experience more states of depression than do men⁷. A study

conducted by Velly, Gornitsky and Philippe showed that out of eighty-three MPS patients and one hundred control subjects that eighty-one percent of the cases of MPS were female patients¹⁴.

Treatments

Treatment for MPS includes many types of therapies ranging from trigger point injection procedures, to prescription drugs, to more conservative measures such as chiropractic care and psychological counseling. As more research is conducted on the psychological aspect of MPS, conservative treatments are increased in utilization.

If mechanical stress on muscles is the suspected cause of MPS then the first line of treatment must include elimination of chronic overuse or the other repetitive stress injuries. If anxiety or depression is the cause of the MPS then pharmacological drugs may have to be used such as antidepressants, or NSAIDS¹.

The spray and stretch technique is a very popular treatment of trigger points and MPS. This is performed by spraying the affected muscle with ethyl chloride producing a temporary anesthesia and then passively stretching the muscle. Trigger point injection is also another option

that produces an immediate symptomatic relief and inactivates the trigger points. The injection technique is used infrequently¹.

Other, more conservative treatments include chiropractic manipulations, acupuncture, electrical stimulation and ultrasound. Research continues to show the relationship between the brain and MPS. As a result, mind body therapies are coming into more common use to reduce myofascial pain. Mind body therapies include stress coping using cognitive-behavioral therapies or meditation. These therapies help in reducing stress levels and anxiety. Using such therapies can help the patient to become aware of the way they react to daily stress. Patients then can control the way they react to their stress^{15,19}.

According to a research article by Eseyel, Caglar, and Alemir entitled "Treatment of Myofascial Pain," patients with MPS had higher scores for anxiety and depression. When they tested treatment methods, neck stretches, ultrasound, and trigger point injections, all treatments were found to be equally effective. The study used the Beck Depression Inventory (BDI) and the Taylor Manifest Anxiety Scale (TMAS) to measure depression and anxiety. The study was made up of 102 patients who had MPS. The patients were placed in three groups, one group received Ultrasound, the

second group neck-stretching exercises and the third group received trigger point injections¹⁶.

A study conducted by Chuen-Ru et al. On physical therapeutic modalities on myofascial trigger points used 119 subjects whom had palpable myofascial trigger points. The study involved two stages. Stage one evaluated the immediate effect of ischemic compression with two different treatment pressures. Stage two evaluated six therapeutic combinations including: hot packs, active range of motion, ischemic compression, electric nerve stimulation (TENS), spray and stretch and interferential current with myofascial release.

The results showed that ischemic compression therapy provided using different pressures and different treatment times produces immediate pain relief and trigger point sensitivity suppression. It was also shown that therapeutic combinations using hot packs, active range of motions, spray and stretch, TENS and interferential current with myofascial release had the most effective results for the treatment of myofascial trigger points and improving cervical range of motion¹⁷.

Conclusion:

There is definite evidence demonstrating the connection between stress, depression and MPS. As people undergo stress, such as psychologic stress, social stress, or anxiety, they have a much higher chance of developing MPS. This is an important concept because of the epidemic of MPS in today's society. In today's world every person is under some level of stress and because of this increase of stress, there is an increase in the prevalence of MPS. Depression is also on the rise in society as well. Depression can be caused from stress and also physical pain such as MPS¹⁸. For females both stress and depression have been shown to have higher rates than in men, increasing incidence of MPS in women¹⁹. As research validates the close connection between stress and myofascial pain, physicians more effectively employ multiple treatment protocols in the treatment of this syndrome. These treatments can include myofascial release, chiropractic adjustments, spray and stretch, electrical stimulation, interferential current and ischemic compression.

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