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Review

MYOFASCIAL PAIN SYNDROME: AN UNDERSTANDING OF MOLECULAR BIOLOGY AND MANAGEMENT

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ABSTRACT

Myofascial Pain Syndrome (MPS) is widespread, undiagnosed, and carries a high cost. While people suffer for years, physicians frequently dismiss MPS. Although MPS can progress into fibromyalgia, there are currently no proven effective treatments for either condition. The subject of several investigations is central sensitisation. This scoping review's objective is to thoroughly seek studies that address the molecular biology and clinical facets of myofascial pain syndrome. We conducted a thorough search of several keywords in Science Direct, PubMed, and Google Scholar to find studies from 2013 to 2021, based on title and abstract, followed by a complete text analysis. Guidelines for PRISMA-ScR review are followed. A better knowledge of the molecular and subcellular mechanisms underlying this condition can be beneficial in effectively managing MPS. This increased understanding might also help current treatment plans to be optimised.

KEYWORDS: *pain, fascial tightness, trigger point, literature review*

INTRODUCTION

The quality of life is adversely affected by chronic pain, which is a major source of morbidity. Muscle and fascia-related discomfort is known as Myofascial Pain Syndrome (MPS). Myofascial discomfort sometimes referred to as "muscle knots," typically develops in "trigger points" (TrPs) or "sensitive areas". In a constricted muscle, there are tiny and sensitive regions called TrPs. These produce pain in a remote area classified as a referred pain zone either spontaneously or in response to compression (1). According to conventional wisdom, "TrPs" are thought to be connected to MPS and vary from "tender points" in that they transmit pain. The concept of MPS is still ambiguous. Some describe it as a regional pain condition or categorise it according to sensitivity and related painful regions. TrPs and myofascial pain, however, are a hallmark.

TRPs can result in either acute pain that generally goes away within a week or persistent pain. It should be remembered

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that chronic MPS, which requires more difficult therapy, affects most patients who receive medical treatment. Therefore, a thorough history should be obtained from the patient. A thorough clinical assessment should be conducted to determine the best therapy strategy and, ultimately, deactivate TRPs (2).

When there is no definitive description, epidemiology, pathophysiology, or prognosis of MPS, there are basic problems with diagnosis and possible research (3). This paper aims to review MPS's empirical investigations and parts comprehensively. Since there is still some debate on a lot of the subject, publications and the medical literature were incorporated to create consensus on the MPS components.

MATERIALS AND METHODS

Multiple keyword combinations were searched for systematically across numerous databases. Included keywords: "pain from fascial tightness." Since 2013, "myofascial pain syndrome" has been searched in the title or abstract of systematic reviews, meta-analyses, and randomised controlled trials. PUBMED was one of the databases used. Between June 2013 and June 2021, all searches were conducted. There were only English-language publications listed. The scoping reviews in the research adhere to PRISMA principles. After a thorough examination, 20 studies were found relevant and were included in this study.

RESULTS AND DISCUSSION

Multiple sites of musculoskeletal pain and sensitivity linked to painful points are frequently used in clinical practice to identify MPS. Aching and intense pain may develop following trauma, excessive usage, or sedentarism. According to research, active employees are less prone than sedentary ones to experience MPS symptoms. The pain may be produced or made worse by palpating a TrP. These results, nevertheless, are not exclusive to MPS. They were also present in "normal" participants in controlled research. According to the literature, 54% of women and 45% of men in the general population have TrPs. Between 37% and 65% of people are thought to experience myofascial discomfort. All of this costs the United States $47 billion per year. One of the most commonly undiagnosed, untreated, and misunderstood causes of the common aches and pains that affect all people is MPS. Though it involves pain and lacks a distinct pathology, MPS is nevertheless often regarded as fiction or combined with psychosomatic diseases (4, 5).

Epidemiology

13.5 to 47% of people worldwide appear to experience chronic muscular pain. Chronic muscular pain is more common in the elderly, women than males, and Caucasians than Blacks. Additionally, it affects manual labourers and those from less wealthy areas more frequently than highly affluent regions (6).

The average MPS prevalence among people with musculoskeletal pain ranges from 30% to 93%. An estimated 46.1% to 27.4% of people have activated trigger sites, and the absence of MPS-defining criteria is to blame for this substantial heterogeneity (7). In addition, 85% of the elderly (those over 65) are affected. Compared to males, women are more susceptible to trigger point activation. The hormonal variations throughout a woman's menstrual cycle are to blame for this (2).

Aetiology

There is still much to learn about the aetiology of MPS. Adhesion could occur in muscles and fascia that have aseptic inflammation. According to current theories, the compression of inflammatory oedema tissues and the activation of sensory neurons by an algogenic chemical in the inflammatory environment cause MPS pain. MPS typically affects those who engage in prolonged low-intensity static activities, such as musicians, dentists, office employees, and other professionals. The residual strain created by the constant static pressure of long-term uncomfortable working positions disturbs the skin's blood circulation. As a result, metabolites build up and excite the nerve terminals in the periphery; this results in sensory nerve dysfunction, which includes allodynia, hyperalgesia, and the spread of referred pain.

Predisposing variables and risk factors are two categories into which the reasons for the onset of MTrP may be subdivided.

The following are some predisposing factors:
1). acute muscular damage or ongoing muscle tension;
2). mental stress, overexertion, or inadequate sleep;
3). muscle cooling to a great extent.
These are some risk factors:
1). metabolic abnormalities and hormonal changes, including hypothyroidism and menopause;
2). vitamin b and iron deficiencies;
3). chronic infection;
4). localised chronic instability of biomechanics;
5) immune disorders.

Pathogenesis

Myofascial pain and the development of TRPs have uncertain pathways. An irregular rise in acetylcholine at the motor end-plate may cause the TRPs and result in a regular muscular contraction; this can be made worse by localised acute or chronic overload in traumatic or micro-traumatic circumstances. Constant muscular contraction thus raises local ischemia and energy expenditure. The alterations may result in pain or hypersensitivity by boosting the local discharge of nociceptive chemicals. Substance P, calcitonin related peptides, and pro-inflammatory cytokines are some of these (8, 9). Sometimes the chemicals can move to nearby spinal cord segments and result in referred pain with TRPs (10). Refractory referred pain can be caused by central pain sensitisation, which can make neurons more excitable and cause the neuronal receptive fields to expand (11). Stecco et al. proposed that muscular fascia, under overload and trauma, may experience pathological alteration, resulting in the biomechanical modification of muscles (12). Eventually, this causes muscles' flexibility and force of contraction to decrease (13). The pathogenic change may be made worse by the inflammatory changes, resulting in or intensifying pain. The aberrant changes in myofibrils, fibroblasts, and extracellular matrix may be connected to the pathological transformation of the muscular fascia (14).

History and physical examination

Most MPS patients experience localised muscular pain and transferred pain in predictable patterns. For instance, myofascial pain in the infraspinatus muscle typically affects the anterior deltoid region and the radial side of the hand. Acute or gradual pain onset is also possible. After muscle strains or other overuse activities, symptoms can develop in some patients. On the contrary, other patients experienced symptoms without any obvious causes.

During a physical examination, the afflicted muscles typically have taut bands and TrPs. The palpable belly of constricted muscles is the taut band. TrP is a prominent tender point on the taut band that can be compressed to exacerbate local and transferred pain. TrPs are categorised as either active or latent. Patients without symptoms can nevertheless have latent TrPs, although active TrPs are only seen in symptomatic patients (7).

Clinical signs and symptoms typically identify MPS. For MPS, there are numerous clinical diagnostic standards. The majority of criteria have been agreed upon, including the following: TrP, recognition of pain while palpating the TrP, particular pain referral mechanism, and local twitch response.

Evaluation

MPS is a diagnosed medical disorder. However, one can confirm the diagnosis using medical technology (such as electromyography and ultrasound). Electromyography is typically used to identify end-plate noise in TrPs. When using diagnosis ultrasound, the region with TrPs may develop more hypoechoic compared to the surrounding muscles (15, 16).

The significance of employing electrophysiological tests and medical imaging is their ability to rule out other musculoskeletal problems. For example, bursitis and tendinopathy can be ruled out with diagnostic ultrasonography. Foraminal stenosis, spondylosis, and scoliosis are just a few structural bone flaws found with a plain radiograph. Neuromuscular illnesses can be examined with electromyography. Additionally, one can perform laboratory tests to find possible nutritional and hormonal deficiencies related to MPS, like hypothyroidism or vitamin D deficiency (16, 17).

Differential diagnosis

Regional pain is a common symptom of several illnesses, including MPS. The common illnesses that a clinical examination and assessment should rule out are tendinopathy, arthritis, bursitis, as well as nerve entrapment. The region and pattern of pain are key factors in the differential diagnosis. For instance, patients with medial elbow pain should be examined for cubital tunnel syndrome or medial epicondylitis.

Fibromyalgia needs to be taken into account for people with persistent multiple TrPs. A disorder known as fibromyalgia causes widespread chronic discomfort. Fibromyalgia and persistent MPS are different to fibromyalgia in two key ways. First, patients with fibromyalgia experience transferred pain and widespread muscle tender spots without taut bands. Physicians should, therefore, thoroughly palpate the location of the pain. Second, fibromyalgia patients frequently have comorbid diseases such as depression, sleeplessness, vertigo, dysmenorrhea, and numbness. Rarely do these symptoms appear with MPS (16, 17).

Treatment and management

Treatment for MPS aims to reduce discomfort and address contributing causative factors. There are numerous ways to treat MPS. Several treatments are being utilised to treat myofascial trigger points, including massage, electrical stimulation, stretching, dry needling/injections, cold laser therapy, and ultrasound. Myofascial trigger points can be relaxed with various massage techniques, including active rhythmic release, trigger point pressure release, and passive rhythmic release (18). The basic idea behind treating trigger points is to temporarily release them to lessen pain and temporarily improve muscular movement; this is frequently achieved with massage, heat (direct or by ultrasound), and needling and injection for persistent trigger points. Stretching and simulation, which effectively work the muscle, come next (16, 17).

Additionally, all patients should receive education on ergonomic modification, including stretching exercises. Muscle relaxants and nonsteroidal anti-inflammatory medications are frequently recommended. However, the available data on their efficacy are still conflicting. In MPS management, physical modalities play a significant part. In numerous studies, extracorporeal shockwave and low-power lasers were reported to lessen pain in MPS patients dramatically. Transcutaneous electrical nerve stimulation can temporarily reduce pain but not permanently. For the treatment of MPS, therapeutic ultrasonography is frequently employed. However, there is still conflicting information about its positive impact (18). Clinicians may need to utilise more invasive techniques to manage MPS in some patients.

In order to release TrPs, doctors can utilise the helpful technique of dry needling. To further reduce discomfort, doctors can inject TrP with a local anaesthetic. MPS may potentially be treated with acupuncture (19). Additionally, eliminating perpetuating factors is essential for effective MPS care, particularly in cases of chronic MPS. For instance, people with vitamin D deficiency may not respond well to standard therapies. Therefore, doctors should prescribe patients vitamin D supplements and other treatments (16, 17).

CONCLUSION

The pathological condition of imbalance in a natural process that results in MPS is thought to be caused by a disturbed biomechanical interaction and manifested in the fundamental characteristics of the fascia. Reports show that trigger points, tension, and pain characterise MPS, and myofibroblasts influence myofascial tension that persists. Furthermore, sedentary living predisposes to MPS and its recurrence, whereas movement and mechanical interventions manage and protect from MPS.

Recent advancements in experimental research have yielded copious information which can be used to comprehend the molecular pathways underlying myofascial pain syndrome. Therefore, the only way to find novel therapies is to understand the molecular and subcellular mechanisms underlying this condition fully. This increased understanding might also help current treatment plans be optimised. However, numerous unanswered questions regarding the signalling mechanisms are still required, demanding more research.

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