NIH HEAL Initiative Workshop on Myofascial Pain
Quantitative Evaluation of Myofascial Tissues: Potential Impact for Musculoskeletal Pain Research

September 16–17, 2020
Executive Summary

The NIH Helping to End Addiction Long-term[SM] Initiative, or NIH HEAL Initiative[SM], convened a workshop on myofascial pain syndrome (MPS) from September 16 to 17, 2020. The primary goal of the workshop was to review methods to quantitatively evaluate myofascial tissues and support better basic and clinical research on the pathophysiology and treatment of MPS.

MPS is currently a clinical diagnosis based on history and physical examination; it includes both "active" and "latent" phases. During the active phase, the patient complains of spontaneous pain that limits the range of motion and has localized, tender indurated foci within myofascial tissues. Palpation of these nodules reproduces the patient's pattern of local and/or radiating pain. During the latent phase, focal palpable nodules are present and may be tender to palpation but without spontaneous pain. The latent phase also includes myofascial dysfunction, including soft tissue stiffness and reduced range of motion (not associated with pain) in the affected area. To date, the palpable tissue abnormalities observed clinically in MPS have not been documented using objective measurement methods, and there is currently no physiological explanation for the clinical findings in either the active or latent phases.

Speakers at the workshop noted that the fascia is highly integrated with muscle and interacts closely with joints, tendons, blood vessels, and nerves. Because changes in one of these tissue types can affect the others, it makes sense to consider them collectively as the myofascial unit. Elucidation of the mechanisms underlying myofascial pain is needed to allow for the development of reliable, objective biomarkers. An objective MPS biosignature that integrates myofascial tissue measurements and sensory, motor, and autonomic findings would facilitate the development of diagnostic criteria and the assessment of treatments. Efforts must be made to determine the phenotypic characteristics of MPS and understand how MPS contributes to other musculoskeletal pain categories such as low-back pain and temporomandibular disorders.

Workshop presenters discussed sophisticated noninvasive techniques to measure tissue structure and function in MPS, including a variety of quantitative magnetic resonance imaging methods, positron emission tomography, several techniques for musculoskeletal ultrasound imaging, elastography imaging approaches (including ultrasound elastography and magnetic resonance elastography), laser Doppler imaging, near-infrared spectroscopy, and electrical impedance myography. Some of these measurement methods have been used in studies of MPS, others have been used in musculoskeletal tissues but could be applied to MPS, and others have been used in other tissues such as liver or brain but could be adapted to myofascial tissues. In addition, computational modeling and the use of artificial intelligence and machine learning can provide insight into complex phenotypes such as MPS.

Although quantitative evaluation shows much promise for enhancing understanding of the pathology of MPS, speakers and discussants repeatedly emphasized that patients' experience of pain is most important. Most of the biomarkers discussed at the meeting are markers of myofascial architecture or

functioning, but biomarkers that can predict patients' pain, distinguish myofascial pain from other types of pain, and inform treatment selection are also needed. More needs to be learned about the factors that drive the pathophysiology and perception of pain in MPS, including how the muscles and fascia communicate with the nervous system.

Researchers should ensure that they are measuring clinically meaningful variables that will help address pain in patients. As has been found in other areas, such as the spine, it is often difficult to ascertain whether alterations observed through imaging are a cause or a result of pathological processes, and it can be difficult to link these objective measures to patients' experiences. Attention should also be paid to functional measures, including stiffness and reduced mobility during the latent phase, as well as broader quality of life measures such as sleep and overall physical activity. Interdisciplinary research is needed to move the field forward. It is likely that multiple underlying pathological processes result in the clinical manifestations of MPS.

Participants urged that opportunities be created to break down silos and create opportunities for exchanges between myofascial pain researchers and tool developers. This workshop was an important step in that direction. To further engage the community of tool developers, myofascial pain researchers should consider attending and presenting at conferences focused on specific technologies. Creating public datasets is another way to engage researchers, including machine learning experts.

In summary, the workshop speakers, panelists, and participants collectively identified new ways to think about the causes and various aspects of myofascial pain, including its active and latent phases. Speakers discussed damage from chronic nociceptive bombardment, a role for low-grade chronic inflammatory processes, muscle contractile dysfunction, hyperexcitability, and taut bands, as well as the potential roles of connective tissue inside and outside the muscle.

Important future directions from this workshop include:

- Longitudinal studies with tissue-level measurement, with correlation of measurements with symptoms
- Increased understanding of the pathophysiology and innervation of myofascial tissues
- Comprehensive phenotyping
- Development of a starting definition of the clinical syndrome, based on history and physical examination and focusing on the unique aspects of the clinical presentation of myofascial pain
- Development of standard diagnostic procedures
- Identification of the most promising animal models and tools
- Establishment of multidisciplinary collaboration networks and engagement of tool developers in MPS research.