Fibromyalgia/Pressure Pain Threshold (FM/PPT) Test ©

This document provides background information on the underlying principles behind the Fibromyalgia/Pressure Pain Threshold (FM/PPT) test.[1]

Soft Tissue Pain

Soft tissue pain (or muscular pain) is extremely common among people with musculoskeletal problems, especially if the problems are chronic. It contributes to the pain that patients with a wide range of musculoskeletal problems experience. For example, many patients with vertebral subluxations also demonstrate clinical evidence of muscular pain.

Various terms have been used to describe syndromes in which pain seems to emanate from muscles and patients demonstrate tenderness on examination. One such term is "myofascial pain syndrome," another is "fibromyalgia." There have been many debates over the years about the similarities and differences between these two terms.

Myofascial Pain

Myofascial pain has been discussed by physicians for almost 100 years. The most comprehensive discussion of myofascial pain is contained in *Myofascial Pain and Dysfunction: The Trigger Point Manual.*[2] As discussed in this text, the hallmark of myofascial pain is the presence of one or more trigger points in muscles. The authors assert that trigger points are tender, but that other clinical findings are also typically present, and help an examiner identify a site as a trigger point. Specifically, they say that palpation of a trigger point produces not only local tenderness but also a characteristic pattern of referred pain. Also, taut bands of muscle can be palpated when a trigger point is present, and stimulation of these bands elicits a local twitch response from a portion of the muscle being examined.

Myofascial pain is often local or regional, although it can be very widespread.

Fibromyalgia

Fibromyalgia (FM) has a very different history. It is a concept developed relatively recently by rheumatologists to describe patients who presented with widespread pain and muscular tenderness, but did not demonstrate abnormalities that suggested any other rheumatologic disorder. Rheumatologists initially used the term, “fibrositis,” and then later, “fibromyalgia,” to describe patients with widespread pain who did not show evidence of any other rheumatologic disorder. But it soon became clear that some patients had evidence of widespread muscular pain, in addition to findings of rheumatoid arthritis or some other rheumatologic disorder. After some debate, rheumatologists have agreed that such patients should receive two diagnoses, for example, for both fibromyalgia and rheumatoid arthritis. Thus, it is possible for a patient to be diagnosed with fibromyalgia even if he/she has some other rheumatologic condition.

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[1] Robinson, J. and McCoy, H. Fibromyalgia/Pressure Pain Threshold (FM/PPT) test © 2002.

[2] Travell, J. G. and Simons, D. G. *Myofascial Pain and Dysfunction: the Trigger Point Manual*. Baltimore: Williams & Wilkins, 1983.

Fibromyalgia is by definition a generalized condition. In 1990, the American College of Rheumatology (ACR) established diagnostic criteria for fibromyalgia[3] based on comparisons between patients with a clinical diagnosis of FM and controls who had either localized musculoskeletal syndromes, such as low back pain, or possible rheumatologic disorders such as rheumatoid arthritis. The authors identified 18 sites (called survey sites) where patients with FM usually experience tenderness with fairly gentle palpation (up to 4 kilograms of force). They found that FM patients were much more likely than controls to report tenderness (that is, report pain when pressure of less than 4 kilograms is applied) in 11 or more of the 18 of the survey sites.

They then proposed that the diagnosis of FM should be based on two criteria:

1. Historical criterion: Patient reports a history of widespread pain lasting more than three months.
2. Tender point criterion on physical examination: Patient demonstrates tenderness (reports pain at less than 4 kilograms of force) in at least 11 of the 18 survey sites.

Pressure Pain Threshold; Relation to Fibromyalgia

The "pressure pain threshold" (PPT) is a concept that has been used to study muscular pain since the 1950s. As the term suggests, the goal of the PPT is to identify the point at which pressure applied over a muscle becomes painful. The expectation is that when very light pressure is applied to a muscle, a patient will feel some pressure, but not pain. As the pressure is increased, a point is reached when the patient perceives the stimulation as painful. This point is the PPT.

The PPT is an objective measure that can be used to assess muscular tenderness. Although it was not developed specifically to help in the diagnosis of FM, it can be used for this purpose. Remember that a patient meets the tender point criterion for FM if he/she reports tenderness in 11 or more of the survey sites identified by the ACR. A point is designated "tender" if a patient's PPT for that point is less than 4 kilograms. Thus, you can decide whether a point is an FM tender point on the basis of your PPT examination.

Tenderness vs. Chronic Widespread Pain in the Diagnosis of Fibromyalgia

The FM/PPT Test enables you to determine whether a patient meets the tender point criterion for the diagnosis of FM. However, in order to warrant the diagnosis of FM, a patient must meet not only the tender point criterion, but also the criterion of chronic widespread pain. This criterion is based on historical information elicited from the patient.

In the diagnostic system developed by the ACR, pain is considered *chronic* if it has been present for more than three months, and *widespread* if it has the following characteristics:

> pain on the left side of the body, pain on the right side of the body, pain above the waist, and pain below the waist. In addition, axial skeletal pain (cervical spine or anterior chest or thoracic spine or low back) had to be present.[4]

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[3] Wolfe, F., Smythe, H. A., Yunus, M. B., et. al. The American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia. *Arthritis Rheum* 1990; 33: 160-172.

[4] Wolfe, F., Smythe, H. A., Yunus, M. B., et. al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. *Arthritis Rheum* 1990; 33: 163.

Unfortunately, there is ambiguity about the definitions of both “chronic” and “widespread.” The problem with the chronicity criterion is that musculoskeletal pain frequently waxes and wanes over time. For example, a person might be symptomatic with low back pain for two weeks, then asymptomatic for four weeks, and then symptomatic again for three weeks. If this alternating pattern continues for more than three months, it would not be clear whether to describe the individual as having chronic low back pain or as having recurring low back pain. Another complication is that some people report that their musculoskeletal pain occurs only when they are quite active physically. It may be difficult for an examiner to determine how often the patient becomes symptomatic, or whether to construe the symptoms as a musculoskeletal problem, or as a normal response to unaccustomed exercise.

A pain diagram helps in the interpretation of widespread pain, and in the identification of ambiguities in the concept. Most of them revolve around the issue of what a quadrant is, and how "quadrant pain" differs from "axial pain."

Definition of Axial Pain

In principle, axial pain refers to midline pain over the sternum, the cervical spine, the thoracic spine, the lumbar spine, or the sacrum.

Definition of Quadrant Pain

For our purposes, the right upper quadrant includes the right side of the neck, the right posterior shoulder girdle down to the inferior border of the scapula, the right side of the chest down to the nipple, and the entire right upper extremity.

The right lower quadrant includes the right side of the back below the iliac crest, the right gluteal region, and the right lower extremity.

The left quadrants are defined in a similar manner.

Comparison of Axial Pain vs. Quadrant Pain

The distinction between quadrant pain and axial pain is subtle.

1. If a patient indicates that he/she has pain directly in the midline of the spine, it is clearly axial pain. However, some people with mechanical spine syndromes indicate that their pain is primarily or exclusively slightly off the midline. Thus, they have pain that is patho-physiologically thought to reflect dysfunction in the spine, but is anatomically localized a slight distance away from the spine. We propose that neck or back pain that is within two inches of the midline be considered axial pain, and that pain farther from the midline be considered quadrant pain.
2. Quadrant pain refers to pain that meets either or two criteria:
    a. It is localized in the chest, neck or back, but is more than two inches off the midline;

        or

    b. It is in one of the extremities.

Suggested Criteria for Identifying Chronic, Widespread Pain

As the discussion above indicates, there are ambiguities in the definition of chronic widespread pain developed by the ACR. These could in principle be resolved in various ways. We suggest that you use the following rules in deciding whether a patient has chronic widespread pain.

1. Consider pain *chronic* only if a patient reports that it has been present on more than half the days during the past three months.
2. Consider pain *widespread* if it is present in the axial skeleton and at least three quadrants.
3. When determining whether a patient meets the widespread pain criterion, use the following rules:
   a. Pain in the head or the abdomen is not considered when you determine whether a patient meets the widespread pain criterion for FM.
   b. Pain in other areas (that is, the neck, upper extremities, chest, back, or lower extremities) should be designated as being either axial pain or quadrant pain—a single site of pain cannot be considered to reflect both axial pain and quadrant pain.

      However, if a patient reports pain in a large area, some of the pain might be construed as axial pain, and some of it quadrant pain. For example, if a patient reports pain in the midline over the sacrum and also pain involving the right buttock diffusely, he would be judged to have both axial pain and right lower quadrant pain.
   c. Pain should be considered axial pain when it is either:
      - In the midline over the spine or sternum; or
      - Off center to the right or left of the spine or sternum, but within two inches of the midline.
   d. Pain should be considered quadrant pain when it is either:
      - In the back or gluteal region, and more than two inches off center; or
      - In the anterior chest and more than two inches off center; or
      - In an upper extremity or lower extremity.

Interpreting Results

In the literature on PPT, some writers use stimuli in units of force while others use units of pressure. Since pressure = force/centimeter^2, when the area of surface contact is 1 square centimeter, pressure is equal to force. The MSM 7000 system uses a stylus tip for testing that has a surface area of one square centimeter, so pressure is equal to force in our system.

Results published by Granges and Littlejohn[5] provide data about the average PPT for normal females (those who do not report any musculoskeletal pain problems). The methods used by Granges and Littlejohn differ from the ones described in this document, so their normative data need to be modified accordingly. (See the Technical Notes below for more information.)

[5] Granges, G., Littlejohn, G. Pressure Pain Threshold in Pain-free Subjects, in Patients with Chronic Regional Pain Syndromes, and in Patients with Fibromyalgia Syndrome. *Arthritis Rheum* 1993; 36: 642-6.

When using the MSM 7000's Fibromyalgia/Pressure Point Threshold test, we consider the average PPT score to be 3.7 kilograms, or 8.16 pounds. Our value of 3.7 kilograms used in this calculation comes from the normative data published by Granges and Littlejohn. They found that among a sample of 60 normal females, the average PPT was 4.2 kilogram/centimeter^2. Their assessment method, however, required examiners to provide increasing pressure until a subject reported pain. In contrast, an examiner using the MSM 7000 system does not apply more than 4 kilogram/ centimeter^2 of force to any site. Thus patients examined with the MSM 7000 system cannot have average PPT scores greater than 4.0 kilograms (8.8 pounds).

In adapting Granges and Littlejohn's data, we noted that their normal subjects had an average of 2.7 survey sites that qualified as FM tender points. We assumed that if Granges and Littlejohn's subjects had been evaluated with our system, they would have received PPT scores averaging 4.4 pounds (2.0 kilograms) on these 2.7 sites, and PPT scores of 8.8 pounds (4.0 kilograms) in the remaining 15.3 sites. Given these assumptions, the average PPT for the subjects on all 18 survey sites would be 3.7 kilograms (8.16 pounds).

Since the standard deviation for PPT 's in Granges and Littlejohn's study was .3 for a study in kilograms, an average PPT should not be considered abnormal unless it is less than 7.5 pounds or 3.4 kilograms.

Data from Fischer[6] indicate that normal males have an average PPT that is 1.36 times the average for females. Thus, males would be expected to have an average PPT close to the maximum possible PPT of 4.0. An average PPT for a male should be considered abnormal if it is less than 3.7 kilograms.

It is useful to compare PPT values that you obtain on patients to normative values, and the MSM 7000 software expresses PPT 's as a percentage of normal. But you should keep in mind that the normal values given above need to be interpreted with discretion, since the methods used by Fischer and by Granges and Littlejohn differ from the methods described in this document.

Technical Notes

Granges and Littlejohn found that the average PPT among 60 normal females was 4.2, with a standard deviation of .3. In their study, they applied increasing pressure to each site until one of the following situations occurred:

- The subject reported pain; or
- The pressure reached 11 kilograms/centimeter^2.

[6] Fischer, A. A. Pressure Algometry over Normal Muscles. Standard Values, Validity and Reproducibility of Pressure Threshold. *Pain* 1987; 30: 115-126.

The methodology described in this document is significantly different, in that the examiner is instructed to apply no more than 4 kilograms/centimeter^2 of pressure to any site being examined. In essence, this methodology cuts off high PPT scores that patients might otherwise attain.

1. It was assumed that the distribution of PPT scores of subjects in Granges and Littlejohn was approximately normal, with mean = 4.2, and standard deviation = .3.
2. This distribution represented the average scores that subjects obtained in response to an examination of the 18 ACR survey sites.
    a. Therefore, the distribution of PPT scores for individual survey sites would be different from the one described in 1 above. As with the distribution described in 1, it would have a mean of 4.2. But its standard deviation would be larger - specifically, it would be .3 * the square root of 18 = 1.27.
    b. In a distribution with mean = 4.2 and standard deviation = 1.27, a score of 4.0 represents a z score of -.24.
3. The methods used by the MSM 7000 software do not permit PPT scores greater than 4.0. In effect, this means that the data obtained by Granges and Littlejohn are "censored" by the methods used here. Only scores from the original distribution that are less than 4.0 (that is, correspond to z scores less than -.24) could occur.
4. If we consider the distribution created by starting with the distribution described in 2b above, and censoring all scores greater than 4.0, the mean of the new distribution is 3.7. This is the value that is considered normal for females in this document.

References

The sources listed below were used for this document.

Test Protocol

Robinson, J. and McCoy, H. Fibromyalgia/Pressure Pain Threshold (FM/PPT) test © 2002.

Texts

Fischer, A. A. Pressure Algometry over Normal Muscles. Standard Values, Validity and Reproducibility of Pressure Threshold. *Pain* 1987; 30: 115-126.

Granges, G., and Littlejohn, G. Pressure Pain Threshold in Pain-free Subjects, in Patients with Chronic Regional Pain Syndromes, and in Patients with Fibromyalgia Syndrome. *Arthritis Rheum* 1993; 36: 642-6.

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Travell, J. G., and Simons, D. G. *Myofascial Pain and Dysfunction: the Trigger Point Manual.* Baltimore: Williams & Wilkins, 1983.

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