Chapter 2
Fibromyalgia Diagnosis

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Key Points

- Fibromyalgia (FM) is associated with fatigue, insomnia, stiffness, irritable bowel, cognitive dysfunction, and insomnia.
- The prevalence has been reported to be 2–4 % of the general population.
- The pathogenesis involves central sensitization with attenuation of the descending inhibitory pathway.
- The diagnosis is based on the new definition for FM designated by the American College of Rheumatology (ACR) in 2010.
- Two key measures for the diagnosis of FM include the widespread pain index (WPI) and severity scale (SS).
- Patients with chronic pain conditions other than FM may subsequently develop secondary FM.

Introduction

Fibromyalgia (FM) is a condition found in many patients complaining of chronic widespread pain. Pain is mostly within the soft tissue and musculoskeletal structures. Symptoms are chronic and persistent leading to increased cost of care by way of recurrent medical visits. Increasing amounts of research and publications have been produced since the release of the American College of Rheumatology (ACR) 1990 criteria for the classification of FM, which provided universal diagnostic

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E. Lawson, M. S. Wallace (eds.), *Fibromyalgia,* DOI 10.1007/978-3-319-15820-4_2

criteria for FM. Since this publication, multiple other literature reviews and research publications have reflected an evolving understanding of FM, and provided more tools for its diagnosis. Characteristics associated with FM include fatigue, insomnia, stiffness, irritable bowel syndrome (IBS), and symptoms of anxiety and depression. A family history of depression or a past history of depression has also been associated with FM [1].

Treatment of FM has a substantial impact on the health-care economy. Wolf et al. performed a study examining service utilization and the cost of care in FM patients. The authors estimated that for each individual FM patient, the service utilization cost was approximately US$ 2274 annually [2].

Epidemiology and Prevalence

In 1990, the ACR released a set of criteria for diagnosing FM. These ACR criteria had been widely accepted by the medical community. Unfortunately, these criteria led to some confusion in diagnosing FM, leading in turn to inaccurate reports of prevalence [3]. This prevalence has been reported to range from 2 to 4% in the general population. It has been found in all ethnic groups that have been studied up until now. The incidence of FM is higher among females than males (3.4 vs. 0.5%) and it increases with age. Wolfe et al. found that FM peaks in middle age with highest peak among women 70–79 years of age (7.4%) compared to age-matched males (1%) [1].

In a study examining the prevalence of FM within the Canadian population, 100 out of 3395 randomly selected adults were diagnosed with FM (3.3% incidence). It was more commonly seen in females than in males with an approximately 3:1 female to male ratio. In this study performed by White et al., the authors found that FM was seen in 4.9% of adult females and 1.9% of adult males. They also found that the prevalence of FM increased with age, peaking in females between 55 and 64 years of age (7.9%) and peaking in males between 45 and 52 years of age (2.5%) [4].

There was a discrepancy between subspecialty clinics diagnosing this condition. Within most rheumatology clinics, approximately 15% of patients were classified as having FM. In other subspecialty clinics, the prevalence rate of FM was only 6%. However, the greatest number of FM diagnosis comes from the primary care clinics [1].

Pathogenesis

FM is one cause for chronic widespread pain, which traditionally has been thought to be due to muscle pathology. However, several trials have refuted this idea. In addition, most researchers now believe that any muscle pathology that is related to FM is secondary to pain and inactivity, rather than a primary process [5]. Today,

central sensitization is the most established pathophysiological mechanism of FM. It is associated with hyperalgesia and allodynia, which are commonly experienced in patients with FM. In fact, patients with FM seem to be more sensitive to multiple different stimuli, including heat, cold, and electrical stimulation [6]. Interestingly, these patients have also been noted to have hypersensitivity to auditory and visual stimuli, which suggests that FM patients experience a global altered sensory processing that is not specific to painful stimuli alone [7]. In a study comparing brain magnetic resonance imaging (MRI) scans of FM patients and controls, those with FM showed an increase in activation of neurons with low-intensity painful stimulation when compared to the control group [8]. In addition, studies have shown that FM patients have structural deformities of forebrain areas involved in pain processing which include the thalamus, striatum, insular cortex, and cingulate cortex [9].

FM patients have also been noted to have a deficiency in the descending inhibitory pathway within the central nervous system (CNS). In healthy patients, pain is transmitted from the periphery to the CNS and the cerebral cortex by way of thalamocortical tract. There are descending inhibitory neurons that release neurotransmitters at the spinal level in order to prevent windup phenomena from occurring. In studies measuring the cerebrospinal fluid of FM patients, there was an increased amount of neurotransmitters associated with nociception such as substance P, excitatory amino acids (e.g., glutamine, glycine, arginine, glutamic acid), and nerve growth factor (NGF). In addition, there was a decreased amount of antinociceptive neurotransmitters such as the biogenic amines (e.g., serotonin, norepinephrine, dopamine). This may explain the attenuation of the descending antinociceptive pain pathways and the increased activation of the ascending pain pathways in patients with FM [10, 11].

One factor associated with the predisposition to FM is a polymorphism in the catechol-*O*-methyltransferase (COMT) enzyme, which breaks down catecholamines such as dopamine and norepinephrine as well as the endorphins. This genetic defect has been linked to depression and chronic pain, and now it is being linked to FM [12]. Interestingly, it has been shown that endogenous opioid levels in FM patients are increased as compared to healthy patients. By looking at mu-opioid receptor (MOR) positron emission tomography (PET), the occupancy of the MOR was compared between 17 FM patients and 17 control patients of same age and sex. Investigators found that the MOR binding potential was reduced in FM patients. This is one possible explanation for the lack of response to opioid medication in the FM patient population [13].

Diagnostic Criteria

Prior to the 1990 ACR publication, FM was known as a chronic manifestation of symptoms including pain, fatigue, stiffness, and insomnia as mentioned by Smythe and Modofsky [14]. Later, Yunus et al. reinforced this view. They also reported that many of these patients were being seen multiple times by different physicians,

Table 2.1 The American College of Rheumatology 1990 criteria for the classification of fibromyalgia[a]. From [16]. With permission from John Wiley and Sons

1. History of widespread pain
Definition. Pain is considered widespread when all of the following are present: pain in the left side of the body, pain in 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) must be present. In this definition, shoulder and buttock pain is considered as pain for each involved side. "Low back" pain is considered lower segment pain
2. Pain in 11 of 18 tender point sites on digital palpation
Definition. Pain, on digital palpation, must be present in at least 11 of the following 18 tender point sites:
Occiput: bilateral, at the suboccipital muscle insertions
Low cervical: bilateral, at the anterior aspects of the intertransverse spaces at C5–C7
Trapezius: bilateral, at the midpoint of the upper border
Supraspinatus: bilateral, at origins, above the scapula spine near the medial border
Second rib: bilateral, at the second costochondral junctions, just lateral to the junctions on upper surfaces
Lateral epicondyle: bilateral, 2 cm distal to the epicondyles
Gluteal: bilateral, in upper outer quadrants of buttocks in anterior fold of muscle
Greater trochanter: bilateral, posterior to the trochanteric prominence
Knee: bilateral, at the medial fat pad, proximal to the joint line
Digital palpation should be performed with an approximate force of 4 kg
For a tender point to be considered "positive," the subject must state that the palpation was painful. "Tender" is not to be considered "painful"

[a]For classification purposes, patients will be said to have fibromyalgia if both criteria are satisfied. Widespread pain must have been present for at least 3 months. The presence of a second clinical disorder does not exclude the diagnosis of fibromyalgia

leading to an increased number of unnecessary diagnostic tests [15]. Subsequently, in 1990, the ACR developed diagnostic criteria in the hopes of providing guidance to physicians in diagnosing FM. A multicenter study was performed, including a total of 558 subjects.— Of these subjects, 293 had FM and 265 were either pain-free or had other painful conditions. The authors concluded that there were two requirements for diagnosis: widespread pain (defined as axial pain with upper and lower segment pain) for at least 3 months and 11 or more of 18 specified tender points on palpation (Table 2.1). The combination of both of these factors resulted in a sensitivity of 88.4 % and a specificity of 81.1 % for diagnosing FM [16].

These criteria were widely accepted within the medical community. However, many primary care physicians (who diagnose the majority of FM cases) were either not performing tender point examinations at all or performing them inaccurately. Those that were not performing the tender point examinations were basing their diagnosis on somatic and cognitive symptoms, as well as symptoms of fatigue [17, 18]. In addition, a problem arose when trying to diagnose FM patients who had improved and were no longer tender at 11 out of 18 tender points since they did not meet the ACR criteria classification [19].

Not present within the ACR criteria was the mention of symptoms most commonly associated with FM. Examples of some of these symptoms include headache, fatigue, IBS, mood disorders, and cognitive dysfunction. These associated symptoms suggest that FM is actually a more complex and multidimensional syndrome that requires a more comprehensive definition than that included within the original ACR criteria [20].

In an attempt to improve some of the problems presented against the ACR criteria, Wolfe and colleagues performed a multicenter study that would lead to the development of a new definition for FM. This study reflected the severity spectrum of patients with FM without the need to implement a tender point examination. The study included 829 total patients and compared those with FM to those with no pain or other pain syndromes. They were each examined and interviewed. The interview included a measurement of the widespread pain index (WPI), which designates the number of painful body regions. Categorical scales were formulated which could be used to evaluate patients' cognitive symptoms, fatigue, somatic symptoms, and sleep. In addition, the authors used these scales to formulate a severity scale (SS). By combining both the WPI and SS, they were able to generate new criteria for FM (Table 2.1). Based on this new definition, 88.1 % of FM cases classified by the original ACR criteria were also included within the new definition. Furthermore, the SS allows for a description of symptom severity, which is extremely helpful in following FM patients with highly variable temporal symptomology [21].

Through this investigation, the ACR identified an alternative method of diagnosis of FM to the classic tender-point criteria, specifically integrating SS-based symptoms [21]. These new alternative diagnostic criteria published in 2010 rely on the WPI and SS as follows: (WPI ≥ 7 and SS ≥ 5) or (WPI 3–6 and SS ≥ 9). The WPI is scored 0–9 based on areas of pain present (Table 2.2). SS is the sum of the severity of three symptoms (fatigue, waking unrefreshed, cognitive symptoms) and the extent of somatic symptoms. The three major symptoms of fatigue, waking unrefreshed, and cognitive symptoms are graded 0 = no problem through 3 = severe: pervasive, continuous, and life-disturbing problems. The severity of somatic symptoms is graded 0 = no symptoms through 3 = a great deal of symptoms. The ACR includes a list of suggested somatic symptoms to consider for this portion of the evaluation [21] (Table 2.2). While this new alternative method to diagnosis is perhaps more lengthy than the previous method, it does not include a physical or tender point examination. In effect, these diagnostic criteria can be used to reliably identify patients with FM by health-care providers who do not plan and perform the tender point examination or who perform the tender point examination incorrectly.

Evaluation

As mentioned earlier, the common manifestations of FM include clusters of symptoms that may be confused with other disease processes. Evaluation for FM includes pain assessment by way of a proper history and physical examination, laboratory evaluation to rule out other causes of pain if indicated, and any other evaluations

Table 2.2 American College of Rheumatology fibromyalgia diagnostic criteria (2010 Alternate). From [21]. Table 4 Fibromyalgia diagnostic criteria. With permission from John Wiley and Sons

Criteria
A patient satisfies diagnostic criteria for fibromyalgia if the following three conditions are met:
1. Widespread pain index (WPI) > 7 and severity scale (SS) score > 5 or WPI 3–6 and SS scale score > 9
2. Symptoms have been present at a similar level for at least 3 months
3. The patient does not have a disorder that would otherwise explain the pain
Ascertainment
1. WPI: note the number areas in which the patient has had pain over the last week. In how many areas has the patient had pain? Score will be between 0 and 19
Shoulder girdle, left hip (buttock, trochanter), left jaw, left upper back
Shoulder girdle, right Hip (buttock, trochanter), right jaw, right lower back
Upper arm, left upper leg, left chest neck
Upper arm, right upper leg, right abdomen
Lower arm, left lower leg, left
Lower arm, right lower leg, right
2. SS scale score:
Fatigue
Waking unrefreshed
Cognitive symptoms
For each of the three symptoms above, indicate the level of severity over the past week using the following scale:
0 = no symptoms
1 = few symptoms
2 = a moderate number of symptoms
3 = a great deal of symptoms
The SS scale score is the sum of the severity of the three symptoms (fatigue, waking unrefreshed, cognitive symptoms) plus the extent (severity) of somatic symptoms in general. The final score is between 0 and 12.
Somatic symptoms that might be considered: muscle pain, irritable bowel syndrome, fatigue/tiredness, thinking of remembering problem, muscle weakness, headache, pain/cramps in the abdomen, numbness/tingling, dizziness, insomnia, depression, constipation, pain in the upper abdomen, nausea, nervousness, chest pain, blurred vision, fever, diarrhea, dry mouth, itching, wheezing, Raynaud's phenomenon, hives/welts, ringing in ears, vomiting, heartburn, oral ulcers, loss of/change in taste, seizures, dry eyes, shortness of breath, loss of appetite, rash, sun sensitivity, hearing difficulties, easy bruising, hair loss, frequent urination, painful urination, and bladder spasms

as needed, such as mood, sleep, or neurological evaluations. In order to facilitate diagnosis, and to reduce the time and cost involved in workup, certain common symptoms and findings can be sought. Common patient complaints that may indicate FM include "I feel as if I hurt all over" and "I feel as if I always have the flu" [22]. Other common symptoms and findings can include:

1. Chronic widespread pain for greater than or equal to 3 months
2. Excess tenderness in soft tissues

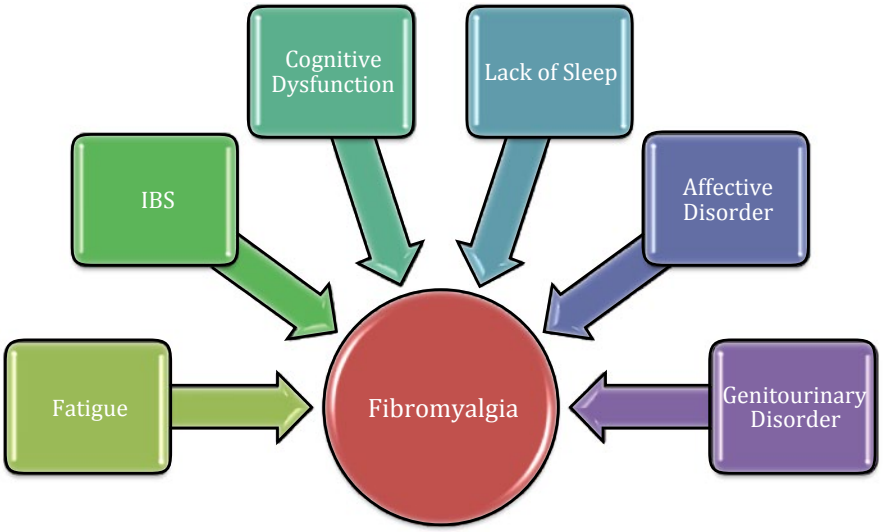

Fig. 2.1 Clinical features associated with fibromyalgia

3. Absence of other conditions that may explain the pain patient is experiencing
4. Other clinical features (Fig. 2.1) such as fatigue, insomnia, emotional distress, stiffness, cognitive dysfunction, IBS, interstitial cystitis, and ureteral syndrome [23].

Fatigue

One of the most common associated symptoms of FM is fatigue. Approximately 80% of patients with FM also fall under the criteria for chronic fatigue syndrome, which include: fatigue for greater or equal to 6 months, sore throat, joint pain, muscle pain, and unrefreshing sleep [24]. The fatigue is commonly worse upon waking, slowly improves over the morning, and becomes worse again in the afternoon. Patients complain of difficulty with sleep and frequent waking in the middle of the night. The fatigue experienced by patients is described as exhausting, both mentally and physically [25]. It may be difficult to identify FM as the cause for fatigue as many other causes may be present in these patients, including sleep disorders and medications such as tricyclic antidepressants and opioids.

Lack of Sleep

Most patients with FM complain of nonrestorative sleep (NRS). NRS leads to impairment in daytime functioning [26]. In these patients, it is harder to take small naps during the day than it is to fall asleep at night. Nonetheless, most of these

patients are energy-deprived and fatigued most of the day. Most patients wake up in the morning with increased fatigue and stiffness, feeling mentally drained and sleep deprived. It is very important to rule out a primary sleep disorder in these patients, such as restless leg syndrome [27] or obstructive sleep apnea.

Affective Disorder

Chronic pain may lead to an increased incidence of affective distress. FM is most commonly associated with anxiety and depression. Approximately 13–71 % of FM patients have associated anxiety. Depression may be seen in 20–80 % of FM patients [28–30]. These associated affective issues may contribute to increased severity of physical symptoms due to enhanced pain perception, decreased activity level, and impaired coping skills.

Patients with chronic pain syndromes are frequently assumed to be the victims of childhood trauma or sexual abuse. There are conflicting studies that both support and refute this idea. A prospective study performed by Raphael KG and colleagues disputed this theory by performing a prospective cohort study which examined patients that had been part of childhood abuse or neglect. Subjects were followed into their adulthood. No association was found between childhood abuse and chronic pain problems during adulthood [31]. However, a prospective observation study performed by Hart-Johnson and colleagues supported the fact that mental and physical abuse is strongly correlated with chronic pain related outcomes in males and females [32].

Stiffness

Patients diagnosed with FM often complain of morning stiffness. This can be very debilitating and may last from 45 min to 4 h. In 2005, a survey questionnaire consisting of 121 items was developed by the National Fibromyalgia Association (NFA) and was administered to 2569 FM patients. Morning stiffness was rated as the most troublesome symptom experienced, followed by fatigue and nonrestorative sleep [33].

Muscle elasticity is decreased with age. A study from McHugh and colleagues found that muscle stiffness may worsen muscle damage incurred during strenuous exercise [34]. It is generally well accepted that concentric muscle contraction and passive stretch can improve stiffness. Thus, increasing activity with limitation of strenuous exercises may improve stiffness in some patients.

Cognitive Dysfunction

Most patients with FM complain of short-term memory loss, difficulty with multitasking, and poor concentration. When compared to patients without FM of the

same age group, FM patients showed decreased working memory, free recall, and verbal fluency but they had the same processing speed for information. When compared to an older population without FM, the FM group had similar performance for working memory and free recall, poorer vocabulary, and faster processing speed. The cognitive delay seen in FM patients seems to be correlated with pain and not with the presence or degree of affective disorder [35].

Irritable Bowel Syndrome

About 30–50 % of patients with FM also have associated IBS. IBS is characterized by increased bowel movements and its severity may be correlated with patients' self-perception of their disease process. IBS in FM patients may be related to widespread central sensitization [36].

Genitourinary Disorders

Approximately 12 % of patients with FM meet the criteria for the diagnosis of female urethral syndrome. Female urethral syndrome is characterized by urinary frequency, urethral pain, suprapubic discomfort, and dysuria. In addition, 60 % of patients with FM complain of urinary urgency [37]. FM also appears to have significant clinical overlap with interstitial cystitis [38].

Related Syndromes

Patients with chronic pain conditions other than FM may eventually develop FM with time. These patients are said to have secondary FM. Primary and secondary FM may not be clinically distinguishable from one another [16]. Common rheumatologic and systemic diseases that present concomitantly with FM include Sjogren's syndrome (50 % of FM patients also present with SS), rheumatoid arthritis (30 % of patients with FM present with RA), and systemic lupus erythematosus (40 % of FM patients present with SLE) [39].

Fortunately, through diligent physical examination and laboratory workup, it is easy to distinguish secondary FM from these co-occurring diseases. For example, RA can present with small joint swelling in the distal upper and lower extremities, which is not present with FM. SLE can present with skin rash and other systemic symptoms that are not present in FM patients. Both of these conditions will also result in elevated erythrocyte sedimentation rate (ESR), which is usually normal in FM [40].

In addition to inflammatory conditions, some environmental factors have been shown to play a role in triggering FM. These factors may include trauma, catastrophic events, emotional incapacitation, and infections [41]. Some infections that have

been noted to trigger FM have been hepatitis C, HIV, Lyme disease, coxsackie B, and parvovirus [42]. It has been noted that in patients with comorbid FM and Lyme disease, symptoms of FM occurred after Lyme disease was contracted, and FM symptoms persisted after resolution of Lyme disease from an antibiotic therapy [43].

Laboratory Evaluation

Laboratory workup is useful when trying to rule out certain conditions that may be part of the differential diagnosis of FM. No specific laboratory finding is correlated with FM. The differential diagnosis includes but is not limited to systemic and inflammatory illnesses (RA, SS, SLE, ankylosing spondylitis, polymyalgia rheumatica, inflammatory myositis), infections (hepatitis C, HIV, Lyme disease, coxsackie B, and parvovirus), endocrine disorders (hypothyroidism, hyperparathyroidism, Cushing's syndrome), peripheral neuropathy, and myofascial pain syndrome associated with trigger points.

Due to the long list of possible diseases that may mimic FM, it is very easy to fall into the trap of ordering laboratory values carelessly. Initial laboratory evaluation should consist of a complete blood count (CBC) with an ESR. One may order a C-reactive protein (CRP) instead of an ESR depending on the disease process being investigated. Recall that FM is not an inflammatory disease and would not result in an elevated ESR and CRP. Furthermore, if an endocrine disorder is suspected, it is reasonable to order laboratory values related to the suspected disorder, such as thyroid function test for suspected hypothyroidism. Other laboratory tests such as antinuclear antibody and rheumatoid factor should be ordered on a case-by-case basis when there is high clinical suspicion for an inflammatory rheumatic disease. These tests have a high rate of being falsely positive in healthy individuals and have poor predictive value when clinical suspicion is low [40].

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Fibromyalgia
Clinical Guidelines and Treatments
Lawson, MD, E.; Wallace, M. (Eds.)
2015, X, 193 p. 6 illus., 5 illus. in color., Softcover
ISBN: 978-3-319-15819-8