

CASE REPORT

Outpatient Rehabilitation of a Patient with Functional Neurological Disorder Receiving Workers' Compensation Benefits: A Case Report

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Background: Functional neurological disorder (FND) is a clinical syndrome characterized by abnormal involuntary movements and specific clinical features that are incongruent with known neurologic diseases. Clinical information is lacking on outpatient rehabilitation for patients with FND. **Case:** A 28-year-old woman visited our hospital for gait disturbance. She had experienced an occupational accident 20 months earlier. Her injuries were relatively minor, but subsequently, she was unable to move her ankle voluntarily and began receiving workers' compensation benefits. The patient had persistent gait disturbance and preferred to walk with an ankle-foot orthosis. However, at her first visit, her ankle could move while walking without her ankle brace. Nerve conduction studies showed no abnormalities. Shortly after receiving an explanation regarding the diagnosis of FND, the patient was able to move her ankle voluntarily; however, her gait disturbance was partially persistent. After outpatient rehabilitation, she was able to walk in different types of footwear without an ankle brace. Satisfied with the result, she agreed to end rehabilitation and her access to workers' compensation. **Discussion:** After diagnosis and rehabilitation for FND following an occupational injury, our patient was eventually able to walk without an ankle brace. In this case, providing the patient with information regarding a diagnosis of FND and obtaining her informed consent for subsequent rehabilitation may have helped to improve the symptoms of FND.

Key Words: functional movement disorder; functional neurological disorder; occupational accident; outpatient; rehabilitation

INTRODUCTION

Functional neurological disorder (FND)—formerly described as hysteria, conversion disorder, or functional movement disorder (FMD)—is commonly observed in clinical practice. Nowadays, FND is the more commonly used terminology. FND accounts for 3%–40% of all patients seen in neurological disorder clinics.^{1–4} There are problems with the terminology of this condition, because it affects diagnosis and treatment and makes it difficult to explain the condition to the patient. Stone et al.⁵ emphasized that the diagnosis should not be one of exclusion. Traditionally, for

patients with FND, clinicians have been limited to ruling out other conditions and then declaring the disorder to be “psychogenic.”¹ Some clinicians may hesitate to explain susceptibility to the patient because they feel that terms such as hysteria or conversion fall within the scope of psychiatry rather than neurology. Edwards et al.⁶ investigated this issue and concluded that the most acceptable term for patient treatment is “functional movement disorder.” A positive diagnosis and early explanation are important. The criteria for a positive diagnosis of FND were revised in 2009.^{7,8} Positive signs of FND and physical training have been suggested as integral parts of diagnosis and treatment.^{8–11}

Received: March 21, 2023, Accepted: November 1, 2023, Published online: December 1, 2023

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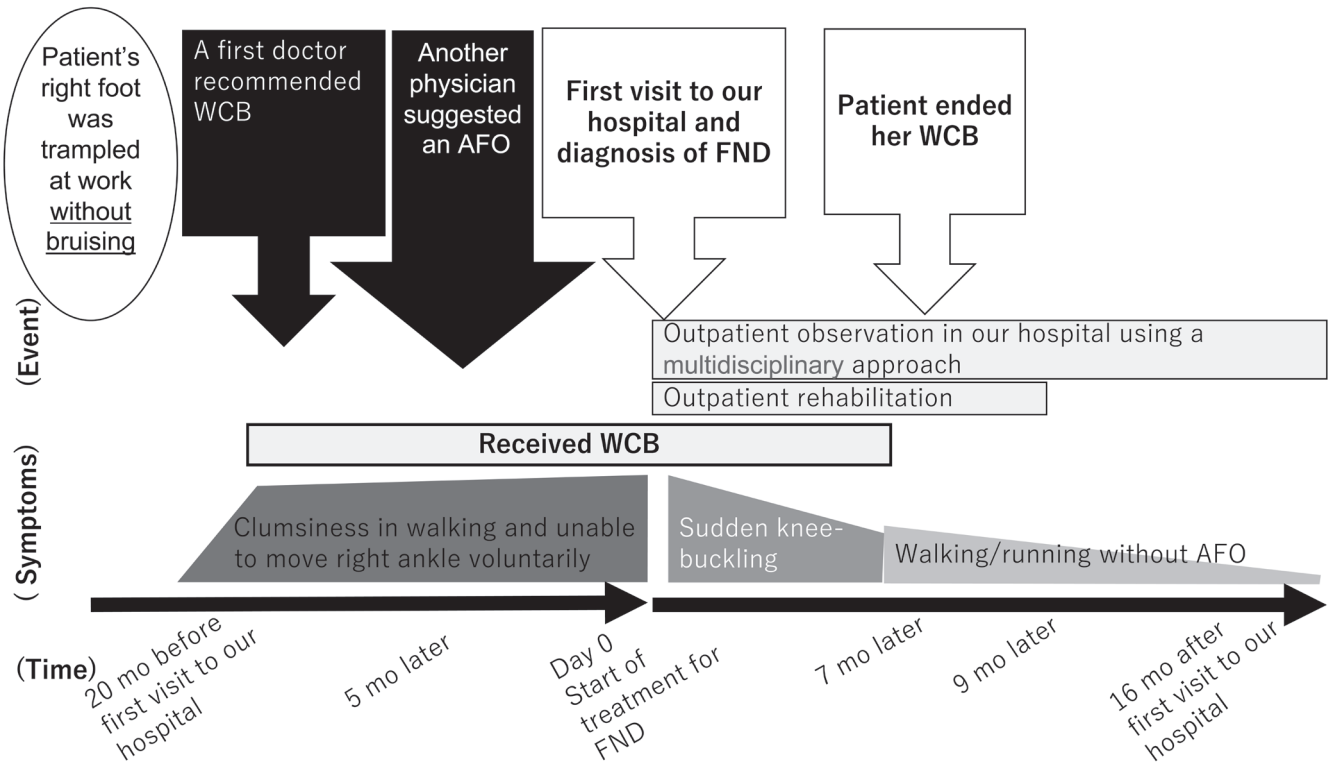


Fig. 1. Time course of recovery in the patient. Nine months after her first visit, she agreed that her physical rehabilitation for FND was a success and she ended her access workers' compensation benefits (WCB). Dissociation of muscle movement of her right ankle remained, but no relapse was observed after the end of outpatient rehabilitation without an AFO and after the end of WCB.

Recently, several studies^{8,10–15)} have reported positive results from inpatient multidisciplinary interventions focusing on exercise retraining; patients have been admitted to such programs after a diagnosis of documented or clinically established FND.^{7,8,11,16,17)} However, there are no standard treatment guidelines. In addition, outpatient rehabilitation allows the patient to be treated over several months without the need for work cessation. To our knowledge, there is no previous report on outpatient rehabilitation for FND for a recipient of workers' compensation benefits. Herein, we present details of the procedures followed for a patient with FND and subsequent maintenance and improvements in an all-outpatient rehabilitation program.

CASE

Clinical Course

A 28-year-old woman with gait disturbance presented to our hospital. She reported a 20-month history of gait disturbance, which had progressively worsened (**Fig. 1**). The patient had no other comorbidities or past medical history

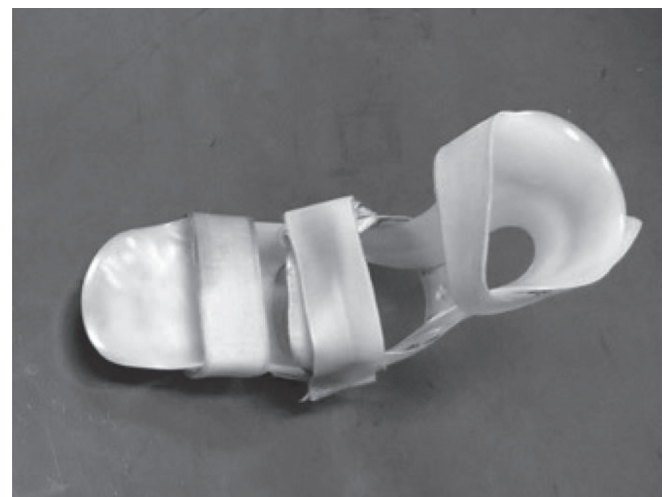


Fig. 2. AFO used by the patient to immobilize the ankle joint: the use of splints or devices that immobilize joints should be avoided in FND patients.¹⁷⁾

prior to consultation and was mostly independent except for her use of a right ankle-foot orthosis (AFO) (**Fig. 2**). She was

not on any medication. Her written informed consent was obtained for publication of this case report.

The patient's symptoms had started 20 months earlier after a work accident. Her right foot was run over three times at slow speed by the wheel of a car driven by a coworker. Following the incident, her pain had diminished within hours and an orthopedic surgeon at a nearby clinic found no contusion or bruising. The patient was able to walk, and the day after the accident, she resumed her job as a staff member at a dental clinic (**Fig. 1**). From this information, it was speculated that the trauma itself had been relatively minor, with few adverse effects.

The following week, the patient noticed she could not voluntarily move her ankle. Finding that she walked clumsily, she decided to return to the orthopedic clinic for further treatment (**Fig. 1**). Her doctor determined that her symptoms were caused by the accident and arranged for her to receive workers' compensation benefits. However, the doctor did not separately address her symptoms or her performance in walking and running. The patient's gait impairment persisted 15 months after the accident. At this point, another physician recommended the use of an AFO (**Fig. 2**) as part of her workers' compensation benefits (**Fig. 1**). Although the patient considered that her walking ability improved with the AFO, albeit with moderate pain in her right leg, she could not move her ankle spontaneously as before.

Twenty months after the accident, a third physician recommended that she undergo an electrophysiological examination at another hospital. The patient then visited our university hospital for the first time and underwent the examination. On her first visit to our hospital, physicians found that her ankle could move while walking without an AFO. When walking without an AFO, the only noticeable gait defect was slight inward foot rotation on the affected side. However, the patient demonstrated a discrepancy in anterior tibialis muscle strength (manual muscle testing; MMT) during examination (muscle strength, 0) and functional ability during tasks such as walking or shoe donning and doffing (muscle strength, ≥ 3), with no sign of foot drop or steppage gait, which clearly contradicted the MMT score of 0. This motor inconsistency is an important finding that is indicative of functional weakness. It indicated that motor performance varied in two different situations when testing the same muscle.

Sudden jerking or give-way weakness is an important finding for diagnosis of FND,^{5,8,11,17} but it was not observed at the first visit. Both the Achilles and patellar tendon reflexes were challenging to elicit, even upon relaxation instructions, with no discernible asymmetry between the left and right

sides. FND patients can display symptoms resembling pyramidal tract lesions, yet tendon reflexes remain normal.⁸ The sensory function of the left leg was uncertain but not deprived; we therefore also evaluated the unaffected side. The left side anterior tibialis muscle strength (5), range of motion (ROM) of ankle dorsiflexion (15 degrees), and sensory function on the unaffected side and both quadriceps and hamstrings were found to be normal, further emphasizing the unique presentation of FND (**Table 1**).

The patient's performance in activities of daily living (ADL) was assessed using the Functional Independence Measure (FIM), in which she scored 125. The patient was independent in all tasks, with the only assistance "needed" in walking, for which she used an AFO. Nerve conduction studies showed no abnormalities. Given the patient's medical history and the results of physical examination, we considered the possibility of FND according to the criteria^{2,7,8,11,16,17} (**Table 1**, Part 2: Positive diagnosis and positive explanation).

We conducted a patient interview (**Table 1**, Part 1: Ask). History-taking itself should be a part of treatment when FND is suspected. In the interview, we sought to acquire information needed to resolve the discrepancy between the patient's subjective symptoms and the observed phenomena.

During examination, we attempted to explain the positive signs of FND. In this case, multidisciplinary teamwork started in the outpatient setting: the physician described FND, and rehabilitation physicians explained the supposed normal function in a motor nerve conduction examination. In addition, the nerves and muscles that moved the patient's ankle were described as far removed from the site of her injury.





Diagnosis

We diagnosed FND based on the criteria outlined by Fahn and Williams¹⁶ and the review by Gupta and Lang.⁷ Despite the lack of explicit objective evaluations in these works, they provide a framework for diagnosing FND. Nerve conduction studies showed no abnormalities, and the patient demonstrated a discrepancy in anterior tibialis muscle strength during examination (muscle strength 0) and functional ability during tasks (muscle strength 3 or more). This motor inconsistency is indicative of functional weakness. The patient's symptoms had begun after a work accident and gradually worsened. These physical examinations and the clinical course suggested the possibility of FND.

Treatment and Rehabilitation

Immediately after examination and diagnosis, the patient was able to move her ankle spontaneously, albeit weakly.

Table 1. Detailed method of initial neurological assessment in treatment of FND

<p>1 Ask </p> <p>1-1 Ask the patient for positive signs. If they have experienced them, assure the patient that it is common and has nothing to do with 'being crazy.'</p> <p>1-2 Ask what the patient thinks is wrong and what should be done. DO NOT START explaining anatomy of nervous system yet, before asking what he/she thinks and looks for.</p> <p>1-3 Don't dive in to ask questions about depression, anxiety, stress, or abuse. Studies show that ONLY around half of the patients have a comorbid anxiety or depression. It would be unnecessarily intrusive at the first assessment.</p> <p>1-4 Time. If the assessment is complicated or difficult, it may require more than 1 h. In such cases, it is helpful to divide big problems into smaller pieces.</p>	<p>2 Positive diagnosis and positive explanation </p> <p>2-1 The diagnosis of FND is positive and not negative. Negative scan does not mean FND. Even positive scan may still be a functional tremor. Positive signs such as Hoover sign or Sonoo abductor sign makes clinical diagnosis of FND. Recommend patients to do the test by themselves to persuade their family.</p> <p>2-2 The positive signs of FND demonstrate the potential of patients for reversibility.</p> <p>2-3 The signs demonstrate the role of attention and distraction—for example, the more the Patient pays attention to the limb, the worse it is.</p>
<p>3 Lead patient to the preferred outcome (last 10-15 mins of the interview)  </p> <p>3-1 Not "Why" but "How" should be emphasized. To treat multiple sclerosis, we don't start to explain why the disease emerged. How we diagnosed and are going to treat is important. "Stress may make you sick" is of no use.</p> <p>3-2 "I see lots of patients with similar symptoms." "You have functional weakness/dissociative seizures. There's a problem with the software of the nervous system rather than the hardware. Because there is no damage, you have the potential to get better."</p> <p>3-3 Making the physiotherapy or psychiatric referral (preferably at a second visit), "I'll see you again. Please come back with questions and your positive sign test. My colleague X has a lot of experience and interest in helping patients with functional movement disorder—he won't think you are crazy either." Psychiatric referral is not always needed, but it is important to triage and to assure that the doctor doesn't think the patient is crazy.</p>	

Modified from Stone¹⁸⁾ and Sonoo⁸⁾.

We recommended that she perform this neurological training at home as an exercise. The patient's gait disturbance persisted to some degree, but she expressed relief that she would eventually be able to walk more freely. We arranged a follow-up visit and set the patient's first goal as walking without an AFO.

At the patient's second visit, her gait was more stable, but another problem had surfaced: she exhibited sudden knee buckling during her work (**Fig. 1**). Sudden knee buckling is suggested as a positive symptom of FND.^{8,11)} When we asked about her foot sensation (it was uncertain at the first visit), she replied that it had been normal for the past 15 months. After receiving this information, we limited evaluation of sensation to avoid any relapse of sensation disorder. In FND, dissociation of memory is not uncommon, and hands-on attachment should be limited to prevent relapse of symptoms. Typically, MMT, ROM, and sensory evaluation require hands-on attachment. We explained to the patient that sudden knee-buckling is one of the common signs of FND¹⁷⁾ and that the area of physical trauma was far from her knee. We also explained that sudden knee-buckling itself appears in

other diseases; however, she had no other symptoms at that time (**Fig. 1**). Other neurological symptoms or susceptibility to physical disease were not observed in follow-up rehabilitation visits, so it was unlikely that sudden knee-buckling itself was caused by physical or neurological injury.

We continued outpatient motor-retraining rehabilitation in several follow-up visits. The rehabilitation program was simple: visual training using a mirror (**Fig. 3**), walking backwards, and climbing up and down stairs, all without an AFO. Home exercises were also introduced. In addition to our clinical observations, we captured videos and still images of the patient performing daily activities, such as walking and navigating stairs, to provide a real-world perspective on her recovery. Although these activities could not provide objective measurements, they offered a visual representation of the patient's ability, thereby illustrating the absence of muscle weakness and the lack of need for an AFO.

After two additional rounds of outpatient rehabilitation, the patient was able to walk without an AFO. She continued her home exercises. During this time, we recommended that she consult a psychiatrist in triage as part of a multidisciplinary



Fig. 3. Motor training using a mirror image.

approach to treating FND^{2,8)} (**Fig. 1**). A psychiatric interview revealed no obvious problems. We invited the patient's family to our hospital to explain her diagnosis and rehabilitation. The family understood our suspicion of FND and agreed to cooperate with exercise retraining and follow-up.

Follow-up consultations continued at 3-month intervals. Seven months after the first visit to our hospital, the patient's sudden knee-buckling had disappeared completely. Nine months after her first visit, she agreed that her rehabilitation was a success and expressed her intention to end her access to workers' compensation benefits (**Fig. 1**). Ten months after her first visit, the patient set new rehabilitation goals of walking using different footwear, such as short boots or *geta*, the Japanese traditional sandal. We initiated a shortened outpatient rehabilitation program and tested the patient using *geta* and European sandals. We also analyzed her steps using *geta* with a video device. The first day that she wore *geta*, she was able to walk up a staircase. She was unable to move her ankle voluntarily, although she admitted that she could unconsciously move her ankle in the staircase trial. She continued her home exercises, and we did not see any decline in her exercise level. Her outpatient rehabilitation was completed in three sessions. The patient was generally satisfied with the results and planned to attend a follow-up visit every 5 months to prevent regression.

DISCUSSION

Herein, we report the all-outpatient rehabilitation of a patient who received workers' compensation benefits based

on symptoms of FND. To our knowledge, this is the first detailed report of outpatient-only treatment for a patient with gait disturbance related to FND.

In a series of publications,^{2,5,18)} Stone and coworkers described the use of a new "recipe" for FND treatment that they claimed could lead to treatment in outpatient settings, even though Stone admitted that FND is difficult to treat.¹⁸⁾ As such, outpatients as well as inpatients can take the lead in their own care in new ways. These methods (**Table 1**) include history acquisition during outpatient examination and providing an explanation to the patient of a positive FND diagnosis, as well as simple advice on self-help techniques.^{8,18)} A demonstration is one of the most therapeutically important parts of a consultation. Patients can observe physical signs in practice, which can help them see the possibility of improvement. Sonoo⁸⁾ introduced this approach in Japan in 2017. Detailed descriptions of FND and positive symptoms are also available for clinicians' reference.^{8,11,18)} This approach does not require as much time or staff resources as traditional cognitive behavioral therapy, and it has been reported to be helpful in FND.^{8,18)} Clinicians themselves can change their perspective regarding the patient's disability during the first visit. In our case, the patient thought she had a work-related nerve injury and then completed rehabilitation with the belief that she was only functionally impaired and the injury was potentially reversible. According to Demartini et al.,¹⁹⁾ if the patient changes their behavior as a result of their new knowledge, then that is close to cognitive behavioral therapy.

Tiered care has been proposed for FND in children,⁹⁾ which can be modified for adults. Step 1 is the neurology consulta-

tion style described above. Step 2 involves multidisciplinary triage and treatment. If that fails, Step 3 involves a more complex and multidisciplinary treatment. Clinicians can feel encouraged knowing that many patients are helped by Steps 1 and 2. In this case, Step 2 was partially executed. This was a brief intervention conducted by rehabilitation physicians, and the patient had only one triage consultation with a psychiatrist. We provided support for her and her family, in addition to the local physician who recommended the use of an AFO to the patient. The formation of multidisciplinary therapeutic alliances might be an effective approach in moderate to severe FND.⁹⁾

Several studies have examined the effects of rehabilitation, including both physical and psychological interventions.^{9,10,15)} Demartini *et al.*¹⁹⁾ prospectively examined the short-term and long-term effectiveness of a telemedicine program for patients with FND that included physiotherapy, occupational therapy, cognitive behavioral therapy, and psychiatric and neurological care. The findings were encouraging, with functional improvements after rehabilitation and follow-up. Apart from the aforementioned studies, little is known about the physical symptomatology in patients with FND.

We believe that understanding the fundamental differences between outpatient and inpatient rehabilitation for FND is integral to the understanding and management of this condition. There are two important differences between reportedly successful inpatient daily rehabilitation^{12–15)} and outpatient rehabilitation spaced out over several months,^{20,21)} as in our case. The first is that inpatient rehabilitation involves a 24-h multidisciplinary team. Conversely, although lacking this constant interprofessional collaboration, outpatient rehabilitation allows for consistent engagement with the patient without the need for work cessation.^{18,20)} This can prevent the onset of disease progression and facilitate smoother transitions, especially in the period leading up to the termination of workers' compensation benefits. Patients who choose inpatient daily rehabilitation to treat FND¹²⁾ are more deeply impaired in terms of ADL. In the study of Nielsen *et al.*,¹²⁾ the mean score on the Berg Balance Scale (BBS) of patients was 39.9 at the time of hospitalization and 51.0 during the follow-up outpatient observation period. In contrast, our patient showed mild local impairment in terms of ADL. Despite relatively mild impairment, she was not naturally improving. However, because of her relatively high FIM score of 125, she did not qualify for hospitalization rehabilitation under Japan's workers' compensation and healthcare system amid the COVID-19 pandemic. This resulted in a lack of multidis-

ciplinary collaboration until her first visit to our hospital, as well as a delay in accurate diagnosis.

The second difference to inpatient rehabilitation is risk management in spaced-out rehabilitation sessions in an outpatient setting. Even in our hospital where multidisciplinary collaboration is practiced, we were hesitant to perform objective tests, including the BBS and 10-m walk. In FND, it is common for patients to experience relapse such as falls or fainting during or after a test.^{19–21)} Even when test results are explained immediately, there is a tendency for symptoms to worsen if the patient is easily influenced.¹⁹⁾ These challenges highlight the unique difficulties in managing FND in an outpatient setting.

This is only one test case, which means that we cannot make any clear recommendation. However, we think it takes about 1 month to build home exercise adherence and, after that, about 2 months to make progress and reach the first goal. Our home exercise programs and outpatient exercises were very simple. We consider that an observation period of about 2 years is required to confirm the diagnosis. If the diagnosis of FND is not correct, the signs of alternative illness should be recognized quickly to allow consultation and treatment from the appropriate department. In the present case, sudden knee-buckling occurred after the patient achieved home exercise adherence. We identified this symptom of FND¹⁷⁾ and provided appropriate support to the patient while explaining the diagnosis.

Short-term intervention by a psychologist is effective in non-epileptic seizures.²⁾ Sudden knee-buckling resembles a non-epileptic seizure. In the present case, knee-buckling occurred after the patient had received an explanation about FND and psychological triage, and the problem disappeared after a brief explanation of sudden knee-buckling. In this case, psychological triage was performed by a psychiatrist only once. Such multidisciplinary teamwork is reported to be effective.⁹⁾

Fortunately, the patient had not injured her head or knees in the workplace accident, and she seemed to have high intelligence. A more organized multidisciplinary approach is recommended in cases that involve intellectual disability or head injury.⁵⁾

The first goal of our rehabilitation program was to achieve independent walking without an AFO. Generally, the use of splints or devices that immobilize joints should be avoided in FND patients.¹⁷⁾ Although rehabilitation clinicians do not usually regard splints or devices as having harmful impacts on ADL, the use of mobility aids, such as wheelchairs, for FND patients can have negative effects on ADL. It is recom-

mended that the use of splints or devices for FND patients be avoided when possible.¹⁷⁾

This study has some limitations. First, our report involves only one case; therefore, the generalizability of our findings may be limited. Second, this study was conducted without a control group and was not compared to conventional follow-up or cognitive behavioral therapy. Ideally, the mechanisms of functional improvement should be elucidated by assessing brain organizational changes using techniques such as diffusion magnetic resonance imaging. Third, the lack of established objective evaluations for FND is an important challenge. In hindsight, we recognize our cautious approach to objective evaluations as a limitation. In our patient with FND, we feared potential relapse because of overt measurements, especially in an outpatient setting where visits were weeks apart. In the future, we aim to incorporate objective evaluations such as the BBS and 10-m walk test.¹²⁾

CONCLUSION

After an occupational injury, followed by a diagnosis of FND and outpatient rehabilitation, our patient was eventually able to walk without an AFO. In this case, providing information about FND and obtaining informed consent for subsequent rehabilitation may have helped to improve the patient's symptoms. Further clinical experience is needed to establish processes for earlier diagnosis and to develop a rehabilitation program for relatively minor or chronic FND.

ACKNOWLEDGMENTS

The authors thank the orthopedics and psychiatry staff of the National Defense Medical College. We thank Analisa Avila, MPH, ELS, of Edanz (<https://jp.edanz.com/ac>) for editing a draft of this manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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