

Orthopaedic Manifestations of the Chikungunya Virus in Jamaica

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ABSTRACT

Objective: To document the musculoskeletal manifestations of the Chikungunya epidemic in Jamaica.

Method: One-hundred cases of patients with Chikungunya infection with sub-acute musculoskeletal symptoms during the 2014 epidemic were collected and reviewed. The cases were collected on the patients who were presented to the outpatient departments of the Orthopaedic clinics in Kingston. The case definition for the diagnosis of Chikungunya, published by The World Health Organization (WHO), was used to identify the subjects. The patients who did not satisfy these criteria or did not have musculoskeletal manifestations after the acute phase were excluded.

Results: The study population consisted of 100 patients with an average age of 55.1 years, 28% of them were men. The time from acute phase to presentation was 3.15 weeks. Areas with pre-morbid musculoskeletal disease were present in 60% of the patients. The shoulder, wrist and knees were the most common areas affected. The areas that had been affected by injury or disease previously were more commonly involved.

Conclusion: This study showed that people over 50 years of age were more likely to suffer from sub-acute musculoskeletal symptoms of Chikungunya and the areas with previous musculoskeletal disease are more likely to be affected.

Keywords: Chikungunya, Jamaica, post-viral arthritis

Manifestaciones ortopédicas del virus Chikungunya en Jamaica

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RESUMEN

Objetivo: Documentar las manifestaciones musculoesqueléticas de la epidemia de Chikungunya en Jamaica.

Método: Se tomaron y examinaron 100 casos de pacientes con la infección de Chikungunya, con síntomas musculoesqueléticos subagudos durante la epidemia de 2014. Los casos fueron recogidos entre los pacientes que acudieron presentaron a los departamentos de consulta externa de las clínicas ortopédicas en Kingston. La definición del caso para el diagnóstico de Chikungunya, publicada por la Organización Mundial de la salud (OMS), se utilizó para identificar a los sujetos. Se excluyeron los pacientes que no satisfacían estos criterios o no presentaron manifestaciones musculoesqueléticas después de la fase aguda.

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Resultados: La población de estudio consistió en 100 pacientes con un promedio de edad de 55.1 años; el 28% de ellos eran hombres. El tiempo de la fase aguda a la presentación fue de 3.15 semanas. Áreas con enfermedad musculoesquelética premórbida estaban presentes en el 60% de los pacientes. El hombro, la muñeca y las rodillas eran las áreas más comunes afectadas. Las áreas que habían sido afectadas por lesión o enfermedad fueron previamente, estaban más comúnmente comprometidas.

Conclusión: Este estudio demostró que la gente de más de 50 años presentaba mayor probabilidad de sufrir síntomas musculoesqueléticos subagudos de Chikungunya, y que las áreas con enfermedad musculoesquelética previa, tenían mayor probabilidad de verse afectadas.

Palabras clave: Artritis post viral

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INTRODUCTION

The Chikungunya virus (CHIKV) is a mosquito-borne viral infection that causes acute onset fever, rash and joint pains. While the infection is rarely fatal, the joint pain engendered by CHIKV can be severe and debilitating. During the epidemic in Jamaica, many patients were referred to the Orthopaedic outpatient departments for disabling joint pains. In addition, referrals were also made for the worsening symptoms of the pre-existing orthopaedic conditions and for the persistence of the musculoskeletal symptoms after the resolution of the acute phase. There is not much documentation of orthopaedic related sequelae associated with the acute and sub-acute phases of CHIKV. The authors have therefore, reviewed 100 patients presented with musculoskeletal symptoms in the sub-acute phase, during the 2014 epidemic in Jamaica.

SUBJECTS AND METHODS

One-hundred cases of the patients with Chikungunya infection with sub-acute musculoskeletal symptoms during the 2014 epidemic, were collected and reviewed. The cases were collected on the patients who were presented to the outpatient departments of the Orthopaedic clinics in Kingston. The case definition for the diagnosis of Chikungunya, published by The World Health Organization (WHO) [Table 1] was used as a part of our inclusion criteria. The patients who did not satisfy this definition nor did not have musculoskeletal manifestations after the acute phase were excluded. The acute phase was considered to have ended when all other symptoms such as fever, rash, anorexia and gross fatigue, had been resolved.

RESULTS

The study population consisted of 100 patients with an average age of 55.1 years, 28% of them were men. The time from the acute phase to their presentation was 3.15 weeks. Pre-morbid musculoskeletal disease was present in 60% of the patients. Most of the patients had multiple areas with one or two areas more symptomatic than the others. The shoulder, wrist and knees were the most common areas affected (Table 2).

The areas that had been affected by injury or disease previously were more commonly affected (Table 3).

Table 1: Case definition of Chikungunya fever.

Proposed case definition of Chikungunya Fever (WHO, SEARO)	
Criteria for diagnosis: 1. Clinical criteria: acute onset of fever $>38^{\circ}\text{C}$ and severe arthralgia/arthritis not explained by other conditions 2. Epidemiological criteria: residing or having visited epidemic areas, having reported transmission within 15 days prior to the onset of symptoms 3. Laboratory criteria: at least one of the following tests in the acute phase: <ul style="list-style-type: none"> – Virus isolation – Presence of viral RNA by RT-PCR – Presence of virus specific IgM antibodies in single serum sample collected in acute or convalescent stage. – Four-fold rising of IgG titers in samples collected at least three weeks apart 	Case definition for surveillance: Possible case: a patient meeting clinical criteria Probable case: a patient meeting both the clinical and epidemiological criteria Confirmed case: a patient meeting the laboratory criteria, irrespective of the clinical presentation

These pathologies ranged from recent trauma to injuries greater than 20 years old that had not been previously symptomatic.

DISCUSSION

Chikungunya virus is a single-stranded RNA alphavirus, from the family *Togaviridae* (1). The disease was first described in 1955 by M Robinson, following an outbreak along the border between Tanzania and Mozambique, in 1952 (2). Chikungunya is transmitted by the bite of the infected *Aedes* mosquito from an infected person to a healthy person. The virus is transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes during the daytime (1–3). The *Aedes aegypti* mosquito is the only type of mosquito identified in Jamaica, capable of transmitting the Chikungunya virus at this time.

In 2004, CHIKV re-emerged from East Africa to cause devastating epidemics that have affected millions in the Indian Ocean Basin and Asia (4). The epidemics have also been initiated by travellers subsequently in Italy and France, as well as human cases exported to most regions of the world, including the Americas where CHIKV could now become endemic (5, 6).

In December 2013, the WHO reported the local transmission of Chikungunya in St Martin. This was quickly followed by reported cases in the French territories of Martinique and Guadeloupe. Within the first three months of 2014, more cases were reported in the British Virgin Islands, St Kitts and Nevis, Anguilla and the Dominican Republic (7). Chikungunya is now found in over 35 territories in the Caribbean and the Americas with over 14 000 confirmed cases and in excess of 874 000 suspected cases in November 2014 (8). The analyses from the Centres for Disease Control and Prevention are warning that this mosquito-borne disease will likely continue to infect travellers to the region as most people in the region are not immune to the virus and will likely

spread the disease to new areas (9). Climate change in the future and globalization may be further responsible for a possible increase in the distribution and activity of mosquito vectors capable of transmitting this disease (10). It is difficult to predict the outcome of such events, but we believe that CHIKV has the potential to become a major public health problem in Jamaica and the Caribbean.

The acute phase

Infected people often present with a sudden onset of fever, rash and significant polyarthralgia/polymyalgia (11). Most patients with CHIKV-infection have arthralgia, that is usually symmetrical and most commonly affects the fingers, wrists, ankles, elbows, toes and knees (12, 13). The definition of CHIKV-infection used in this study is the accepted case definition used by the Ministry of Health in Jamaica created by the WHO and the South-East Asia Regional Office (SEARO): fever \pm skin rash \pm joint symptoms epidemiologically linked to CHIKV (fever, joint pains, rash within a household or positive laboratory test – polymerase chain reaction (PCR), Immunoglobulin M (IGM), enzyme-linked immunosorbent assay (ELISA) or physician diagnosed CHIKV with the exclusion of other diagnoses for fever are shown in Table 1 (14). The symptoms may last for a few days to a few weeks, but joint pains can be experienced for an extended period of time (15). In this phase, patients often complain of intense debilitating polyarthralgia. The spine and proximal joints can become inflamed with large joint effusions especially in the knees and elbows. Most CHIKV-infected patients experience significant improvements in pain and incapacity within a week. In the sample studied, we found an average of 3.15 weeks from acute symptoms to the time of presentation to the orthopaedic surgeon for a relapse. The patients with previous orthopaedic injuries and conditions with or

Table 2: Musculoskeletal areas affected by the Chikungunya virus.

Musculoskeletal areas involved	Number of cases
Cervical	12
Shoulder	20
Wrist	29
Elbow	1
Fingers	5
Knees	23
Hip	2
Ankles	14
Feet	18
Other	17

Table 3: Areas affected by Chikungunya virus that had pre-morbid disease

Pre-morbid disease	Area affected by CHIKV	Site
12	20	Shoulder
6	12	Cervical spine
7	29	Wrist
1	2	Hip
13	23	Knee
2	14	Ankle
8	18	Feet
11	17	Others include: lower back pain and achilles tendonitis

without a history of surgical intervention often complain of greater intensity of the symptoms in these affected areas in the acute setting. In addition, these affected areas appear to resolve at a slower rate when compared to the unaffected areas. The nature of the orthopaedic surgical intervention does not seem to influence the severity of the symptoms experienced among the patients.

Chikungunya virus causes a debilitating, musculoskeletal inflammatory disease in humans. Macrophages constitute the major inflammatory infiltrates in musculoskeletal tissues during these infections (16). There are currently no licensed medicines or vaccines for any of the arthritis/myositis-associated CHIKV treatment. In Jamaica, the analgesia recommended by the health authorities is paracetamol. The rationale for this is to avoid the use of the non-steroidal anti-inflammatory in patients who may have dengue haemorrhagic fever since both illnesses have similar clinical presentations and are borne by the same vector. We believe that paracetamol is ineffective in reducing the inflammation in this condition. We suggest that the cases of the Chikungunya should be treated with non-steroidal anti-inflammatory drugs (NSAIDs) in the acute setting, because of the inflammatory pathology. If there is a concern about haemorrhagic disease, evaluating the platelets may be an effective, cheap and fast method of assessing the risk. Increasing the use of NSAIDs in the acute CHIK-infection may shorten the length of the disabling polyarthralgia/polyarthritis and possibly reduce its relapse and chronicity.

The sub-acute phase

Some patients have a relapse of symptoms (eg polyarthralgia, polyarthritis, or tenosynovitis) in the weeks and months after the acute illness. We found that the upper limbs were most commonly affected with 55% of the symptoms observable in the fingers to the shoulders with the wrists being the most common (29%). Many of these patients do not respond well to the usual acetaminophen and non-steroidal anti-inflammatory analgesia, suggesting that the nature of the chronic pain may not only be nociceptive, but also neuropathic (17, 18). The development of the symptoms in the sub-acute phase is highly dependent on the patient's age. In the study by Sissoko, individuals older than 45 years were significantly more likely to develop chronicity (13). Particularly in elderly patients over the age of 60 years, CHIKV has been found to have significant acute arthritogenic activities and may in fact contribute to the chronic incapacitating arthritis as described for many other alphaviruses (16, 19, 20). In addition,

the likelihood of persistent arthralgia can be influenced by the underlying disorders and the severity of the pain at disease onset (13). We found the average age of the study sample to be 55.1 years with almost half of the patients (47%) being 60 years or older.

A relatively common presentation was pain within or around the tendons and transitioning to tenosynovitis or tendonitis (Figure).

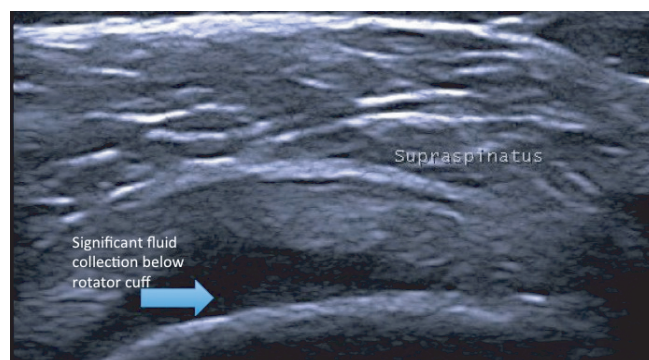


Figure: Ultrasound image showing oedematous supraspinatus tendon with subtendon collection in a patient showing signs of shoulder impairment in sub-acute phase of the Chikungunya infection.

Chopra *et al* found that tenosynovitis/enthesopathy rather, than synovitis was evidenced by ultrasonography in numerous cases (21). Manimunda *et al* revealed on magnetic resonance imaging (MRI) findings, joint effusions, erosions of the bone, marrow oedema, synovial thickening, tendinitis and tenosynovitis. The authors concluded that CHIKV arthritis is a chronic inflammatory erosive arthritis (22). It was also found that CHIKV persisting in the synovial tissue was associated with fibroblast hyperplasia and strong angiogenesis, leading to cell apoptosis and tissue lesions as evidenced by the high levels of matrix metalloproteinase-2 (16).

It was theorized that these observed molecular and cellular findings might contribute to chronic arthralgia/arthritis (18). This may suggest that short courses of varying doses of steroids (eg prednisone (0.5 – 1 mg/kg) in the acute may be beneficial to patients particularly if NSAIDs) have been ineffective.

Clinically, we have found that the joints and other areas that were already affected by underlying disorders including trauma and orthopaedic surgical interventions, were more susceptible. We found that an average of 60 per cent of the patients had pre-existing orthopaedic conditions at the same site.

The chronic arthralgic phase is normally characterized by fluctuations in intensity and relapses, generally less severe than the acute phase; however, there are still significant limitations in the range of motions of the

affected joints and, hence, impairment in the quality of life of these patients.

CONCLUSION

We observed that in Jamaica, the Chikungunya infection has a sub-acute phase with debilitating musculoskeletal manifestations. The areas affected were found to be mainly in the upper limbs with the wrist being the commonest affected area. The majority of the patients experienced symptoms and signs of CHIKV in the areas that sustained previous injuries or had pre-existing orthopaedic conditions. We found that people over 50 years are more likely to suffer from sub-acute musculoskeletal symptoms of Chikungunya.

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