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Algorithm

Potential benefits of therapeutic exercise in the recovery from chikungunya symptoms

[*Potencialidades del ejercicio físico terapéutico en la recuperación de los síntomas de la chikungunya*]

[*Potencialidades do exercício físico terapêutico na recuperação dos sintomas da chikungunya*]

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SUMMARY

The musculoskeletal sequelae of the chikungunya virus can have a significant impact on healthcare systems for months or even years after the acute phase. Therefore, this article addresses the potential of therapeutic exercise as a complement to the rehabilitation of affected patients. Appropriate exercise (for the acute, subacute, and chronic phases) is suggested to improve joint mobility, alleviate persistent pain, strengthen weakened muscles, and prevent the progression of debilitating symptoms. It is argued that

incorporating exercise and interdisciplinary collaboration supports a faster, safer, and more sustainable recovery, thus improving the quality of life for individual patients. Finally, the article underscores the importance of clinical research for individualized rehabilitation protocols and their relationship to functional outcomes in patients with post-chikungunya sequelae.

Keywords: therapeutic physical exercise, chikungunya, recovery

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RESUMEN

Las secuelas musculoesqueléticas del virus chikungunya pueden tener un impacto significativo en los sistemas de salud durante meses o incluso años después de la fase aguda. Por lo tanto, este artículo ha abordado el potencial del ejercicio físico terapéutico como un complemento para la rehabilitación de los pacientes afectados. Se sugiere un ejercicio apropiado (fases aguda, subaguda y crónica) que mejore la movilidad articular, alivie el dolor persistente, fortalezca los músculos debilitados y prevenga la progresión de síntomas incapacitantes. Se argumenta que la incorporación del ejercicio y la cooperación interdisciplinaria apoyan una recuperación más rápida, segura y sostenible que mejora la calidad de vida del paciente individual. Finalmente, el artículo subraya la relevancia de la investigación clínica para los protocolos de rehabilitación individual y su relación con la evolución funcional en pacientes con secuelas post-chikungunya.

Palabras clave: ejercicio físico terapéutico, chikungunya, recuperación.

RESUMO

As sequelas musculoesqueléticas do vírus Chikungunya podem ter um impacto significativo nos sistemas de saúde durante meses ou mesmo anos após a fase aguda. Portanto, este artigo de opinião discutiu o potencial do exercício físico terapêutico como um complemento para a reabilitação dos pacientes afetados. Sugere-se um exercício adequado (fases agudas, subaguda e crônica) que melhore a mobilidade articular, alivie

a dor persistente, fortaleça os músculos enfraquecidos e previna a progressão de sintomas incapacitantes. Argumenta-se que a incorporação do exercício e a cooperação interdisciplinar apoiam uma recuperação mais rápida, segura e sustentável, melhorando a qualidade de vida do paciente individual. Por fim, o artigo destaca a relevância da pesquisa clínica para os protocolos de reabilitação individual e sua relação com a evolução funcional em pacientes com sequelas pós-Chikungunya.

Palavras-chave: exercício físico terapêutico, chikungunya, recuperação

INTRODUCTION

Clinical manifestations of chikungunya

Chikungunya virus (CHIKV) is a crucial factor in the epidemiological characterization and timely management of this arbovirus. The symptomatic pattern has fluctuated with its return in the Americas, but it retains other syndromic characteristics that differ from other infections transmitted by *Aedes aegypti* and *Aedes albopictus,* including dengue and Zika virus (Tortosa *et al.,* 2024).

The manifestations have traditionally been classified into three evolutionary phases: acute phase, subacute phase and chronic phase, with unique pathophysiological and functional consequences (Estigarribia *et al.,* 2024).

DEVELOPMENT

1. Acute phase: Acute onset and a strong inflammatory response

Chikungunya is a virus, and in its acute phase, it typically lasts 3 to 10 days, causing an acute onset of infection that often involves rapid viral replication and activation of the innate immune system. High fever, usually above 39°C, is one of the cardinal signs and begins suddenly, accompanied by chills, frontal or retro-orbital headache, and marked

asthenia. However, severe (symmetrical) arthralgia is the most prominent sign and is characteristic of most peripheral joints of the body (wrists, hands, ankles, or feet) (Kang *et al.*, 2024).

This arthralgia can be severe enough to cause pain when walking, gripping objects, and even performing simple tasks, giving rise to the term "chikungunya," which in the Makonde language means "to bend" or "to twist." During this phase, skin manifestations are also very common. Between 40 and 75% of patients present with a generalized maculopapular rash, pruritic or not, primarily affecting the trunk and extremities (Maure *et al.*, 2024).

Occasionally, conjunctival hyperemia without purulent discharge is present, which helps distinguish it from bacterial infections. The spectrum of symptoms includes photophobia, retro-orbital pain, and non-exudative conjunctivitis. From a hematological perspective, leukopenia and moderate thrombocytopenia are observed, although to a lesser degree than in cases of dengue.

Bleeding is infrequent, which represents another differentiating clinical component. Internally, in the gastrointestinal tract, there are reports of nausea, vomiting, diffuse abdominal pain, and diarrhea correlated with systemic viral infection. To a lesser extent, however, patients may complain of chest pain, severe myalgia, and cervical or axillary lymphadenopathy, thus completing the acute inflammatory picture (Cerqueira *et al.*, 2024).

2. *Subacute phase: persistence of joint involvement and symptomatic relapses*

Subacute phase: prolonged joint involvement and symptomatic relapses. The subacute phase, which occurs from the second week to three months after onset, is characterized by the persistence or recurrence of joint symptoms. Arthralgia persists in a high percentage of patients, although with fluctuations in intensity.

Peripheral polyarthritis, edema in small joints, and morning inflammatory pain that improves with movement are frequently present. Persistence is observed in such cases due to the prolonged presence of inflammatory mediators such as IL-6, IL-1β, and TNF-α, which maintain an active immune state. Enthesitis, tenosynovitis, and joint stiffness are also described at this stage, often contributing to functional restriction (de Lima *et al.,* 2022).

In some situations, notably among the elderly or people with pre-existing rheumatological diseases, mild febrile relapses, extreme fatigue, and paresthesia may develop. Additionally, a subset of patients exhibits residual post-exanthem hyperpigmentation, transient hair loss (telogen effluvium), and persistent itching (Lima *et al.,* 2022).

Less common neurological complications have been described (peripheral neuropathies, Guillain-Barré syndrome, meningoencephalitis, and balance disorders). Although atypical, these manifestations pose a diagnostic challenge and a burden of morbidity, particularly in older adults and immunocompromised populations (Grabenstein *et al.,* 2023).

3. *Chronic phase: rheumatological sequelae and prolonged functional impairment*

The chronic phase of chikungunya, the period in which some symptoms last for more than three months, occurs in 20% to 40% of patients, although some studies indicate that the figures may be higher, especially in people over 45 years of age (Webb *et al.,* 2022).

The defining characteristic is chronic rheumatologic syndrome following chikungunya, which can present as chronic arthritis, recurrent polyarthralgia, persistent stiffness, and disabling pain. Clinical features similar to common rheumatologic diseases, such as rheumatoid arthritis, spondyloarthropathies, and accelerated osteoarthritis in previously damaged joints, have been recognized (Webb *et al.,* 2022).

Persistent inflammation is linked to dysregulation of the immune response and the presence of viral fragments in synovial tissues, which may persist, as suggested by recent immunopathological studies. Along with joint involvement, the chronic phase can also involve considerable fatigue, sleep disturbances, reactive depression, limited mobility, and a severely impaired quality of life (Webb *et al.*, 2022).

This ongoing characteristic not only places a burden on health services but also highlights the need for clinical follow-up and rehabilitation programs to alleviate functional limitations.

Warning signs

The warning signs of chikungunya are a set of clinical manifestations that show an abnormally advanced or possibly severe stage of the disease, and early diagnosis is crucial to prevent systemic complications (de Souza *et al.*, 2023).

Although most cases result in a self-limiting illness, symptoms related to acute illness (fever lasting more than five days, chest pain, difficulty breathing, uncontrollable vomiting, or obvious dehydration) can be seen as early signs of a disorder that needs the attention of a health professional.

These are manifestations of systemic pathology that go beyond the typical inflammatory responses observed during the acute phase, but could be related to cardiovascular, gastrointestinal, or respiratory complications. Another set of warning symptoms is related to changes in neurological status (de Souza *et al.*, 2023).

A list of symptoms may include confusion, extreme drowsiness, seizures, sudden weakness, progressive paresthesia, or difficulty walking, and could be signs of complications such as meningoencephalitis, peripheral neuropathies, or Guillain-Barré syndrome. These symptoms are especially prominent in older adults, newborns, and those with chronic comorbidities, and caution is warranted in monitoring for presentation in these groups (Grabenstein *et al.*, 2023).

The onset of a severe and prolonged headache, with or without neck stiffness, is a significant warning sign indicating the need to seek immediate medical attention. Finally, there are warning signs of hemodynamic or metabolic compromise, such as hypotension, marked pallor, cold sweats, oliguria, and general decline.

Chikungunya has rarely been found to cause severe dengue-like bleeding, bleeding gums, persistent nosebleeds, and extensive bruising may indicate a hematologic difference that warrant evaluation.

In pregnant women, reduced fetal movement and severe abdominal pain become particularly relevant due to the risk of vertical transmission and obstetric complications. Well-defined identification of and response to these signs will reduce morbidity and decrease serious outcomes, confirming the need for timely recognition of warning signs (Grabbenstein & Tomar, 2023).

Potential of therapeutic physical exercise

Therapeutic physical exercises for the treatment of patients with chikungunya depend on the typical pathophysiology of the virus, particularly the joint and musculoskeletal involvement beyond the acute phase. Synovial inflammation, morning stiffness, and reduced range of motion occur during the subacute and chronic stages, leading to functional limitations that affect a person's independence (Santos *et al.,* 2025).

However, international literature supports the notion that stepped and supervised therapeutic physical activity has the ability to limit residual inflammation, improve joint nutrition, and protect against periarticular adhesions or fibrosis.

Therefore, gentle joint exercises and active stretching are important means of maintaining pain-free range of motion. Similarly, muscle strengthening exercises are highlighted because patients often experience substantial atrophy and loss of muscle mass and strength secondary to prolonged bed rest, debilitating arthralgia, and functional disuse. Isometric and subsequently isotonic exercises allow for the restoration

of healthy muscle function without excessively stimulating the inflammatory response in the affected joints (Coutinho *et al.,* 2022).

The basis of modern therapeutic physical activity is the understanding that adequate strengthening of the core, shoulder girdle, and periarticular musculature improves mechanical stability, reduces pain perception, and enables the performance of activities of daily living (Santos *et al.,* 2025).

This results in improved biomechanical healing and a reduced progression to post-chikungunya rheumatological syndrome. Finally, light aerobic exercise, such as controlled walking, stationary cycling, or aquatic activities, can be incorporated based on its positive effects on cardiorespiratory fitness, pain management, and overall quality of life (Caicedo *et al.,* 2019).

Regular aerobic exercise stimulates the secretion of endorphins, improves venous return, reduces fatigue, and helps regulate emotional state, particularly when affected by chronic pain and reduced functional capacity. It has also been documented that exercises performed in an aquatic environment reduce joint stress and allow for safe activity for patients with persistent arthritis (Buitrón *et al.,* 2015).

As such, the nature of the indications for therapeutic exercise should be adapted, progressive, and appropriate to the phases of the patient's clinical journey, with the aim of facilitating complete healing and minimizing the chronicity of joint sequelae (Table 1) and (Figure 1).

Table 1. *Example of prescription of therapeutic physical exercises according to clinical phase of Chikungunya*

Clinical phase	Therapeutic objectives	Recommended types of exercises	Dosage / Frequency	Clinical precautions
Acute phase (0–10 days)	- To achieve pain and inflammation control. - To maintain minimum joint mobility. - To prevent severe stiffness.	------	--------	- Avoid pain. - Do not use it intensely. - Discontinue use if fever occurs.
Subacute phase (2 weeks – 3 months)	- Restore joint range of motion. - Reduce stiffness. - Restore muscle function.	- Full active mobility. - Active stretching. - Gentle isometrics. - Light cardio.	- 3–5 times/week. - 10–15 repetitions. - Cardio 10–20 min.	- Avoid overloading. - Increase intensity if there is no pain.
Chronic phase (more than 3 months)	- Improve strength and endurance. - Reduce long-term effects. - Restore functionality.	- Progressive strengthening. - Proprioception and balance. - Moderate aerobics. - Aquatic exercises.	- 3–4 sessions/week. - 2–3 sets of 10–15 reps. - Aerobic 20–40 min.	- Avoid excessive loads. - Gradual progression. - Monitor for inflammation.

Fig. 1. *Informative and communicative poster on how to proceed in the recovery from chikungunya*

Future lines of research

Research into therapeutic physical exercise with patients diagnosed with chikungunya requires the development of longitudinal studies, which allows for an adequate description of the progression of rheumatological and musculoskeletal sequelae over time.

It will also be important to design studies to evaluate the specific effect of various types of exercise, including aquatic exercise, progressive neuromuscular strengthening, proprioceptive training, or low-impact aerobic exercise, to see which one has the best improvement for each clinical phase and with respect to the predominant symptom profile.

Similarly, controlled studies that include objective assessments (e.g., for inflammatory biomarkers, ultrasound for synovial function, and quantitative indices of strength, endurance, and joint mobility) were advocated. This could allow us to develop more specific, evidence-informed protocols and, consequently, more precise therapeutic prescriptions. Furthermore, it would be instructive to examine the effect of therapeutic exercise on psychosocial aspects, such as quality of life, treatment adherence, pain perception, and return to work or participation in sports (especially in disadvantaged populations).

Finally, areas of interest include the development of interdisciplinary rehabilitation systems that integrate physical medicine, physiotherapy, therapeutic physical activity, rheumatology, and community care, and evaluating the effectiveness of telerehabilitation or remote interventions in areas with limited access to healthcare services. Applying studies on these novel methods will help establish cost-effective and scalable measures to address the growing burden of Chikungunya sequelae in Latin America and Cuba, as well as in other endemic areas.

CONCLUSIONS

Therapeutic exercise is a fundamental intervention for achieving functional recovery in people who have had chikungunya, given the substantial musculoskeletal effects that characterize the subacute and chronic phases of the disease. Controlled joint mobility, stretching, and progressive strengthening have been shown to play important roles in

reducing pain, improving range of motion and functional recovery, and preventing the chronicity of rheumatological sequelae.

Providing individualized therapeutic exercise programs is effective in reducing long-term joint stiffness, increasing biomechanical stability, and regaining muscle strength lost during the period of inactivity associated with acute pain.

Isometric, isotonic, and light aerobic exercises combined can offer not only physical recovery but also emotional regulation, fatigue reduction, and an improved quality of life for the patient. At the same time, exercise-based physical rehabilitation should be developed and implemented as an integral component of the holistic management of chikungunya, as treatment must be tailored to the clinical phase and individual characteristics of each patient.

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The authors have participated in the writing of the work and analysis of the documents.