

Case Study

# Muscular Cysticercosis Presenting with Right Side Foot Drop – A Case Study

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## I N F O

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## A B S T R A C T

Cysticercosis is a parasitic infection caused by the larvae of the tapeworm *Taenia solium*. It can manifest as either neural or extraneural forms. Extra neural forms commonly involve eyes, skeletal muscles and subcutaneous tissue in the form of a single or multiple submucosal or subcutaneous firm nodules. This single case study is a rare case of muscular cysticercosis affecting the tibialis anterior muscle causing compression of the deep peroneal nerve causing foot drop. This study is to prove the efficacy of functional electrical stimulation along with modified exercise therapy, and ankle foot orthosis (AFO) for management of foot drop. A 42-year-old man presented with a case of foot drop. He was initially treated in the Department of General Surgery and was diagnosed with cysticercosis of the tibialis anterior muscle, which caused compression in the deep peroneal nerve and resulted in foot drop. The subject presented with severe weakness and paralysis of the right foot dorsiflexor muscles, resulting in significant gait impairment and balance issues. He was treated with anthelmintic and nonsteroidal anti-inflammatory drugs (NSAIDs) and physiotherapy management. A four-week physiotherapy intervention was administered, comprising functional electrical stimulation, AFO, muscle strengthening, proprioceptive exercises, and gait training. The results demonstrated substantial improvements in gait, functional mobility, and dorsiflexion power from 1 to 4 in MRC grading and from 38% to 90% in FADI score suggesting the beneficial impact of physiotherapy in managing foot drop following muscular cysticercosis. This case study sheds light on the potential effectiveness of physiotherapeutic interventions with medications in enhancing motor function and quality of life in subjects with foot drop resulting from this rare parasitic infection.

**Keywords:** Cysticercosis, *Taenia Solium*, Foot Drop, Fes, Ankle Foot Orthosis

## Introduction

The tapeworm larvae *Taenia solium*, which cause cysticercosis, are parasites which grow following ingesting pork tapeworm eggs, via the feco-oral pathway by consuming food that has been faecally contaminated, or through autoinfection. It can show up as extra neural or neural forms. Eyes, skeletal muscles, and subcutaneous tissue in the form of a single or numerous submucosal or subcutaneous hard nodules are examples of extra neural forms that are frequently present.<sup>1</sup> Cysticercosis is highly endemic in the northern part of India; Bihar, Uttar Pradesh and Punjab; muscular cysticercosis is a rare presentation of cysticercosis, accounting for less than 5% of all cases.

Taeniasis was found in 18.6% of rural pig farming communities in Mohanlalganj block, Lucknow district, Uttar Pradesh.<sup>2,3</sup> Foot drop, often referred to as drop foot, is a condition where a person struggles to elevate their foot, which causes them to walk with a dragging or slapping gait. Near the head of the fibula, the peroneal nerve is situated. Compression or damage to the peroneal nerve can result in foot drop. The treatment includes electrical stimulation of the peroneal nerve, ankle and foot re-education exercises, ankle stretches and supportive devices like ankle-foot orthoses (AFOs) which provide support and maintain the foot in the correct position, aiding in walking and gait training.<sup>4</sup> In some cases, surgery may be necessary to explore the nerve and repair injured tendons, or fuse bones to stabilize the foot and ankle.

## Ethical Approval

This case was referred to the Department of Physiotherapy, Chettinad Hospital and Research Institute. It is a single case study where physio techniques were incorporated for efficacy. This study was performed in a period of 4 weeks in the month of July 2023 and it was ethically approved by the Institutional Human Ethics Committee. An explanation about the study was given to the respondent

and informed consent was obtained from the subject. The subject participated voluntarily and his confidentiality was maintained throughout the study.

## Case Report

A 42-year-old male subject presented with complaints of pain and swelling over the anterolateral aspect of the proximal tibia right leg, difficulty in walking and a sudden inability to lift his right foot for the past 3. He had a non-vegetarian diet for and a history of taking pork both homemade and from hotels 3 years back. He was not a known alcoholic or smoker. He lived in a moderately endemic area of cysticercosis. His medical history revealed no previous injury or trauma and no pathological illness.

Diagnostic ultrasound (Figure 1) revealed there was an intramuscular multiseptated lesion with multiple echoes measuring 1.9 x 2.7 x 4.8 cm, volume 13.5 cc at a depth of 1 cm from the skin. CBC report revealed increased WBC count and the rest of the parameters were normal. The pathology report shows negative HIV and HBsAg. The X-ray report showed no abnormalities. The nerve conduction velocity report showed reduced CMAP and SNAP of deep peroneal nerve with inconsistent F wave latency in the right foot.

The subject was treated in the Department of General Surgery Chettinad Hospital and Research Institute, Kelambakkam, with anti-helminthic and nonsteroidal anti-inflammatory drugs (NSAIDs) and was referred to the Department of Physiotherapy for management of foot drop. Physical examination revealed a palpable, soft, tender mass in the anterolateral aspect of the upper part of the right leg. Measuring approximately 3 x 3 cm in diameter. There was severe tenderness on the site of the lesion with warmth; the overlying skin appeared normal. Muscle girth measurement was 36 cm at the left calf and 41 cm at the right calf. His range of motion at hip knee and ankle were full and pain-free.

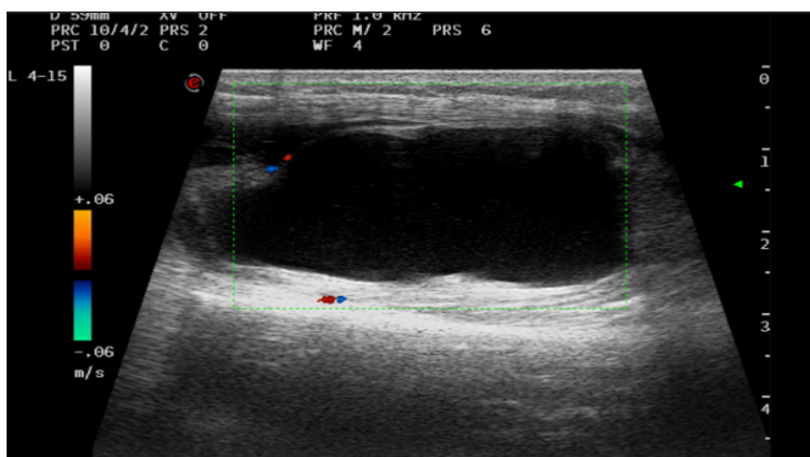


Figure 1. Ultrasound Imaging of Right Tibial Anterolateral Aspect

Motor assessment revealed weak doriflexors - tibialis anterior 1/5, extensor digitorum longus (EDL) and extensor hallucis longus (EHL) -1/5, invertors 2/5 and evertors 4/5, hip and knee muscle power was normal. Sensation was reduced in the

L4 and L5 dermatome and gait was high stepping gait. The subject was treated with functional electrical stimulation, exercise therapy (Table 1) and AFO.

**Table 1. Exercise Regimen for Foot Drop**

Week	Exercise Programme	Repetitions and Hold
1st week	Calf stretches Ankle dorsiflexion Isometric knee exercises Straight leg raise Toe pull Inversion and eversion	15-sec hold, 10 times repetition
2nd week	Marble pick-ups Assisted dorsiflexion with elastic band Toe-to-heel rocks Ball lift with both feet Toe curl exercise	20-sec hold, 10 times repetition
3rd week	Ankle Dorsiflexion with Theraband Flamingo tip-toe standing	20-sec hold, 10 times repetition
4th week	Marble pick-ups Balance and proprioception training Wedge board standing Wobble board training Toe curl exercise Single leg standing with eyes open and closed Gait training: The subject underwent gait training with an emphasis on proper foot clearance and heel-toe pattern during walking.	20-sec hold, 10 times repetition 15 min

## Intervention

### Functional Electrical Stimulation (FES)

Functional Electrical Stimulation (FES) is a therapeutic technique that uses electrical impulses to activate muscles and produce functional movements in individuals with neuromuscular conditions or paralysis. The primary goal of FES is to improve muscle function, increase strength, and enhance functional abilities for daily activities and mobility. During FES, electrodes are placed on the skin over specific muscles or nerves. These electrodes deliver

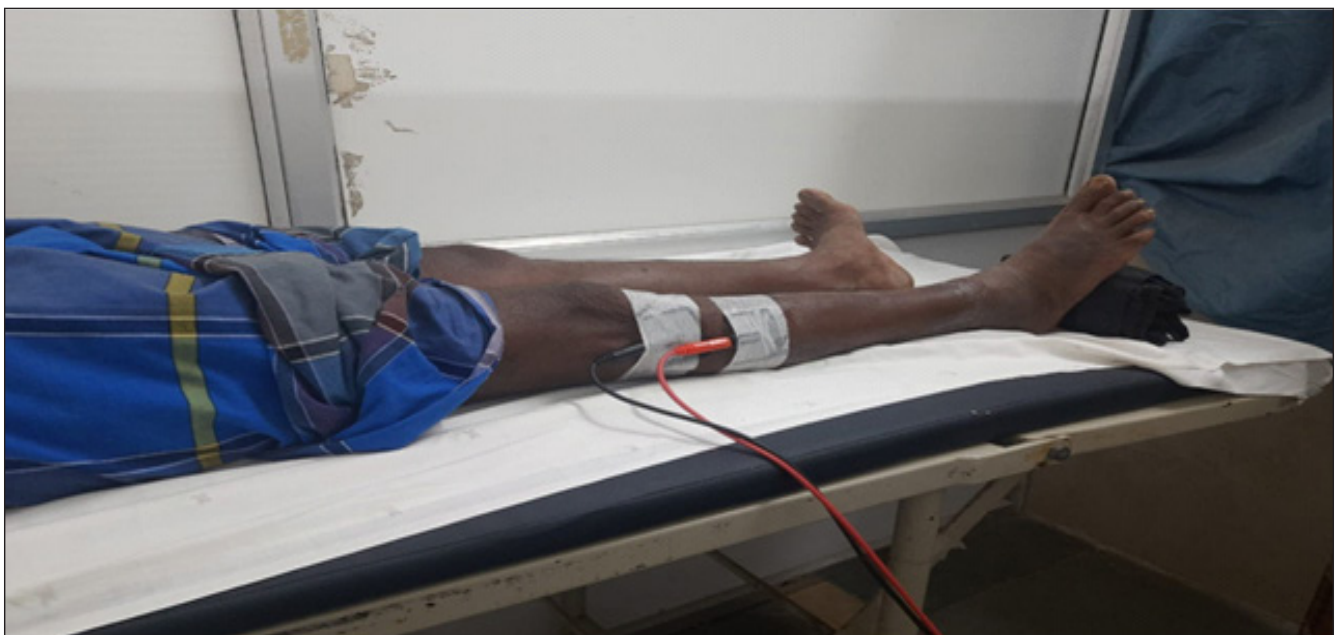
controlled electrical impulses, which stimulate the target muscles to contract. The electrical stimulation mimics the natural signals sent by the nervous system to activate muscles during voluntary movement.<sup>5</sup>

### Position of the Subject

Supine lying position and sand bag placed under the foot

### Position of the Electrode

Inactive over neck of fibula, active over the motor point of tibialis anterior (Figure 2).



**Figure 2. Functional Electrical Stimulation of Tibialis Anterior**

## Parameters

Asymmetrical biphasic pulsed currents with a square wave shape.

**Pulse duration:** 200–350 microseconds

**Frequency:** 40 hertz

**Intensity:** 20–80 mA

**Time to ramp up:** 0–2 seconds

**Time to ramp down:** 0–2 seconds

**Time allotted:** 15 minutes

## Ankle Foot Orthoses

An AFO orthotic is an orthotic device designed to support and correct foot and ankle conditions, especially foot drop. It keeps the foot in a 90° position. It typically consists of a footplate, uprights, ankle joint, and calf band, and may have a dorsiflexion assist mechanism. The AFO promotes a more natural gait, making walking more efficient and less fatiguing, preventing muscle contractures and preserving the potential for functional improvement with appropriate therapy.<sup>6</sup>

**Table 2. Medical Research Council (MRC) Scale Values for Muscles Around Ankle Joint**

Ankle Muscles	Pre-Test	Post-Test
Dorsiflexors	1	4
Plantar flexors	4	5
Invertors	2	4
Evertors	4	5
EHL	1	4
FHL	4	5

EHL: Extensor hallucis longus, FHL: Flexor hallucis longus

**Table 3. Foot and Ankle Disability Index (FADI)**

Outcome	Baseline	4th Week
FADI	38%	90%

## Outcome Measures

### Medical Research Council (MRC) Scale

The MRC scale (Table 2) is commonly used to assess muscle strength. It grades muscle strength on a scale from 0 (no movement) to 5 (normal strength). It can be applied to muscles involved in foot dorsiflexion.<sup>7</sup>

### Foot and Ankle Disability Index (FADI)

FADI is a subject-reported outcome measure designed to assess the impact of foot and ankle conditions on an individual's functional ability and quality of life.<sup>8</sup>

## Discussion

The diagnosis of muscular cysticercosis can be challenging due to its unusual presentation and overlapping symptoms

with other musculoskeletal disorders. The successful management of muscular cysticercosis in this case highlights the effectiveness of anthelmintic medications, such as albendazole, in targeting the parasite. Additionally, NSAIDs played a supportive role in managing the subject's pain and inflammation.<sup>9</sup> FES had an impact on the dorsiflexors, enhancing walking. FES may facilitate walking by increasing ankle dorsiflexion and toe clearance.<sup>10</sup> Modified exercise for foot and ankle muscles improved the muscle strength significantly and the functional ability of the subject.<sup>11</sup> The most popular orthosis for foot drop is AFO.<sup>12</sup> Regular usage of AFO for foot drop in conjunction with exercise will increase mobility while also lowering the chance of falling.<sup>13,14</sup> AFOs have an orthotic effect that increases gait speed and functional ambulation. In order to prevent FD during the swing portion of the gait cycle, AFO can compensate for foot drop by maintaining the foot in a neutral posture.<sup>15</sup>

Our findings demonstrated that after physical therapy sessions over the course of 4 weeks, our subject regained full strength of the ankle dorsiflexors and regained sensation with full functional independence. From Table 2, it can be seen that the power of ankle muscles increased from 1 to 4 in four weeks' duration with FES and exercises. From Table 3, values of FADI increased from 38% to 90% showing a significant increase in muscle power and functional ability of the subject.

## Conclusion

Foot drops caused by muscular cysticercosis can be effectively treated by medication and physiotherapy, this single case study proved the effectiveness of early intervention in treating foot drops caused by worm infections with medications and a comprehensive physiotherapy approach including functional electrical stimulation, exercises and AFO in managing foot drop associated with muscular cysticercosis. By addressing gait abnormalities, muscle weakness, balance deficits, and pain, the subject experienced functional improvement and a return to normal activities.

**Conflict of Interest:** None

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