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CASE REPORT

# Asymptomatic multiorgan cysticercosis. A case report from Bolivia

## Cisticercosis multiorgánica asintomática. A propósito de un caso en Bolivia

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## ABSTRACT

**Introduction:** cysticercosis is an infectious disease caused by Taenia solium, endemic to Latin America, Asia, and Africa. It is acquired by consuming Taenia eggs in contaminated water and food, or undercooked pork. It generally causes mild or asymptomatic disease, except for neurocysticercosis, which can be severe and potentially fatal. Symptoms depend on the number of parasites, their location, and the host's immune response. Diagnosis is based on epidemiological data, clinical presentation, and imaging studies, primarily computed tomography.
**Objective:** to use computed tomographic images to identify the degree of tissue damage caused by Taenia solium in an asymptomatic Bolivian adult.
**Clinical case:** a 52-year-old Bolivian female patient from a rural area, with a wooden house, dirt floor, no sewage or drinking water, a housewife, who practices open defecation and raises pigs to support her household. She had a personal health history, but an inadequate diet. She was taken to the Roberto Galindo Hospital due to a traffic accident, where an emergency CT scan of the head and abdomen was performed due to direct trauma to those areas. The studies revealed calcifications in multiple organs, findings suggestive of massive cysticercosis.
**Conclusions:** cysticercosis is a parasitic disease transmitted fecal-orally, preventable but highly contagious from country to country due to social migration. It constitutes a serious health problem due to the biological, economic, and social damage it entails, making increased epidemiological surveillance essential.

**Keywords:** Taenia Solium; Cysticercosis; Neurocysticercosis; Parasitic Disease.

## RESUMEN

**Introducción:** la cisticercosis es una enfermedad infecciosa, producida por *Taenia solium*, endémica en América Latina, Asia y África. Se adquiere al consumir huevos de *Taenia* en agua y alimentos contaminados o carne de cerdo mal cocinada. Generalmente produce enfermedad leve o es asintomática, excepto la

neurocisticercosis, que puede llegar a ser grave y potencialmente letal. La sintomatología depende del número de parásitos, de su localización y de la respuesta inmunológica del hospedero. El diagnóstico se basa en datos epidemiológicos, cuadro clínico y estudios de imagen, fundamentalmente la tomografía axial computarizada. **Objetivo:** identificar mediante imágenes tomográficas el grado de daño tisular provocado por *Taenia solium* en adulta boliviana asintomática.
**Caso clínico:** paciente boliviana femenina, 52 años de edad, procedente de área rural, vivienda de madera, piso de tierra, sin alcantarillado ni agua potable, ama de casa, practica fecalismo al aire libre y se dedica a la crianza de cerdos para contribuir al sustento del hogar; antecedentes personales de salud, pero con alimentación inadecuada. Es llevada al hospital "Roberto Galindo", por accidente de tránsito, donde le realizan TAC de cráneo y abdomen de urgencia por traumas directos en esas localizaciones; en los estudios se encontraron calcificaciones en múltiples órganos, hallazgos sugestivos de cisticercosis masiva.
**Conclusiones:** la cisticercosis es una enfermedad parasitaria de transmisión fecal-oral, prevenible pero altamente contagiosa de país a país por la migración social. Constituye un serio problema de salud por los daños biológicos, económicos y sociales que acarrea, por lo que se hace indispensable aumentar la vigilancia epidemiológica.

**Palabras clave:** Taenia Solium; Cisticercosis; Neurocisticercosis; Enfermedad Parasitaria.

## INTRODUCTION

Parasitic diseases worldwide have had a significant impact on the population, affecting the health, life expectancy, and productivity of millions of people. Clinically, these diseases are highly varied and range from very mild symptoms to death. One of the most common parasites transmitted through the consumption of contaminated food is Taenia solium. The WHO declared diseases caused by Taenia solium to be part of its list of neglected diseases in 2010.[1] Taeniasis or Cysticercosis is caused by Taenia solium, which has pigs as its intermediate host, and Taenia saginata, whose intermediate host is cattle.[2] Its most serious manifestation, neurocysticercosis (NCC), is considered the main parasitic disease that affects the central nervous system in humans.[3] According to Clemente Robles, in 1935 Ochoterena histopathologically studied some brains from the General Asylum sent by Salazar Viniegra: it was cerebral cysticercosis[4] and thus the history of this disease began.

In Latin America, cysticercosis has been documented in at least 18 countries, presenting itself as a public health problem, especially in rural areas. According to the World Health Organization, the prevalence of porcine cysticercosis in the region is significant, particularly in Brazil, Bolivia, Colombia, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Peru, and Venezuela, with Peru and Bolivia being the most affected. The Andean regions of Ecuador and its neighboring countries are identified as hyperendemic for cysticercosis.[5]

In Cuba, thanks to the ongoing efforts of the National Health System, there is no incidence of this disease. However, the above motivates us to present the case of a Bolivian patient with multi-organ cysticercus infestation, with the aim of serving as a warning to increase prevention measures and epidemiological surveillance. The objective of this case presentation is to identify, using CT images, the degree of tissue damage caused by *Taenia solium* in an asymptomatic Bolivian adult.

## CASE REPORT

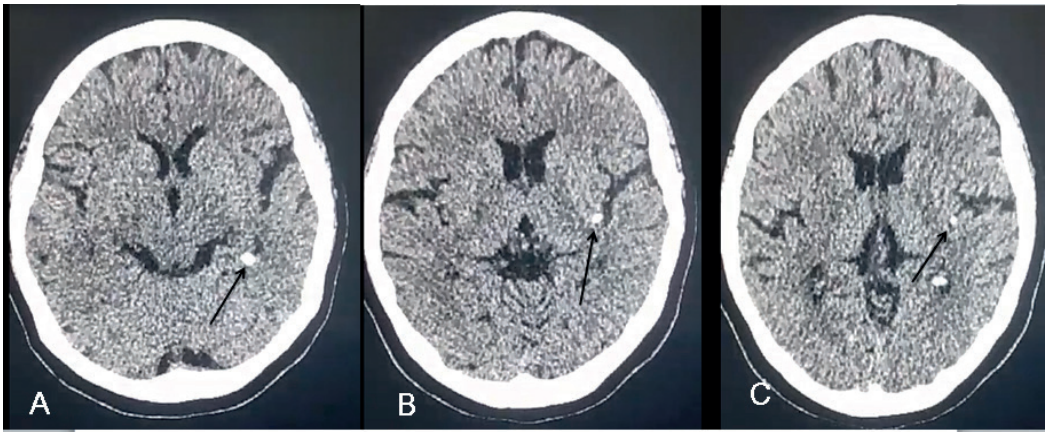


**Figure 1.** CT scan of the head, axial sections, brain parenchyma window. Small hyperdense images, calcific density in the left cerebral hemisphere in relation to calcifications (arrows)

A 52-year-old female patient from a rural area with a wooden house with a dirt floor and no sewage or drinking water service was diagnosed. She was a housewife who practiced open defecation and raised pigs to support her household. She had a medical history, but an inadequate diet and an incomplete vaccination schedule due to lack of access to health services. She was taken to the emergency room of the Roberto Galindo Terán Hospital due to a traffic accident. An emergency CT scan of the head and abdomen was performed due to direct trauma to those areas (figures 1,2,3,4). The scans revealed calcifications in multiple organs, leading to suspicion of massive cysticercosis.

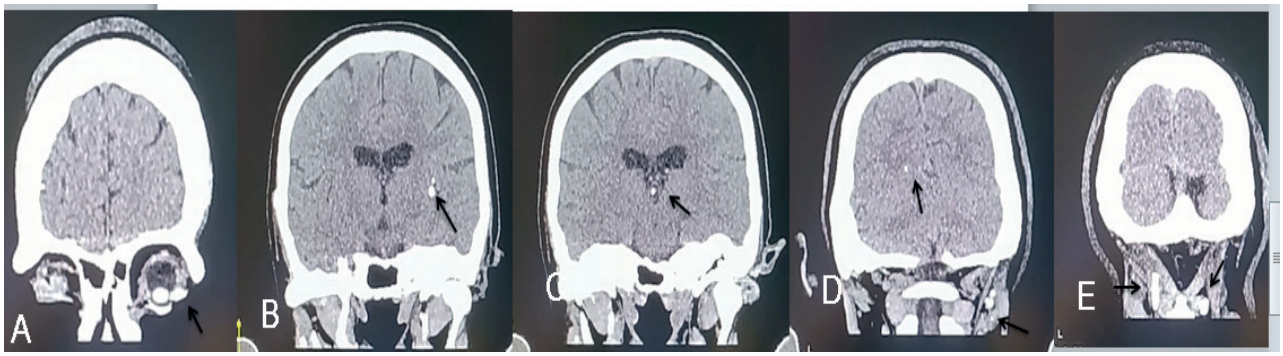


**Figure 2.** CT scan of the head, coronal reconstructions, brain parenchymal window. Small hyperdense images, calcific density in relation to calcifications (arrows). A: ocular. B and D: brain parenchymal. C: intraventricular. D and E: cervical soft tissue

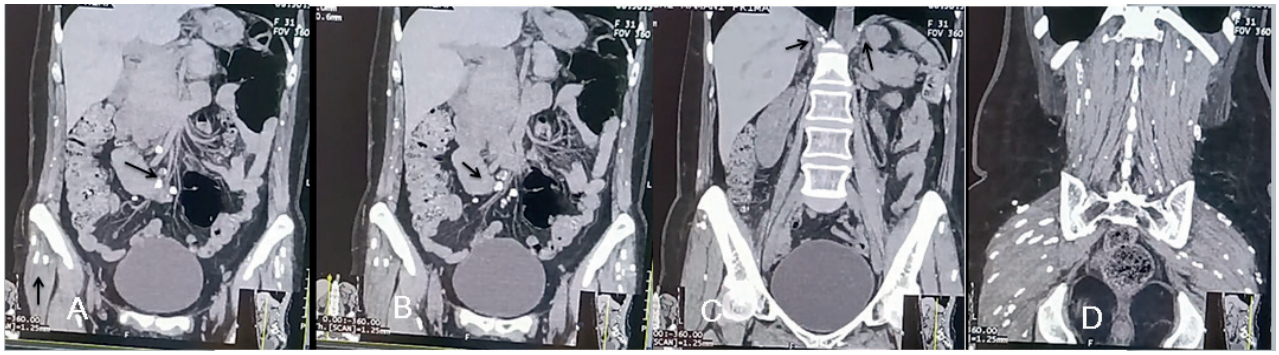


**Figure 3.** Plain CT of the abdomen, coronal reconstructions. Small hyperdense images, calcific density associated with calcifications (arrows). A and B: pelvic muscles and mesenteric lymph nodes. C: both hemidiaphragms. D: dorsal and gluteal muscles

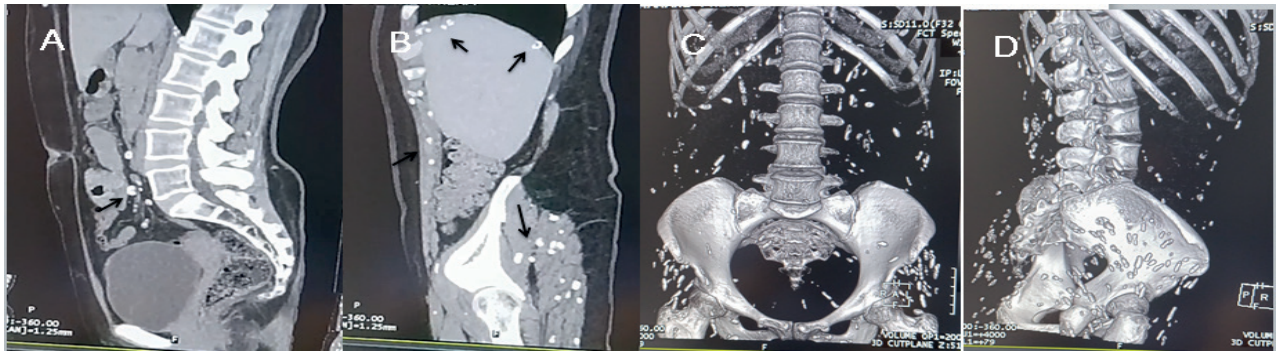


**Figure 4.** Plain CT of the abdomen. A and B: sagittal reconstructions. C and D: volumetric reconstructions. Small hyperdense images, calcific density in association with calcifications (arrows). A: lymph nodes. B: liver and abdominal and gluteal muscles. C and D: generalized soft tissue calcifications.

## DISCUSION

Parasitic diseases have become a major public health challenge worldwide due to various causes, including water and food safety, certain cultural habits, and problems related to environmental sanitation, among others. [2] Cysticercosis is a zoonosis of great public health importance. Approximately 50 million people worldwide are estimated to be infected with cysticercosis, although the number is likely higher, as a high number of infections are subclinical. Epidemiological data worldwide indicate that prevalence varies in percentages

within and between countries, and is directly related to poor socioeconomic conditions, lack of sanitation, and lack of drinking water in areas where pigs are fed outdoors and have easy access to human feces. This zoonosis is endemic in Latin American countries, most of sub-Saharan Africa, and large regions of Asia.[6] Human cysticercosis is a zoonosis whose most serious manifestations are associated with disability, discrimination, high medical costs, loss of productivity, complex surgical procedures, impaired quality of life, and even death.[3] Therefore, due to its frequency and severity, this disease constitutes a serious public health problem and causes enormous economic damage.[4]

Similarly, NCC specifically represents a significant burden on public health, with significant economic and social consequences.[7] It has become an alarming problem, with an estimated 50,000 deaths annually, affecting 50 million people. It is the most common parasitic infection of the central nervous system. In the United States and some European countries such as Spain, it has become an alarming problem due to the growing immigration of people from endemic areas.[2] In Portugal, it is a common disease; several endemic areas have been identified in the north of the country, the increase of which is due to emigrants from former Portuguese African colonies.[8] For this reason, since 2018, the Infectious Diseases Society of America and the American Society of Tropical Medicine and Hygiene recognized neurocysticercosis as a public health problem.[9] Cysticercosis is a disease common to humans and pigs caused by infestation with the larva (intermediate form or cysticercus) of Taenia solium (Cysticercus cellulosae). The larvae can lodge in any tissue or organ, but prefer to lodge in subcutaneous cellular tissue, muscles, viscera, and the central nervous system; their preferred site is the brain. The vesicles are rounded or oval, about 5 mm in diameter; they are formed by a membrane containing a clear liquid like rock water, and the larva, or scolex, resembles a grain of rice.[4] It is transmitted by the fecal-oral route and has a significant impact, since it is the cause of epilepsy in approximately 30 % of cases worldwide, as well as in high-risk countries and communities, especially in places where pigs roam freely. It is estimated that up to 70 % of the etiologies of epilepsy are attributed to this infection.[10]

T. solium has a two-host life cycle, occurring between humans and pigs. Both pigs and humans can be intermediate hosts for the larval form, while humans are the only definitive host for the adult larva. Typically, the cysts are ingested by humans from contaminated pork; the scolex subsequently anchors to the intestinal wall and matures into the adult form (a 2- to 4-meter-long ribbon worm). The gravid proglottids (each of the morphological segments into which the worm divides) and the microscopic fertile eggs enter the external environment through feces. In areas with poor waste disposal and unhoused pigs, they may ingest human feces contaminated with T. solium eggs. After ingestion, the embryos are released from the eggs, cross the intestine, enter the circulation, and from there, reach peripheral tissues, including the central nervous system. The cycle is completed when humans consume infected pork. Like pigs, humans can develop cysticercosis after consuming proglottids and fertile eggs, so most infections occur via the fecal-oral route.[6] Generally, intestinal taeniasis does not cause any discomfort; nor does cysticercosis cause health problems in pigs, so we can say that the T. solium parasite is silent and harmless to its natural hosts.[11] However, at the clinical level, two major syndromes can be distinguished: neurocysticercosis (NCC) and extraneural cysticercosis.[9] In Honduras, Ecuador, and Peru, a close association between neurocysticercosis and seizures has been observed among the rural population. Similarly, in Colombia, Guatemala, Honduras, Mexico, Nicaragua, and Venezuela, the disease is underreported.[5]

Neurocysticercosis is a disease that can be severe and have a chronic course. It is subdivided into parenchymal and extraparenchymal forms. The latter include ocular, spinal, subarachnoid, and intraventricular disease.[9] In parenchymal form, the cysticercus is located in cortical regions and basal ganglia; in subarachnoid form, the cysts are located mostly in the basal cisterns and cerebral sulci; mixed or disseminated neurocysticercosis may also occur.[12] The symptoms of cerebral cysticercosis depend on the location of the lesion. In parenchymal lesions, they often begin with epileptic seizures and even focal symptoms due to a mass effect. The surrounding inflammation can cause cerebral infarctions by occluding small perforating arteries. Extraparenchymal lesions can cause hydrocephalus, either due to mechanical obstruction of the ventricular system or due to arachnoiditis when located in the subarachnoid space. In many cases, symptoms appear years after CNS invasion due to inflammation, the mass effect, or residual calcifications.[8] The presence of the parasite in the human brain can cause a variety of clinical problems, such as seizures or epilepsy, severe headaches, blindness, mental retardation, and even death.[11] Other less common symptoms include intracranial hypertension, ataxia, cranial nerve palsies, and meningeal symptoms. There are several stages of neurocysticercosis, with the cystic phase referring to the living form of the parasite within the brain parenchyma, and the calcified phase corresponding to the final involution of the cyst. The calcified phase of the parasite is the most common.[12] Common long-term complications associated with parenchymal calcified NCC lesions include seizures (38,0 %) and headaches (34,0 %). In addition, neurocognitive deficits, learning disabilities, depression, psychotic episodes, and cerebrovascular disease are also present.[13] The diagnosis of cysticercosis involves a combination of clinical information, laboratory tests, and imaging studies.[7] With the aid of X-rays, the characteristics of cysticercous calcifications have been defined.[4] Ultrasonography is the initial and most effective technique for evaluating

cysticercosis in soft tissues such as the liver. Other imaging techniques such as computed tomography and magnetic resonance imaging may also be useful.[6]

Specifically, for the diagnosis of neurocysticercosis, neuroimaging studies allow for the assessment of the parasite's developmental stage, its number, and its location.[8] Currently, diagnostic methods are based on brain imaging using Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and immunodiagnosis, with the detection of antibodies against the parasite or cysticercus-specific antigens.[8] Once the cysticerci migrate to the brain tissue, they are classified into an initial phase, which is considered viable, a degenerative phase, and a nonviable phase. Cysticerci considered viable appear on CT as round, hypodense lesions, approximately 5 to 20 mm in diameter. These generally do not cause edema in surrounding tissues and are not affected by the administration of contrast media. When cysticerci degenerate, the cyst wall gradually thickens. This is generally accompanied by a surrounding inflammatory reaction. When contrast medium is administered, ring enhancement is observed. All of this reflects the inflammatory response mounted by the host against the parasite, and this is frequently associated with seizures. Nonviable cysts are those that initially had increased wall density; they are calcified nodular lesions, ranging in size from 1 mm to 10 mm. These cysts do not involute in most cases; in some cases, they are accompanied by seizures.[9]

Recent studies support the fact that MRI is more sensitive than CT for detecting intraventricular cysticerci, cysts in cisterns, and at the base of the skull, and allows for better visualization of the scolex and small intraparenchymal vesicles.[8] In other words, it is the technique of choice for extraparenchymal parasites, while CT is the most sensitive technique for calcified parasites.[15]

## CONCLUSION

Cysticercosis, particularly its neurocerebral form, represents one of the most serious and challenging parasitic infections for global public health. Although it is a preventable disease, its persistence and spread are fueled by structural conditions such as poverty, lack of access to drinking water, inadequate basic sanitation, and cultural practices related to pig farming. The effects of the disease not only compromise individual health, generating neurological disability, social stigmatization, and life-threatening risks, but also impose a considerable economic burden on healthcare systems. Therefore, cysticercosis requires a comprehensive and sustained response: strengthening epidemiological surveillance, strengthening health education, promoting veterinary control, and ensuring public policies aimed at mitigating the social determinants that perpetuate its cycle. Only in this way will it be possible to advance toward its effective control and protect the health and dignity of the most vulnerable populations.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## AUTHOR CONTRIBUTION

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