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Case Report

Disseminated neurocysticercosis in a vegetarian: An intriguing case report

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ABSTRACT

Disseminated neurocysticercosis (NCC), caused by *Taenia solium*, is a significant public health concern in developing regions and responsible for epilepsy in majority of the cases. This case report presents an intriguing instance of disseminated NCC in a 35-year-old vegetarian male from an urban area in western Uttar Pradesh. The conventional mode of infection is through undercooked pork, raising questions about alternative transmission routes for vegetarians. Possible routes of infection for the patient include contaminated food or water, unhygienic practices, cross-contamination, exposure to infected individuals or animals, and changing dietary habits. This case highlights the importance of considering atypical transmission routes for NCC, even in regions where pork consumption is uncommon. Public health efforts must emphasize proper food hygiene and sanitation to reduce NCC transmission risk, and further research is needed to understand factors contributing to NCC in non-endemic and vegetarian populations.

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1. Introduction

Disseminated neurocysticercosis (NCC) is a parasitic infection caused by the larval stage of *Taenia solium*, commonly known as the pork tapeworm.¹ It is considered a significant public health concern in several regions of the world, particularly in developing countries with poor sanitation and inadequate hygiene practices.^{2,3} Disseminated NCC is a severe form of the disease, characterized by the widespread presence of cysticerci (cysts) in various organs, including the central nervous system (CNS), muscles, and subcutaneous tissues.² This case report presents a fascinating and unique clinical presentation of disseminated NCC in a 35-year-old male belonging to the Hindu community, residing in an urban area of western Uttar Pradesh.

2. Epidemiology

Neurocysticercosis is one of the most common parasitic infections affecting the CNS globally. It is particularly endemic in Latin America, Sub-Saharan Africa, India, and Southeast Asia. In these regions, the high prevalence of intestinal taeniasis (tapeworm infection) in humans is responsible for the transmission of NCC.³ The consumption of undercooked pork contaminated with the eggs of *T. solium* or the ingestion of food or water contaminated with human feces containing tapeworm eggs are the primary modes of infection. The urbanization and changing dietary habits in developing regions have contributed to the spread of NCC, making it a growing concern in urban settings.⁴

3. Life Cycle of *Tenia Solium* in Humans

Taenia solium is a human tapeworm responsible for two distinct clinical conditions: taeniasis, characterized by adult tapeworms residing in the small intestine, and cysticercosis,

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caused by the presence of larval stages in various tissues, including the brain, muscles, and eyes. The life cycle of this parasite involves humans and pigs, primarily. Humans acquire the infection by consuming undercooked or uncooked pork contaminated with *T. solium* larvae (cysticerci), which mature into adult tapeworms in the small intestine within a few months. Tapeworm carriers release eggs or proglottids in their feces, contaminating the environment and posing a risk to pigs and dogs, the main intermediate hosts.⁵

In humans, ingestion of *T. solium* eggs can occur through contaminated food, vegetables, and water. Infection may also happen through auto-infection, involving the anal-oral route due to contaminated hands or internal auto-infection, where proglottids or eggs from the intestine reflux into the stomach. Cysticercosis can affect various anatomical areas but is particularly prominent in the central nervous system (CNS), leading to neurocysticercosis (NCC). NCC is the most common parasitic disease of the CNS and a significant cause of epilepsy.⁶

This report presents a case of disseminated cysticercosis in a patient with neurocysticercosis, subcutaneous cysticercosis, and myocysticercosis. The infection involved multiple tissue types, highlighting the severity and complexity of the disease.

3.1. Clinical presentation

The clinical presentation of disseminated neurocysticercosis (NCC) can exhibit significant variation, influenced by the location and quantity of cysticerci in the body. Seizures, headaches, focal neurological deficits, and cognitive impairment are the prevailing and widespread symptoms. However, in cases of disseminated NCC, the clinical picture becomes intricate, given that cysticerci may affect multiple organs concurrently. Particular attention should be given to ocular involvement, as it can result in visual disturbances and, if not promptly identified and treated, may lead to blindness.⁷

3.2. Diagnostic challenges

Diagnosing disseminated neurocysticercosis (NCC) can be quite challenging due to its diverse and nonspecific clinical presentation. In regions where the disease is prevalent, healthcare providers may consider NCC as a possibility when a patient has a history of exposure to contaminated food and water sources, combined with typical neurological symptoms. To aid in the diagnosis, imaging techniques like computed tomography (CT) and magnetic resonance imaging (MRI) are indispensable. These imaging modalities play a crucial role in identifying the presence and precise location of cysticerci. A characteristic and telltale finding in the images is often referred to as the "Starry sky appearance," which points to the existence of multiple cystic

lesions scattered throughout the brain parenchyma, thus assisting in confirming the diagnosis.⁸

Furthermore, the detection of specific antibodies against *T. solium* can significantly contribute to the diagnostic process. Blood tests that reveal the presence of these antibodies further support the suspicion of NCC, adding valuable evidence to establish the parasitic infection as the underlying cause of the patient's symptoms.⁹

3.3. Management

The treatment of disseminated neurocysticercosis (NCC) includes administering antihelminthic medications like albendazole (400 to 800 mg per day). Prior to antihelminthic treatment, steroids are given to prevent anaphylactic reactions. Seizures are managed with anti-epileptic medications (AEDs) for the patient's safety and well-being. A multidisciplinary approach involving various specialists ensures comprehensive care. Regular monitoring and follow-up visits are essential to assess treatment response and adjust therapy as needed. Preventive measures, such as educating the patient to avoid contaminated food and water sources, are also emphasized.¹⁰

Disseminated neurocysticercosis is a rare and intriguing presentation of this parasitic infection. As globalization and population movements continue to increase, it is essential for healthcare professionals to be vigilant in recognizing disseminated NCC in both endemic and non-endemic regions. Early diagnosis and prompt treatment are crucial to prevent long-term neurological deficits and complications. This case report sheds light on the complexities of disseminated NCC and emphasizes the need for further research and awareness to tackle this significant public health issue effectively.

4. Summary of the Case

A 35-year-old male, without hypertension or diabetes, presented with complaints of abnormal body movements. He works as a driver, adheres to a vegetarian diet, and is from an urban area in western Uttar Pradesh. Previously, he experienced one episode of generalized tonic-clonic seizures (GTCS) but had no history of head trauma, meningitis, or high-grade fever with altered sensorium. A CT scan of his head revealed disseminated neurocysticercosis, presenting a "Starry sky" pattern. Multiple hypodense cystic structures with eccentric hyperdense foci, exhibiting enhancement, were observed in bilateral cerebral parenchyma, basal ganglia, thalami, cerebellar hemispheres, sulcal spaces in cerebral hemispheres, and along the subependymal lining of the left lateral ventricle, indicative of Neurocysticercosis. Additionally, hypodense lesions with eccentric enhancing focus were noted outside the cranium in bilateral extraocular muscles, muscles of mastication, and suboccipital region,

suggestive of Myocysticercosis. He showed improvement with a daily dose of 800 mg sodium valproate. Blood tests revealed the presence of *Taenia solium* antibodies, confirming the neurocysticercosis infection. The patient's blood investigations were negative for HIV, HCV, HBsAg, and VDRL. Generalized lymphadenopathy was observed on examination, and FNAC of lymph nodes suggested "parasitic infestation" with occasional calcification foci and inflammatory cells on a thin proteinaceous background. A fundus examination showed no abnormalities. The patient was prescribed oral steroids, which were gradually tapered, and received a daily dose of 400 mg albendazole.

5. Discussion

This case report presents a compelling instance of disseminated neurocysticercosis (NCC) in a 35-year-old male belonging to the Hindu community, residing in an urban area of western Uttar Pradesh. Disseminated NCC is a severe form of the disease characterized by widespread cysticerci presence in various organs, including the central nervous system (CNS), muscles, and subcutaneous tissues. It is crucial to explore how a vegetarian individual got affected by NCC, as the traditional mode of infection for *T. solium* is through the consumption of undercooked pork contaminated with tapeworm eggs. This raises intriguing questions regarding alternative routes of transmission and the risk factors contributing to this unusual presentation.¹¹

5.1. Possible ways a vegetarian got affected by NCC

1. Contaminated food or water: Although the primary mode of transmission is linked to pork consumption, there have been reported cases of NCC transmission through contaminated food or water sources. It is plausible that the patient might have consumed food or water contaminated with tapeworm eggs, leading to the infection.
2. Unhygienic practices: Another possibility is that the patient might have unknowingly ingested tapeworm eggs due to poor hygiene practices. For instance, if the patient had contact with contaminated surfaces or objects, such as utensils or hands, after exposure to infected individuals, this could have facilitated the transmission of tapeworm eggs to his digestive system.
3. Cross-contamination: Cross-contamination in food preparation areas is a significant concern for vegetarians who share cooking spaces with individuals who consume pork. If proper sanitation measures were not followed, there is a chance that the patient's food might have been contaminated with tapeworm eggs.
4. Exposure to infected individuals or animals: The patient's occupation as a driver might have exposed him to a diverse range of people and environments, including areas where pork consumption is more

prevalent. Additionally, if the patient had contact with pigs or individuals with intestinal taeniasis, transmission through direct or indirect exposure is possible.

5. Changing dietary habits: Urbanization and globalization have led to changing dietary habits in various regions. Even among vegetarians, the adoption of non-vegetarian foods, including meat and fish, can increase the risk of exposure to tapeworm eggs if proper food safety practices are not adhered to.

The diagnostic criteria for disseminated cysticercosis encompass the simultaneous presence of neurocysticercosis (NCC), subcutaneous cysticercosis (SCC), and myocysticercosis (MCC) involving multiple cysticerci.¹² The preferred method for confirming SCC is through pathological examination. In this particular case, the diagnosis was supported by physical examination findings, serologic testing positive for cysticercosis, changes observed in nodular lesions after albendazole treatment. The CT scan results, positive serological findings, history of epileptic seizures, and presence of cysticercosis outside the central nervous system (CNS) strongly indicated NCC.¹³ Before initiating treatment, the patient received oral steroids to prevent potential anaphylactic reactions.¹⁴ Additionally, an ophthalmologist conducted a fundus examination to rule out the presence of larvae in the retina.

These combined diagnostic approaches contributed to a comprehensive assessment of disseminated cysticercosis in this case, allowing for accurate diagnosis and appropriate treatment to manage the parasitic infection effectively.

This case highlights the need for increased awareness and surveillance of NCC transmission routes, especially in regions where vegetarianism is practiced. Healthcare providers should consider the possibility of atypical transmission routes in patients presenting with NCC-like symptoms who do not have a history of consuming pork. Further research is essential to understand the factors contributing to the emergence of disseminated NCC in non-endemic regions and vegetarian populations.

6. Conclusion

The presented case of disseminated NCC in a vegetarian individual is a remarkable and unusual occurrence that prompts a deeper exploration of alternative transmission routes for *Taenia solium*. This case underscores the importance of considering NCC as a differential diagnosis in diverse populations, even in regions where pork consumption is not common. Public health efforts should focus on raising awareness about proper food hygiene, sanitation, and preventive measures to reduce the risk of NCC transmission, regardless of dietary preferences. Further research is required to identify potential risk factors and pathways leading to NCC in non-endemic

areas, ultimately aiding in the development of targeted interventions to control and prevent this significant public health concern.

7. Source of Funding

None.

8. Conflict of Interest

None.

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