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Neurocysticercosis

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Introduction
Neurocysticercosis (NCC) is one of the most common parasitic infections of the central nervous system in humans and is the most serious clinical manifestation of cysticercosis. NCC is caused by the ingestion of the larval form of the pork tapeworm Taenia solium. The parasite is endemic in low income developing countries where pigs are commonly raised, including the countries of Central America, South America, and parts of Africa and Asia (Nwakudu & Sahchuck, 2014). The parasite Taenia solium encysts in the brain and can cause a broad range of symptoms including seizures, headaches, hydrocephalus, encephalitis, stroke and mental health and cognitive disorders. NCC is a leading cause of acquired epilepsy in epidemic regions. Up to 25%-30% affected individuals presenting evidence of the parasitic infection. This infection process is usually due to the lack of appropriate hygiene or sanitation.

Pathophysiological Processes
Neurocysticercosis occurs when the encysted larval form of T. solium invades the central nervous system of a human host. Also known as the “parkinson’s” of the CNS, it is one of the eight cysticercosis in humans that can affect the human brain. Humans are the definitive host and harbor the adult parasite while omnivorous and herbivorous animals such as pigs, are the intermediate host and harbor the larval forms of the parasite. The adult parasite rarely resides in the human host and usually resides in the lower digestive tract of the individual. Here it absorbs nutrients from the small intestine because the parasite lacks its own digestive tract. However, the larval form of the parasite which are contained in fluid filled sacs (cysts) can cause significant degrees of illness if tissue invasion occurs (Broadbent & Ekhhelwedi, 2013).

Two major pathways leading to the disease transmission of NCC exist: 1) The infection of humans via contaminated environmental media or food 2) The ingestion of swine caused by the direct ingestion of human faeces, contaminated soil, food or water containing the parasitic embryos. Autoinfection and autoinvasion of eggs by the tapeworm-carrying host, via fecal-oral transmission can also be a potential exposure pathway (Eramtor, Ramtor, & Gays, 2010).

Below: Lifecycle of pork tapeworm, T. solium. Copyright 2014 by CDC

Case Study: Neurocysticercosis in Wisconsin

Reported cases of Neurocysticercosis in the United States, including both immigrant and new cases occurring in the United States annually with a substantial amount of cases. The most recent reported cases in the United States included laboratory and clinical data in the public. The disease transmission, including transmission pathways, reduction and symptoms and when and where to seek help for treatment are all implications of neurocysticercosis.

Patient 1
A 25 year old woman who presented with these focal seizures. She had been diagnosed with seizures in the Philippines 2 months prior to symptom presentation. There were no local neurological deficits or examination. An MRI showed a few ring-enhancing lesions located in the right frontal lobes. An Electroencephalography (EEG) and serum and cerebrospinal fluid cysticercosis IgG were negative. Diagnosis of Neurocysticercosis (NCC) was suspected. The patient was treated with a 22-day course of albendazole. Patient had moved from Mexico 14 years prior. Examination showed decreased sharp perception on the left limbs and increased pain response to hot and cold temperatures. MRI showed 16 x 8 mm ring-enhancing in the right frontal parasial area. Due to high suspicition of tumour two brain biopsies were performed, one showing normal brain tissue and another showing adenoma. Significance and symptoms can be correctly diagnosed and treated in the United States: cysticercosis.

Patient 2
A 32 year old men complaining of left arm dysesthesias and numbness, with radiating to left neck and face. Symptoms also included difficulty speaking, hearing, and dull headaches for the past year. She had admitted to traveling to Mexico several times in the past. Brain MRI showed 2 cystic brain lesions in the right parietal lobes. Cysticercosis serum IgG was 0.61 and considered positive. The patient was prescribed gabapentin and a 10-day course of albendazole. Levetiracetam was prescribed for seizure prophylaxis. Patient reports being healthy and doing well 5 years after initial presentation (Nwakudu et al., 2014).

Signs and Symptoms
The clinical presentation and severity of the disease process is diverse and can present with a myriad of manifestations. Signs and symptoms can vary depending on the clinical presentation, location, development of the cystercosis and the host’s immunological response to the parasite. The most common clinical manifestations is epilepsy and occur in 70% of infected patients. Psychiatric and cognitive problems increase with diagnosis, involving delusions, hallucinations and changes in behaviors. Clinical presentations in patients infected with NCC and may cause a delay in diagnosis (Shah & Chakrabarti, 2013). Additional symptoms from the invading larva on the central nervous system include: headaches, hydrocephalus, nausea, blurred vision, vertigo, and ataxia. (Eramtor, Ramtor, Amaya, Eramtor & Gays, 2010). Most symptoms are commonly seen within the first month of infection and symptoms can be graphically affected by the location and size of the cyst as well as the amount of cysts affecting the host (Cantey et al., 2014).

Nursing Implications
Implications for nursing care can be incorporated in several aspects of the disease process. Due to the diverse clinical manifestations of neurocysticercosis (NCC), importance is placed on correct identification of signs and symptoms and vigilance in recognizing common symptoms of NCC that may parallel other psychiatric and lead to misdiagnosis (Shah & Chakrabarti, 2013). Health care workers however still need to remain alert to potential cases or appropriate NCC health centers. Recently NCC has been known to be more prevalent in newly minted patients. However growing concern has encouraged the transmission of this disease here within the United States. Even with the increased awareness of this disease, under-reporting of essential data and confirmed cases is lacking (Cantey et al., 2014).

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Conclusion
Neurocysticercosis results from the invasion of the central nervous system of a human host by the larval form of the adult tapeworm, T. solium. While this disease has been uncommon in the United States prior to 1965, new cases are emerging at an unprecedented rate due to immigration, with an estimated 1,000 new cases occurring in the United States annually with a substantial amount of cases. The most recent reported cases in the United States included laboratory and clinical data in the public. The disease transmission, including transmission pathways, reduction and symptoms and when and where to seek help for treatment are all implications of neurocysticercosis.

References
Nwakudu, O. A., & Ekechukwu, K. U. (2013). Neurocysticercosis: a human host by the larval form of the adult tapeworm, T. solium. While this disease has been uncommon in the United States prior to 1965, new cases are emerging at an unprecedented rate due to immigration, with an estimated 1,000 new cases occurring in the United States annually with a substantial amount of cases. The most recent reported cases in the United States included laboratory and clinical data in the public. The disease transmission, including transmission pathways, reduction and symptoms and when and where to seek help for treatment are all implications of neurocysticercosis.


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Image: Case is an image of a Taenia egg at a high magnification of 400x. When consumed by humans Taenia eggs can lead to cysticercosis, including a serious condition known as neurocysticercosis. On the left and right are two images of human brain tissue. The darker regions are cysts in the brain of the patient. Copyright 2014 by CDC.