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Added Value of Antigen ELISA in the Diagnosis of Neurocysticercosis in Resource Poor Settings

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Abstract

Background: Neurocysticercosis (NCC) is the most common cause of acquired epilepsy in Taenia solium endemic areas, primarily situated in low-income countries. Diagnosis is largely based upon the "Del Brutto diagnostic criteria" using the definitive/probable/no NCC diagnosis approach. Neuroimaging and specific T. solium cysticercosis antibody detection results are at the mainstay of this diagnosis, while antigen detection in serum has never been included. This study aimed at evaluating the addition of antigen detection as a major diagnostic criterion, especially in areas where neuroimaging is absent.

Methods: The B158/B60 monoclonal antibody-based enzyme-linked immunosorbent assay (ELISA) for the detection of circulating cysticercus antigen was carried out retrospectively on serum samples collected during a hospital-based study from 83 people with epilepsy (PWE) in an endemic area.

Results: The addition of antigen results as a major criterion allowed the correct diagnosis of definitive NCC in 10 out of 17 patients as opposed to 0/17 without antigen results in the absence of neuroimaging. A sensitivity of 100% and a specificity of 84% were determined for the diagnosis of active NCC using antigen ELISA. While the use of a higher cutoff improves the specificity of the test to 96%, it decreases its sensitivity to 83%.

Conclusions: In areas where neuroimaging is absent, NCC diagnosis according to the existing criteria is problematic. Taking into account its limitations for diagnosis of inactive NCC, antigen detection can be of added value for diagnosing NCC in PWE by supporting diagnostic and treatment decisions. Therefore, we recommend a revision of the "Del Brutto diagnostic criteria" for use in resource poor areas and suggest the inclusion of serum antigen detection as a major criterion.

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Introduction

More than 80% of people with epilepsy (PWE) live in low-income countries [1], where the prevalence of active epilepsy is approximately twice that of high-income countries [2]. Moreover, in many of those countries over 75% of PWE have no access to treatment with anti-epileptic medication [3].

Infectious diseases play a major role in the etiology of epileptic seizures and epilepsy in developing countries [1]. A recent review reported that 29% of PWE also had neurocysticercosis (NCC) [4], caused by the larval stage of *Taenia solium*, a zoonotic parasite.

The treatment of NCC depends on the stage of the disease and the number and localization of lesions. The determination of an optimal treatment is still a developing field of research, it may have to be tailored to individual cases and relies largely on results of neuroimaging techniques. However, there is frequently no or very limited access to/availability of these neuroimaging tools in low-income endemic countries.

To assist in diagnosis, a number of immunodiagnostic tests have been developed, among which is the enzyme-linked immunoelectrotransfer blot (EITB) that detects specific antibodies against *T. solium* cysticerci in serum and was reported to have a high specificity (100%) and sensitivity (98%) [5,6]. This test is widely recognized; unfortunately it is expensive and in a format (Western Blot) not very applicable in most resource-poor laboratories in endemic areas. More field applicable enzyme-linked immunosorbent assay (ELISA) formats have been developed to detect specific antibodies and antigens in the serum, although they have until