

Short Report: Could Neurocysticercosis Be the Cause of “Onchocerciasis-Associated” Epileptic Seizures?

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Abstract. We conducted a nodule prevalence survey in four onchocerciasis sentinel communities in Moyo and two in Kanungu districts of Uganda. Seven (33.3%) out of 21 excised “onchocercomas” (nodules) in Moyo District and excised onchocercomas from four of six persons in Kanungu District turned out to be cysts of *Taenia solium*. We concluded that the prediction of nodule prevalence for noninvasive rapid epidemiologic assessment (REA) to target areas for mass chemotherapy with ivermectin in the African Program for Onchocerciasis Control (APOC) supported areas may have been influenced by other pathologies. *T. solium* infection may be the main cause of “onchocerciasis-associated epileptic seizures” in many onchocerciasis endemic communities that have been causally linked to onchocerciasis. Lastly, widespread neurocysticercosis may be a concern in mass treatment programs that provide praziquantel (for managing schistosomiasis) or albendazole (for managing intestinal worms or lymphatic filariasis) because these drugs may kill cerebral cysticerci, resulting in severe adverse events.

Onchocerca volvulus worms, the cause of onchocerciasis, promote the formation of palpable subcutaneous nodules (“onchocercomas”). Control of onchocerciasis is the focus of a large African program (the African Program for Onchocerciasis Control—APOC) based on the provision of community-directed mass treatment with ivermectin (Mectizan®, donated by Merck & Co.). APOC has used nodule prevalence for noninvasive rapid epidemiologic assessment (REA) to target those areas where mass ivermectin treatment should be directed (i.e., communities with nodule prevalence $\geq 20\%$).¹ The extent to which true “onchocercomas” (nodules) have been confused with other pathologies potentially reduces the prediction of onchocerciasis through REA by the nodule prevalence survey.

In 2005, we conducted a nodule prevalence survey in 4 onchocerciasis sentinel communities in Moyo District, in northwest Uganda, after 12 years of mass ivermectin treatment. Compared with a baseline nodule prevalence of 66% in 200 persons examined in 1993, we found 11.43% of 420 persons examined in the follow-up survey during 2005 had nodules. Twenty-one onchocercomas were excised, sectioned, and stained by H&E to allow us to evaluate the vitality and fertility of *O. volvulus* worms (results to be reported elsewhere). We were surprised to find that 7 (33.3%) of these 21 clinical onchocercomas were in fact cysts of *Taenia solium* (Figure 1). The follow-up survey in 2 sentinel communities of Kanungu District of southwestern Uganda during 2006 revealed a nodule prevalence of 2.4% in 296 examined persons. The results revealed that 4 of 6 persons with onchocercomas had, on microscopic examination, subcutaneous cysticercosis, whereas the other two had calcified onchocercomas. In one of these individuals, three *T. solium* cysts were removed.

Cases of epileptic seizures were reported in some of the sentinel villages and in other onchocerciasis endemic communities of these districts. Seizures causally linked to onchocerciasis remain controversial.^{2,3} In contrast, *T. solium* neurocys-

ticercosis is being increasingly recognized as a major cause of epilepsy in East Africa.⁴ The existence of subcutaneous cysticercosis in Kanungu and Moyo districts suggest that *T. solium* infection may be the main cause of “onchocerciasis-associated epileptic seizures” in many of these onchocerciasis endemic communities. Our findings of subcutaneous cysticercosis are also important in that onchocerciasis projects that are using nodule prevalence to evaluate the impact of ivermectin distribution on onchocerciasis will suffer from reduced prediction of those evaluations. The proportion of false “onchocercomas” identified clinically in follow-up nodule surveys

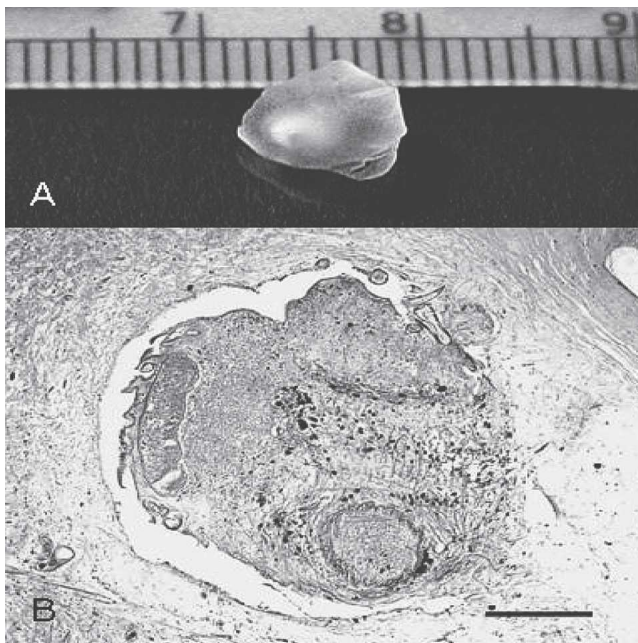


FIGURE 1. Photomicrograph of *Taenia solium* cysticerci removed from patients in Uganda mistakenly identified (clinically) as *Onchocerca* nodules. **A**, Bladder of cyst from excised “nodule,” showing the fluid-filled bladder and invaginated scolex and spiral canal that appear as dense area. Scale is in mm. **B**, H&E stained section through the scolex region illustrating one of the suckers (bottom of field) and several hooklets (top of field). Scale bar = 100 μ m.

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would have increased onchocerciasis nodule prevalence by 3.8% in Moyo District, and by 1.6% in Kanungu District in the follow-up survey. This is a 66.6% and 33.3% increase in nodule prevalence in the follow-up survey for the Kanungu and Moyo districts, respectively. Lastly, widespread neurocysticercosis may be a concern in mass treatment programs that provide praziquantel (for managing schistosomiasis) or albendazole (for managing intestinal worms or lymphatic filariasis) because these drugs may kill cerebral cysticerci, resulting in headache, seizures, and other adverse events.⁵

We recommend that further studies be conducted to determine the prevalence of *T. solium* dermal and neurocysticercosis in both onchocerciasis endemic and non-onchocerciasis endemic communities to assess the prevalence of *T. solium* in onchocerciasis endemic communities and the attributable fraction of epilepsy that might be due to one or another condition. A case control study in onchocerciasis endemic areas with reported epileptic seizures could help in assessing to what extent *T. solium* is the actual cause of epileptic seizures in onchocerciasis endemic areas.

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