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A Novel Nano-Chip Card Assay as Rapid Test for Diagnosis of Lymphatic Filariasis Compared to Nano-Based Enzyme Linked Immunosorbent Assay

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Abstract : Filariasis is a parasitic disease caused by small roundworms. The filarial worms are transmitted and spread by blood-feeding black flies and mosquitoes. Lymphatic filariasis (Elephantiasis) is caused by Wuchereriabancrofti, Brugiamalayi, and Brugiatimori. Elimination of Lymphatic filariasis necessitates an increasing demand for valid, reliable, and rapid diagnostic kits. Nanodiagnostics involve the use of nanotechnology in clinical diagnosis to meet the demands for increased sensitivity, specificity, and early detection in less time. The aim of this study was to evaluate the nano-based enzymelinked immunosorbent assay (ELISA) and novel nano-chip card as a rapid test for detection of filarial antigen in serum samples of human filariasis in comparison with traditional -ELISA. Serum samples were collected from an infected human with filarial gathered across Egypt's governorates. After receiving informed consenta total of 45 blood samples of infected individuals residing in different villages in Gharbea governorate, which isa nonendemic region for bancroftianfilariasis, healthy persons living in nonendemic locations (20 persons), as well as sera from 20 other parasites, affected patients were collected. The microfilaria was checked in thick smears of 20 µl night blood samples collected during 20-22 hrs. All of these individuals underwent the following procedures: history taking, clinical examination, and laboratory investigations, which included examination of blood samples for microfilaria using thick blood film and serological tests for detection of the circulating filarial antigen using polyclonal antibody- ELISA, nano-based ELISA, and nano-chip card. In the present study, a recently reported polyoclonal antibody specific to tegumental filarial antigen was used in developing nano-chip card and nano-ELISA compared to traditional ELISA for the detection of circulating filarial antigen in sera of patients with bancroftianfilariasis. The performance of the ELISA was evaluated using 45 serum samples. The ELISA was positive with sera from microfilaremicbancroftianfilariasis patients (n = 36) with a sensitivity of 80 %. Circulating filarial antigen was detected in 39/45 patients who were positive for circulating filarial antigen using nano-ELISA with a sensitivity of 86.6 %. On the other hand, 42 out of 45 patients were positive for circulating filarial antigen using nano-chip card with a sensitivity of 93.3%.In conclusion, using a novel nano-chip assay could potentially be a promising alternative antigen detection test for bancroftianfilariasis.

Keywords : lymphatic filariasis, nanotechnology, rapid diagnosis, elisa technique
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