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THE FILARIAL DANCE SIGN IN SCROTAL FILARIAL INFECTION- A RETROSPECTIVE STUDY

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ABSTRACT

Objective. To determine the value of the filarial dance sign as a diagnostic sign of scrotal filarial infection and to recognize unsuspected scrotal filariasis by this sign.
Methods. Five symptomatic patients in whom the filarial dance sign was shown on high-resolution ultrasonography were studied, investigated, and followed after treatment with diethylcarbamazine citrate. Two patients underwent fine-needle aspiration.
Results. Multiple foci (nests) of motile (live) filarial worms were observed in most patients. Fine-needle aspiration of the dilated lymphatic vessels in 2 patients confirmed the presence of microfilariae. Four of 5 patients had a favorable response to treatment with diethylcarbamazine citrate.
Conclusions. High-resolution ultrasonography is a useful technique for diagnosing scrotal filariasis in symptomatic patients and is very useful in the follow-up period for assessing the response of worms to treatment.

INTRODUCTION

Nearly 2 months ago, a 38-year-old male patient with a history of scrotal pain and swelling was referred to us for a scrotal ultrasonographic examination because of clinically suspected varicoceles. On real-time high-resolution ultrasonography (HRUS), we detected anechoic tubular channels in the spermatic cord, which failed to show any flow on color flow imaging. Within these anechoic channels, we detected linear, echogenic, undulating structures with a persistent twirling motion. This peculiar ultrasonographic appearance was consistent with the filarial dance sign (FDS) of live adult filarial worms, described before by Amaral *et al*1 and Suresh *et al*.2 This patient was found to have microfilaremia on peripheral blood smears. Under ultrasonographic guidance, we aspirated the anechoic channels that showed the FDS, and we could show live microfilariae on light microscopy. The patient was then followed after therapy with diethylcarbamazine citrate (DEC). Over 3 years, we then evaluated this ultrasonographic sign as a means for diagnosing unsuspected cases of scrotal filariasis in our population, which is nonendemic for bancroftian filariasis.

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The aims of our study were (Amaral *et al*., 1994) to determine the value of the FDS as a diagnostic sign of scrotal filarial infection in symptomatic patients from our nonendemic population; (Suresh *et al*., 1997) to recognize unexpected and unsuspected scrotal filariasis; (Chatterjee, 1980) to aspirate and prove the diagnosis; and (Grove, 2000) to follow up after medical therapy.

MATERIALS AND METHODS

Our study group comprised 5 patients in whom the FDS was seen on real-time HRUS of the inguinoscrotal region. The ages of the patients were between 20 and 38 years. All patients had scrotal pain and swelling. Two patients had bilateral scrotal swelling, and 3 had unilateral swelling. Three patients had a history of fever, and 1 had infertility. With the patient in the supine position, the inguinoscrotal region was scanned with a linear broadband phased array transducer (5–12 MHz) on an HDI 3000 System (Philips Medical Systems, Bothell, WA). The ultrasonographic findings were recorded on video and hard copies. Color and pulsed Doppler modes were used to differentiate lymphatic vessels from blood vessels and to show worm movements. Routine blood counts and peripheral smears for microfilariae were obtained from all patients. Two of the patients consented to have fine-needle aspiration, which was performed under ultrasonographic guidance with 24-

gauge needles. The needles were placed in the anechoic scrotal channels (presumed to be lymphatic vessels), which had positive findings for the FDS. The aspirates were subjected to light microscopy. All patients received oral DEC in the dose of 6 mg/kg of body weight per day for 3 weeks. Follow-up ultrasonographic examinations were conducted after therapy to monitor worm movements.

RESULTS

In all patients, tubular anechoic channels were detected adjacent to the testes and epididymides (Fig. 1).

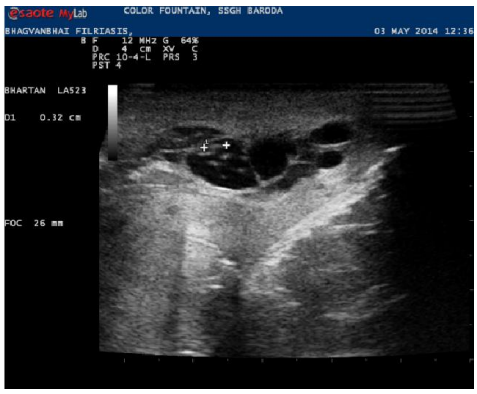

Figure 1. Dilated scrotal lymphatic vessels appearing as anechoic tubular channels containing echogenic linear undulating structures, which represent the adult filarial worms. These structures have the peculiar movements characteristic of the FDS on real-time ultrasonography.

These channels did not show flow on color flow imaging and were presumed to be lymphatic vessels. Within some segments of these channels, echogenic linear structures with a persistent random twirling motion were observed. On examination of these sites with color flow imaging, a mosaic pattern of color flow was observed (Fig. 2).

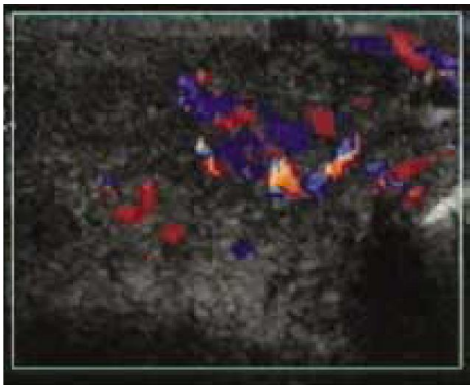

Figure 2. Typical mosaic of color indicative of motile worms on color flow imaging of *Wuchereria bancrofti* were shown in both cases

BHAGVANBHAI_FILRIASIS_20140503123338_1235460.avi

Video Clip 1 - Real time Ultrasound (10MHz) showing nest with "dancing" echogenic particles

On pulsed Doppler imaging, a peculiar rhythmic pattern of movement was shown (Fig. 3). The FDS was unilateral in 3 patients and bilateral in 1. Most patients (4 of 5) had multiple foci of moving echoes, whereas a single focus was seen in 1 patient. Two patients also had hydroceles without any internal echoes. One patient had varicoceles, which were shown on color flow imaging. One patient had inguinal lymphadenopathy. Peripheral blood smears revealed that all 5 patients had microfilaremia. The microfilarial density, however, was not determined in this study. Two patients underwent ultrasonographically guided fine-needle aspiration (Fig. 4). Clear fluid was aspirated from the anechoic channels in both patients. On light microscopy, live microfilariae of *Wuchereria bancrofti* were shown in both cases. All patients were followed up after 3 weeks of oral therapy with DEC. In 4 of the patients, the FDS was not shown on the follow-up ultrasonography. In 1 patient, neither the linear echogenic structures nor movements could be identified, whereas in 2 patients, the linear echogenic structures were still shown on the follow-up examinations, but they did not have the movements characteristic of the FDS (Fig. 5) One patient did not have any appreciable change in movements.

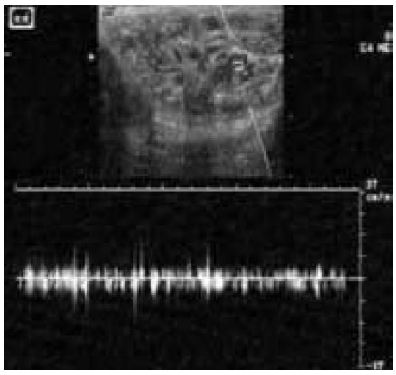

Figure 3. Pulsed Doppler interrogation of the moving structures showing the peculiar rhythmic pattern of movement

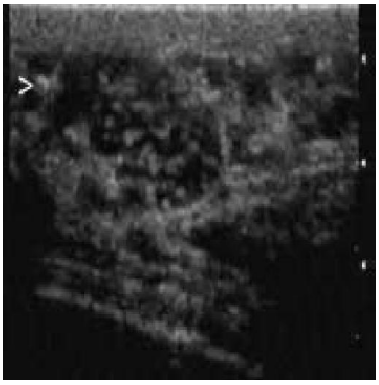

Figure 4. Fine-needle aspiration performed by placing the needle in the dilated lymphatic vessels in which the FDS is shown. The arrowhead indicates the needle tip

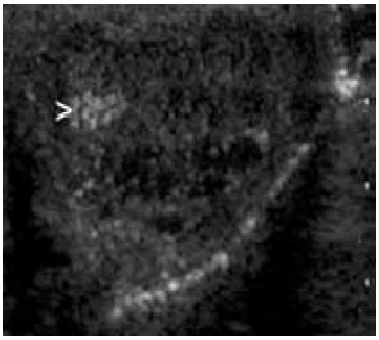

Figure 5. Dead worm (arrowhead) shown as an echogenic tubular structure without movement on real-time ultrasonography

DISCUSSION

Wuchereria bancrofti is distributed widely throughout the tropics and subtropics3 and is a major cause of morbidity in parts of Asia, Africa, and the western Pacific region. (Suresh *et al*., 1997) It is estimated that approximately 120 million people are affected worldwide (Suresh *et al*., 1997 and Grove, 2000); of these, 75 million are asymptomatic. (Suresh *et al*., 1997) Adult worms are found in the lymphatic vessels and lymph nodes of humans only; there is no animal reservoir. (Chatterjee, 1980 and Grove, 2000)

Life Cycle of W bancrofti

After copulation, the female adult worm gives birth to live microfilariae. These are released into the lymphatic vessels and ultimately find their way into the bloodstream. In most strains, they circulate in the blood in the largest numbers at night and are said to have nocturnal periodicity. (Weatherly) Female mosquitoes of the *Culex*, *Aedes*, and *Anopheles* genera act as intermediate hosts. (Chatterjee, 1980 and Weatherly) The mosquitoes ingest the microfilariae during a blood meal. The microfilariae then pass into the midgut of the mosquito and invade the intestinal wall, and within 24 hours, most find their way to the thoracic muscles, where they metamorphose into larvae within 1 to 3 weeks. (Weatherly) The larvae migrate to the tip of the proboscis sheath and penetrate into the skin of the human host during the next blood meal. The larvae localize in the lymphatic vessels of the human host and develop into adult worms. Incubation periods are usually 6 months to 1 year, and adult worms can live for
15 years or more.5

Clinical Features

Many patients are asymptomatic with microfilaremia. (Grove, 2000) Clinical manifestations are either acute or chronic. In the acute stage, there is a characteristic inflammation in response to the trapped worms, their metabolites, or both. (Weatherly) The cardinal manifestation is acute lymphangitis, usually with associated lymphadenitis. Patients may have fever, headache, backache, and nausea. (Grove, 2000) Acute funiculitis, epididymitis, or orchitis may also be seen.(Grove, 2000) Microfilariae are difficult to show during the acute phase. (Weatherly) Chronic manifestations include lymphadenopathy, hydrocele, chyluria, and lymphedema. After lymphatic obstruction, proliferative changes occur; the worms die and are absorbed or become calcified. (Weatherly) The edema is soft at first but becomes fibrotic after the growth of connective tissue in the area. This advanced chronic disease, called elephantiasis, develops in only a small percentage of highly reactive individuals who have been infected repeatedly for many years.

Diagnosis

Diagnosis of the disorder is based on the appearance of microfilariae in blood smears and occasionally in hydrocele fluid or chylous urine. (Grove, 2000) A concentration method can be used. Serologic tests may be of some value, but these cannot differentiate between the various forms of filariasis or between past and present infections. (Grove, 2000) Before the description of the FDS on ultrasonography, there were no methods available to detect adult filarial worms in vivo. Standard techniques for visualizing the lymphatic system (lymphangiography and lymphoscintigraphy) are cumbersome and, moreover, do not directly identify or localize the parasites. (Amaral, 1994) Ultrasonography, by localizing the adult worms, permits assessment of the response to therapy. (Suresh *et al*., 1997) The FDS was first described by Amaral and coworkers in 1994. (Amaral, 1994) They described the movements of live adult filarial worms in the lymphatic vessels as "peculiar, random-appearing movements of objects inside a vessel-like structure." The worms are shown on HRUS as linear echogenic structures with persistent, random, almost tireless twirling movements. This sign is so striking that once it is detected on HRUS, it cannot be mistaken for anything else. Numerous studies have reported the use of ultrasonography for localizing live adult filarial worms. (Amaral, 1994; Suresh *et al*., 1997; Noroes *et al*., 1996; Faris *et al*., 1998; Dreyer *et al*., 1998) Most of these, however, have been from endemic areas, and the patients have had asymptomatic microfilaremia. Our group of patients came from a zone that is nonendemic for bancroftian filariasis. These patients primarily had symptoms and were referred for scrotal ultrasonography by their physicians. High resolution ultrasonography in turn allowed us to make a diagnosis of filariasis by showing live adult worms. The use of ultrasonography in the diagnosis of symptomatic filariasis has been reported before, (Williams *et al*., 1996) but, to our knowledge, ours may be the first such series of patients. In another series, (Faris *et al*., 1998) motile filarial worms were not observed in men with clinical filariasis. These patients, however, had clinical findings of lymphedema and hydrocele, and none of them had microfilaremia. Therefore, these men were probably not infected at that time and were presumed to have had old infections.

Patients in our series had more acute than chronic manifestations, and all had microfilaremia. In 2 patients, we aspirated the dilated lymphatic channels and could show live microfilariae in the aspirates. This finding proves that the appearance of the FDS on HRUS correlates with active release of microfilariae by the worms and hence indicates active infection (which may or may not be clinically apparent at the time). Several studies have documented the macrofilaricidal efficacy of DEC. (Noroes *et al*., 1997; Dreyer *et al*., 1998) The response of adult filarial worms to DEC is known to be variable and is a matter of debate. In a single patient, various worm nests may have varying responses to the drug. Nevertheless, ultrasonography, being the only modality that can show the adult worms, is an ideal technique for following patients receiving therapy. Although the aim of our study was not to assess the macrofilaricidal efficacy of DEC, we found ultrasonography very useful in the followup period to document the response of worms to the drug. Complete absence of worm movements on follow-up examination was taken as a positive response. In our study, (Grove, 2000) (80%) of 5 patients had a positive response to the drug, which correlates with results from previous studies.

Conclusions

High-frequency, high-resolution scrotal ultrasonography is a valuable technique for diagnosing scrotal filarial infection in symptomatic patients. In nonendemic areas, where filariasis is often not the first differential diagnosis in a patient with scrotal pain and swelling, HRUS can facilitate a definitive diagnosis of filariasis and identification of unsuspected cases

even before chronic manifestations such as lymphedema hydrocele have appeared. The appearance of motile filarial worms on ultrasonography correlates with active release of microfilariae into the lymphatic vessels and hence indicates active infection. Ultrasonography is the only diagnostic modality that can show live adult filarial worms; therefore, it is an ideal technique for following patients receiving therapy.

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