Intra-ocular nematode worms: rare but important

Clinicians need help from a parasitologist for accurate identification

Migration of nematode larvae in the human body is a normal part of the life cycle of many parasites. Ocular disease caused by the abnormal migration of human or animal, juvenile or adult nematode worms in the eye is uncommon, but important as they induce visual impairment and pose diagnostic and management challenges. The detection of a worm, in or near the eye, is always a dramatic occurrence for both patient and clinician. Such patients frequently complain of the sensation of movement of an object in the eye, and the clinician can occasionally see the worm in the conjunctiva, on the eye itself, or in the anterior or posterior chambers.

The nematodes that have been isolated from the human eye are of human or animal origin and belong to different groups, including filariae, strongylids, metastrongylids and ascarids [1]. Parasites infect the eye either by extension from the infected adjacent tissues, or by haematogenous dissemination to the eye.

The adult worm of *Wuchereria bancrofti*, the causative agent of lymphatic filariasis, is found in the lymphatics, but has also been recovered and clearly identified from intra-ocular locations in humans. Fernando [2] described the first local case of adult *W. bancrofti* in the anterior chamber of the human eye. Although numerous reports of filarial infection of the human conjunctiva and the anterior chamber have been published [3–5], infections of the vitreous are rare. This issue of the journal (page 167) reports an instance of a *W. bancrofti* juvenile female worm extracted from the vitreous of eye—the first report of such a case in the world [6]. It is difficult to identify a female specimen of a filarioid with certainty, but the position of the vulval opening in relation to the oesophagus is an indication of the species [7].

Loa loa is a subcutaneous filarial parasite of humans, endemic in west and central Africa. It is reported sporadically from other parts of the world in travellers returning from endemic areas. This parasite has been reported in Sri Lanka in an expatriate girl who had been infected in Nigeria, hence classified as an imported infection [8]. Eye infections may occur when the adult

worm meanders into the subconjunctival tissue prompting the appellation "eye worm".

Onchocerciasis (river blindness) is a chronic parasitic infection of humans caused by the nematode *Onchocerca volvulus*. The major feature of the disease is ocular and dermatological pathology, of which itching is the commonest and blindness the most serious. Discussion of this filarial parasite is outside the scope of this article.

Almost all infections of the human conjunctiva with filarial worms of animal origin represent infections of *Dirofilaria* species from dogs, cats and related carnivores. This zoonotic infection is now widely recognised by clinicians, pathologists and parasitologists worldwide, and unless there is some unusual presentation about the case, they may not be routinely published. *D. (Nochtiella) repens*, the subcutaneous worm of dogs is incriminated as the aetiologic agent infecting humans in Sri Lanka, and is associated with subcutaneous migration and nodule formation. The second largest number of cases of *D. repens* in the world has been reported from Sri Lanka, the largest number being reported from Italy [9, 10]. In Sri Lanka, contributory factors could be the high prevalence of *D. repens* in dogs—up to 60% [11]—and availability of efficient vectors of this nematode, *Aedes aegypti* and *Anopheles subalbatus*, found as peri-domestic species in urban areas [12, 13]. Ocular dirofilariasis usually involves a migrating worm, most frequently invading the eyelid or conjunctiva [9].

The more unusual zoonotic infections, such as ocular disease caused by *Brugia* species, a zoonotic infection acquired from dogs, still hold sufficient interest to merit publication. The world's second case of *Brugia* species, probably *B. ceylonensis*, was isolated from the conjunctiva of a Sri Lankan man [7].

Nematodes of zoonotic origin, namely the heart worm of dogs (*Dirofilaria immitis*) [14] and adult *Ancylostoma* (probably *A. tubaeformae*) have been isolated from the vitreous [1]. Humans may act as a definitive host in hookworm infections caused by *Necator americanus* or *Ancylostoma duodenale*. They may also be dead-end hosts for canine hookworms (e.g. *A. braziliense, A. caninum* and *A. ceylanicum*) [11, 15, 16], or *A. braziliense* and *A. caninum* (now regarded as *A. tubaeforme)* from cats [15].

Ocular toxocariasis is caused by the nematode larvae of *Toxocara canis*, found in dogs. Human transmission is usually via geophagia, the ingestion of food contaminated with *Toxocara* eggs, or contact with infected puppies, often resulting in devastating ocular or systemic effects. This is typically a monocular disease of young children, and its clinical findings include posterior and peripheral retinochoroiditis, optic papillitis, and endophthalmitis, which relate to the migration of a wandering larva and the granulomatous inflammatory host response that it provokes [17, 18].

Ocular angiostrongyliasis results from ocular migration of *Parastrongylus* (=*Angiostrongylus*), a rodent lung worm, found in bandicoots in Sri Lanka. It has been isolated in the eye on three occasions from the anterior chamber and once from the vitreous [19–22]. Of a total of 17 authentic ocular infections reported, four have been from Sri Lanka. The infection may not necessarily have been acquired by eating raw or undercooked intermediate or paratenic hosts, but rather by accidental ingestion of infective larvae liberated from damaged mollusks contaminating raw leafy vegetables [20, 21]. A larva isolated from the anterior chamber of the eye in 1925, may not only be the first case in the world of ocular infection reported, but also the first report of the genus *Parastrongylus* in humans [23, 24].

Gnathastomiasis is a significant cause of ocular disease in east Asia, with sporadic cases being reported worldwide. It is the second most common ocular parasite in Thailand [25]. No cases of ocular gnathastomiasis have been reported from Sri Lanka, although two have been diagnosed in subcutaneous tissue [26]. As humans can get infected by drinking water containing infected *Cyclops*, it is a potentially threatening eye infection.

Diagnosis of worms isolated from the eye is usually based on identification of the parasite on morphological criteria in cross-section and specific serology. The presence or absence of the head bulb, the number of cephalic papillae, and the pattern of the cuticle and the longitudinal and transverse striations seen on transverse sections of the worm are important in identification, specially in filarioids [7]. The ends of the worm, male or female, contain the greatest amount of morphologic information, and every effort should be made to collect and preserve the entire specimen. The clinician who removes an intact worm from the eye, must make an accurate identification with the help of a specialist in parasitology. When it is necessary to distinguish between similar species, the application of molecular technology will be useful. The development of species specific probes allows identification where microscopic diagnosis is virtually impossible. However, because the number of specific probes needed to accomplish the task is large and its application is limited, it is unlikely that a significant number will be generated and made available for routine use.

Emerging zoonotic infections continue to be recognized in new geographical areas and in different locations in humans as a result of global travel, changes in livestock production and trade, growing contact between man and exotic animals, and shifts in human eating and food preparation habits. Additionally, people are becoming susceptible as a result of their behavioural changes, and the organisms are developing new routes of transmission. Medical personnel need to be alert to the possibility of the presence of worms in the eye, both in currently recognized clinical presentations and in unusual ones.

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