experience with 85 patients for 21 years. *Ann Intern Med* 1983; **98**: 76–85.
3 Lamprecht P, Voswinkel J, Lilienthal T, Nolle B, Heller M, Gross WL *et al*. Effectiveness of TNF-alpha blockade with infliximab in refractory Wegener's granulomatosis. *Rheumatology (Oxford)* 2002; **41**: 1303–1307.
4 Bartolucci P, Ramanoelina J, Cohen P, Mahr A, Godmer P, Le Hello C *et al*. Efficacy of the anti-TNF-alpha antibody infliximab against refractory systemic vasculitides: an open pilot study on 10 patients. *Rheumatology (Oxford)* 2002; **41**: 1126–1132.
5 Stone JH, Uhlfelder ML, Hellmann DB, Crook S, Bedocs NM, Hoffman GS. Etanercept combined with conventional treatment in Wegener's granulomatosis: a six-month open-label trial to evaluate safety. *Arthritis Rheum* 2001; **44**: 1149–1154.

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Sir,

Use of oral ivermectin in a patient with destructive rhino-orbital myiasis

Myiasis refers to infestation of living tissue of vertebrate animals by the eggs or larvae (maggots) of flies of the order of Diptera. Larval infestation occurs in the nose in 81% of cases, in the ear in 11%, and in the face in only 1%. Orbital myiasis cases are rare worldwide.[1–7] Conventional treatment consists of the removal of the larvae from affected sites, a painful and cumbersome task, sometimes made impossible in smaller cavities.[8,9] There have also been reports of drugs used topically to facilitate the removal, sometimes with frustrating results. We describe a patient with destructive rhino-orbital myiasis caused by larvae of the New World screwworm *Cochliomyia hominivorax* successfully treated with oral ivermectin prior to surgery.

A 55-year-old male patient was admitted to the Department of Ophthalmology, State University of Campinas with a 4-day-history of intense pain in his left orbital region, a crawling sensation, and maggots coming out of the nose. One week earlier he had mild fever, anorexia, and frontal headache. The clinical examination showed no light perception in the left eye. Discrete diffuse oedema around the nose and left orbit was noted. The eyelid was thickened and there was a necrotic, loose tissue lesion invading the left orbit (Figure 1). A purulent rhinorroea with a marked foetor was also present. Examination of the right eye was unremarkable. He was known to suffer from advanced carcinoma of ethmoidal sinus previously treated by chemotherapy and radiotherapy without success. Rhinoscopy revealed necrotic material in the nose with crawling maggots which were identified as larvae of *Cochlomyia hominivorax*. Laboratory findings were within normal limits. Computed tomography (CT) of the orbit revealed diffusely increased soft-tissue density extending to the orbital apex and obscuring orbital details. Bony destruction of the medial wall of the orbit and opacification of the ethmoidal sinus were present (Figure 2). The patient was given a single oral dose of ivermectin (200 μg/kg) and intravenous clindamicin was initiated to control associated infection. The patient showed continuous improvement and a complete resolution of the myiasis was observed after a 48-h period. Orbital exenteration was performed. No larvae were observed during the surgery or in the pathological examination of the orbital contents. The patient was discharged home on the fourth postoperative day.

Human myiasis is relatively common. It is more common in undeveloped and tropical countries, although there have been reports of myiasis all over the Planet. Most cases of myiasis probably occur when a

Figure 1 Appearance of lesion in the left orbit of a 55-year-old man with rhino-orbital myiasis caused by *Cochliomyia hominivorax*.

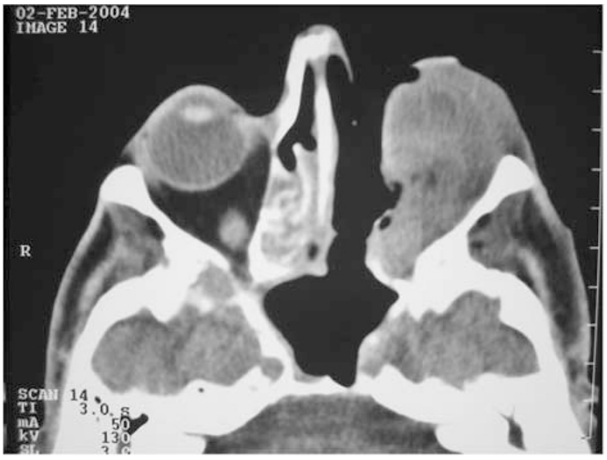

Figure 2 Orbital CT scanning showing the extent of the lesion.

female fly lands on the host and deposits eggs or larvae. The invasive parasitic larvae may result in destruction of orbital tissue, desfigurement, and even death. Once larvae are present on the eye or adnexa oculi, the symptoms depend on the location and invasiveness of the larvae. Facultative species tend to produce mild infestations, while obligatory species can be invasive.[1–3]

Nasal and orbital myiasis in the New World is usually caused by *Cochliomyia hominivorax*, the aetiology of this patient. The fly is attracted by the bad odour of exposed and diseased body cavities.[1,9–11] Early diagnosis and treatment are important to avoid gross destruction of the tissues and to control secondary infection. The proximity of the brain and the possibility for intracranial invasion from the orbital apex renders this a potential life-threatening condition.[1,10,11]

Compromise of periorbital tissues by malignant disease, surgery, ischaemia, or infection may predispose the patient to myiasis. Crowded conditions, debility, low socio-economic status, and poor personal hygiene are other predisposing factors.[2] Advanced carcinoma of the ethmoidal was the predisposing factor in our case. The patient also was from a rural background and was in a low socioeconomic status. The foetor coming out of the nose and poor local hygiene probably encouraged deposition of eggs.

Cochliomyia hominivorax, of the Callipharidae family, is an obligatory parasite with the capacity to produce deep, festering, disfiguring wounds that occasionally result in death. It is found throughout Central and South America, although reports have identified this parasite in Asia and Africa. Adult females deposit eggs in open wounds or discharging orifices such as the nose. Larvae invade adjacent living tissue, including cartilage and bone.[8]

Management of nasal and orbital myiasis consists of mechanical removal of the larvae followed by treatment of any sequelae. Topical preparations reported to immobilize maggots for easy removal include chloroform, ether, ethanol, turpentine, oily drops, and hydrogen peroxide.[1,2,11] In our patient, the larvae were eliminated prior to surgery after a single oral dose of ivermectin (200 μg/kg), making the manual removal of the larvae, which is an unpleasant treatment for the patient and the doctor, an unnecessary procedure. Ivermectin is usually used in veterinary medicine and is effective in humans for the treatment of filarial, scabies, and strongyloidosis.[12] We suggest that oral ivermectin should be considered as an option for treatment of human cavitary myiasis.

References

1 Kersten RC, Shourkrey NM, Tabbara KF. Orbital myiasis. *Ophthalmology* 1986; **93**: 1228–1232.
2 Balasubramanya R, Pushker N, Bajaj MS, Rani A. Massive orbital and ocular invasion in ophthalmomyiasis. *Can J Ophthalmol* 2003; **28**: 297–298.
3 Sachdev MS, Kumar H, Roop, Jain AK, Arora R, Dada VK. Destructive ocular myiasis in a noncompromised host. *Indian J Ophthalmol* 1990; **38**: 184–186.
4 David S, Rupa V, Mathai E, Nair S. Non Hodgkins lymphoma of ethmoidal sinus with rhinoorbital myiasis. *Indian J Cancer* 1996; **33**: 171–172.
5 Agarwal DC, Singh B. Orbital myiasis—a case report. *Indian J Ophthalmol* 1990; **38**: 187–188.
6 Baliga MJ, Davis P, Rai P, Rajasekhar V. Orbital myiasis: a case report. *Int J Oral Maxillofac Surg* 2001; **30**: 83–84.
7 Wood TR, Slight JR. Bilateral orbital myiasis. Report of a case. *Arch Ophthalmol* 1970; **84**: 692–693.
8 Chodosh J, Clarridge J. Ophthalmomyiasis: a review with special reference to *Cochliomyia hominivorax*. *Clin Infect Dis* 1992; **14**: 444–449.
9 DeBord BA. Rapid extermination of nasal myiasis. *Laryngoscope* 1959; **69**: 543–544.
10 Caca I, Unlu K, Cakmak SS, Bilek K, Sakalar YB, Unlu G. Orbital myiasis: case report. *Jpn J Ophthalmol* 2003; **47**: 412–414.
11 Rocha EM, Yvanoff JL, Silva LM, Prado AP, Caldato R. Massive orbital myiasis infestation. *Arch Ophthalmol* 1999; **117**: 1436–1437.
12 Chippaux JP, Bouchite M, Boussinesq M, Ranque S, Baldet T, Demanou M. Impact of reported large scale ivermevtin treatments on the transmission of Loa-loa. *Trans R Soc Trop Med Hyg* 1998; **92**: 454–455.

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Sir,

Macular hole surgery with and without indocyanine green assistance

We read with interest the article by Slaughter and Lee[1] on macular hole surgery with and without indocyanine green assistance. Pars plana vitrectomy followed by internal gas tamponade is the key operation in the treatment of macular hole. In addition, internal limiting membrane (ILM) peeling has been suggested to improve the success rate of macular hole surgeries.[2] Indocyanine green (ICG) staining has been used to enhance the intraoperative visualization of the ILM.[2] Yet, it is still unclear as to whether the use of ICG will affect the visual outcome of macular hole surgeries because of its potential toxicity.[2–4] Slaughter and Lee have nicely addressed this important issue in their article. They have found no statistically significant difference in the mean postoperative visual acuity between two groups of patients who have undergone macular hole surgeries, one of which received ICG-assisted ILM peeling and the other received ILM peeling without ICG staining. However, we would like to discuss two important issues regarding this study.

Firstly, it has been shown in many *in vitro* studies that the toxicity of ICG to retinal cells is related to its concentration and duration of application.[3,5] Therefore, the concentrations and durations of ICG application may be crucial in causing different degrees of retinal toxicity and hence affecting the visual outcome in macular hole surgeries with ICG-assisted ILM peeling. These important parameters relating to the use of ICG have not been elaborated in the article, and we are keen to learn more about this key information.

Secondly, the postoperative visual acuity was used as one of the most important outcome measures in this study. Yet, visual acuity can be heavily affected by cataract and posterior capsular opacification, both of which are common conditions after pars plana vitrectomy and cataract extraction, respectively. The severities of these conditions in the studied cases, however, have not been discussed. We would therefore like to know whether the influence of cataract and posterior capsular opacification have been taken into account during the analysis of the postoperative visual acuity. Furthermore, LogMAR visual acuity would be a better option as compared to Snellen visual acuity since the latter is less precise especially in those patients with macular holes in whom the visions are usually poor.

While we commend Slaughter and Lee for their success in macular hole surgeries using ICG-assisted ILM peeling, we hope the above issues can broaden the discussion and deepen our understanding on how the use of ICG may affect the visual outcome of macular hole surgeries.

References

1 Slaughter K, Lee IL. Macular hole surgery with and without indocyanine green assistance. *Eye* 2004; **18**: 376–378.
2 Kwok AK, Li WW, Pang CP, Lai TYY, Yam GHF, Chan NR *et al*. Indocyanine green staining and removal of internal limiting membrane in macular hole surgery: histology and outcome. *Am J Ophthalmol* 2001; **132**: 178–183.
3 Yam GHF, Kwok AKH, Chan KP, Lai TYY, Chu KY, Lam DSC *et al*. Effect of indocyanine green and illumination on gene expression in human retinal epithelial cells. *Invest Ophthalmol Vis Sci* 2003; **44**: 370–377.
4 Gandorfer A, Haritoglou C, Gass CA, Ulbig MW, Kampik A. Indocyanine green-assisted peeling of the internal limiting membrane may cause retinal damage. *Am J Ophthhalmol* 2001; **132**(3): 421–433.
5 Maia M, Margalit E, Lakhanpal R, Tso MO, Grebe R, Torres G *et al*. Effects of intravitreal indocyanine green injection in rabbits. *Retina* 2004; **24**(1): 69–79.

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