Nasal infestation by *Linguatula serrata* in a dog in the United Kingdom: case report

Word count: 1539 (excluding references and abstract)

Summary: A two-year-old, female neutered, cross-breed dog imported from Romania was diagnosed with nasal infestation of Linguatula serrata after she sneezed out an adult female. The dog was presented with mucopurulent/sanguinous nasal discharge, marked left-sided exophthalmia, conjunctival hyperaemia and chemosis. Computed tomography and left frontal sinusotomy revealed no further evidence of adult parasites. In addition, there was no evidence of egg shedding in the nasal secretions or faeces. Clinical signs resolved within 48 hours of sinusotomy, and with systemic broad-spectrum antibiotics and non-steroidal anti-inflammatory drugs. Recommendations are given in this report regarding the management and follow-up of this important zoonotic disease.

Keywords: *Linguatula serrata*, linguatuliasis, pentastomiasis, dog, parasitology, case report.

Introduction:

Linguatula serrata is a worm-like arthropod parasitic organism from the order Pentastomida, for which canines serve as a definitive host with nymphs and adults found in their upper respiratory tract (Acha & Szyfres 2003). Herbivores (including cattle, sheep and goats) become infected by ingesting eggs shed in the faeces or nasal

secretions of infected definitive hosts, and serve as intermediate hosts by harbouring encapsulated larvae in their internal organs and lymph nodes. Definitive hosts are infected by ingesting the encapsulated larvae found in raw viscera. Upon contact with gastric acid, the larvae migrate up the oesophagus towards the nasopharynx to complete their life cycle (Acha & Szyfres 2003).

Linguatuliasis is a zoonotic disease. The high incidence of human nasopharyngeal as well as visceral linguatuliasis cases in the Middle East is due to the frequent infestation of farm animals and dogs in this region as reported (Meshgi and Asgarian 2003, Mohammadi *et al.* 2008; Nourollahi Fard *et al.* 2011; Nourollahi Fard *et al.* 2010; Oluwasina *et al.* 2014; Rezaei *et al.* 2011; Yilmaz *et al.* 2011). Visceral linguatuliasis in people is most common where the prevalence of infected dogs is high; a prevalence of up to 62% in stray dogs has been reported in Iran (Rezaei *et al.* 2011), while a prevalence between 27% and 45% is reported in Nigeria and North West Iran (Meshgi and Asgarian 2003; Oluwasina *et al.* 2014). Intraocular linguatuliasis has also been described. (Koehsler *et al.* 2011; Lazo *et al.* 1999; Pal *et al.* 2011;)

To our knowledge, there are no written reports of canine or human linguatuliasis in the United Kingdom, and there is no known efficient treatment or generally accepted follow-up plan for affected cases. This report presents the management and follow-up plan of an exceptional case of *Linguatula serrata* infestation in a dog in the UK.

Case report:

A two year old, 10 kg female neutered crossbreed dog presented to a primary care centre for lethargy, left sided nasal discharge and epistaxis. The dog had been imported from Romania 2 months prior to presentation and had been in the owners' possession for 1 week. She had been fully vaccinated and previously treated with selamectin (Stronghold®; Pfizer) and a praziquantel/pyrantel/febantel formulation (Milbemax®; Novartis). No abnormalities were reported on physical examination apart from the nasal discharge and that the dog had sneezed out a worm-like parasite. At that point haematology[1] and coagulation times[1] were within normal limits, and biochemistry[2] revealed raised alanine transferase activity (ALT; 1250 U/L, reference interval (RI) 0-110 U/l) and total protein (TP; 82 g/l, RI 53-78 g/l). The dog was started on fenbendazole (Panacur; Intervet) 100 mg/kg SID PO 7 days, praziquantel/pyrantel (Drontal®; Bayer) 5 mg/kg PO once, and meloxicam (Metacam®, Boehringer Ingelbheim) 0.1 mg/kg PO SID; fenbendazole and praziquantel/pyrantel were prescribed as a broad spectrum anti-parasitic treatment by the primary veterinarian prior to identification of the parasite, as this combination is considered sufficient as a broad-spectrum antiparasitic treatment against nematodes and cestodes (Miro *et al*. 2007; Schmid *et al*. 2010). The parasite was submitted for identification to Idexx laboratories and was confirmed as an adult female *Linguatula serrata* based on characterization features such as the presence of two pairs of hooks surrounding the central mouth, transverse striation of the cuticle and a flattened body that is wider in the anterior portion (tongue-shaped); description of Linguatula serrata, life cycle and pictures and schemas are available in various publications (Gunn and Pitt 2012; Hendrix and Robinson 2014; *Rezaei and al*. 2011) The patient was referred because she developed left sided exophthalmos and was still lethargic with left sided nasal discharge.

On referral, the patient was transferred immediately to an isolation unit. All staff in contact with the patient wore protective equipment including full body suit with hat, goggles, mask, gloves, overshoes and an apron; these protective steps were in accordance with the hospital isolation unit policy and in an endeavour to decrease the zoonotic risk from contact with nasal secretions or faeces, and the patient remained in the isolation unit to avoid egg shedding elsewhere. Physical examination revealed mild left-sided epistaxis, left-sided exophthalmos and resistance to retropulsion (Figure 1). Repeated biochemistry revealed elevated TP (77·4 g/L; 49 to 71 g/L), mild hyperglobulinaemia (49·7 g/L; 21 to 41 g/L) and hypoalbuminaemia (27·7 g/L; 28 to 39 g/L). ALT activity was within normal limits. A complete blood count revealed mild eosinophilia (2·20×10^9/L; 0 to 1·3) and basophilia (0·33×10^9/L; 0 to 0).

The patient was anaesthetised for computed tomography (CT) of the head, thorax and abdomen, which revealed left frontal sinusitis (Figure 2A), fluid-attenuating accumulation in the retrobulbar space causing left exophthalmos (Figure 2B), and two oesophageal lesions which were consistent with granulomata (Figure 3). Retroflex nasopharyngoscopy was within normal limits. Anterograde rhinoscopy revealed the left nasal mucosa was mildly erythematous with increased mucoid secretions and a moderate bulging at the level of the left frontal sinus ostium, but no parasite was seen. Oesophagoscopy revealed lesions covered by smooth mucosa that were consistent with granulomata and had no communication with the oesophageal lumen.

Trephination of the left sinus immediately followed imaging and allowed for the removal of thick mucopurulent material from the sinus, but no parasites were seen. The

nasofrontal ostium appeared narrowed and the mucosal lining was chronically inflamed. The frontal sinus was emptied completely, flushed and closed routinely. Histopathology on the left sinus mucosa revealed a severe diffuse lymphoplasmacytic rhinitis consistent with inflammation secondary to underlying parasitic aetiology. No adult parasites, larvae or eggs were seen on histopathology or cytology of the nasal and sinus mucosa. Culture on the left sinus mucosa identified a moderate growth of *Pasteurella* spp. and *Staphylococcus pseudintermedius*, both sensitive to cephalexin. Baermann and flotation examination on faeces was negative for eggs, *Giardia* and *Angiostrongylus*. Serology[3] was negative for *Ehrlichia, Borrelia, Anaplasma* and *Dirofilaria immitis*.

The patient recovered quickly from anaesthesia and sneezing and epistaxis resolved within 48h of surgery. She was discharged on meloxicam (Loxicom®; Norbrook) 0.05 mg/kg PO for 4 days and cephalexin (Rilexine®; Virbac) 20 mg/kg PO for 7 days and was kept quarantined at the initial rescue centre for one month. Lastly, the recommendation was made that faecal analysis (Baermann and flotation) be repeated weekly for one month, then monthly for 6 months.

Discussion:

To our knowledge this is the first case report in the veterinary literature of canine linguatuliasis in the United Kingdom. The report presents the management and follow-up plan of this exceptional case with high zoonotic potential, and raises awareness of the potential importation of zoonotic diseases due to increased international movement of pets.

Veterinary surgeons and owners, who are likely to be in direct contact with canine nasal secretions and faeces containing eggs are at risk of zoonotic infestation with visceral linguatuliasis. Three cases of canine nasopharyngeal linguatuliasis were recently reported in Italy (Bordicchia *et al.* 2014; Paoletti *et al.* 2003). This case report confirms importation of dogs also poses a zoonotic risk for the UK. As demonstrated in the management of the case presented here, the use of protective equipment (gloves, mask, goggles, apron) and strict hygiene should be observed by veterinary personnel to avoid contact with the nasal secretions and faeces of infested dogs. In addition, infested dogs should be isolated from other dogs and their faeces should be disposed of as potentially zoonotic material.

Once the diagnosis of linguatuliasis was made, the aim of the investigation was to determine if any more adult parasites were present in the upper respiratory tract, and if there was evidence of egg shedding.

Advanced imaging and frontal sinus trephination allowed thorough investigation to exclude the presence of any other adult parasites. Given the absence of eggs in the patient's faeces and nasal secretions, the zoonotic risk was considered low. However, egg shedding could have been intermittent. Egg shedding through nasal secretions is reported to occur 5 to 6 months post experimental ingestion of larvae (Tavasouli *et al.* 2001; Hobmaier 1940). This led to the recommendation that faecal sampling would take place for at least six months following discharge from the referral hospital.

The main limitation of the investigation of this case was that presence of larval forms of *Linguatula serrata* still in migration between the stomach and the nasopharynx could not be ruled out although none were observed. Literature is scarce on the life cycle of *Linguatula serrata*, and the actual timeframe for migration of larvae is not well documented. Clinical signs due to presence of the parasite in the throat or nasopharynx in humans start within hours of ingestion of the larvae (Mohammadi *et al.* 2008), and experimental work in dogs has also shown very rapid larval migration (Hobmaier 1940). Based on this, close monitoring of clinical signs including recrudescence of upper respiratory tract signs were recommended in addition to isolation for one month following discharge from the referral hospital.

The lesions that were consistent with granulomata of the distal oesophagus as revealed by CT were likely to be related to the migratory path of *Linguatula serrata* up the oesophagus. However, other causes of granuloma formation including infestation by other parasites (e.g. *Spirocerca lupi*) could not be completely excluded.

The clinical signs affecting the orbit were most likely related to sinusitis, which can affect ipsilateral retrobulbar tissues, as described in cats and dogs (Mason *et al.* 2001; Hamilton *et al.* 2000; Wilkinson *et al.* 1982). The possibility existed that these signs could have been secondary to a retrobulbar granuloma but there was no CT evidence to support this.

There is no known efficient treatment against *Linguatula serrata* larval or adult forms, despite anecdotal use of systemic ivermectin in dogs (Paoletti *et al.* 2003). Ivermectin was not prescribed for the patient in this report due to a lack of evidence for its efficacy.

Currently, surgical retrieval of adult forms from the nasopharynx and sinuses remains the only treatment option in infested dogs. The use of fenbendazole and praziquantel in this patient was only intended as a broad-spectrum anti-parasitic treatment in an imported animal, prior to identification of the parasite.

In conclusion, this first reported case of linguatuliasis in a dog in the UK serves as an example of an imported 'tropical' disease with zoonotic potential; it is unclear at this stage if cases reported elsewhere in Europe, such as Italy, represent isolated imported cases or expansion of core endemic areas. Case management was based on knowledge of the life cycle of *Linguatula serrata* and evaluation of the zoonotic risk. Veterinary surgeons working in the UK and owners importing dogs need to be aware of the risk of importing zoonosis and how to prevent the spread of infestation from imported infested animals.

[1] Axiom laboratories

[2] In house, Quantum system

[3] Idexx SNAP 4DX (ELISA, antibodies detection)

Figures Legends:

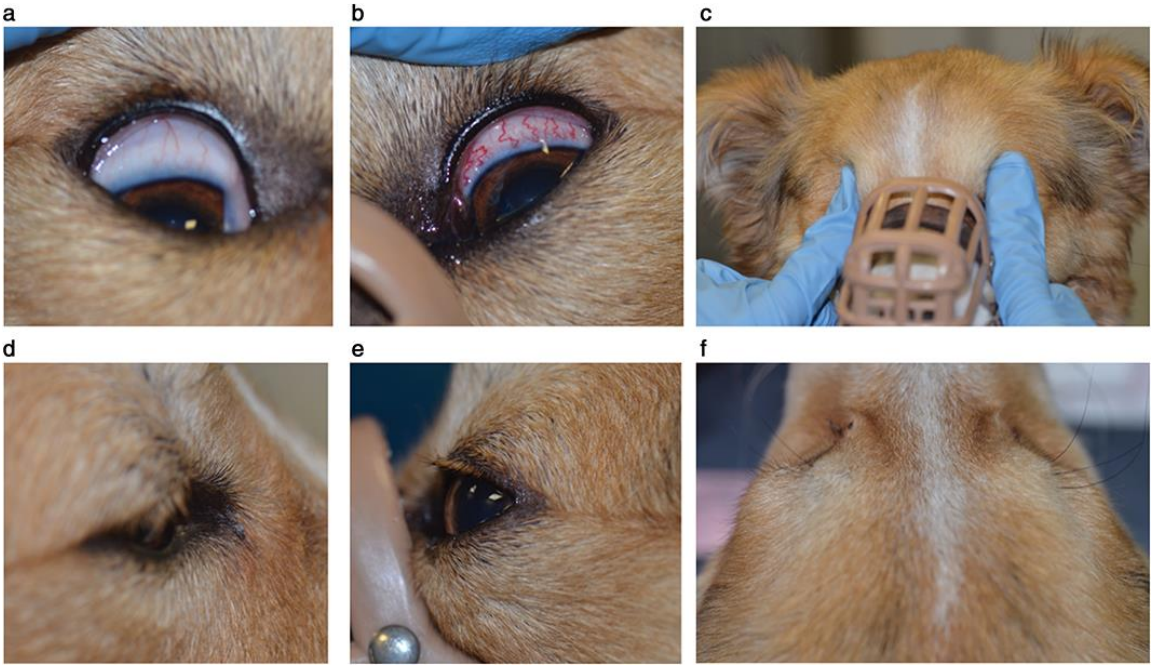

Figure 1(a-f). Right eye with a healthy conjunctival vessel pattern (1a). Left eye with conjunctival hyperaemia and chemosis, and episcleral venous congestion (1b). Resistance to retropulsion of the left globe compared to unimpeded resistance to retropulsion of the right (1c). Lack of exophthalmos in the unaffected side when viewed from the side (1d). Obvious exophthalmos of the left eye with periorbital swelling under the skin as seen from the affected side (1e). Exophthalmos seen from above affecting the left side (1f).

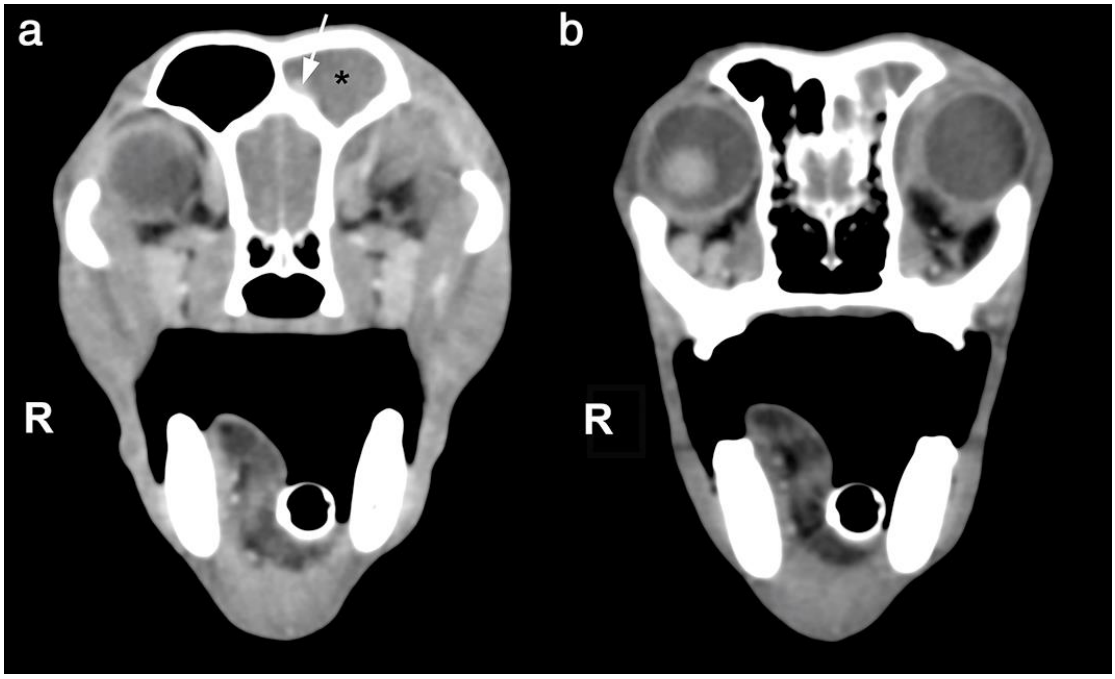

Figure 2 (A-B): Computed tomography (CT) transverse images of the head. Area of contrast enhancement within the sinus (Figure 2A, arrow) and left frontal sinus filled with soft tissue attenuating material (Figure 2A, asterisk). Left exophthalmos with fluid-attenuating accumulation in the retrobulbar space (Figure 2B).

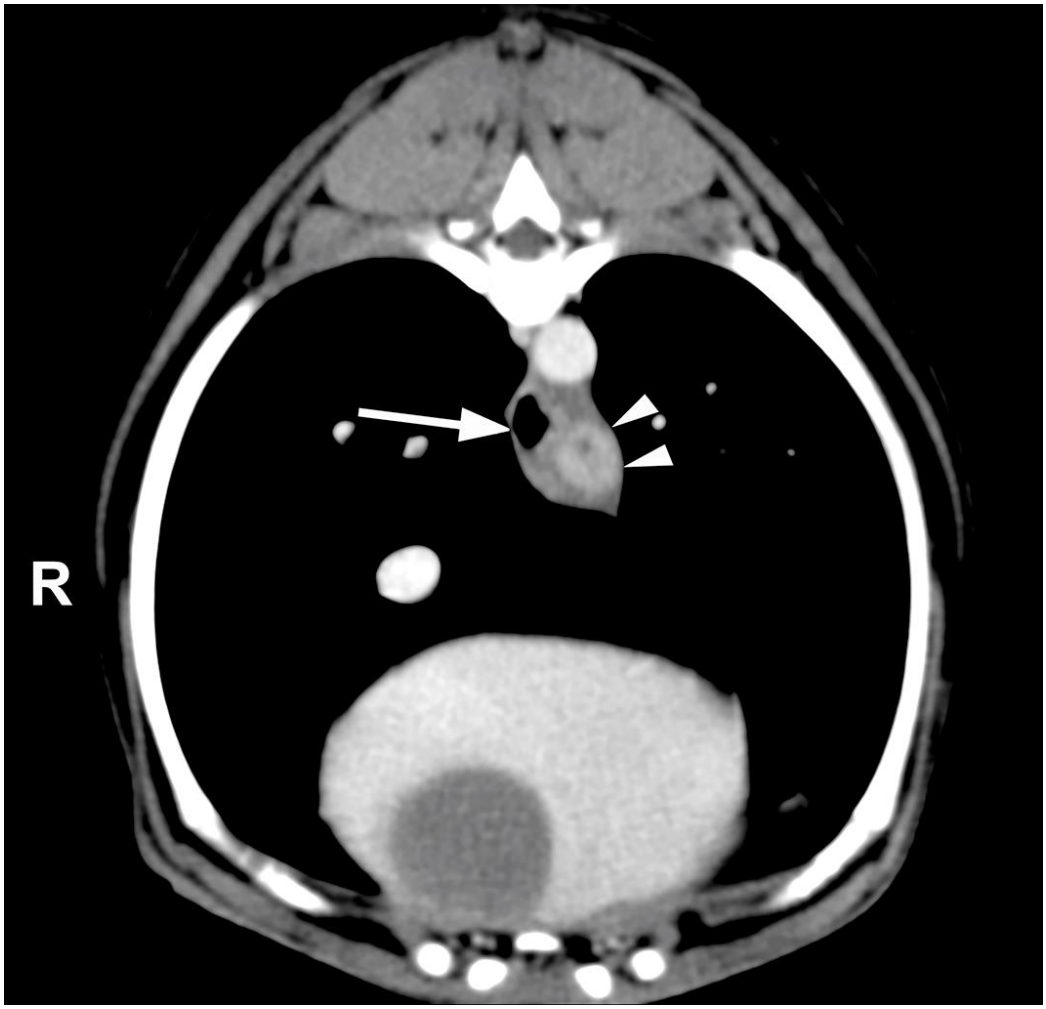

Figure 3: CT transverse image of the thorax showing the oesophageal lumen containing a small amount of gas (white arrow), and two oesophageal lesions consistent with granulomata (arrowheads).

Conflict of interest:

No conflict of interest has been declared

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