Pathological changes in mesenteric lymph nodes infected with *L. serrata* nymphs in Iranian sheep

M. YAKHCHALI* AND A.A. TEHRANI

Introduction

The phylum pentastomida consists of about 100 species of endoparasites of vertebrates. Of importance in veterinary and human medicine is the family Linguatulidae of which species of the genus *Linguatula* are zoonotic parasites [25]. *Linguatula serrata* is commonly referred as “tongue worm”, because many species within the phylum have transparent tongue-shaped bodies [1]. The life cycle of *Linguatula* specie involves two consecutive hosts. Dogs, cats, foxes and other carnivores are the definitive hosts of this cosmopolitan parasite [17, 25, 27]. Observation of nymph stages of *L. serrata* in the MLNs of small ruminants may be a strong preoccupation in Iran, where people are high consumers of sheep and goat meats. Furthermore, the raw consumption of infected livers may also lead to infection in humans called the Halzoun or Marrara syndrome [6, 19]. Linguatolosis in human was also reported by other researchers in Iran [9, 11, 22]. Nevertheless, pathological study on affected MLNs with *Linguatula* nymph from intermediate hosts in Iran has not been yet reported. For this purpose, the present study was carried out to find out the histopathological changes of affected MLNs by the *L. serrata* nymphs in sheep from Iran.

Materials and Methods

A total of 136 carcasses of the sheep slaughtered in the industrial Urmia abattoir in Iran were inspected. Five jejunal MLNs were collected from each sheep [15]. Infected MLNs with *L. serrata* were collected and put separately into a container with 10% buffered formalin, according to the animal origins. The MLNs were measured and examined grossly for the presence of the nymphs of *L. serrata* and morphological characteristics were used to identify the parasite [25]. All mesenteric lymph...
nodes (MLNs) containing immature stage of *L. serrata* were fixed in 10% formalin and paraffin. The lymph nodes were sectioned in 4-5 µm thick pieces. Sections were stained with Haematoxylin and Eosin and examined under light microscope [10].

**Results**

Grossly, the infected MLNs were enlarged and reached in average 2.5 x 1.5 x 1.0 cm³. Externally, the infected MLNs appeared smooth and oedematous. The cut sections revealed multiple cystic areas which the diameters have varied from 0.5 to 0.8 cm and which contained shiny grey white material. These materials were morphologically identified as *L. serrata* nymphs and were scattered throughout the cystic areas and the lymph node (figure 1). As shown in Table I, 30.9% (42/136) of the inspected sheep carcasses exhibited infected MLNs. The *L. serrata* larval and nymph stages were predominantly evidenced in the infected lymph nodes and the nymph stage was highly the most prevalent although some other parasites such as lung worm larvae (43.39%) were also found in the infected MLNs. In addition, in average 21 parasites per infected MLN were recorded.

### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Number of inspected carcasses</td>
<td>136</td>
</tr>
<tr>
<td>Number of carcasses with parasite-infected MLNs</td>
<td>42</td>
</tr>
<tr>
<td>Prevalence of infected MLNs (%)</td>
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<td>Types of parasites (%)</td>
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<td><em>L. serrata</em> (%)</td>
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<td>Others (%)</td>
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<td>Parasite stages (%)</td>
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<td>Nymph (%)</td>
<td>60.1</td>
</tr>
<tr>
<td>Mean number of parasites per MLN</td>
<td>21</td>
</tr>
</tbody>
</table>

*MLN: mesenteric lymph nodes.*

**TABLE I:** Prevalence of *L. serrata* nymph infection in mesenteric lymph nodes in sheep from Iran.

Histopathological analysis of MLNs revealed traumatic foci of migratory route of the parasite with cystic spaces. The empty spaces were expanded, filled with oedema and surrounded by necrotic areas (figures 2 and 3). Lymphocytes in the periphery of the necrotic areas were apoptotic and chromatolysis was seen in nuclei (figure 3). Granulomatosis lesions were formed with giant cells and macrophages around the necrotic area. The vascular lesion included pre-vascular cuffing and vacuities (figure 4). The endothelial cells around the vascular wall were swollen and surrounded with infiltrated mononuclear cells. Thrombosis was found in the vessels.

**Discussion**

In the present study, infected MLNs from sheep carcasses exhibited inflammatory lesions (oedema, necrotic areas, mononuclear cell infiltrates and vascularitis) around cystic cavities

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**FIGURE 1:** Mesenteric lymph nodes of natural infected sheep with *L. serrata* (arrows) in a cystic cavity.

**FIGURE 2:** Oedema in mesenteric lymph node. The lymph vessel is severely dilated (arrow), Haematoxylin and Eosin, X 400.

**FIGURE 3:** Mesenteric lymph node in sheep. Note the lack of lymphocytes, the necrotic underlying tissue (N) and the evident empty spaces (ES). Apoptotic lymphocytes (AL) are found in the empty spaces, Haematoxylin and Eosin, X 400.
induced by the parasite migration. The histopathological changes observed in the MLNs were in agreement with the findings of other researchers [7, 19, 23]. JUBB et al. [5] have previously noted that cysts are commonly observed in MLNs of sheep. Furthermore, viable nymphs can be found in normal MLNs, but usually the nodes show focal or diffuse hyperplasia and oedema, with dead nymphs progressively encysted in encapsulated abscesses and calcification of the older lesions which resemble to tubercles [5]. During their migration, the L. serrata larvae may produce lesions in the intermediate host similar to those produced by Ascaris and Strongyle larvae [5, 18].

There was a strong inflammatory reaction in tissues infected with L. serrata. SELF and KUNTZ [19] reported that because of compatibility between the host and the chronic infection with the nymph, the tissue reaction is usually mild and is not granulomatous. However, granulomatous lesions in MLN induced by L. serrata or by other infectious agents such as bacteria and fungi [10] would simultaneously exist [2, 8, 12]. Often the aberrant parasites will cause an over-reaction and serious host damage [24]. The failure of the immune system to fight off the pathogens in spite of large population of immune cells in the tissue is not clearly understood and requires further investigation.

In the present study, the prevalence of L. serrata in sheep was relatively high. This finding was in close agreement with previous finding in sheep from Urmia, Iran [29]. SHEKARFOROUSH et al. [21] reported that 11.5% of examined sheep in Shiraz was infected by L. serrata. The frequency of L. serrata in small ruminants of Babol was 33.9% [3]. It seems that sheep plays an important role in the epidemiology of this parasite in comparison with other ruminants in different parts of Iran. The presence of L. serrata in live stock indicated that human infections could potentially be acquired from raw consumption or under-cooked visceral organs of sheep. Some women, particularly of tribal origin, believe that consumption of raw or undercooked liver of sheep and goat because of its high content of iron and vitamins is useful for growth of the foetus [15].

As a conclusion, the results of the present histopathological study confirm the possible and frequent invasion of MLNs by L. serrata nymphs in sheep. Because of the high prevalence of parasite-infected MLNs in Iranian sheep and as the parasite infection may promote another concurrent infections during larva tissue migration in the intermediate host, a systematic and rigorous inspection of the MLNs in slaughtered sheep would be important for limiting the infection risk in humans.

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References

MESENTERIC LYMPH NODE INJURY INDUCED BY L. SERRATA IN SHEEP


