

## Research Article

# Parasitic infections and their tissue response: a histopathological study

A. Manoharan\*, Sowmya Srinivasan

Department of Pathology, Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, India

**Received:** 12 March 2016

**Accepted:** 22 April 2016

**\*Correspondence:**

Dr. A. Manoharan,

E-mail: medicomano@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Many pathogenic organisms including parasites cause inflammatory lesions and microscopic findings are useful tool for the aetiological diagnosis. The causes of parasite induced tissue damage can either be due to the physical pressure exerted by the parasites or the toxic secretory products which may lead to hypersensitivity reactions. The commonly encountered tissue responses are eosinophilic infiltration, abscess formation and granulomatous inflammation. Main objective of the study is to study the parasitic infections involving various tissues and organs and to assess the tissue response elicited against these parasites.

**Methods:** The histopathologically diagnosed parasitic infections over a period of 7 years from January 2007 to December 2013 were analysed. The histological identification of parasite and tissue reaction was evaluated in correlation with clinical presentation. *Enterobius vermicularis* which is the most common parasitic infestation in appendix was excluded from the study.

**Results:** Over a period of 7 years 9 cases of parasitic infections were found. These include 2 cases each of filariasis, cysticercosis, and hydatid cyst, and 1 case each of ascaris enteritis, amoebic colitis, and conjunctival parasite. The specific tissue reactions included eosinophilic infiltrate in filariasis and ascaris enteritis and xanthogranulomatous reaction in cysticercosis.

**Conclusions:** Among the 9 cases only 2 hydatid cysts and one genital filariasis were clinically diagnosed. Remaining cases were incidentally found only on the histopathological examination. This emphasises that careful histopathological examination is essential for the diagnosis of these lesions to provide specific treatment for the patients.

**Key words:** Parasite, Tissue response, Histopathology

### INTRODUCTION

The parasite is a living organism that lives in (endoparasite) or on (ectoparasite) another organism, termed its host. It obtains nourishment and protection but offers no benefit in return. Consequently, the host suffers from various diseases, infections and discomforts. Parasites of humans are classified in a number of major divisions.

They include the Protozoa, the Fungi, the Platyhelminthes (cestodes, trematodes), the

Acanthocephala, the Nematoda or roundworms, and the Arthropoda (insects, spiders, mites, tick, and so on). The common infestations are amoeba in the intestine causing amoebic colitis, filariasis in scrotum, *Ecchinococcus* causing hydatid cyst in liver, Cysticercosis caused by larval cysts of the tapeworm *Taenia solium*. On histopathology, these parasites produce tissue responses which provides clue in the search of parasites and to confirm diagnosis.

Giemsa staining is necessary for the detection of hemoparasites (*Plasmodium* species, *L. donovani*, *Babesia* species and *microfilariae*) in thick and thin blood

films, *Leishmania donovani* in bone marrow and splenic aspirates, *trypanosomes* in lymph node imprints and *G. lamblia*, *microsporidia* and *Entamoeba histolytica* (*E. histolytica*) in imprints of gastrointestinal biopsy. Tissue stains like H and E and PAS help not only in the identification of the parasite (tissue nematodes, Toxoplasma) but also in the visualization of host tissue response and morphology.<sup>1-3</sup>

**METHODS**

The histopathologically diagnosed parasitic infections over a period of 7 years from January 2007 to December 2013 were analyzed. It involves the clinical presentation

of parasitic infestation, histological identification of the parasite and the various tissue reactions elicited against each parasitic infestations. Also special stains were done such as PAS (Periodic acid Schiff stain) to confirm amoebic colitis.

**RESULTS**

In the present study over a period of 7 years there were 9 parasitic lesions identified on histopathological examination. Among these 9 cases, there were 2 cases (22.2%) each of filariasis, cysticercosis, and hydatid cyst, and 1 case (11.1%) each of ascaris enteritis, amoebic colitis, and conjunctival parasite - *Demodex follicularum*.

**Table 1: Clinical presentation of parasitic lesions in the present study.**

HP diagnosis	Age	Sex	Site	Clinical diagnosis
Filariasis	48	M	Epididymis	Scrotal swelling- pyocele
Filariasis	60	M	Scrotum	Genital filariasis
Ascaris enteritis	58	M	Midgut	Intestinal obstruction
Cysticercosis	24	F	Arm	Soft tissue swelling
Cysticercosis	35	M	Shoulder	Soft tissue swelling
Amoebic colitis	65	F	Rectal mucosa	Carcinoma rectum
Hydatid cyst	58	M	Liver	Hydatid cyst
Hydatid cyst	30	F	Liver	Hydatid cyst
<i>Demodex follicularum</i> conjunctivitis	29	M	Conjunctiva	Progressive nasal pterygium

**Table 2: Parasitic lesions and their tissue response in the present study.**

Parasite/ lesion	Tissue response
Filariasis	Eosinophilic abscess, fibrosis, calcification, lymphoid aggregate with germinal centre formation.
Ascaris enteritis	Mucosal ulceration, eosinophilic infiltration, fibrosis, submucosal edema and congestion.
Cysticercosis	Inflammatory infiltrate, xanthogranulomatous reaction.
Amoebic colitis	Mucosal ulceration, cytoplasmic vacuolation, congested blood vessels
Hydatid cyst	Mononuclear cell infiltration, fibrosis, haemorrhage, calcification, congested blood vessels.
<i>Demodex folliculorum</i>	Neutrophilic infiltration, vacuolation in epithelium, ulceration and haemorrhage.

**Table 3: Common occurrence of parasites in various studies.<sup>4-8</sup>**

Authors	Site	Occurrence
Jeevitha Dhanabal et al <sup>5</sup>	Intestinal parasites	<i>Entamoeba coli</i> (26%) and <i>E. histolytica</i> (22%)
Sabesan S et al <sup>8</sup>	Genital filariasis	72.6%
Vora SH et al <sup>6</sup>	Soft tissue cysticercosis	88 %
Rao SS et al <sup>4</sup>	Hydatid cyst in Liver	72%
Norn MS et al <sup>7</sup>	<i>Demodex follicularum</i> in hair follicle	13%
Present study	Genital filariasis, Hydatid cyst in liver, soft tissue cysticercosis.	Each 22.2%.
	Intestinal parasites, conjunctival parasite	<i>E. histolytica</i> , <i>Ascaris</i> , <i>Demodex follicularum</i> - each 11.1%

Both cases of filariasis were seen in males presenting as filarial epididymitis and scrotal filariasis. The age of the patients was 48 and 60 years. Lowest age group was seen

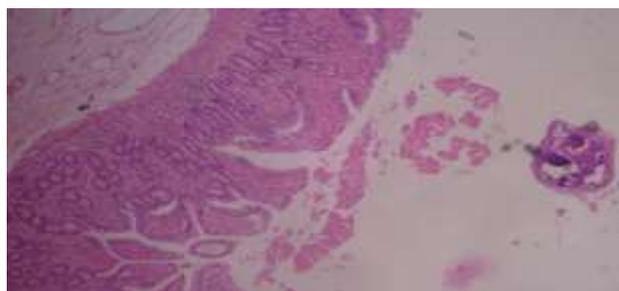
with cysticercosis (24 and 35 years). The 2 cases of cysticercosis presented as soft tissue swellings in the arm and shoulder of the patients.

**Table 4: Comparison of age group in the present study with peak age range.**<sup>1,2,8,9</sup>

Parasitic infestation	Peak age range(years)	Age group in our study(years)
Filariasis	35-80	48 and 60
Ascaris	15-35	58
Cysticercosis	20-40	24 and 35
Amoebic colitis	2-40	65
Hydatid cyst	21-50	35 and 58
Demodex follicularum	30-50	29

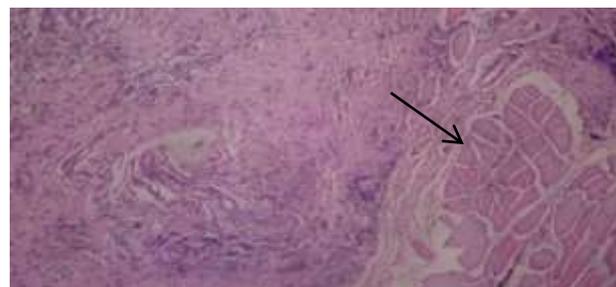


**Figure 1: Filariasis: cut section of gravid filarial worm with microfilariae surrounded by dense eosinophilic abscess, H&E 10X.**

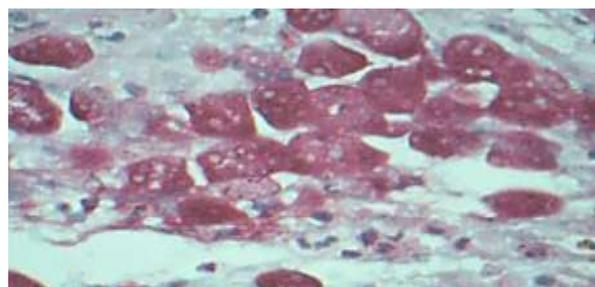


**Figure 2: Ascaris enteritis: ulcerated intestinal mucosa with larva of *Ascaris lumbricoides* in the lumen, H&E, 10X.**

Both cases of hydatid cysts were involving the liver and the age of the patients was 58 and 35 years. Ascaris enteritis was identified in a male patient of 58 years presenting as intestinal obstruction.

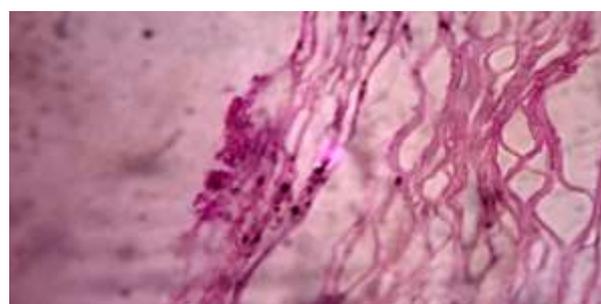


**Figure 3: Cysticercosis: cysticercus larva surrounded by chronic inflammation, H&E,10X.**



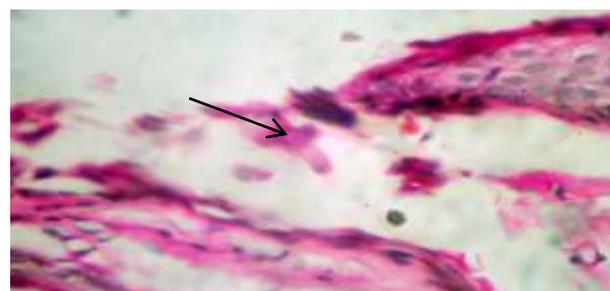
**Figure 4: Amoebic colitis: trophozoites of *E. histolytica*, PAS, 40X.**

The single case of Amoebic colitis was seen in a 65 years old female patient and clinically was diagnosed as carcinoma for which biopsy was taken.



**Figure 5: Hydatid cyst: endocyst, H&E, 40X.**

*Demodex follicularum* conjunctivitis was recognised in a 29 years old male patient with progressive nasal pterygium. The specific tissue reactions included dense eosinophilic infiltrate in filariasis and ascaris, and xantho granulomatous reaction in cysticercosis.



**Figure 6: *Demodex follicularum*: ulcerated epithelium with parasites, H&E,40X.**

**DISCUSSION**

Parasitic infections are common occurrences in the gastrointestinal tract (GIT), especially appendix. However their identification as isolated organ involvement other than GIT particularly in the soft tissues is very rare. In the present study there were only 9 cases of parasitic lesions identified only on histopathological examination over a period of 7 years. Out of these 9 cases there were 2 each of filaria, cysticercosis, and hydatid

cyst, and 1 case each of ascaris enteritis, amoebic colitis, and conjunctival parasite. The age group range for filariasis was 48-60 years and lowest age group was seen with cysticercosis (24-35 years). The specific tissue reactions included eosinophilic infiltrate in filariasis and ascaris, and xanthogranulomatous reaction in cysticercosis.

Immune mediated tissue response in filariasis is composed of eosinophils, lymphocytes, plasma cells and large macrophages surrounding the dead parasite. In later stages, granulation tissue with newly formed blood vessels and inflammatory cells is seen which may help to eliminate the source of insult and facilitate tissue remodelling. The dead parasite may further undergo dystrophic calcification.<sup>10</sup> In the present study there were dense eosinophilic aggregates surrounding the parasite in both cases. In the case of scrotal filariasis there were also multiple foci of calcification.

The tissue response to ascaris causes mucosal ulceration, eosinophilic infiltration, fibrosis, submucosal oedema and congestion. An increase in the numbers of peripheral blood and tissue eosinophil's is a hallmark of helminth infections, especially with tissue-invasive stages. Accumulation of eosinophil's in the intestinal mucosa may arise as a result of chemotactic factors released due to mast cell/ IgE-worm antigen interaction, T cell-mediated eosinophilopoiesis which can occur locally and/or in the bone marrow, and chemoattractants released from the parasites themselves.<sup>11</sup> In the present study there was mucosal ulceration, oedema vascular congestion and transmural eosinophilic infiltration in the case of ascaris enteritis.

Human cysticercosis is a parasitic infestation caused by *Cysticercus cellulosae*, the larvae of the pork tape worm, *Taenia solium*. It occurs due to food contamination. The common sites of occurrence of cysticercus are skeletal muscle, subcutaneous tissues, brain and eye, in the decreasing order of frequency. It produces tissue responses such as inflammatory infiltrate and xanthogranulomatous reaction.<sup>11,12</sup> The two cases in the present study showed xanthogranulomatous reaction surrounding the parasite.

Amoebiasis is caused by the protozoan parasite *Entamoeba histolytica*. The ulcer is flask-shaped with the broad base composed of fibrin and cellular debris. A sharp line divides the necrotic and viable mucosa (this feature is due to the lytic action of the trophozoites). Trophozoites are found on the surface of the ulcers, in the exudate and in the crater.

They can be found in all the layers of intestine and in the small veins of the submucosa. There is minimal inflammatory response in the early ulcers. However, as the ulcer widens there is accumulation of neutrophils, lymphocytes, histiocytes, plasma cells and sometimes eosinophils. Histologic sections of an ameboma reveal

granulation tissue, fibrosis, chronic inflammatory cells and clusters of trophozoites usually concentrated in the submucosa near small points of ulceration. The cytoplasm of the trophozoites is vacuolated with erythrocytes within the vacuoles. They are differentiated from macrophages by PAS stain, which stains the cytoplasm of the trophozoites red.<sup>11</sup> In the present study there was mucosal ulceration with trophozoites surrounded by neutrophils. The trophozoites were strongly PAS positive.

Echinococcosis or hydatid cyst is a zoonotic helminth which can sometimes affect human mainly the liver and the lung. The tissue response results from multiple host-parasite relationships such as mononuclear cell infiltration, fibrosis, necrosis and areas of calcification.<sup>13</sup> Both cases of hydatid cysts in the liver were clinically diagnosed and the cysts with surrounding fibrosis and minimal mononuclear cell infiltration and calcification were identified in the present study.

*Demodex* mites are common commensal organisms of the pilosebaceous unit in human beings and have been implicated in pityriasis folliculorum, rosacea-like demodicosis, and demodicosis gravis. *D. folliculorum* is usually found in the follicular infundibulum. *Demodex* mites are pathogenic when present in excessive number or penetrating into the dermis. Histopathology shows dense perivascular and perifollicular lymphohistiocytic infiltrates neutrophils and multinucleated histiocytes. *Demodex* mites can be seen in follicular infundibula, infundibular pustules or in perifollicular inflammatory infiltrate.<sup>14</sup> In the present study the mites were seen amidst the inflammatory infiltrate.

## CONCLUSION

Parasitic lesions can present with clinically variable manifestations. Among the 9 cases over a period of 7 years, only the 2 cases of hydatid cysts and one scrotal filariasis were clinically diagnosed. Remaining cases were incidentally found on the histopathological examination based on morphology of parasite and the host tissue response. There were variable tissue responses like aggregates of eosinophils, xanthogranulomatous reaction, vascular congestion and fibrosis identified around the parasites. This emphasises that histopathology is essential for the diagnosis of these lesions that helps to provide specific treatment for the patients.

## ACKNOWLEDGEMENTS

Authors would like to thank all technicians of histopathology section who helped them in slide making and staining.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: Not Required*

## REFERENCES

1. Papparella S. Histology in diagnosis of parasitic diseases. *Parassitologia*. 2004;46(1-2):157-8.
2. Damjanov I, Linder J. Anderson's pathology, tenth edition. 1996:747-8.
3. Gutierrez Y. Diagnostic pathology of parasitic infections with clinical correlations. Oxford university press. Second edition.
4. Rao SS, Mehra B, Narang R. The spectrum of hydatid disease in rural central India: An 11-year experience. *Ann Trop Med Public Health* 2012;5:225-30.
5. Dhanabal J, Selvadoss PP, Muthuswamy K. Comparative study of the prevalence of intestinal parasites in low socioeconomic areas from South Chennai, India. *Journal of Parasitology Research*, vol. 2014(2014). Article ID 630968.
6. Vora SH, Motghare DD, Ferreira AM, Kulkarni MS, Vaz FS. Prevalence of human cysticercosis and taeniasis in rural Goa, India. *J Commun Dis*. 2008;40(2):147-50.
7. Norn MS. Incidence of *Demodex folliculorum* on skin of lids and nose. *Acta Ophthalmol (Copenh)*. 1982;60(4):575-83.
8. Sabesan S, Vanamail P, Raju K, Jambulingam P. Lymphatic filariasis in India: Epidemiology and control measures. *J Postgrad Med*. 2014;232-8.
9. Rayan P, Verghese S, McDonnell PA. Geographical location and age affects the incidence of parasitic infestations in school children. *Indian J Pathol Microbiol*. 2010;53(3):498-502.
10. Mahalingashetti PB, Subramanian RA, Jayker SS, Vijay A. Lymphatic filariasis. A view at pathological diversity. *Trop Parasitol*. 2014;4:128-32.
11. Behnke JM. Taylor and Francis. Parasites: immunity and pathology. 1990;186-8.
12. Karthikeyan TM, Manimaran D, Mrinalini VR. Cysticercus of the breast which mimicked a fibroadenoma. A rare presentation. *Journal of Clinical and Diagnostic Research*. 2012;9:1555-6.
13. Khadidja H, Achour Y, Houcin B, Vasile C. Histological Appearance of Echinococcus Granulosus in Algeria. *Bulletin UASVM Veterinary medicine*. 2014;71(1):79-84.
14. Hsu C, Hsu MM, Lee JY. Demodicosis: A clinicopathological study. *J am acad dermatol*. 2006;60(3):453-62.

**Cite this article as:** Manoharan A, Sowmya S. Parasitic infections and their tissue response: a histopathological study. *Int J Res Med Sci* 2016;4: 1938-42.