

Parasitic infections and their tissue response: A histopathological study

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Abstract

Background: 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, Echinococcus causing hyatid cyst in liver, Cysticercosis caused by larval cysts of the tapeworm Taenia solium. On histopathology, theses parasites produce tissue responses which provides clue in the search of parasites and to confirm diagnosis.

Methods: The Histopathologically diagnosed parasitic infections over a period of 4 years from January 2015 to December 2018 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.

Results: 17(54.84%) cases were female and mean age was 36.12±16.20 years (range 4-63 years). The mean age was lower in females compared to males. In the present study over a period of 4 years there were 31 parasitic lesions identified on histopathological examination. Among these 31 cases, there were 27 cases of hydatid cyst, 2 cases of Enterobius vermicularis, 1 case of Cysticercosis, and 1 case of Ascaris enteritis.

Conclusion: The histopathology is essential for the diagnosis of these lesions that helps to provide specific treatment for the patients.

Keywords: Parasite, Tissue response, Histopathology.

Introduction

Histopathology represents a science on structure and functions of tissues in ill individuals. Histopathological analysis plays an important role in the diagnosis of human diseases of different etiologies such as neoplastic, infectious, parasitic, deficiency diseases and of intoxications. Histopathological examination allows to identify the parasite species involved, the area of pathological lesions, possible complications of bacterial and viral origin, and the outlook of treatment. Histopathological examination provides information about impact of parasites on the host organism.

Detection of histopathological changes during certain parasitic invasion is particularly important for differential diagnosis and often confirms the presence of parasitic diseases.

The pathogenesis of parasitic diseases is complex. In general, parasites can cause pathology by mechanical disruption as they migrate through or displace tissues. Other secrete toxic substances, but the predominant pathological mechanism is via the human immune response to infection. Eggs and degenerating larvae often induce granuloma formation, which can cause fibrosis or mass effect on other tissues if excessive.

When considered with relevant clinical information, the histological features seen in tissue biopsies may provide sufficient information to correctly identify a particular type of organism

Giemsa staining is necessary for the detection of hemoparasites (*Plasmodium* species, *L. donovani*, *Babesia* species and microfilariae) in thick and thin bloodfilms, *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.¹⁻³

This study was aimed at determining the role of histopathology in the diagnosis of human parasitic diseases and revealing pathological changes occurring during invasions caused by different parasitic species.

Material and Methods

The Histopathologically diagnosed parasitic infections over a period of 4 years from January 2015 to December 2018 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.

Study design: Hospital based last 4 year study {will be performed retrospectively as well as prospectively}

Study place: Dept. of Pathology, S.P.Medical College, Bikaner

Study Unit: Tissue specimens obtained from study population

Sampling method: Purposive non-probability sampling,

Sample size: all patients reporting to the Pathology dept. within study duration and eligible as per inclusion criteria will be included in the study.

Source of data: All the biopsy or surgically excised specimens and reference material submitted to the Department of Pathology, SPMC, Bikaner for histopathological study during a four year period, from Jan 2015 - Dec 2018 (Three years of retrospective and one years of prospective study).

Methods of collection of data

Data for retrospective study will be obtained from departmental records and medical records department. Tissue blocks and slides would be retrieved and reviewed. Data for prospective study will be obtained from clinical records and tissue specimens.

Clinical data will be obtained from hospital records and requisitions submitted along with tissue specimens received in the department. Gross examination will be carried out on specimens. Tissue bits will be routinely processed. Three to five micron thick sections will be made from paraffin blocks and will be stained with H&E stain. Special stains shall be done whenever necessary.

Data analysis

After entering data into Excel worksheet, it will be analyzed with the help of frequency, proportion, mean,

standard deviation and tests of significance wherever applicable.

Results

17(54.84%) cases were female and mean age was 36.12±16.20 years (range 4-63 years). The mean age was lower in females compared to males.

In the present study over a period of 4 years there were 31 parasitic lesions identified on histopathological examination. Among these 31 cases, there were 27 cases of Hydatid cyst, 2 cases of Enterobius vermicularis, 1 case of Cysticercosis, and 1 case of Ascaris enteritis.

Table 1. Disease wise distribution

Disease		No. of case	Percentage
Hyatid cyst	Lung	1	3.22%
	Liver	24	77.42%
	Spleen	1	3.22%
Gluteal cyst		1	3.22%
Enterobius vermicularis		2	6.44%
Ascaris enteritis		1	3.22%
Cysticercosis		1	3.22%
Total		31	100.00%

Parasitic infestation	Peak age range(years)	Age group in our study
Hydatid cyst	21-50	17-75
Enterobius vermicularis	7-13	6-8
Ascaris	15-35	15
Cysticercosis	20-40	30

Authors	Site	Occurrence
Rao SS et al	Hydatid cyst in liver	72%
Shereen M. Hamdona et al	Enterobius vermicularis in appendix	18.2%
Hemant Kumar et al	Ascaris	46.88%
Vora SH et al	Soft tissue cysticercosis	88%
Present study	Hydatid cyst liver Enterobius vermicularis Ascaris & Cysticercosis	77.42% 6.44% Each 3.22%

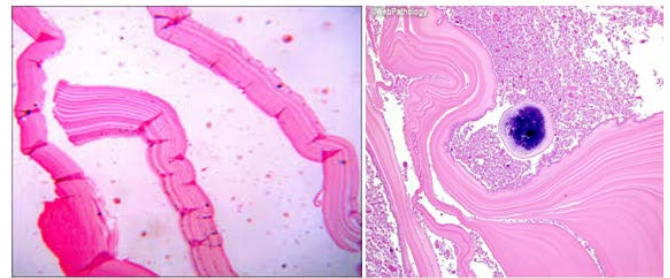


Figure-1: The wall of hydatid cyst consists of laminated membranous structure which is lined by germinal epithelium. A calcified scolex also seen.

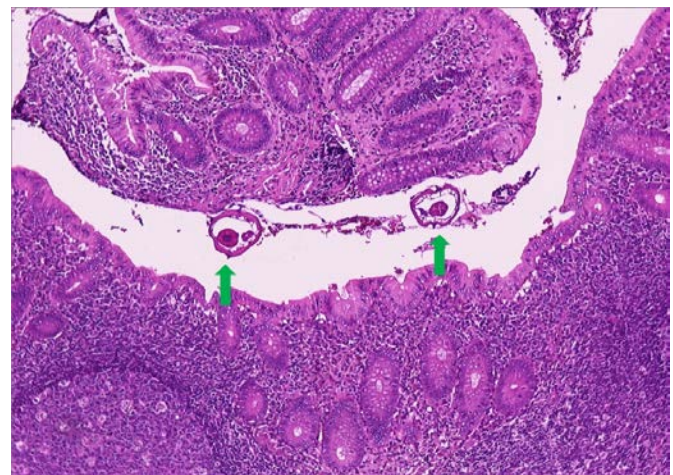


Figure 2: Presence of worms in luman of appendix- the underlying mucosa appears normal. H&E stain 100x

Discussion

The correct and timely diagnosis of infectious disease is essential for immediate onset of the effective treatment. Stool microscopy is a faster method but is not relevant in all types of parasites and stool cultures and serological tests may be useful in supporting diagnosis.^{3,4} In this respect, histopathological approach is also informative in identifying the pathogen but as an invasive method it is unnecessary in most cases. Thus, biopsies are usually done for diagnostic purposes and for excluding other entities while resections are only used in complicated cases.

Echinococcosis or hydatid cyst is a zoonotic infection caused by dog tapeworm *E. granulosus*. Humans, who are incidental intermediate hosts, do not play a role in the biological cycle and usually a “dead-end” for parasite. These cysts commonly occur in the lungs and liver, but can be found in any other organ or tissue including bones, spleen, heart, eye, brain, and genitourinary tract. After accidental ingestion of echinococcal eggs by humans embryos penetrate the intestinal mucosa, enter the portal circulation and carried out to the liver, lungs and other organs. Larvae develop into fluid filled hydatid cysts, that consist of an external membrane and an inner germinal layer. Daughter cysts and brood capsules develop from the inner aspect of germinal layer. The tissue response results from multiple host parasite relationships such as mononuclear cell infiltration, fibrosis, necrosis and areas of calcification.⁵ Cases of hydatid cysts in the liver were clinically diagnosed and the cysts with surrounding fibrosis and minimal mononuclear cell infiltration and calcification were identify.

Gastrointestinal infection due to *Enterobius vermicularis* occurs worldwide and is considered to be the most common helminth infection. *E. vermicularis*

infestation of the appendix can produce clinical features of acute appendicitis, referred to as 'appendiceal colic', independent of histological acute inflammation. This colic due to a parasitic infestation is explained by the hypothesis of appendiceal lumen obstruction.⁶ At pathological examination, macroscopically normal appendix was noted. This was confirmed histopathologically. Instead, either no tissue reaction or a chronic inflammatory infiltrate of eosinophils is associated. The luminal obstruction may cause an increase in the intraluminal pressure which impairs the circulation of the appendix wall and mucosal damage may cause bacterial invasion, inflammation, sepsis and finally necrosis and perforation.⁷

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 chemo attractants released from the parasites themselves.⁵ 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.^{5,6} The

case in the present study showed xanthogranulomaous reaction surrounding the parasite.⁸

Conclusion

The histopathology is essential for the diagnosis of these lesions that helps to provide specific treatment for the patients.

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