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Spectrum of parasitic infections on fine-needle aspiration cytology presenting as superficial nodules: A retrospective study of 5 years in a tertiary care hospital

Zini Chaurasia[1], Swapnil Agarwal[2], Renu Gupta[3], Cheta Singh[4], Surbhi Jain[5]

[1,4,5]Senior Resident, [2]Medical Officer, [3]Professor and Head, Department of Pathology, Dr. Baba Saheb Ambedkar Medical College and Hospital, New Delhi, India

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ABSTRACT

Background: Parasitic infestations are very common in a developing nation like India. They may present as superficial nodules and are often either missed or misdiagnosed as other soft-tissue lesions. Fine-needle aspiration cytology (FNAC) is an easy, minimally invasive technique to detect, and diagnose these lesions. Parasitic infections are present in every age group with cysticercosis being the most common parasitic infestation. The present study highlights the role of cytology in diagnosing parasitic lesions and also analyzes the spectrum of these lesions in a tertiary care hospital. **Aims and Objectives:** This study was carried out to assess the spectrum of parasitic infestations in a tertiary care hospital of North West Delhi over 5 years (2015–2019). This was a retrospective and descriptive study done in the Department of Pathology, Dr. BSA Hospital, Delhi. **Materials and Methods:** Sixty-six cases out of a total of 15094 FNACs performed over 5 years (2015–2019) that were diagnosed as parasitic lesions on FNAC were included in our study. The records were retrieved, analyzed, and recorded. Clinical details were obtained from the FNAC requisition slips. **Results:** A total of 66/15094 FNACs conducted over 5 years were diagnosed as parasitic lesions. Fifty-seven cases of cysticercosis, six cases of filariasis, two cases of echinococcosis, and one case of toxoplasmosis were identified. **Conclusion:** As parasitic infections pose a problem in a developing country like ours; hence, early detection is always helpful and reduces the morbidity associated with it. Careful assessment of cytological material aspirated from superficial nodules can be very helpful in detecting parasites.

Key words: Parasitic infestations; Fine-needle aspiration cytology; Cysticercosis; Filariasis

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INTRODUCTION

Southeast Asia comprising developing countries like India is burdened with diseases like parasitic infestations pertaining to poor hygienic practices. These infestations are very common in every age group and are a significant reason for malnutrition and morbidity in society. They also lead to delays in developmental milestones and growth retardation. Parasitic infections such as cysticercosis, echinococcosis, filariasis, and ascariasis are included in neglected tropical diseases.[1]

Parasitic lesions may present as superficial nodules and may be misdiagnosed for other entities. Fine-needle aspiration cytology (FNAC) is a rapid, minimally invasive, simple, and outpatient procedure, hence making this technique a suitable procedure for the early diagnosis of parasitic lesions.

Aims and objectives

This study aims to highlight the role of FNAC in the definitive diagnosis of parasitic lesions even in clinically unsuspected/misdiagnosed cases and simultaneously study the cytology of parasitic lesions.

Address for Correspondence:
Dr. Zini Chaurasia, Senior Resident, Department of Pathology, Dr. Baba Saheb Ambedkar Medical College and Hospital, New Delhi, India.
Mobile: +91-8130109369. **E-mail:** 1989.zini@gmail.com

MATERIALS AND METHODS

Fine-needle aspiration cytology is an outpatient procedure, done in the Department of Pathology of Dr. BSA Medical College and Hospital. An average of 3000 FNAC are done each year amounting to a total of 15,094 cases over 5 years from January 2015 to December 2019. FNAC was done using a 22 gauge needle, material aspirated was spread on a glass slide, and stained with May–Gruenwald–Giemsa after air drying. Out of these 15,094 cases, 66 cases were diagnosed as Parasitic Lesions. The records of these cases were retrieved, analyzed, and recorded. Clinical details were obtained from the FNAC requisition slips.

ETHICAL CLEARANCE

Approval was obtained from the Local Ethics Committee of the institute where the study was conducted vide no F. 5(50)/2020/BSAH/DNB/COMMITTEE/22305.

RESULTS

This is a retrospective study of 5 years duration from January 2015 to December 2019. All the FNACs done were reviewed and the cases where a diagnosis of parasitic lesion was given were included in the study. A few cases where the background was suggestive of a parasite but a definitive organism could not be identified, were not included. A total of 66 cases were, thus, included in the study. Out of 66 cases, clinical diagnosis of parasitic lesions was suspected in only 20 cases.

The study included patients from the age of 3–84 years of age with the maximum number of cases in the age group of 16–30 years (50%). Very few elderly patients were diagnosed with parasitic lesions (4.54%). Female preponderance was also observed in our study (62.1%), as shown in Table 1.

Most of the patients presented with a palpable nodule varying in size from 0.5 to 5 cm. The nature of aspirate was clear in the maximum number of cases, that is, 39 (59.09%), pus was aspirated in 14 (21.2%) cases and the rest of them had blood mixed aspirate 13 (19.71%). The most commonly affected site in this study was the upper extremities 18 (27%), followed by the neck 11 (16.6%) and the chest wall 10 (15.15%). One case demonstrated a parasite in the thyroid gland, which is very rare Table 2.

Cytological findings revealed cysticercosis as the most common parasite in our study 57 (86.36%), followed by Filaria 6 (9.09%). Two cases of *Echinococcus* and a single case of Toxoplasmosis were also observed.

Table 1: Age – gender distribution

Age group	Females	Males
0–15 years	7	6
16–30 years	20	13
31–45 years	11	4
46–60 years	1	1
Above 60 years	2	1
Total	41	25

Table 2: Site distribution

S. No.	Parasite	Sites (number of cases)
1	Cysticercosis	(a) Upper extremity (16) (b) Cervical swellings (11) (c) Chest wall (10) (d) Trunk (7) (e) Lower extremity (7) (f) Scalp (2) (g) Others (4)
2	Filariasis	(a) Upper extremity (2) (b) Cervical swellings (2) (c) Thyroid gland (1) (d) Inguinal swelling (1)
3	Toxoplasmosis	Cervical lymph node (1)
4	Echinococcosis	Anterior neck swelling (2)

In cases of cysticercosis, the diagnosis was made on the demonstration of the fragment of the larval bladder wall as found in all our 57 cases of cysticercosis. The bladder wall was seen as an acellular, pinkish, laminated membrane with an inner nuclear layer. Hooklets seen in only four cases were identified as refractile, triangular in shape with one pointed end, and two blunt ends (Figure 1). Eggs were seen in two cases and calcifications in six cases.

All cases of filariasis (6) demonstrated the presence of microfilaria with a central column of nuclei. However, an adult worm was seen in three cases. Cytology smears showed microfilaria as coiled, slender organisms with a blunt head, tapered end with multiple nuclei, and morphologically identified as *Wuchereria* with numerous embryonated eggs (Figure 2).

Three cases were diagnosed in lymph nodes (2 – Cervical, 1 – inguinal). Aspirates from lymph nodes showed Microfilaria in a background of reactive lymphoid cells. The cervical lymph node aspirate also showed the presence of a gravid adult female worm in the background of lymphoid background (Figure 3). One case diagnosed in the thyroid gland, smears from which showed microfilaria and thyroid follicular epithelial cells with Hurthle change in the background of colloid. One case detected in the Submandibular gland, where clear fluid was aspirated, revealed microfilaria in a background of mixed inflammatory cells and normal acini of the salivary gland. Two cases were detected in the upper extremities, one of which had adult worms in addition to

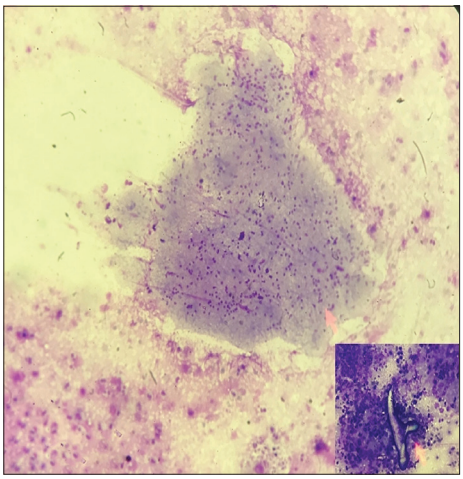

Figure 1: Laminated bladder wall with nuclei of cysticercosis (MGG, ×200). Inset showing characteristics hooklets of cysticercosis (MGG, ×400)

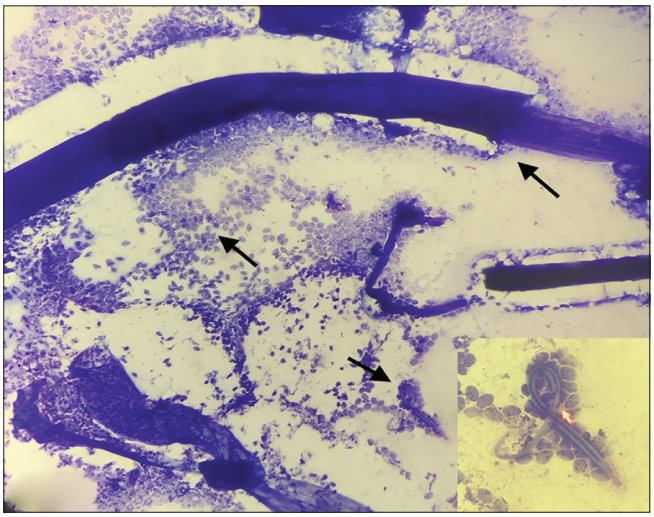

Figure 2: Adult worm, numerous embryonated eggs of filaria along with microfilaria (MGG, ×200). Inset showing microfilaria of *Wuchereria* where the nuclei is not extending up to the tip (MGG, ×400)

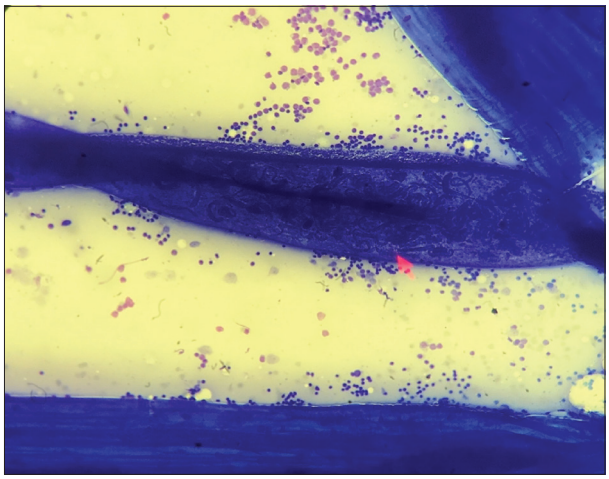

Figure 3: Gravid adult female worm with multiple coiled microfilaria in a reactive lymphoid background (arrow). MGG, ×200

microfilaria. After the diagnosis of filariasis was made, the peripheral smear of patients was taken and examined for eosinophilia and the presence of microfilariae. Eosinophilia was seen in all cases; however, none of them demonstrated microfilaria in peripheral blood.

Only two cases of Echinococcosis, commonly known as hydatid cyst, were incidentally diagnosed in anterior neck swelling. The aspirate was blood mixed in both cases. The smears showed fragments of thick laminated membranes in a dirty background with debris. In addition to these, detached refractile hooklets along with calcareous spherules were also noted (Figure 4).

A single case of Toxoplasmosis was diagnosed in a 65-year-old male patient who presented with multiple enlarged anterior and posterior cervical lymph node swelling. Pus was aspirated and cytological smears were made. Smears showed clusters of crescent-shaped tachyzoites of toxoplasma in a background of mixed inflammatory cells comprising neutrophils, lymphocytes, and a fair number of plasma cells. Foreign body giant cells and granulomas were also seen. Serology was done to confirm the diagnosis which turned out positive for IgM.

The background was pink, granular, and proteinaceous in 39 (59.09%) cases, necrotic in 13 (19.6%) cases, and suppurative in 14 (21.21%) cases. Most of the cases demonstrated mixed inflammatory infiltrate with 22 (33.3%) showing predominantly eosinophils. Palisading histiocytes were seen in 36 (54.54%) cases. Foreign body giant cell reaction was seen in 21 (31.8%) and epithelioid cell granulomas in 5 (7.57%) cases (Figure 5).

In all cases, where epithelioid cell granulomas were seen Ziehl–Neelsen staining for AFB was done and found to be negative.

DISCUSSION

Parasitic lesions are a burden on developing countries like India. They cause significant morbidity and, hence, the need for early diagnosis. These lesions are often misdiagnosed clinically. The cervical swellings may be mistaken as lymphadenitis, whereas nodules present on the upper and lower extremities may be suspected as epidermal inclusion cysts or soft-tissue lesions. Abdominal swellings and nodules on the back are generally diagnosed as lipomas. FNAC serves as an easy, quick, minimally invasive, outpatient procedure for correct, and definitive diagnosis of parasitosis.

Various studies have established that cysticercosis is the most common cause of parasitic lesions in India, as seen

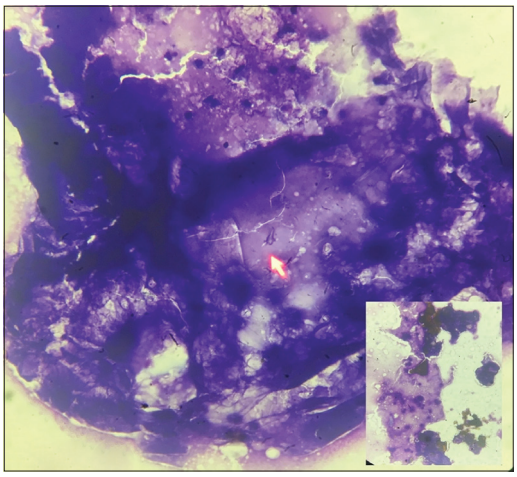

Figure 4: Scolices with hooklet (arrow). Inset (MGG, 400X) showing calcareous spherules. MGG, ×200

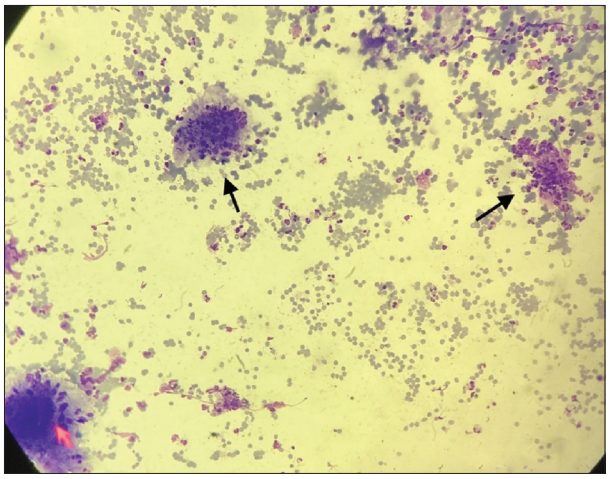

Figure 5: Giant cells in the background as seen in smears. MGG, ×200

in this study also.[2] The incidence of cysticercosis in our study was found to be 86.7%. Humans are the definitive host of *Taenia solium*. The causative agent of cysticercosis in humans is the larval stage (cysticercus cellulose) of *T. solium*. Non-vegetarians get the infection from the consumption of undercooked meat of the intermediate host, that is, pigs, whereas the vegetarian population gets infected with the *T. solium* eggs and gravid segments of the parasite from contaminated water or uncooked vegetables.[3]

Frequent sites affected by cysticercosis are subcutaneous tissue followed by skeletal muscle. Less commonly affected sites are the eyes, brain, liver, and lungs.[4] In our study, also upper limb was the most common affected site (86.36%), followed by the chest wall, neck, and lower extremity.

On FNAC, in most cases, cyst fluid was aspirated which represents the fully developed cyst. The cyst was ovoid, white, and opalescent and contains an invaginated scolex with hooklets that are bathed in clear cyst fluid.[3,4] Cyst wall is rich in glycoprotein which invokes little inflammatory response when it is intact. However, when it degenerates, it causes a mixed inflammatory response followed by calcification.[5-7] Mixed inflammatory infiltrate was seen in most cases comprising neutrophils, lymphocytes, eosinophils, and palisading histiocytes as also seen in the study of Gill et al.,[3] foreign body giant cells and epithelioid cell granulomas mentioned in the spectrum of an inflammatory response by Saran et al.,[5] were also observed in our study. Calcifications were appreciated in two of the cases.

Filariasis is transmitted by mosquitos and is caused by closely related nematodes, *Wuchereria bancrofti*, and *Brugia* species. About 90% of cases are caused by *Wuchereria*.[8] When mosquito bites, larvae are released into the bloodstream and develop in lymphatic channels. They, then, mate and release microfilariae in the bloodstream, which, then, lodge in various organs such as the thyroid, skin, breast, extremities, lymph nodes, and vulva.[9,10] The patients of filariasis are mostly clinically asymptomatic and detected incidentally on routine examination of peripheral blood smear.[11] In the present study, also none of the patients were suspected of filariasis. The arm swelling was clinically suspected to be lipomas and cervical ones were diagnosed as lymphadenopathies.

In cytological smear preparations of a case suspected of filariasis, adult worms and coiled microfilaria can be seen. Verghese et al., described the presence of microfilaria in thyroid swellings, which is a rare site. In the present study also, one case demonstrated microfilaria in a thyroid swelling. Two cases of arm swellings and three lymph nodes swelling showed microfilariae, adult worms along with inflammatory cells, and giant cell as also reported by various authors.[10,12]

Hydatid disease also known as echinococcosis is a potentially serious, sometimes fatal condition caused by cysts containing the larval stages of *Echinococcus granulosus*. Humans can only be infected by eating eggs passed by an infected dog and cannine.[13] Hydatid cysts are most commonly seen in the liver followed by the lungs, and kidneys, and less commonly in muscles and bones. They are usually missed clinically in superficial swellings, where it is a rarity.[13] We would like to emphasize that FNAC is not recommended in clinically suspected cases of hydatid cysts due to the risk of rupture of the cyst with spillage of contents, leading to an anaphylactic reaction. However, in our cases, as the swelling was superficial and unsuspected of being a parasitic lesion, FNAC was performed and no such complication was noted after the procedure, as also seen in a few similar studies.[14] Cytology smears demonstrate scolices with attached hooklets in

an inflammatory background. Furthermore, cyst wall with parallel laminations is appreciated in many cases. The diagnosis of hydatid disease must be supplemented by various other investigative modalities. Radiological investigations such as USG, CT, and MRI must be done to determine whether the cyst is unilocular or multilocular and also to find its relation to surrounding tissues.[15]

Toxoplasmosis is a zoonotic infection caused by the protozoan *Toxoplasma gondii*, an obligate intracellular parasite.[16] Infection occurs by eating contaminated undercooked meat, exposure to infected cat feces, or mother-to-child transmission during pregnancy. The infection causes cyst formation in the body usually in the brain, muscles, and heart. Toxoplasmosis can be asymptomatic or present with symptoms of fever and lymphadenopathy to diffuse organ system involvement depending on the immunity of the host. The disease is most likely to cause symptoms in immunocompromised individuals and congenitally infected infants.[17] A confirmatory diagnosis of Toxoplasmosis is made on cytology by the presence of the intracytoplasmic organism, tachyzoites which are crescentic, cup-shaped organisms in a background of the polymorphous population of reactive lymphoid cells, tingible body macrophages, and clusters of epithelioid cells with or without necrosis.[18] Serological confirmation and special stains must be performed to differentiate the tissue cyst of *T. gondii* from other cysts such as Sarcocystis, isospora, microsporidia, leishmania, and pneumocystis.

A clear aspirate in superficial palpable nodules should raise a high index of suspicion of parasitic lesions irrespective of clinical differential diagnosis. The variable spectrum of host responses in terms of inflammatory cells must also be assessed while reviewing cytology slides for the diagnosis of parasitosis.

Limitations of the study

This study included only 66 cases, which is meagre considering the endemicity of parasitic infestations in our country, therefore, a study with large sample size needs to be conducted.

CONCLUSION

Superficial nodules hold an array of differential diagnoses on cytology. Parasitic diseases are important differential diagnoses when it comes to endemic areas like India. As seen in this study, FNAC provides an easy and quick diagnostic tool for early detection. Cytomorphology showing parasitic fragments of different organisms in a clear aspirate are a diagnostic feature of parasitic lesions. However, aspiration of clear fluid and variable host response consisting of eosinophils, foreign body giant cells, and granulomas must also be carefully screened. An early diagnosis will, thus, help in prompt treatment and reduce the risk of serious complications.

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Authors Contribution:
ZC- Concept, coordination, statistical analysis and interpretation of the results, preparation of manuscript and revision of the script; **SA-** Review of the script and preparation of manuscript; **RG-** Revision of the script; **CS and SJ-** Data collection and interpretation.

Work attributed to:
Dr. Baba Saheb Ambedkar Medical College and Hospital, New Delhi - 110 085, India.

Orcid ID:
Dr. Zini Chaurasia - https://orcid.org/0000-0002-5804-735X
Swapnil Agarwal - https://orcid.org/0000-0002-2387-411X
Dr. Renu Gupta - https://orcid.org/0000-0001-9818-5282
Dr. Cheta Singh - https://orcid.org/0000-0002-6487-6269
Dr. Surbhi Jain - https://orcid.org/0000-0001-7317-9097

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