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Worm in the Spine: Cytological Evaluation of a Rare Spinal Abscess

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Abstract: ***Neuroparasitic infections are uncommon causes of neurological disease and rarely present with spinal cord involvement resulting in acute paraplegia. We report a rare case of a 33-year-old male who presented with severe lower back pain, rapidly progressive paraplegia, and loss of bowel and bladder sensation. Radiological findings suggested an infective spinal pathology, clinically favoring tuberculosis. During surgical management of L5 spondylolisthesis and disc bulge, an unexpected spinal abscess was encountered. Cytological examination of the aspirated pus revealed multiple elongated larval forms within a dense neutrophil-rich inflammatory background, establishing an incidental diagnosis of neuroparasitic infection. Notably, peripheral blood and cerebrospinal fluid analyses showed no eosinophilia, highlighting a diagnostic pitfall. Morphological assessment was best achieved on Papanicolaou-stained smears, which demonstrated superior visualization of larval morphology, segmentation, and surrounding clear spaces compared with other routine stains. This case emphasizes that parasitic infections should remain a differential diagnosis in patients presenting with acute paraplegia, even in the absence of eosinophilia, and underscores the important diagnostic role of cytological examination and Pap staining in identifying parasitic larvae.***

Keywords: Spinal abscess, Cytology, *Angiostrongylus Cantonensis, Toxocara Canis,* and *Trichinella Spiralis*

1. Introduction

Neuroparasitic infections are an important but under-recognized cause of neurological disease, particularly in endemic regions[1]. Most central nervous system parasitic infections present as eosinophilic meningitis or intracranial space-occupying lesions, whereas spinal involvement causing acute paraplegia and abscess formation is extremely rare[2]. Larval migration into neural tissue can produce inflammatory or compressive pathology that closely mimics tuberculosis, autoimmune disorders, or neoplasms, making diagnosis challenging[3].

Eosinophilia in peripheral blood or cerebrospinal fluid is commonly considered a diagnostic clue; however, rare cases without eosinophilia have been reported, potentially leading to missed or delayed recognition of parasitic infection[4]. Identification of parasites in cytological material is exceptionally uncommon and often represents an accidental diagnosis during evaluation of infective lesions[5].

Currently, no specific cytological staining technique is universally recommended for optimal demonstration of larval parasites in cytological specimens. This case highlights the importance of cytological examination, and we incidentally observed that Papanicolaou (Pap) stain provides superior visualization and morphological characterization of larval forms than other cytological stains. Importantly, parasitic infection should not be excluded in patients presenting with acute paraplegia even in the absence of eosinophilia.

2. Case Presentation

A 33-year-old male presented with severe lower back pain for 48 hours resulting in inability to sit, followed by complete weakness of both lower limbs for 36 hours along with loss of bowel and bladder sensation. There was no significant past, personal, or family history, and the patient was vitally stable at presentation. On neurological examination, tone, power, and reflexes were absent in bilateral lower limbs, with associated bowel and bladder sensory loss, suggestive of acute paraplegia.

Radiological evaluation showed suspicious L5 spondylolisthesis on X-ray lumbosacral spine. MRI spine revealed L5 spondylolisthesis with L5–S1 posterior disc bulge and meningeal enhancement extending from the D4 level to the conus medullaris, raising suspicion of an infective etiology, clinically favoring tuberculous involvement (Pott's spine). MRI brain additionally demonstrated a small acute subarachnoid hemorrhage involving bilateral superior frontal and posterior occipital regions.

Cerebrospinal fluid (CSF) examination was performed to rule out tuberculosis. CSF analysis did not show lymphocyte predominance. The adenosine deaminase (ADA) level was mildly elevated but remained below the typical diagnostic threshold for tuberculous meningitis. As noted in the report, increased CSF ADA levels (>10 IU/L) primarily indicate T-cell activation and are considered a sensitive marker for tuberculous meningitis, although elevation may also occur in fungal, bacterial, parasitic infections, and lymphoma. Hematological investigations revealed hemoglobin of 15.3 g/dL and total leukocyte count of 13,900/cmm with neutrophilic predominance (82%), lymphocytes 14%, and eosinophils 2%. Urine routine microscopy and other biochemical investigations were within normal limits. During surgical management for L5 spondylolisthesis and disc bulge correction, an unexpected spinal abscess was identified intraoperatively. Approximately 0.2 cc of thick white sticky pus was aspirated and submitted for cytological evaluation.

3. Discussion

Neuroparasitic infections most commonly present as eosinophilic meningitis or intracranial lesions, while spinal cord involvement causing abscess formation and acute paraplegia remains exceptionally rare[2,6]. The present case represents an unusual manifestation of neuroparasitosis diagnosed incidentally on cytological examination of spinal abscess material. Cytological smears demonstrated dense neutrophil-rich inflammation with multiple elongated worm-like organisms[Fig.1] measuring approximately 60–500 µm. The larvae showed slender curved morphology, distinct surrounding clearing[Fig2], occasional segmentation[Fig3], and tapering or blunt ends. These morphological features strongly favoring helminthic larval forms[7].

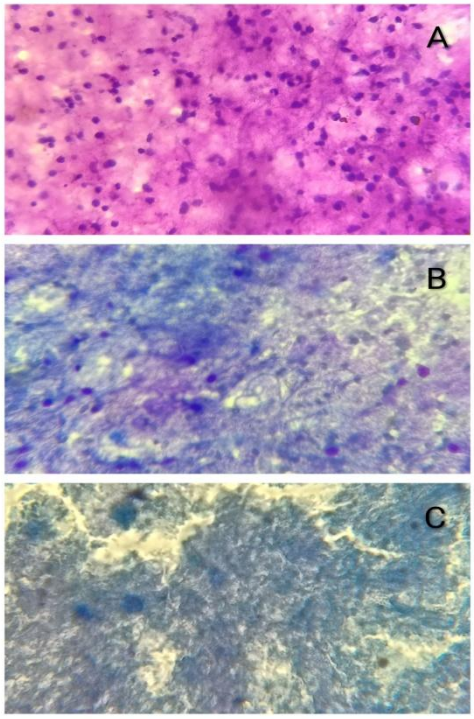

Figure 1: (A) H&E stain and (B) MGG stain showing numerous neutrophils, histiocytes, and lymphocytes in an inflammatory background with poorly visualized worm-like organisms. (C) AFB stain negative.

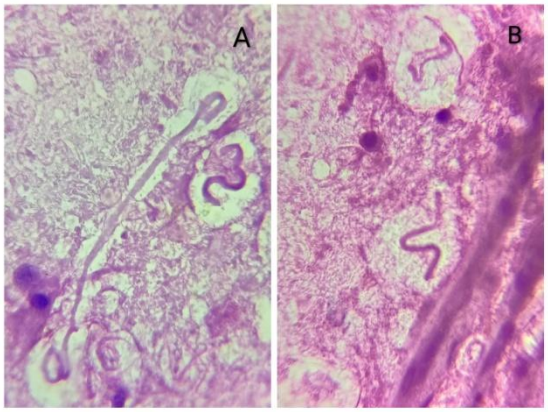

Figure 2: (A, B) PAP stain - Curved worm like organisms measuring approximately 60–100 µm, with one elongated form measuring about 400–500 µm, showing distinct clearing.

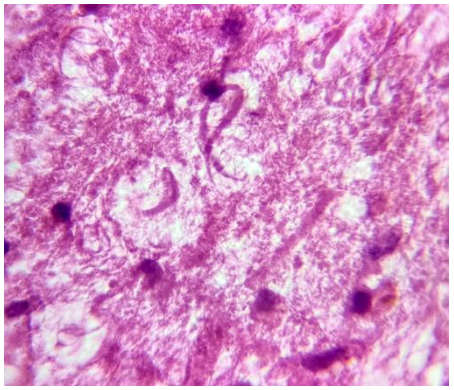

Figure 3: PAP stain - showing segmentation of larval body with distinct clearing.

Fungal organisms were considered in the differential diagnosis but were excluded morphologically. Fungal elements typically demonstrate branching filamentous hyphae, septations, and lack the characteristic curved and coiled configuration and perilarval clear space seen in parasitic larvae[Fig.4]. The absence of branching structures and fungal morphology ruled out fungal etiology[8].

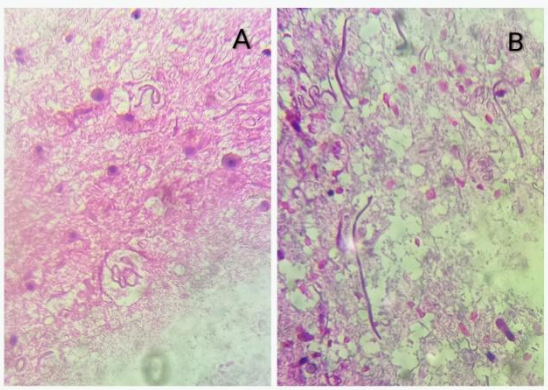

Figure 4: (A) PAP stain - stain showing worms in a coiled pattern with distinct clearing. (B) Demonstrating elongated, slender worm-like organisms with a curved end.

Neuroparasitic infections are classically associated with peripheral or cerebrospinal fluid eosinophilia; however, atypical presentations without eosinophilia have been reported and may delay diagnosis[4]. In the present case, both

peripheral blood and CSF lacked eosinophilia despite clear evidence of parasitic structures, emphasizing that eosinophilia is not mandatory for diagnosis.

Correlation of larval morphology and patient exposure history- including close contact with dogs and cats and recent non-vegetarian dietary intake- suggested possible zoonotic helminthic infection. Based on size and morphology, the differential diagnoses included *Angiostrongylus Cantonensis, Toxocara Canis,* and *Trichinella Spiralis.* According to CDC parasitology data and published literature:
Angiostrongylus Cantonensis larvae measure approximately 250–350 µm in human tissue[9].
Toxocara Canis larvae range from 70–400 µm depending on developmental stage[9].
Trichinella Spiralis newborn larvae measure approximately 80–120 µm in length[10].
The observed larval size spectrum (60–500 µm) in our case likely represents variable developmental stages or partially sectioned organisms in cytological preparations.

An additional important observation in this case was the diagnostic utility of the Papanicolaou (Pap) stain, which provided superior visualization of larval morphology, segmentation, and internal structural details compared with routine stains. Currently, no standardized cytological staining protocol exists for detection of parasites in fluid specimens, and recognition largely depends on careful morphological examination. This case therefore highlights the value of routinely preparing Pap-stained smears when parasitic infection is suspected in cytological fluids.

Definitive species identification could not be achieved because of limited sample volume and loss of patient follow-up after discharge against medical advice (DAMA). Confirmation of neuroparasitic infections generally requires molecular detection using PCR assays or serological methods such as ELISA for parasite-specific antibodies.

4. Conclusion

Spinal neuroparasitic infection causing acute paraplegia is exceptionally rare and may occur even without peripheral or CSF eosinophilia. This case highlights the value of cytological examination in the accidental detection of parasitic larvae within spinal abscess material. Papanicolaou (Pap) stain proved particularly useful for clear visualization of larval morphology. Parasitic infection can closely mimic tuberculous or other infective spinal lesions. Parasitic etiology should always be considered in acute paraplegia, even in the absence of eosinophilia, to enable timely diagnosis and management.

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