Case Report

Spinal intramedullary abscess due to *Candida albicans* in an immunocompetent patient: A rare case report

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INTRODUCTION

Involvement of the central nervous system (CNS) by *Candida* sp. usually leads to meningitis and cerebral microabscesses, especially in immunocompromised individuals or when anatomic barriers are breached by surgery or implanted devices.[67] However, CNS involvement in...
immunocompetent patients represents an even rarer entity.[7] To the best of our knowledge, *Candida albicans* intramedullary abscesses had only been reported once in an immunocompetent who did not need neurosurgery.[39] Here, we report a cauda equina *C. albicans* intramedullary abscess, representing the second report in literature and the first case approached surgically.

**CASE REPORT**

A 44-year-old female patient sought the neurosurgery service at Hospital Santa Paula with a complaint of lower back pain associated with paraparesis for 2 years with progressive worsening of the condition between crises. She reported development of paraplegia in the past year. In an investigation of multiple hospital admissions, she previously underwent treatment for CNS fungal infection and neurotuberculosis in late 2020 with amphotericin B (for 6 weeks) followed by voriconazole (for 4 weeks) with an ineffective result. The cerebrospinal fluid (CSF) contained 43 cells (75% lymphocytes, monocytes 22%, macrophages 3%), protein 175 mg/dL; glucose 26 mg/dL; lactic acid 42 mg/dL; lactate dehydrogenase 30 U/L; adenosine-deaminase 6.2 U/L; gamma globulin 31.62%; microbiology negative; antibodies for syphilis, *Borrelia burgdorferi*, toxoplasmosis, cytomegalovirus (CMV), herpes simplex 1 and 2, herpes zoster, cysticercosis, human immunodeficiency virus (HIV), and human T-lymphotropic virus were not reactive; no cancerous cells were identified. She also presented a history of seizures and meningitis.

On neurological examination, the patient presented with dysarthria, horizontal nystagmus with preservation of extrinsic eye movement, Grade III strength in upper limbs with wrist spasticity, plegia in lower limbs, and anesthesia from the T12 level without proprioception. She also presented with bicipital, tricipital, and styloradial hyperreflexia in upper limbs, with bilateral exaltation points and positive Hoffmann’s sign, besides patellar and aquilean areflexia, and negative Babinski’s sign.

For better evaluation, magnetic resonance imaging (MRI) images of the brain and spine were requested. Brain MRI showed thickening and leptomeningeal impregnation by gadolinium compromising both lateral fissures, insula, and frontotemporal operculum, evidencing diffuse pachymeningitis [Figure 1]. The MRI of the spine showed marked diffuse leptomeningeal enhancement along the anterior and posterior pial surfaces of all medullary segments, as well as medullary cone, marked segmental narrowing of the medulla at T10-T11 levels with hypersignal in the weighted sequences at T1 and T2/STIR associated with the tumefactive effect of the cone spinal cord with intramedullary lesion at this level, hypointense in T1-weighted image and hyperintense in T2/STIR weighted [Figure 2].

From the imaging findings and their relationship with the clinic, the patient underwent surgery and biopsy of the lesion. A T10-T11 laminectomy was performed and, after straight opening of the dura mater, a whitish lesion was found in the intramedullary region, suggestive of an abscess, being, therefore, drained and biopsied for analysis [Figure 3].

The culture of the surgical specimen tested positive for *C. albicans* and the histopathological evaluation of the lesion revealed extensive fibrinoid material and presence of hyaline septate pseudohyphae and fungal spores, with strong impregnation by Grocott methenamine silver stain [Figure 4]. These findings are consistent with intramedullary abscess due to *C. albicans* infection, being the second case report in the literature.

**DISCUSSION**

*Candida* spp. are considered opportunistic commensal pathogens that promote infection under host predisposing conditions.[55] When the CNS is involved in patients with systemic candidiasis, several clinical manifestations can

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**Figure 1:** Preoperative magnetic resonance imaging. (a) Coronal gadolinium-enhanced image, (b) sagittal gadolinium-enhanced image, (c) axial T2/FLAIR-weighted image showing a slight reduction in the thickness of the leptomeningeal impregnation of the lateral fissures and frontotemporal operculum on both sides suggestive of diffuse pachymeningitis.
be overlooked due to the severity of the patient’s situation. It is primarily found in immunocompromised hosts or when anatomic barriers are breached by surgery, implanted devices, nonpenetrating blunt trauma to the back, or intermittent systemic corticosteroid, typically leading to decrease in the level of consciousness, meningitis, and cerebral microabscesses. However, other manifestations such as macroabscesses, sometimes suggestive of spinal tumors, are a more rare entity, especially when intramedullary. Nevertheless, infection by Candida spp. has also been reported in immunocompetent individuals, as in this case report, but it is a rare event.

There are a wide array of infectious causes of intramedullary myelitis, most of them caused by B. burgdorferi, Treponema pallidum, Mycobacterium tuberculosis, HIV, herpes simplex virus, varicella-zoster virus, CMV, Epstein-Barr virus, rabies, and schistosomiasis. When the infection leads to an intramedullary spinal cord abscess, it is usually associated with high mortality and neurological morbidity and rarely encountered in modern neurosurgical practice. We reviewed all cases of spinal intramedullary abscesses in the past 10 years [Table 1]. We found that approximately 68% of patients were male and 32% of female, the median age was 25, 86 years old (4 months – 82 years old), the main location was at thoracic level and the most frequent pathogen was from a tubercular source. Among all the reports, none of them identified an intramedullary abscess caused by C. albicans, which demonstrates the rarity of this entity once again.

C. albicans spinal infection still configures a challenging diagnostic. MRI is useful in diagnosing medullary abscesses, but those infections may mimic a neoplastic process as myxopapillary ependymoma or leptomeningeal carcinomatosis. Besides, the albuminocytologic dissociation often present may come from Guillain–Barré syndrome, cerebral meningitis, malignant lymphoma, spinal hemangioma, multiple sclerosis, central hemorrhagic disease, myelitis, and cerebrospinal infarction, making diagnosis more difficult. However, the CSF of patients with candidal CNS abscesses generally presents no biochemical or cytologic abnormalities. Proteins are usually discreetly high, and a discreet pleocytosis with polymorphonuclear or lymphocytic predominance can be equally frequent, which increases the suspicion of a Candida infection, especially when the diagnosis is uncertain, as in the case presented. In addition, some studies still highlight genes related to candidiasis.

Colonystimulating factor 2, Ras protein-specific guanine nucleotide-releasing factor 1, and phospholipase C gamma 2 are examples related to increased susceptibility to CNS Candida infection, but functional and bioinformatic studies are needed to identify possible variants that could have influenced Candida spp.
Table 1: Studies published in the past 10 years reporting intramedullary abscess.

| Paper                  | Age (years) | Sex | Place                | Anamnesis                                                                 | Pathogens                                                                 |
|------------------------|-------------|-----|----------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Higuchi et al., 2011   | 51          | M   | T2-T7                | Fever and tetraplegia                                                    | S. viridans                                                               |
| Iwasaki et al., 2011   | 61          | M   | T10-Conus            | Paraparesis and hypesthesia                                              | Cryptogenic sources                                                       |
| Houx et al., 2011      | 16 months   | M   | C2-S1                | Tetraplegia                                                               | Prevotella oralis and Peptostreptococcus asaccharolyticus                |
| Roh et al., 2011       | 78          | M   | T9                   | Sudden onset of drowsiness, weakness in both legs and a 4 day history of back pain, fever, chills, and myalgia. Flaccid paraplegia and complete sensory loss, except for light touch, below the level of T4. | Listeria monocytogenes                                                    |
| Akhaddar et al., 2011  | 82          | M   | T6-T7                | Difficulty walking without sphincter disturbance or fever. Moderate left lower extremity weakness with the Babinski sign | E. coli                                                                  |
| Terterov et al., 2011  | 59          | M   | C3-C7                | Rapidly progressive quadriaparesis                                       | S. viridans                                                               |
| Hood et al., 2011      | 57          | M   | C6-T1                | Severe neck and shoulder pain, which progressed over several days to right-sided hemiparesis with dysesthesias. | S. aureus                                                                |
| Malik et al., 2011     | 5           | M   | T11-L1               | Acute progressed from urinary hesitancy and frequency to complete urinary retention | Mycobacterium tuberculosis                                                |
| Aggarwal et al., 2011  | 5           | F   | T12-L1               | Acute-onset paraparesis with differential loss of sensation              | Sterile on culture                                                       |
| Mohindra et al., 2012  | 3           | F   | Holocord             | Worsening gait problems, urinary incontinence, complete loss of sensation below D4 level, flaccid paraplegia, with no grip in both hands | S. aureus                                                                |
| Hassan et al., 2012    | 53          | M   | Conus                | Acute retention of urine following an acute onset of back pain and left-sided buttock numbness, decreased sensation in the left side S-3/4 dermatomal area and some lower lumbar spine tenderness and follow by rapid and progressive paraparesis | Streptococcus milleri and S. intermedius                                   |
| Silva et al., 2012     | 52          | M   | C4-C5                | Tetraparesis, predominantly on the left side, and hyperreflexia in lower limbs with preserved vibration and position sensation in all four limbs. | Staphylococcus epidermidis                                               |
| Ferroir et al., 2012   | 60          | M   | T12-L3               | Paraplegia                                                               | S. aureus                                                                |
| Kapu et al., 2012      | 38          | F   | T12-L1               | Insidious onset, slowly progressing back pain with pain radiating anteriorly to abdomen of 1 week duration associated with weakness and numbness of both lower limbs | Neurocysticercosis                                                       |
| Khalid et al., 2012    | 4           | M   | T1-T6                | Fever and acute flaccid paralysis                                         | M. tuberculosis                                                          |
| Kim et al., 2012       | 63          | M   | L1                   | Recurrent meningitis                                                      | S. aureus                                                                |
| Chopra et al., 2012    | 18 months   | M   | T5-T6                | Progressive weakness of the lower limbs                                  | Tubercular source                                                        |
| Bukhari et al., 2013   | 1           | m   | L3-S3                | Fever, stiffness on the neck, and the reflexes over the upper and lower limbs were exaggerated | S. milleri and Bacteroides fragilis                                     |
| Sinha et al., 2013     | 44          | F   | C2-C5                | Gradually progressive weakness on the left side of her body with numbness on the contralateral side | S. milleri                                                               |
| Tekin et al., 2013     | 36          | M   | T10                  | Fever and signs of meningeal irritation                                   | Tubercular source                                                        |
| da Silva et al., 2013  | 1           | F   | T2-L3                | Fever and with progressive and ascending weakness.                       | Pyogenic infection                                                       |

(Contd...)
| Paper                      | Age (years) | Sex | Place     | Anamnesis                                                                                                                                                                                                                                                                                                                                                   | Pathogens                                |
|---------------------------|-------------|-----|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Sanaullah et al., 2013   | 14          | M   | T12-L1    | Paraparesis of the lower limbs and a progressive loss of power of Grade 3/5, and hypoesthesia in the L4/L5 dermatomes of his right lower limb.                                                                                                                                                                                                                   | Tubercular source                        |
| Bommakanti et al., 2013  | 33          | M   | Holocord  | Intermittent fever associated with chills and rigors for 6 days and sudden onset of weakness in both the lower limbs, complete loss of sensations below the level of nipples and urinary retention, lower limb weakness and bladder incontinence                                                                                                                                                     | Tubercular source                        |
| Thakar et al., 2013      | 45          | F   | C5-C6     | High-grade fever, neck pain, paresthesias in all limbs, decreased sensation in the trunk, rapidly progressive, decreased sensation in the trunk, rapidly progressive, lower limb weakness, and bladder incontinence                                                                                                                                 | 
|                           |             |      |           | E. coli                                                                                                                                                                                                                                                                                                                                                  |                                           |
| Ramesh et al., 2013      | 18 months   | F   | Holocord  | Rapidly progressive paraplegia with fever                                                                                                                                                                                                                                                                                                                  | E. coli and Pseudomonas aeruginosa P. mirabilis |
| Nicola et al., 2014      | 9 months    | M   | C4-C6     | Right hemiparesis                                                                                                                                                                                                                                                                                                                                        | Coccioides immitis                       |
| Tan et al., 2014         | 55          | M   | C2-C3     | Rapidly progressed to quadriplegia with worsening mental status                                                                                                                                                                                                                                                                                           | Mycoplasma hominis                       |
| Whitson et al., 2014     | 17          | M   | C5-T2     | Bicep and deltoid weakness with fever of 38.5°C and leukocytosis of 11,500 cells/dl.                                                                                                                                                                                                                                                                     | Klebsiella oxytoca and Pseudomonas       |
| Vadivelu et al., 2014    | 17 months   | M   | L1-S1     | Decreased oral intake, constipation, regression in developmental motor milestones, legs atrophy and lower extremities bear weight.                                                                                                                                                                                                                       |                                           |
|                           | 26 months   | M   | L1-S1     | Fever, neck stiffness, vomiting, lethargy, and difficulty bearing weight.                                                                                                                                                                                                                                                                                   | Enterococcus faecalis and E. coli Enterobacter sakazakii |
| Kanaheswari et al., 2014 | 2 years and 3 months | M | T9-S2     | Fever, cough, lethargy, acute urinary retention, lower limbs hypotonia, areflexia, and loss of sensation.                                                                                                                                                                                                                                                  | Aspergillus                              |
| McCaslin et al., 2014    | 19          | F   | T12-L1    | Several fever and bilateral lower extremity weakness.                                                                                                                                                                                                                                                                                                       | S. aureus                                |
| Takebe et al., 2014      | 65          | M   | T11-T12   | Left thigh pain, urinary incontinence legs weakness and numbness, saddle anesthesia, paraparesis, hypesthesia to thermal and painful nociception, and light touch sensation below the level of the left L-1 and right L-2 segments, including the perianal area.                                                                 | M. tuberculosis                          |
| Chittem et al., 2014     | 33          | M   | Holocord  | Fever, rapidly progressive weakness of lower limbs and urinary retention Paresthesia of lower limbs                                                                                                                                                                                                                                                     | M. tuberculosis                          |
| Arnaiz-Garcia et al., 2015 | 40          | F   | Holocord  | Fever, cephalah lethargy, vomiting, left side numbness, lack of sphincter control.                                                                                                                                                                                                                                                                           | M. tuberculosis S. aureus                |
| Kamat et al., 2015       | 2           | F   | Entire neural axis Extending from the mid-thoracic spine up to the brainstem | Flaccid quadripareis and septic shock                                                                                                                                                                                                                                                                                                                      | P. mirabilis Corynebacterium species and Peptococcus species |
| Papaevangelou et al., 2015 | 15 months  | F   |           | High fever, right side weakness. severe right hemiparesis (+2/5), ptosis of the right eyelid, salivation, and difficulty breathing and swallowing.                                                                                                                                                                                                         |                                           |

(Contd...)
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| Paper                        | Age (years) | Sex | Place                  | Anamnesis                                                                                   | Pathogens                          |
|------------------------------|-------------|-----|------------------------|--------------------------------------------------------------------------------------------|------------------------------------|
| Bhanage et al., 2015         | 4 months    | F   | T11-S2                 | Intermittent fever, lethargy, weak cry, refusal of feeds, acute onset weakness of both lower limbs. | M. tuberculosis                     |
| Dho et al., 2015             | 12 months   | F   | Holocord intramedullary abscess | High fever, progressive paraparesis; vomiting, lethargy, hypesthesia below the C4 dermatome, bilateral biceps jerks weakness and bilateral knee and ankle jerks absent. | Peptostreptococcus asaccharolyticus |
| Bajema et al., 2016          | 20          | M   | Cervical spine         | Progressive proximal right upper extremity weakness, urinary retention and occasional incontinence. | Coccidioidomycosis                  |
| Karaaslan et al., 2016       | 1           | M   | Extend through the whole spinal cord | Paraplegia, bladder dysfunction, neck rigidity, bilateral lower extremity weakness, and distended bladder with overflow incontinence. | E. coli                            |
| Vo et al., 2016              | 35          | M   | C2-C5                  | Decreasing sensation and worsening motor strength in all four extremities. | Streptococcus pneumoniae            |
| Shaikh et al., 2016          | 10 months   | F   | Holocord abscess C3-C4 | Fever, bilateral lower limb weakness with urinary retention, flaccid paraplegia. | Fusobacterium nucleatum and Peptostreptococcus micros S. aureus |
| Sugawara et al., 2016        | 60          | M   |                        | Neck pain and rapidly progressive palsy of the left upper arm. |                                    |
| Damaskos et al., 2016        | 77          | F   | L5-S1                  | Back pain associated with intense radicular pain irradiating mainly to the right calf and urinary incontinence. | Tuberculous longitudinally extensive myeloradiculopathy Tubercular source |
| Kasundra et al., 2016        | 17          | M   | Cervical and dorsal cord | Fever, acute sensorimotor paraparesis, absent of tendon reflexes, and anesthesia below D9 spinal level. | Tubercular source                  |
| Sahoo et al., 2016           | 22          | F   | D7-D8                  | Fever, weakness and numbness of both lower limbs with retention of urine, and bilateral hypoacousis. |                                    |
| Liu et al., 2016             | 28          | M   | T11                    | Lower back pain, lower limb sensory, motor dysfunction, spastic paresis, and exaggerated bilateral tendon reflexes. | Tubercular source                  |
| Muniz et al., 2017           | 21 months   | F   | T3                     | Fever with output of purulent material. | Congenital dermal sinus No growth on bacterial culture |
| Vankipuram et al., 2017      | 1           | M   | C5-C6                  | Swelling over the left upper dorsal region with intermittent fever, weakness of the lower limbs | Tassigny et al., 2017              |
| Tassigny et al., 2017        | 15 months   | F   | L1-S3                  | Progressive bilateral lower limb weakness and flaccid paraplegia. | E. coli                           |
| Marciano et al., 2017        | 57          | M   | T5-T11                 | Progressive back pain, paraparesis, and decreased sensation below the umbilicus. | N/A                                |
| Ghali et al., 2017           | 9 months    | M   | T8-T10                 | Subacute fever and back tenderness, opisthotonic posture, macrocephaly, a splayed, tense, bulging anterior fontanel, and nuchal rigidity. | Tubercular source                  |
| Verdier et al., 2018         | 10          | F   | C2-C6                  | Fever, stiff neck, back cervical pain, and progressive left hemiparesis. | S. viridans                        |
| Ratre et al., 2018           | 14          | M   | C5-C6                  | Asymmetric spastic quadriparesis, four limbs hypertonia, deep tendon reflexes were diminished in bilateral upper limbs, and exaggerated in both the lower limbs. | Tubercular source |

Table 1: (Continued)
infection reported in this article. As we have discussed, there are cases with no laboratory evidence of immunodeficiency or no identifiable cause of immunosuppression,[7] as we observed in this case report.

CONCLUSION

C. albicans intramedullary abscess represents a very rare clinical entity, especially in immunocompetent patients. It must, however, be considered as an important etiology for spinal intramedullary abscesses and as a differential diagnosis in intramedullary pathologies. Critical evaluation of every case, early diagnosis, timely referral and surgical management of the abscess is essential to improve neurological outcome.

Declaration of patient consent

Patient’s consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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### Table 1: (Continued).

| Paper                  | Age (years) | Sex | Place          | Anamnesis                                                                 | Pathogens                       |
|------------------------|-------------|-----|----------------|----------------------------------------------------------------------------|---------------------------------|
| Acharyya et al., 2018[1] | 11 months   | F   | L5-S1          | Weakness in lower limbs and left upper limb, spastic paraparesis of both lower limbs with exaggerated deep tendon reflexes. | Gram-negative bacilli           |
| Alsubaie et al., 2019[6] | 10 months   | F   | T6-T7          | Loss of ability to sit and crawl, persistent swelling at mid-back (thoracic area), fever | Finegoldia magna               |
| Agyei et al., 2019[3]   | N/A         | M   | C2-C3          | Upper and lower extremity weakness                                        | Fusarium species               |
| Sode et al., 2019[4]    | 23          | F   | T4-T6          | Paraplegia, sensory impairment                                            | Tubercular source              |
| Meegada et al., 2020[44]| 10          | F   | T11-T12        | Intermittent headaches, fever, neck pain                                  | Tubercular source              |
| Bevan et al., 2020[11]  | 3           | F   | Cervical       | Gait disturbance                                                           | No growth on bacterial culture |
|                        | 1           | F   | Cervical       | Torticollis, lethargy, fever, tachypnea                                    | Propionibacterium species      |
| Seroto et al., 2020[57] | N/A         | N/A | Cervical       | History of nonmissile penetrating injury of the spine                     | N/A                            |
| Akimoto et al., 2020[5] | 17          | M   | T5-T12         | Meningeal signs, paraplegia, sensory impairment, and urinary retention     | S. intermedius                 |

N/A: Not available, M: Male, F: Female, S. viridans: Streptococcus viridans, E. coli: Escherichia coli, S. aureus: Streptococcus aureus, M. tuberculosis: Mycobacterium tuberculosis, S. intermedius: Streptococcus intermedius, S. milleri: Streptococcus milleri, P. mirabilis: Proteus mirabilis
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