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Intramedullary cysticercosis of the spinal cord: A review of patients evaluated with MRI

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ABSTRACT

Objective: Review of cases of intramedullary spinal cord cysticercosis diagnosed with MRI to outline the features and outcome of this overlooked form of presentation of neurocysticercosis.
Methods: MEDLINE, LILACS, and manual search of case reports or case series of patients with intramedullary cysticercosis evaluated with MRI. Abstracted data included: demographic profile, clinical manifestations, neuroimaging findings, therapy, and follow-up.
Results: Forty-three patients were reviewed. Mean age was 36 years, and 65% were men. Most patients (67%) had parasites located at the thoracic spinal cord. All but two patients had a single cyst. The most common form of presentation was a subacute or chronic transverse myelopathy. On MRI, all lesions had signal properties paralleling that of CSF, and most were surrounded by edema and had a "ring-like" pattern of abnormal enhancement. The scolex of the parasite was visualized in 16 (37%) cases. Twenty-nine patients underwent surgical resection of the lesion, and 14 were medically-treated. Follow-up data was available in 20 surgically-treated and 13 medically-treated patients. Twelve (60%) of the 20 surgically-treated patients recovered completely, and the remaining were left with sequelae or did not improve. In contrast, all the 13 medically-treated patients recovered completely after the use of cysticidal drugs plus corticosteroids (11 cases) or corticosteroids alone (two cases).
Conclusions: Intramedullary cysticercosis is rare. Clinical and neuroimaging findings may resemble those of other intramedullary lesions, but the visualization of the scolex or the incidental discovery of intracranial lesions provide helpful diagnostic clues. Prognosis is benign provided the correct diagnosis is suspected and patients receive prompt therapy.

1. Introduction

Neurocysticercosis, defined as the infection of the central nervous system and its covering by the larval stage of the tapeworm *Taenia solium*, is a pleomorphic parasitic disease due to individual differences in the number and location of lesions [1]. Cysticerci may be located anywhere in the central nervous system, including the brain parenchyma, the intracranial subarachnoid space, the ventricular system, or the spinal cord; in the latter, parasites usually lodge in the spinal subarachnoid space as the result of a descending flow of vesicles from the intracranial subarachnoid space [2].

Albeit rare, intramedullary spinal cord cysticercosis poses diagnostic and therapeutic challenges. Clinical and neuroimaging findings may be indistinguishable from those of other spinal cord lesions. The location by itself creates concern on the potential risks related to therapy. Here, the literature on intramedullary spinal cord cysticercosis is reviewed to outline its clinical and neuroimaging features, and to comment on the diagnostic and therapeutic challenges of this often overlooked form of the disease.

2. Methods

A literature search of patients with intramedullary spinal cord cysticercosis was performed using the electronic MEDLINE database (National Library of Medicine, Bethesda, MD). Key words "cysticercosis" and "neurocysticercosis" were combined with "intramedullary", "spinal cord", and "spine". Limits or language restrictions were not applied to the search; instead, all abstracts and clinical notes without an abstract were reviewed to identify potentially eligible articles. Thereafter, a search of the electronic database of LILACS (using same key words) as well as a manual was search that included the authors' files as well as the list of references of selected articles was undertaken to find articles

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not included in MEDLINE. Potentially included articles were independently reviewed by the authors, and disagreements in inclusion criteria or data abstraction were resolved through discussion and consensus.

Selected studies were those that included original data on patients with a primary diagnosis of intramedullary spinal cord cysticercosis evaluated with MRI. Articles describing patients with spinal subarachnoid cysticerci causing symptoms due to compression of the spinal cord, as well as those reporting patients who were primarily evaluated for symptoms related to intracranial lesions were excluded. To be eligible, the information given in the publication must be clear enough to allow its inclusion as a definitive case of neurocysticercosis according to currently accepted diagnostic criteria [3]. Besides clinical and neuroimaging findings, abstracted data of selected articles included country of origin of the publication, demographic profile of reported patients, specific location of parasites, therapy, histopathological findings (when available) and outcome.

3. Results

Fig. 1 summarizes the article selection process. Our search identified 260 papers, of which 39 described patients with intramedullary spinal cord cysticercosis evaluated with MRI [4–42]. Seven of these papers were excluded from this review. Three of them described patients with massive infection with parenchymal brain cysticerci in whom intramedullary cysts became clinically evident only after the use of cysticidal drugs [36–38], two reported duplicated data [39,40], clinical data could not be abstracted in one [41], and the remaining paper could not be found [42]. The 32 selected articles reported a total of 43 patients with intramedullary cysticercosis evaluated with MRI [4–35].

The mean age of the 43 included patients was 35.7 ± 16.7 (age range 5 to 70 years), and 28 (65%) were men. Most patients came from cysticercosis-endemic areas, including India (27 cases), Brazil (5 cases), China (2 cases), and Mexico (one case). The remaining eight patients were diagnosed in developed countries (mainly the US) but were immigrants from endemic areas or had history of traveling abroad.

Clinical manifestations started suddenly in five patients, had a subacute onset from one to two weeks in four, and progressed chronically in the remaining 34, in whom signs and symptoms evolved from one month to 3 years (mean, 7.3 ± 8.9 months). All patients presented with a syndrome of partial or complete transverse myelopathy characterized by various combinations of sphincter dysfunction associated with weakness and impairment of sensory modalities below the level of the lesion. Increased muscle stretch reflexes in the lower extremities and Babinski signs were frequently elicited. Some patients presented with specific syndromes (according to the location and level of the cyst) such as the Brown–Sequard syndrome [29] or the conus medullary syndrome [20]. Back pain was a prominent complaint in 14 (33%) patients.

Eleven patients underwent a lumbar puncture. Cytochemical analysis of CSF was normal in four cases, and revealed moderate lymphocytic pleocytosis associated with increased protein contents in five patients, and isolated elevation of protein contents or lymphocytic pleocytosis in one patient each. CSF glucose levels were within the normal range in all cases. Seven patients had an ELISA for the detection of anti-cysticercal antibodies in CSF, yielding positive results in six. Anti-cysticercal antibodies in serum by the use of the EITB assay was evaluated in only one patient, who had positive results.

MRI allowed precise localization of the intramedullary lesion in all cases. Cysts were located at the thoracic spinal cord in 29 (67%) patients, at the cervical level in seven, and at the lumbo-sacral level (including the conus medullary) in five. In the remaining two patients, cysticerci where found at multiple intramedullary levels. Most (58%) thoracic cysts were located in the lower segments (T7-T12) of the dorsal cord. Thirty-seven of the 41 patients with localized affection of the spinal cord had a single cyst and the other four had two confluent cystic lesions. An associated syringomyelic cavity was noted in one patient [10]. All lesions appeared as fluid-filled cysts that were hypointense on T1-weighted and hyperintense on T2-weighted sequences, and most were surrounded by edema causing focal enlargement of the spinal cord. An internal hyperintense dot corresponding to the scolex of the parasite was seen in 16 cases. MRI after intravenous administration of gadolinium was performed in 30 patients, showing abnormal enhancement of the lesions in all but three cases. The pattern of abnormal enhancement was "ring-like" in 24 cases and "nodular" in three.

Thirty patients also underwent imaging studies of the brain (CT or MRI), which did not reveal intracranial cysticerci in 21 cases. Eight of

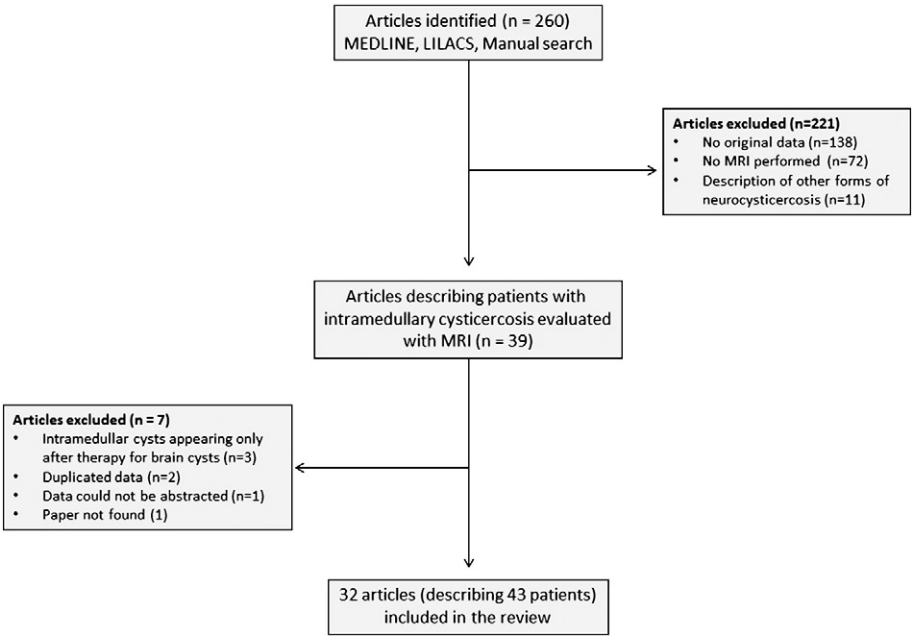

Fig. 1. Study flow diagram.