

# CYSTICERCOSIS OF THE CENTRAL NERVOUS SYSTEM

## II. SPINAL CYSTICERCOSIS

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**SUMMARY** - The compromising of the spinal canal by cysticercus is considered infrequent, varying from 16 to 20% in relation to the brain involvement. In the spinal canal the cysticercus predominantly places in the subarachnoid space. Clinical signs in spinal cysticercosis can be caused by direct compression of the spinal cord/roots by cysticercus and by local or at distance inflammatory reactions (arachnoiditis). Another mechanism of lesion is degeneration of the spinal cord due to pachymeningitis or circulatory insufficiency. The most frequent clinical features are signs of spinal cord and/or cauda equina compression. The diagnosis of spinal cysticercosis is based on evidence of cerebral cysticercosis and on neuroradiological examinations (myelography and myelo-CT) that show signs of arachnoiditis and images of cysts in the subarachnoid space and sometimes, signs of intramedullary lesions, but the confirmation can only be made through immunological reactions in the CSF or during surgery. The clinical course of 10 patients with diagnosis of spinal cysticercosis observed among 182 patients submitted to surgical treatment due to this disease are analyzed. The clinical pictures in all cases were signs of spinal cord or roots compression. All but two presented previously signs of brain cysticercosis. Neuroradiological examinations showed signs of arachnoiditis in 4 patients, images of cysts in the subarachnoid space in 5, and signs of arachnoiditis and images of cysts in one. The 6 patients that presented intraspinal cysts were submitted to exeresis of the cysts and 2 patients with total blockage of the spinal canal underwent surgery for diagnosis. The 2 remaining patients with arachnoiditis and blockage of the spinal canal were clinically treated. All of the six patients submitted to cyst exeresis had initial improvement but 4 of them later developed arachnoiditis and recurrence of the clinical signs and only 2 remained well for long-term. The 2 non operated patients had no improvement of their clinical signs. Two patients died later due to complications of cerebral cysticercosis. Based on the experience acquired in the management of these patients we indicate surgical treatment for patients that present free cyst in subarachnoid space. For those who present arachnoiditis, surgery is indicated only when there is doubt in the diagnosis. Intramedullary cysts should also be surgically treated.

**KEY WORDS:** spinal cysticercosis, diagnosis, treatment.

### **Cisticercose do sistema nervoso central: II. Cisticercose raquídea**

**RESUMO** - O comprometimento do canal raquídeo na neurocisticercose é pouco frequente variando de 1,6 a 20% em relação ao encefálico. No canal raquídeo os cisticercos localizam-se predominantemente no espaço subaracnóideo. As manifestações clínicas da cisticercose raquídea mais frequentes são sinais e sintomas de compressão da medula e/ou da cauda equina, que podem ser causadas por compressão direta por cisticercos e por reação inflamatória à distância, ou por degeneração da medula por paquimeningite ou por insuficiência circulatória. O diagnóstico da cisticercose raquídea é baseado no antecedente de cisticercose encefálica e nos exames neuroradiológicos (mielografia e mielotomografia) que mostram sinais de aracnoidite e imagens de cistos no espaço subaracnóideo e, ocasionalmente, sinais de lesões intramedulares. Entretanto, estas lesões não são específicas e a confirmação do diagnóstico depende da positividade de reações imunológicas no LCR ou da observação cirúrgica. Neste estudo foram analisadas retrospectivamente as evoluções clínicas de 10 pacientes com cisticercose raquídea observados entre 182 pacientes

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que necessitaram de tratamento cirúrgico devido à cisticercose do SNC. As manifestações clínicas em todos os casos foram sinais de compressão medular ou da cauda equina. Oito pacientes apresentaram sinais prévios de cisticercose encefálica. Os exames neurorradiológicos mostraram sinais de aracnoidite em 4 pacientes, imagens de cistos no espaço subaracnóideo em 5 e sinais de aracnoidite e imagens de cistos em um. Os 6 pacientes que apresentaram cistos raquídios foram submetidos a exérese de cistos e 2 pacientes com bloqueio total do canal raquídeo foram submetidos a cirurgia para esclarecimento diagnóstico. Os 2 pacientes restantes, com aracnoidite e bloqueio do canal raquídeo, foram tratados clinicamente. Os 6 pacientes submetidos a exérese de cistos apresentaram melhora transitória pós-operatória, mas 4 deles desenvolveram aracnoidite e tiveram recidiva dos sinais clínicos; os outros 2 permaneceram bem. Os 2 pacientes não operados não tiveram melhora clínica. Dois pacientes morreram tardiamente devido a complicações da cisticercose encefálica. Baseados na experiência adquirida no tratamento destes pacientes, indicamos cirurgia para os pacientes que apresentam cistos livres no espaço subaracnóideo no canal raquídeo. Para os pacientes que apresentam aracnoidite, a cirurgia é indicada somente quando há dúvida diagnóstica. Os pacientes com cisticercos intramedulares também devem ser tratados cirurgicamente.

**PALAVRAS-CHAVE:** cisticercose raquídea, diagnóstico, tratamento.

Cysticercosis, a infestation with *Cysticercus cellulosae*, the larval form of *Taenia solium*, is the most frequent parasitosis of the central nervous system (CNS). Details regarding epidemiological, pathological and clinical aspects of the illness were presented in the part I of this study. The clinical pictures of cysticercosis result from the different locations of the cysticerci and from parasite/host interaction. These facts allows the occurrence of a variety of signs and symptoms reflecting the compromising of the different regions of the CNS and the individual immunological response. In the CNS the cysticercus mainly places in the intracranial compartment and its localization in the spinal canal is considered infrequent<sup>4,14,16,25,46,53,78,81,84,85,88,90,109,116,117,122</sup>.

In this report we present our experience with surgical treatment of patients with spinal cysticercosis treated at the Division of Neurosurgery of the Hospital das Clínicas, Ribeirão Preto Medical School, over the last 20 years.

### CLINICAL MATERIAL AND METHODS

A total of 180 patients with neurocysticercosis requiring surgical treatment were seen at the Neurosurgery Division, University Hospital, Faculty of Medicine of Ribeirão Preto, from 1970 to June 1993. Of these, 2 had the isolated spinal form and 8 had the spinal form associated with brain involvement.

Besides being based on clinical and epidemiologic findings, the diagnosis of neurocysticercosis was also based on antigen-antibody reactions (complement fixation reaction, indirect immunofluorescence test, ELISA) in the CSF, on neuroradiological examinations (ventriculography with positive contrast and computerized tomography, CT) and/or on pathological examinations. Myelography and computerized myelotomography were used for the diagnosis of the spinal form.

Eight patients were treated by an approach to the spinal canal followed by clinical treatment and 2 were only submitted to medical treatment. Medical treatment was done with corticosteroids (dexamethasone at the dose of 16 mg/day for 1 week, followed by a slow and progressive reduction until full removal of the drug). Anticysticercal drugs were not used.

The results of treatment were evaluated on the basis of the course of clinical (sensorimotor and autonomic) signs.

### SUMMARY OF CASES

**Clinical Features and Examinations.** The clinical characteristics of the patients studied are presented in Table 1. Patient age at the onset of the disease ranged from 16 to 47 years; 90% of them aged 20 to 50 years and 40% 20 to 30 years (mean 30.8 years). Seven patients were females and 3 were males. The duration of symptoms upon admission ranged from 2 months to 4 years (70% with symptoms for less than 1 year, and 40% with symptoms for less than 6 months).

**Surgical Treatment and Results.** Eight of the 10 patients were submitted to laminectomy for cyst exeresis or for diagnosis. The other 2 presented intense arachnoiditis at myelography and were submitted to clinical treatment. The results of treatment are presented in Table 2.

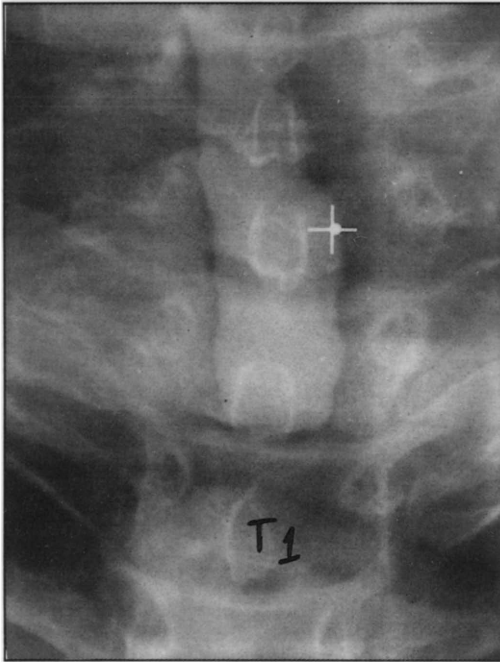
Table 1. Clinical features of patients with spinal cysticercosis.

Identification	Age	Sex	Past medical History	Present History	Neurological Examination
1. DABP 2901	36 Y	F	1979 - Submitted to VPS due to hydrocephalus CSF + for cysticercosis.	1983 - Difficulty in walking and sphincter changes starting 5 months before.	Walks with support.
2. TSSM 136758	24 Y	F	-	1984 - Sudden lumbar pain starting 8 months before with irradiation to the right leg.	Tactile/painfull hypethesia in the L3-S1 path on the left and in the L5-S1 path on the right Bilateral + Laségue Sign.
3. AMC 125938	16 Y	F	1984 - Submitted to VPS due to hydrocephalus CSF + for cysticercosis.	1985 - Decrease in strenght in the lower limbs.	Crural paraparesis.
4. MMAA 44367	47 Y		1980 - Submitted to VPS due to hydrocephalus. Several episodes of lymphocytic meningitis. CSF + for cysticercosis.	1986 - Lumbar pain irradiating to the right leg. Decreased in strenght in the lower limb and sphyncter changes starting 3 months before.	Crural paraparesis.
5. ECAN 156089	41 Y	F	1985 - Submitted to VPS due to hydrocephalus and to exeresis of racemose cysts in the cisterna magna.	1987 - Lumbar pain irradiating to the right leg (L5-S1).	Decreased in the dorsal flexion of the right foot. Tactile/ painfull on the lateral surface of the leg and on the sole of the right foot.
6. PRRF 148743	23 Y	M	1985/1989 - Episodes of lymphocitic meningitis CSF + for cysticercosis. Normal CT and MRI of the brain.	1989 - Chest pain irradiating to the lower legs.	Normal.
7. DLB 205858	35 Y	M	1988 - Exeresis of racemose cysts of the cisterna magna.	1990 - Lumbar pain irradiating to the lower limbs and decreased strenght of the lower limbs starting 1 year and 3 months before.	Crural paraparesis.
8. MGM 236996	22 Y	F	1989 - Craniotomy for exeresis of racemose cysts of the left Sylvian cistern.	1990 - Chest/lumbar pain irradiating to the lower limbs and decreased strenght of the lower limbs starting 4 months before.	Crural paraparesis. Tactile/painfull hypoesthesia with T3 level.
9. CRC 306037	24 Y	M	1989 - Lymphocitic meningits CT: Hydrocephalus CSF + for cysticercosis.	1992 - Lumbar pain irradiating to the left leg (L5-S1).	Laségue Sign + on the left.
10. OACR 163375	40 Y	F	1977- Submitted to VPS due to hydrocephalus. CSF + for cysticercosis.	1978 - Progressive decrease in strenght of the 4 limbs and difficulty in urinating starting 4 months before.	Confined to her beed. Spastic tetraparesis and urine retention.

CSF, cerebrospinal fluid; CT, computerized tomography; F, female; M, male; MRI, magnetic resonance imaging; VAS, ventriculoatrial shunting; VPS, ventriculoperitoneal shunting; Y, years.

Table 2. Diagnosis and treatment of patients with spinal cysticercosis.

Identification	Complementary Diagnosis	Treatment	Post-Treatment Course	Final Result	Folow-up
1. DABP 2901	Myelography: irregular filling gaps from T11 to L5 suggesting arachnoiditis.	Clinical (1983)	Slow and progressive worsening. Walking with support. Developed a neurogenic bladder.	Worsened	12 years
2. TSSM 136758	Myelography: images suggesting cysts from L1 to S1.	L2-L5 Laminectomy (1984): - exeresis of subarachnoid racemose cysts. - Moderate arachnoiditis	Temporary remission of the pain. Myelography (1987): wide lumbar filling gap (arachnoiditis).	Unchanged	3 years
3. AMC 125938	Myelography: Blockage of the spinal canal with an inflammatory aspect in T11. Irregularities in the contrast column from T8 to T10 (arachnoiditis).	T7-T12 Laminectomy (1984): - intense arachnoiditis.	Progressive worsening with paraplegia and incontinent bladder. Death due to increased ICP in 1986.	Worsened	2 years
4. MAAA 44367	Myelographies: (11/07/89) images suggesting cysts in T12-L1 (15/10/89) images suggesting cysts in T10-L1; inflammatory blockage in L1. Myelo-CT (15/12/89): images suggesting a cysts in T9.	T12-L2 Laminectomy (1987): - exeresis of racemose cysts of the cauda equina. - discrete arachnoiditis.	Still with lumbar pain. Improved muscle strenght in the lower limbs. Improvement of the sphincter disorders.	Improved	7 years
5. ECAN 156089	Myelography: blockage with inflammatory aspect in L4.	L3-L5 Laminectomy (1987): - exeresis of racemose cysts of the cauda equina. - discrete arachnoiditis.	Full improvement of pain.	Improved	2 years
6. PRRF 148743	Myelography: apparently normal (inadequating contrasting). Myelo-CT: hypodense image suggesting a cyst in T9.	T8-L2 Laminectomy (1990): - exeresis of subarachnoid racemose cysts. - moderate arachnoiditis.	Progressive worsening with the development of paraparesis and sphynter disorders.	Worsened	3 years
7. DLB 205858	Myelography: total blockage in C7-T1 with irregular filling gaps on the left (several levels) of the cervical canal.	Clinical (1989).	Unchanged. Death due to increased ICP in 1991.	Unchanged	2 years
8. MGM 236996	Myeography: inflammatory blockage in T12-L1 with filling gaps suggesting cysts in L4-L5.	L1-L4 Laminectomy (1990): -exeresis of active and degenerated subarachnoid racemose cysts. -moderate arachnoiditis.	Improved pain. Persistence of decreased muscle strength in the left leg.	Improved	3 years
9.CRC 306037	Myelography: normal Myelo-CT: hypodense image suggesting a cyst on the right in L3-L4.	L4-L5 Laminectomy (1992): - exeresis of subarachnoid racemose cysts. - moderate arachnoiditis.	Partial improvement of pain. Myelo-CT: signs of arachnoiditis at the laminectomy level.	Improved	1 year
10. OACR 163375	Myelography: Full Blockage of the spinal canal in C5-C6 and irregular filling gaps suggesting arachnoiditis.	C4-C7 Laminectomy (1978): - intense arachnoiditis.	Discrete improvement of motor deficit.	Unchanged	10 years



*Fig 1. Descendent myelography showing total blockage of inflammatory aspect in C7-T1 and irregular gaps of filling on the left (several levels) of the cervical canal, both of them due to arachnoiditis. The patient had a previous diagnosis of cerebral cysticercosis.*

The 6 patients submitted to cyst exeresis presented improved clinical signs and symptoms after surgery but the regression of symptoms was only transitory in 2 of them, since they developed arachnoiditis. Two of the improved patients presented blockage of the spinal canal and evidence of discrete/moderate arachnoiditis at surgery. The other 2 did not present signs of arachnoiditis.

The 2 operated patients with myelographic evidence of arachnoiditis presented intense arachnoiditis at surgery and did not present clinical improvement after treatment.

The 2 patients submitted to clinical treatment showed no improvement.

## COMMENTS

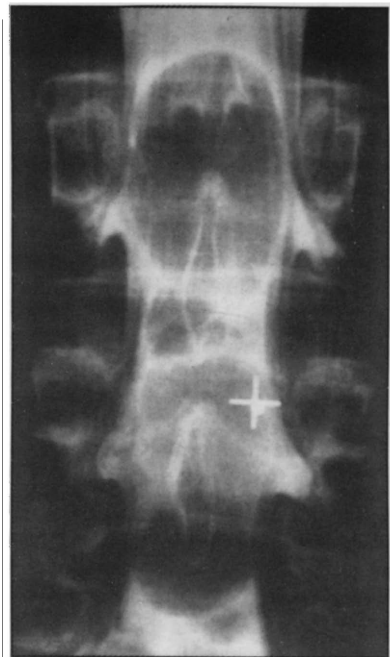
Among the forms of neurocysticercosis that can be submitted to surgical treatment are those which develop signs due to local compression of the brain and of the cranial nerves, the forms that develop intracranial hypertension, and the spinal form.

The spinal form of cysticercosis of CNS is infrequent when compared to the cerebral form, with an incidence of 1.6 to 20%<sup>4,14,19,25,46,50,53,78,81,84,85,88,90-109,112,116,117</sup>. Hernandez-Absalón<sup>54</sup> published a case of a cyst in the rachidial canal and, in an extensive review of the literature, detected 75 other cases published. Siqueira et al<sup>92</sup> published a case of intramedullary

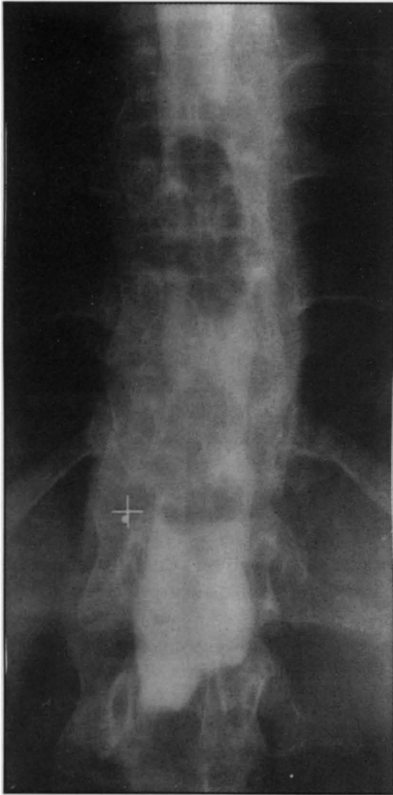
Five patients whose myelography or myelotomography presented images suggesting cysts were submitted to laminectomy for cyst exeresis (Cases 2,4,6,8 and 9). Two of these (Cases 4 and 8) also presented blockage of the spinal canal with an inflammatory aspect and no other evidence of arachnoiditis. At surgery, active racemose cysts and moderate arachnoiditis were detected in 4 of them, and one racemose cyst plus discrete arachnoiditis in the fifth patient (Case 2).

Four patients (Cases 1,3,7 and 10) showed evidence of arachnoiditis at myelography and 3 (Cases 3,7, and 10) of them also had blockage of the spinal canal. Two (Cases 1 and 7) were treated clinically and case 3, with blockage of the canal, was submitted to laminectomy for diagnostic clarification. Intense arachnoiditis was detected at surgery.

The remaining patient (Case 5) presented inflammatory blockage of the spinal canal with no other signs of arachnoiditis and was submitted to laminectomy for diagnostic clarification. At surgery, a racemose cyst associated with moderate arachnoiditis was found.



*Fig 2. Myelography showing oval shaped, regular and well delineated gaps of filling suggesting cysticerci (confirmed by surgery) in the subarachnoid space (L4-S1).*



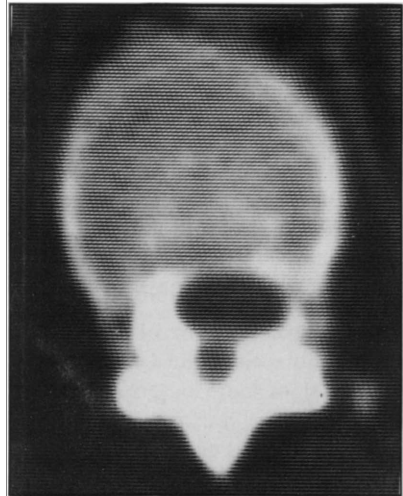
*Fig 3. Myelography showing gaps of filling in T10-L1, suggesting cysticerci confirmed by surgery and total blockage of inflammatory aspect in L2 (arachnoiditis). The patient had a previous diagnosis of cerebral cysticercosis.*

cysticercus and detected 26 additional cases in the literature. The low incidence observed in our hospital by Takayanagui and Jardim<sup>109</sup> should be attributed to the lack of awareness of the problem and to the difficulty in making the right diagnosis at the time.

The cysticercus may reach the spinal canal through the arterial blood circulation or through the CSF from the subarachnoid space<sup>25,50,81,117</sup>. The possibility of a direct passage of cysticerci from the ventricles to the ependymal canal (ventriculo-ependymal route) is supported by some authors<sup>25,81</sup>. Others<sup>88,98</sup> have postulated the possibility of invasion of the nervous system through retrograde blood flow via the inner vertebral venous plexus and the intervertebral veins. The blood route is considered to be the most frequent source of intramedullary infestation<sup>25,81,117</sup>, while the subarachnoid route is responsible for most extramedullary infestations. The ventriculo-



*Fig 4. Myelography showing total blockage of inflammatory aspect in L4 (arachnoiditis). The patient had a previous diagnosis of cerebral cysticercosis. At surgery, a racemose cysticercus was found with discrete arachnoiditis.*



*Fig 5. Myelotomography showing a hypodense, rounded and regular gap of filling dorsally placed in the spinal canal suggesting a cysticercus, confirmed during surgery (diagnosis of cysticercosis had been previously done based on CSF examination).*

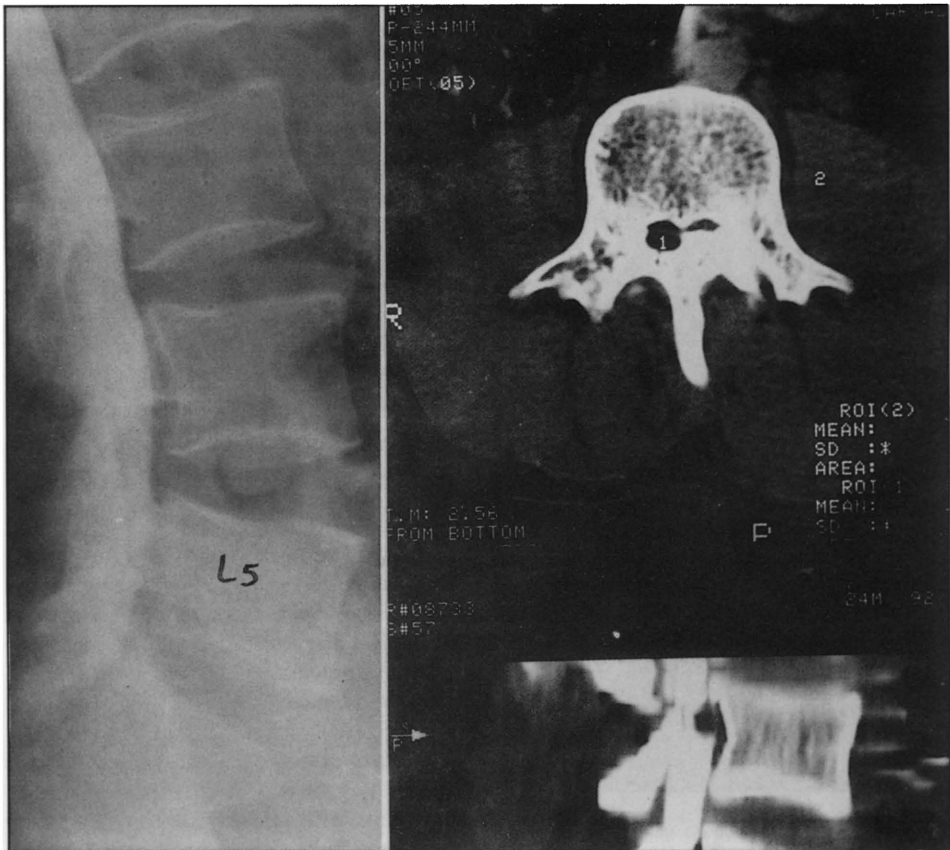


Fig 6. Examinations of a patient with lumbar pain irradiating to the left lower limb. A (left). Myelography showing no changes. B (right). Myelotomography showing a rounded and regular hypodense image (1- upper, arrows - bottom), displacing the spinal cord anteriorly, suggesting a cysticercus, confirmed during surgery (the patient had positive CSF immunodiagnostic reaction for cysticercosis).

ependymal route is considered to be of little practical importance<sup>55</sup>. In our cases, all of them of extramedullary localization, spinal infestation probably occurred by the subarachnoid route, since eight cases presented cerebral cysticercosis before the spinal manifestation.

Several authors have reported that the cysticerci reaching the spinal canal by the subarachnoid route are preferentially located in the cervical region because, due to their size, the cysticerci have difficulty in passing the arachnoid trabeculae located in the upper portion of the spinal canal<sup>25,81,86,117</sup>. These reports were not confirmed by our observations since in most of our cases, all of them of extramedullary localization, the location was in the lumbosacral region, and in the cases reviewed in the literature by Honda et al.<sup>55</sup> there was practically no difference with respect to cysticercus location inside the spinal canal.

From a pathological viewpoint, the nervous lesions of medullary cysticercosis may occur due to direct compression by the cysticercus itself, by local or distant inflammatory reaction (arachnoiditis), and by degeneration of the medulla due to pachymeningitis or circulatory insufficiency<sup>58,81</sup>. The intradural extramedullary forms are the most frequent, and are followed by the intramedullary form<sup>25,54,81,92</sup>. Epidural cysts are rarely observed<sup>2,25,55,81,85</sup>.

The clinical manifestations most commonly observed are signs of intramedullary, radicular or cauda equina compression such as flaccid or spastic paresis, sensory deficits, sphincter disorders,



*Fig 7. Surgical exposure of the lumbar spinal canal in patient of Figure 2. The cauda equina is evident through the arachnoid membrane that was not opened. Several active cysts (fluid content similar to CSF) can be seen displacing the spinal roots in the subarachnoid space. Thickening and opacification of the arachnoid (moderate arachnoiditis) is evident on the upper part of exposure.*

with free cysts in the subarachnoid space, myelography shows rounded or elongated subtraction images, with sharp and regular contours, which may be considered pathognomonic of cysticerci in endemic areas (Fig 2). However, the association of cyst images and of canal blockade (Fig 3) may be observed, and this blockade does not always lead to intense arachnoiditis (Case 4). Similarly, the isolated observation of canal blockade does not always correspond to arachnoiditis only, with no cysts (Fig 4). Computerized tomography after injection of contrast medium into the spinal canal (myelotomography) may show hypodense images (Fig 5), which in patients from endemic areas are suggestive of spinal cysts. This examination is more sensitive than myelography in the detection of spinal cysts (Fig 6).

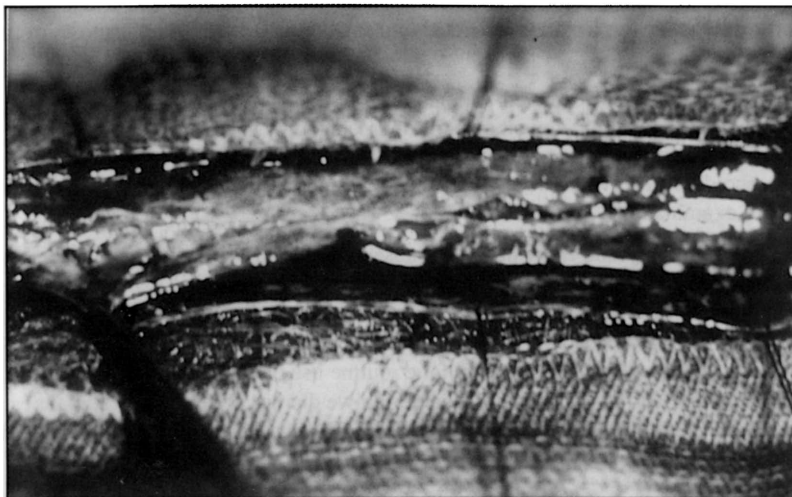
Thus, a presumptive diagnosis of spinal cysticercosis can only be made on the basis of the presence of cerebral cysticercosis, through positive specific immunodiagnostic reactions in the CSF, or by myelography or myelotomography when images suggesting a cysticercus are detected in patients from endemic areas. There are no other possibilities of differentiating spinal cord and radicular signs caused by cysticercosis from those of different etiology.

irradiating pain, and pyramidal signs<sup>25,55,117</sup>. Besides these, signs of cerebral involvement are frequently observed since spinal cysticercosis is often associated with cerebral cysticercosis<sup>25,85,116,117</sup>.

The laboratory diagnosis of spinal cysticercosis can be made by CSF examination as also done for brain cysticercosis, i.e., on the basis of positive specific immunodiagnostic reactions<sup>102</sup>. Therefore, positivity of the complement fixation reaction was less than 50% in the cases reviewed by Honda et al.<sup>55</sup>. Furthermore, CSF examination may provide signs of blockade of the CSF circulation at the level of the spinal canal which, however, do not allow a differential diagnosis from other expansive processes.

In contrast to the cerebral forms, simple spinal radiographs and CT contribute little to the diagnosis of spinal cysticercosis. Routine radiological diagnosis of spinal cysticercosis is based on myelography and myelotomography. Magnetic resonance imaging as in the cerebral cysticercosis<sup>57,111</sup>, may be very useful in displaying intra or extramedullary cysts, but due to its high cost it is still of limited use for our patients. In patients with arachnoiditis, myelography shows irregularities along the canal and at times full blockade (Fig 1), and signs of an expansive intramedullary process may be observed in patients with intramedullary cysts. In these cases, etiological diagnosis is possible only when there is association with cerebral cysticercosis or when the specific immunodiagnostic reaction for cysticercosis is positive in the CSF. In patients





*Fig 8. Surgical exposure of the lumbar spinal canal. The intense inflammatory process caused firm adherence among the roots of the cauda equina that became a block.*

The efficacy of treatment of spinal cysticercosis with medications such as praziquantel or albendazole has not yet been established. Therefore, like brain cisternal or ventricular cysts, cysts located in the subarachnoid space of the spinal canal should not respond well to medications. This can occur probably because the drugs do not reach therapeutic level in the subarachnoid space.

When a diagnosis of spinal cord or radicular compression by free cysts in the spinal canal is made, surgical treatment is indicated and consists of exeresis of free cysts by laminectomy. During the surgical act, cysts of easy removal are usually found, with no inflammatory reaction of the arachnoid membrane (Fig. 7). Washing the canal with physiological saline may remove other cysts located below or above the site of laminectomy, although it is not possible to be certain that all cysts were removed. The immediate clinical course of the patients is very good after exeresis of free cysts in the spinal canal, with improved subjective sensitive signs and motricity. Therefore, these patients tend to develop arachnoiditis on a medium- or long-term basis, with a relapse or the appearance of new clinical manifestations, as observed in 4 of our 6 patients. When degenerating cysts are present, they usually adhere to the spinal cord and to the roots and their full resection may be difficult even when using microsurgical procedures, resulting in important neurological deficits. In these cases we partially resect the cysts to relieve possible compressive effects and we leave in place the areas with most adhesions.

In patients with intramedullary cysts, surgical treatment is always indicated for decompression of the medulla or for diagnostic clarification. In general, cyst resection is technically simple since the cysts usually adhere weakly to the parenchyma even when they are in the degenerative stage<sup>2,14,22,92</sup>, like the cysts in the cerebral parenchyma. However, degenerating intramedullary cysts may present adhesions to nervous tissue and especially to vessels, impairing resection<sup>22</sup>. This difficulty may be reduced with the use of microsurgical techniques.

In patients with compression due to arachnoiditis revealed by myelography, microsurgical lysis of the inflammatory reaction (Fig 8) is often very difficult and traumatic and usually does not provide satisfactory clinical improvement unless the lesion is quite localized. On the contrary, the perspective of neurological worsening after the surgical procedure carried out on a spinal cord that usually presents associated circulatory deficiency may be considered the rule in these cases. For this reason, we indicate surgical treatment in patients with spinal cord compression due to

arachnoiditis only when the lesion is restricted to a small area or when the diagnosis of full canal blockade is doubtful.

The clinical course of operated patients does not appear to be related to the presence of myelographic blockade without any other signs of arachnoiditis or with the observation of discrete or moderate arachnoiditis during the surgical act. It seems to be related with the presence of intense arachnoiditis observed during surgery and demonstrated by irregular filling gaps in the myelographic examination.

The high mortality and morbidity rates observed in the past among patients submitted to intracranial cysts exeresis were related to the difficulties in the surgical management of patients with arachnoiditis and aseptic meningitis caused by cyst rupture during surgery. Today these problems have been partially reduced by using microsurgical techniques and by the satisfactory control of aseptic meningitis with corticosteroids. With the routine use of corticosteroids during intracranial or spinal surgery and during the postoperative period we did not observe clinical manifestation of an inflammatory reaction due to cyst rupture, although this reaction may be detected by CSF examination<sup>33</sup>.

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