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ENDOSCOPIC APPROACH TO FOURTH VENTRICLE CYSTICERCOSIS

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ABSTRACT - Neurocysticercosis is the most frequently observed parasitosis of the central nervous system worldwide. The fourth ventricle is the most frequent site of intraventricular infestation, a location that carries a higher risk for CSF blockage and intracranial hypertension due to CSF blockage. A great number of patients become shunt dependent which carries a poorer prognosis. We report on a case of a patient with symptomatic obstructive hydrocephalus due to cysticercus in the fourth ventricle where an endoscopic approach via a frontal burr hole was performed. Although there is no consensus in the literature for the optimal treatment of this disease, this method seemed adequate for treatment of fourth ventricle cysticercosis in patients with hydrocephalus, aqueductal and foramen of Monro dilatations.

KEY WORDS: cysticercosis, endoscopy, fourth ventricle, hydrocephalus.

Tratamento endoscópico da cisticercose do quarto ventrículo

RESUMO – A neurocisticercose é a parasitose mais freqüentemente encontrada no sistema nervoso central. O quarto ventrículo é o local mais frequente de infestação intraventricular, uma localização que acarreta grande risco de bloqueio da circulação liquórica e subseqüente hipertensão intracraniana. Grande número de pacientes se torna dependente de derivações liquóricas, o que determina pior prognóstico. Relatamos o caso de um paciente com quadro de hidrocefalia obstrutiva secundária a cisticerco localizado no quarto ventrículo que foi abordado por via endoscópica. Apesar de, até o momento, não haver consenso na literatura sobre o melhor tratamento da neurocisticercose intraventricular, o tratamento neuroendoscópico parece ser método eficaz de tratamento nos pacientes com hidrocefalia e dilatação dos forames de Monro e do aqueduto.

PALAVRAS-CHAVE: cisticercose, endoscopia, quarto ventrículo, hidrocefalia.

Neurocysticercosis(NCC) is a parasitic disease caused by infection with the larval stage of *Taenia solium* and is the most frequent parasitic infestation of the central nervous system[1,2]. In Brazil NCC has been observed in 2.7 to 7.5% of patients hospitalized with neurological disfunction[3,4]. The infestation of the ventricles is attributed to active passage of hexacanthous embryo through the cappilaries of the choroid plexus[5]. Intraventricular involvement occurs in 7-33% of cases[1,2,6]: the fourth ventricle is the most frequent site of parasitic invasion in intraventricular disease and is associated with significant rates of morbidity and mortality[7,8]. Intraventricular cysts can cause hydrocephalus and are potentially fatal. They are not always amenable to medical management, usually requiring surgical intervention either for its removal or cerebrospinal fluid (CSF) shunting[9-11].

In this report, a minimally invasive endoscopic approach to fourth ventricular NCC is described as an effort to use a less invasive procedure to remove the cyst and to treat hydrocephalus.We propose an endoscopic approach trough a frontal transforaminal route which allows removal of the the fourth ventricle cyst and treatment of hydrocephalus as well. The literature is reviewed and the other therapeutic modalities are analyzed and compared.

CASE

A 56-year-old man with a ten year history of epileptic seizures controlled with phenobarbital was admitted to the hospital with a three month history of a daily headache and progressive gait unsteadiness. Neurological examination showed patient alert, fully oriented, with gait ataxia, global hiperreflexia and bilateral papilledema. MRI demonstrated third and lateral ventricles hydrocephalus, with

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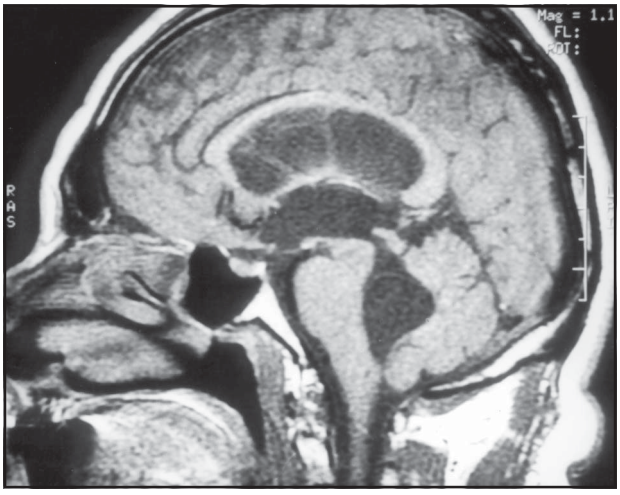

Fig 1. Preoperative sagital T1-MRI with gadolinium demonstrating dilatation of the ventricular system and a non-enhancing cyst in the fourth ventricle.

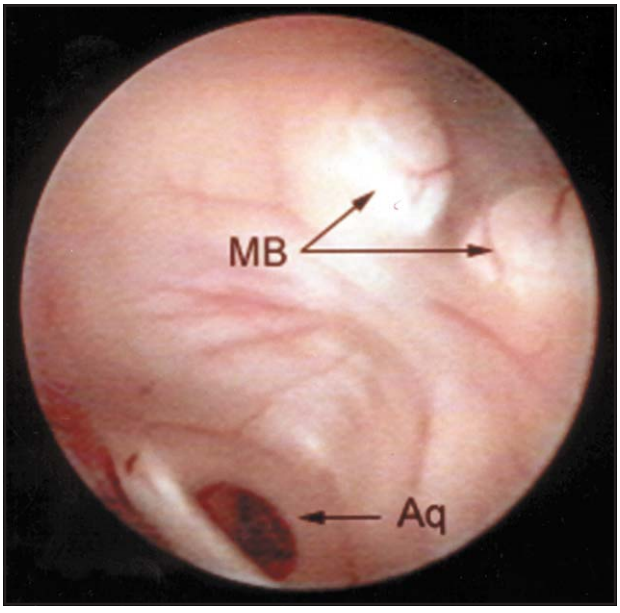

Fig 2. Intraoperative endoscopic picture of the fourth ventricular cyst that was posteriorly aspirated using a catheter.

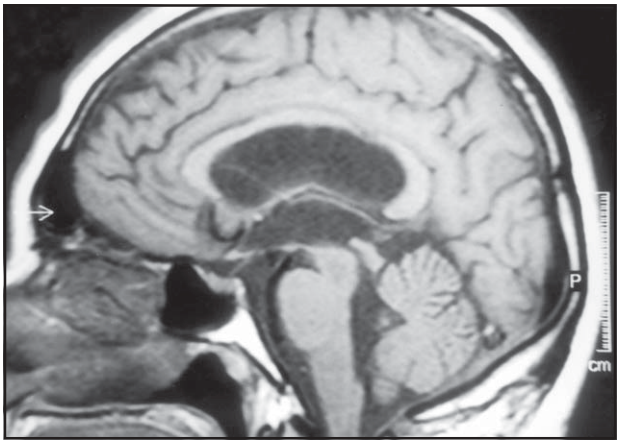

Fig 3. Follow up T1 MRI with gadolinium showing no signs of hydrocephalus and a normal fourth ventricle.

a huge cyst in the fourth ventricle with no contrast enhancement (Fig 1).

The patient was operated on using a rigid endoscope (Aesculap AG/Tuttlingen/Germany)via a right frontal burrhole, 2 cm anterior to the coronal suture over the midpupillary line. The dura was incised and the scope was introduced in right lateral ventricle. After inspection of the lateral ventricle, the operation sheat was advanced into the third ventricle under visual control, the aqueduct and posterior comissure were identified. This was feasible because the forame of Monro was markedly dilated. The domus of the cyst was visualized in fourth ventricle (Fig 2).Using a 6-french cateter, the cyst was easily aspirated through the aqueduct and withdrawn together with the scope. After this step, an endoscopic third ventriculostomy was easily performed by blunt puncture with the aid of a 4-French Fogarty balloon catheter.

The pacient had an uneventful recovery and remained assymptomatic and shunt free one year after the procedure. Follow up MRI shows no signs of hydrocephalus and a normal fourth ventricle (Fig 3).

DISCUSSION

When the larval form of the pork tapeworm *Taenia Solium* passes through the choroidal plexus, it may either migrate caudally to reach the basilar cisterns or lodge as cysts in the ventricular system. Probably due to the effect of gravitational forces that favor migration from the superior cavities to the inferior ones, the fourth ventricle is the most frequent site of parasitic invasion[7,12,13]. At this location the parasite may: 1. obstruct the CSF pathways leading to fast development of obstrutive hydrocephalus and consequently intracranial hypertension; 2. degenerate, leading to an ependimal reaction with an inflamatory obtruction of CSF system; 3. grow and cause mass effect[9,13,14]. Ventricular cysts appears on CT as lesions that distort the anatomy of the ventricular system and cause obstuctive hydrocephalus. These lesions are usually isodense to CSF and are not well imaged on CT. MRI however better detects the ventricular cysts because the scolex is visualized[6,12,15,16]. Ependymitis is a relative contraindication for surgical removal of the cysts and can be identified on contrast-enhanced MR images[9,10,11,17,18].

Several modalities of treatment for neurocysticercosis in the fourth ventricle were reported in literature. The direct surgical approach via a posterior fossa exploration carry inherent risks of morbidity and mortality. The relief of intracranial pressure (ICP) is permanent only when a unattached cyst is encountered in the fourth ventricle as in 19 of 49 patients described by Colli et al.[11] and 11 of 17 described by Apuzzo et al.[9]. Transient and permanent neurological

deterioration was seen in 14.8-42.1% in surgical series[9-11,19] and was related to the presence of inflamatory reaction in posterior fossa, opening of the inferior aspect of the cerebellar vermis and the distortion of normal anatomical structures due to inflamatory process. For Citow et al.[18] gadolinium enhancement of IVNCC lesions on MRI presumably indicates the presence of diffuse ependymal inflammation, representing the great difficulty required to resect these lesions, due to what they propose only shunt procedures for these patients. The need of a shunt on the pos operative period, which occurs in 15 to 25% of the surgical series, is not avoided by this surgical approach[9-11,18,20].

CSF shunting is an effective procedure for treatment of associated hydrocephalus with relief of 50-95%cases. Nevertheless, shunt disfunction rate is very high corresponding to 30-67% in clinical series. Reasons to this ocurrence are very well demonstrated in the literature and explained by shunt obstruction for inflamatory cells, cysts or high protein[11,13,21,22]. The protacted course of these patients and their high mortality rates, up to 50% in 2 years, are directly related to the number of surgical interventions for shunt revisions due to multiple dysfunction[13,22]. Placement of a ventriculoperitoneal shunt followed by a course of antihelminthic medication seems to promote shunt longevity, reducing shunt revisions from 33% to 90% as described by Kelly at al.[21]. Another important issue is that the untreated cyst in the fourth ventricle can pottentially expand and cause signs of mass effect, like three of seven cases related by Apuzzo et al.[9].

Cysticidal treatment is effective in up to 90% of cases of fourth ventricle cisticercosis[8]. Intraventricular cysts may disappear within three months after treatment. Since definitive medical therapy with antiparasitic agents demands time, there is an outstanding risk of acute clinical deterioration of ICP during the clinical treatment period. This happened in 11 of 24 cases of Apuzzo[9] requiring an urgent ventriculostomy. CSF shunt was not avoided as in 60% of Proaño's clinical series[8].

Endoscopic approaches for intraventricular neurocysticercosis has been described recently[7,23-26]. Proaño et al. performed an endoscopic exploration of fourth ventricle that showed a ventricle inflamatory entrapment secondary to ependymitis[8]. Bergsnaider reported five cases of fourth ventricular exploration with a flexible endoscope performing a midline durotomy between the opisthion and posterior arch of C1 and by advancing towards forth ventricle through Magendie foramen (transvalecular route). He achieved removal of all cysts, although 3 of 5 patients required CSF diversion. Shunting was performed before the procedure in one case and after removal of the cysts in two other patients[23].

There are many important nervous structures surrounding the aqueduct, like the nuclei of IIIrd, IVth, and Vth cranial nerves, as well as the decussation of troclear nerves, the brachium conjunctivum of the superior cerebelar peduncle, and the *fasciculus longitudinalis medialis.* So, great care must be taken to not injure them. Endoscopic approaches to aqueductal region via a frontal route was performed by Schroeder and Gaab for the treatment of aqueductal stenosis in 17 patients, one had a forniceal contusion without symptoms and four disturbances of ocular mobility due to injury of aqueductal roof. Two of these two were permanent[27,28]. Anandh et al.[26] described a right transfrontal approach using a rigid endoscope to enter the lateral and third ventricle and to remove fourth ventricle cysts in three patients, followed by a standard third ventriculostomy, like we performed with our case. The authors removed the cystic lesions in all patients with no mortality and a case evolving with transient hemiparesia and ocular ptosis probably to lesion of the periaqueductal region. We propose the frontal transforaminal transaqueductal route for selected cases. A cisticercus in the fourth ventricle must be carefully evaluated after a detailed study of the MRI, looking for hydrocephalus with forame of Monro and aqueductal dilatation, and no ependimal enhancement. This procedure allows the removal of the cyst and offers a treatment for hydrocephalus, leaving the patient free of shunt procedures.

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