SHORT REPORT

Solitary brainstem abscess successfully treated by microsurgical aspiration

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Abstract
A case of pyogenic pontine abscess detected by computerized tomography scan in a 10-year-old boy is presented. While on broad-spectrum antimicrobial treatment, he deteriorated and developed new symptoms of respiratory distress. Microsurgical exposure of the abscess and aspiration of pus resulted in rapid improvement in his neurological state and radiological resolution of the lesion. The aim of this article is to emphasize the importance of prompt diagnosis and the role of surgical drainage of pus in the management of brainstem abscesses.

Key words: Pyogenic abscess, brainstem, antibiotic therapy, open drainage, computerized tomography.

Introduction
Solitary pyogenic abscess of the brainstem is a rare occurrence, and until a decade ago, it was frequently not recognized during life. This, together with an old neurosurgical dogma that brainstem lesions were inoperable, contributed to the uniformly fatal outcome of this disease. In recent years, however, new neuroimaging methods and improved neurosurgical techniques have resulted in a few case reports of survival.

This article describes a case of solitary pontine abscess with excellent recovery following microsurgical exposure of the lesion and drainage of the pus under direct vision.

Case report
A 10-year-old boy was admitted to the Neurosurgical Department of the King Khalid University Hospital because of diplopia, difficulty in swallowing and weakness of the left side of the body. These symptoms developed 15 days earlier after a short episode of fever, headache and malaise. When the patient was admitted to a local hospital 5 days after onset of his illness, he was apyrexial and had no signs of meningeal irritation. However, he had left-side abducens and facial palsies as well as a right hemiparesis and an extensor right plantar reflex. During the following days these symptoms deteriorated and difficulty of swallowing and speech ensued. A lumbar puncture revealed clear, colorless cerebrospinal fluid with a normal cell count and protein content. The blood investigations were unremarkable apart from a slight increase of the erythrocyte sedimentation rate to 20 mm in the first hour. A cranial computerized tomography (CT) scan disclosed a low density area in the pons with smooth ring enhancement after intravenous contrast injection (Fig. 1). A brainstem abscess was considered to be the most likely diagnosis, but a cystic tumor or a tuberculoma could not be excluded. The patient was already on a broad-spectrum antimicrobial treatment con-
FIG 1. Preoperative computerized tomography scan before (a) and after (b) intravenous contrast injection showing a low density area in the pons with a thin ring enhancement. The fourth ventricle is markedly compressed.

sisting of mefoxin, ampicillin and amikacin, and the antituberculous drugs Rifampicin and Isoniazid at the time of transfer.

On admission, the child was drowsy, afebrile and had no meningeal signs. There were left-side abducens and facial palsies, and the gag reflex was reduced. His speech was markedly slow and dysarthric. There was a mild right hemiparesis. The tendon reflexes were increased in the lower limbs with bilaterally positive Babinski signs and ankle clonus. The systemic examination revealed no focus of active infection apart from a bad molar tooth. A tuberculin skin test was negative.

As the patient's condition had been stable for the last few days, conservative management was continued. The antibiotic treatment was adjusted to chloramphenicol, penicillin G and metronidazole, and dexamethasone was added. Three days after admission, however, the patient became more drowsy and developed symptoms of respiratory distress with episodes of apnea. A repeat cranial CT scan showed no change in the size of the lesion and there was no hydrocephalus. The patient was taken to surgery and a small midline suboccipital craniotomy was performed. The cerebellum and cisterna magna appeared unremarkable. Under the operating microscope, the fourth ventricle was entered through a small incision in the midportion of the cerebellar vermis. There was a large swelling in the floor of the fourth ventricle, more on the left side, with a prominent vessel on its top (Fig. 2). The swelling was punctured with a 20 gauge cannula at the site of maximal fluctuation. There was no resistance on entering the abscess cavity, and approximately 6 ml of nonviscous yellow-greenish pus was aspirated. The swelling collapsed immediately. Microscopic examination revealed a few Gram-positive cocci, but bacterial cultures were negative.

The patient's neurological state improved gradually. A CT scan 1 week after operation showed a tiny residual enhancement in the pons (Fig. 3). Because of slight bone marrow depression the chloramphenicol and metronidazole were discontinued 2 weeks after the start. The antibiotic therapy was continued postoperatively with intravenous penicillin and cefazolin for 6 weeks. On discharge, the patient had an abducens palsy and a residual facial weakness. He returned to school 1 month later, and his performance has been excellent. The last follow-up examination 5 months after surgery revealed a mild squint without diplopia and elevated tendon reflexes of both legs, but
FIG. 2. A view of the floor of the fourth ventricle through a small incision in the vermis showing a large swelling with prominent vascularity.

no Babinski signs. A repeat CT scan confirmed total resolution of the abscess (Fig. 4).

FIG. 3. Enhanced CT scan 1 week after operation. There is a small residual ring structure in the pons. The fourth ventricle can be seen in normal position.

FIG. 4. Enhanced CT scan 5 months postoperatively confirms complete resolution of the abscess.

Discussion

The rarity of solitary pyogenic abscess involving the brainstem is attested by the observation made by Weickhardt and Davis, who found only four such cases among some 330,000 autopsy files of the US Armed Forces Institute of Pathology. Russell and Shaw estimated that solitary brainstem abscess constitutes less than 4% of all posterior fossa abscesses and probably less than 1% of all intracranial abscesses. According to Kashiwage et al., only 60 cases have been reported in the literature. Since then only a few case reports have been added.

Most brainstem abscesses develop either by hematogenous metastasis from remote foci of infection, usually in the lungs, or by direct extension from an adjacent structure, mostly the ears, accounting for 34% and 29% of all reported cases, respectively. It is remarkable that the infective source remains unknown in 37% of brainstem abscesses, compared with 10–18% of brain abscesses in other locations.

Prior to the advent of the CT scan, early diagnosis and management of brainstem abscess constituted a formidable challenge. Patients with brainstem abscess most commonly present with cranial nerve deficits, especially facial weakness, dysphagia and abducens palsy, together with hemiparesis, headache and fever. However, classical brainstem syndromes that would allow a precise anatomical localization are rather infrequent. Moreover,
the clinical picture is often complicated by co-existing basal meningitis and dural thrombophlebitis. The clinical course has been rapidly progressive deterioration ending uniformly in death, usually within a week or two after the onset of symptoms.\textsuperscript{1,2,18,19} This led Hulme in 1961 to conclude that: "Hitherto the diagnosis has been made only at necropsy; it seems unlikely, however, that any effective surgical intervention would be practicable even if the condition were recognized during life ...".\textsuperscript{1} Since that time, however, the prognosis has improved, mainly due to the introduction of CT scan, more potent antibiotics and microsurgical and stereotactic techniques.

The first two cases of survival with brainstem abscess were reported in 1974.\textsuperscript{4,12} Both patients underwent surgical evacuation of the abscess with good functional recovery in one case, thus confirming that brainstem abscess is amenable to treatment if an early diagnosis can be made.

With the cranial CT scan, identification and localization of intra-axial brainstem lesions have been greatly facilitated. On CT, pyogenic abscess in the brainstem has, as elsewhere in the brain, a fairly characteristic appearance consisting of central hypodensity surrounded by a smooth ring enhancement after intravenous contrast injection.\textsuperscript{3,6,13} It has been estimated that, when allied to the clinical data, CT scan enables a confident and correct diagnosis of abscess in 73\% of cases.\textsuperscript{15} However, signs of infection may be absent in half of the patients with brain abscess,\textsuperscript{15,17,20} and the white cell count in cerebrospinal fluid (CSF) may be normal in up to 40\% of the cases.\textsuperscript{17,20} The risk of lumbar puncture in brain abscess victims should also not be underestimated.\textsuperscript{20,21} Based on the CT scan alone differentiation between an abscess and a glioma of the brainstem may prove very difficult if not impossible.\textsuperscript{5}

To date, 14 patients, including the present case, have survived brainstem abscesses.\textsuperscript{3–13} Only in one case was the lesion located in the medulla oblongata,\textsuperscript{3} the remaining abscesses involved the pons and midbrain. Three patients\textsuperscript{8,9,13} were managed conservatively with antimicrobial drugs alone, one of which required, however, a ventriculo-atrial shunt for obstructive hydrocephalus.\textsuperscript{13} All three patients made a good recovery with no or only a mild neurological deficit.

The other 11 survivors underwent evacuation of pus in addition to antimicrobial therapy.\textsuperscript{3–7,10–12} The evacuation of pus was achieved by open surgery in seven patients and CT-guided stereotactic aspiration in the remaining four.\textsuperscript{7,10} Two of the surgical cases presented with obstructive hydrocephalus and ventriculo-peritoneal (VP) shunts needed to be inserted before the diagnosis of brainstem abscess was established.\textsuperscript{4,11} In a third patient, a VP shunt was performed for delayed communicating hydrocephalus.\textsuperscript{6}

The results of surgical management of brainstem abscess have been more variable. Excellent outcome with mild residual neurological deficit was reported in all four cases who were treated by stereotactic aspiration\textsuperscript{7,10} and four of the seven patients who had open surgery (Refs 3, 5, 12, and present case). Of the remaining three cases, the outcome was poor only in one patient in whom drainage and extirpation of the abscess was pursued.\textsuperscript{4} In contrast, multiple aspirations did not seem to interfere with a good outcome.\textsuperscript{5,7}

The question of the optimal treatment for brainstem abscess remains open. The lack of an accurate bacteriological diagnosis is a source of uncertainty regarding the outcome of conservative management alone. Progressive neurological deterioration, as in our case, and enlargement of abscesses despite antibiotic therapy have also been observed by several authors in other intracranial locations.\textsuperscript{22–24} We therefore suggest that a trial of antimicrobial treatment in brainstem abscess may be justifiable as long as the patient's clinical condition is stable and close neurological observation with CT monitoring is available. However, surgical evacuation of the pus should be carried out without delay at the first sign of clinical deterioration or CT evidence of enlargement.

Although CT stereotaxy and ultrasound-guided needle aspiration seem to be the less invasive procedures, open operation and aspiration of pus under direct vision is not
necessarily associated with a higher morbidity if the microsurgical technique is applied through a small, carefully planned craniotomy. An open microsurgical approach offers the following advantages: (1) the abscess is penetrated at the point of highest fluctuation ensuring the least possible damage to the brainstem; and (2) there is direct visual control of the collapse of the abscess indicating complete evacuation of the pus.

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References