Pediatric brainstem abscess: a case-based review

Hassen Hadi Almuhammed*

ASTRACT

Solitary brainstem abscess is uncommon condition with high mortality and morbidity. The diagnosis require high index of suspicion and appropriate imaging. It can be managed by medical treatment alone, stereotactic aspiration of the purulent material, or by surgical drainage along with medical therapy. Here, I present a case of a child with large solitary brainstem abscess involving the pons and the medulla oblongata without systemic infection or systemic predisposing factors. The patient managed by mean of microsurgical drainage and antibiotic therapy. The literatures on brainstem abscess was reviewed and an over view of the literature is presented. This case-based review of brainstem abscess reinforce the conclusion that early diagnosis and proper management with microsurgical drainage and maximal medical therapy may result in a good prognosis.

Key words: Brainstem abscess, antibiotics, microsurgical drainage

INTRODUCTION

Brainstem is an uncommon site of a brain abscess with high mortality and morbidity[1] and a solitary brain stem abscess of undefined etiology are even rare.[2] The pons is the most common site of the abscess, followed by the midbrain, while medullary abscesses are distinctly rare.[3] The cause of the brainstem abscess is usually a hematogenous dissemination from a distant site[4] and the most common causative microorganisms identified are streptococcus and staphylococcus species(spp.).[5] but still other bacterial spp., tuberculous, and fungal abscesses are also reported.[6] The best method of treatment is not yet defined. It can be managed by medical treatment alone.[4,5] stereotactic aspiration of the pus[1], or microsurgical drainage or excision of the abscess.[2,7] Prolong systemic antibiotic therapy is usually required.[2,4] With the presence of high index of suspicion and advanced diagnostic tools (including brain CTS and MRI), a prompt diagnosis of brainstem abscess with proper management may result in a good outcome.[8]

Case Report

A five year old girl referred to our service (department of neurosurgery, Sader teaching hospital) with 2 weeks history of repeated vomiting, walking difficulty, poor feeding, and squint. Low grad fever also reported by the family. On general examination, the patient looks ill, pale with normal body temperature. Neurological examination revealed ataxic gait, gaze palsy with bilateral abducens nerves palsy and hyperreflexia on both upper and lower limbs. Brain CTS shows cystic brainstem lesion **(Figure-1)**. Brain MRI shows low T1, High T2 and faint ring enhancing lesion taking the whole contour of the pons and upper part of the medulla in the axial and sagittal plans correspondingly. No nodular enhancement seen **(Figure 2,3 and 4)**. A diagnosis of glioma was suggested.

Fig 1. Preop.Brain

***MBCHB, FICMS, Department of Neurosurgery, Al-Sader Teaching Hospital, Basrah, Iraq**
Email: hhjasim.hh@gmail.com, Phone No. : +9647801416613

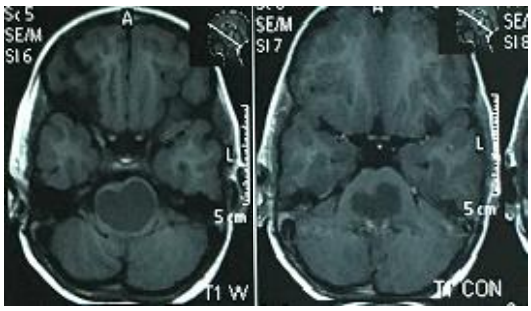

Fig 2. Preop. Brain MRI T1 without & with contrast

Fig 3. Preop. Sagittal T2 MRI

Fig 4. Preop. Coronal T2 MRI

After carful assessment and preparation of patient, a suboccipital craniotomy was performed. Through Infravermian, retrovelar approach, the brainstem encountered and a small bulge over the upper part of the medulla seen and no floating mass could be detected. Gentle aspiration from a small puncture was performed and aspiration of 3cm^3 of purulent fluid conducted. Gentle enlargement of the puncture and aspiration of more purulent fluid (total 10 cm^3) achieved. No hard mass or capsule detected. When the pus ceased to output, the surgical procedure was terminated. Gentle hemostasis and closure achieved. Purulent material sent for cytology, direct stain and culture and sensitivity. Broad spectrum systemic antibiotics were immediately administered (Ceftriaxone) and continued for four weeks. The patient transferred to the intensive care unit for 2 days and the post-operative course passed smoothly without complication. Immediate post-operative brain CTS (on the same day of operation) shows clean surgical field with shrinkage of the cyst **(Fig. 5)**.

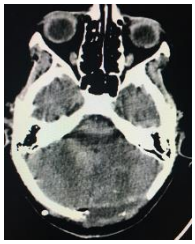

Fig 5. Post op. CTS

The result of cytology revealed numerous pus cells with acute inflammatory cells and macrophages, and no malignant cells detected, a diagnosis of abscess was given. Gram stain was negative, while culture and sensitivity shows growth of staphylococcus aureus which is sensitive to ceftriaxone antibiotic. After 2 weeks ,the patient shows great improvement regarding her vomiting and walking difficulty. No improvement happen regarding squint and abduces nerves palsy. New Brain MRI done after one month that revealed complete shrinkage of the cyst with small encephalomalaciac area seen at the site of the brainstem puncture **(Fig. 6,7 and 8).** Patient developed small subcutaneous collection at the site of craniectomy which is aspirated under local anesthesia and it revealed to be CSF collection that resolved later on conservatively.

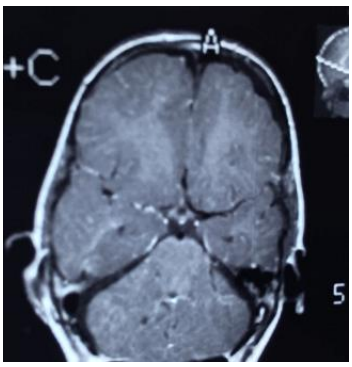

Fig 6. post op.T1 Brain MRI with contrast

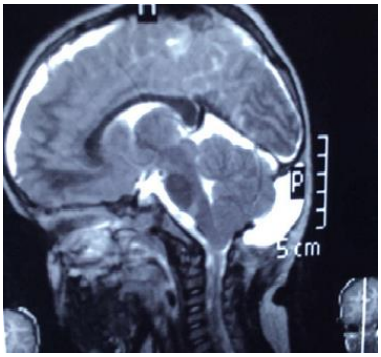

Fig.7 post op.T2 sagittal brain MRI

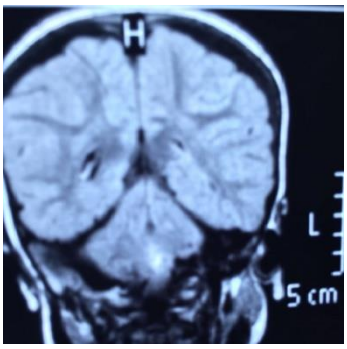

Fig 8. Post op. coronal T2 brain MRI showing the post op. changes

DISCUSSION

Brainstem abscess is a very rare condition with high mortality and morbidity.[1] The lesions were considered to be invariably fatal before 1974 [9] that is before the advent of the accurate imaging techniques, and they were typically diagnosed at autopsy. The mortality was very high and surgery would be prohipitive.[10] Over the past 30 years, the diagnosis and management of the brainstem abscess has been facilitated by a number of technologic advancement which have resulted in a significant reduction of mortality and morbidity. Computed tomography (CTS) and MRI have allowed earlier and accurate identification of the lesion and thus contribute immeasurably to the reduction in mortality compared to the pre CT era.[6] In addition, improvement in the microsurgical techniques, image guided stereotaxy, isolation techniques for the identification of the microorganisms, and presence of broad spectrum antibiotics have led to more efficacious management of the brainstem abscess.[2,11,12] The incidence of brainstem abscess, like any brain abscess, in general depend on the geographical location and the living standards within a given region. It has been estimated that brainstem abscess account for less than 1% of all intracranial abscesses and less than 4% of posterior fossa abscesses in the developed world[12], but the incidence is higher in the countries where the living conditions remain poor. Ramalho etal. [9] reported that brainstem abscess represent up to 8% of all intracranial space occupying lesions in the developing countries. Brainstem abscess, like any infection, also show higher incidence in people with certain predisposing factors such as immune deficiency syndromes like HIV infections, diabetes, and congenital heart diseases.[2] The cause of brainstem abscess is usually a hematogenous dissemination from a distant source of infection[4] and although the source of the infection is frequently apparent [13-15] still the definite cause remain obscure in up to 30 % of patients.[2,6,8] Our patient presented above shows no definite site of infection although we search for that retrospectively. The brainstem abscess may be part of multiple metastatic brain abscesses which is the most common or may be solitary[2, 7,15], as seen in this patient. Brainstem abscesses are caused by a wide variety of bacteria. Most series have shown an increased incidence of brainstem abscesses caused by aerobic organisms

including streptococci and staphylococci.[2,5,11] but still more recent studies revealed increased incidence of abscesses caused by anaerobic microorganisms including bacteroides and anaerobic streptococci.[6,9] Although most abscesses caused by a single microorganism, mixed infection occur in up to one-third of cases. Stein etal. [6] reported a brainstem abscess caused by mixed aerobic and anaerobic organisms including haemophilus and peptostreptococci. In this case report a positive culture of staphylococcus aureus was found. Hermes DN, etal. [13] also reported a brain stem abscess caused by staphylococci in a Brazilian amazon man. The incidence of staph. aureus abscesses was particularly high during the preantibioticera [16] but subsequently there is a decline in the incidence which is likely due to presence of effective antibiotics. Despite the major advances in the techniques of microorganisms isolation, still negative culture remain as high as 20-30% in most series. [1] The clinical picture of brainstem abscess has not changed significantly from the classical description. In the pediatric age group, the mean age of occurrence is 8 ± 4 years, without a gender predominance.[3,17] The clinical presentation depend on the abscess size, exact location within the brain stem, immunological status of the patient and the aggressiveness of the microorganism.[2] The clinical course may be very rapid because the space is very limited. The most common clinical symptoms and signs are those of raised intracranial pressure and focal neurological deficit secondary to space occupying lesion, tissue destruction and the surrounding edema.[2,17] The clinical symptoms and signs of a brainstem abscess may be indistinguishable from those of other brainstem lesions, however, they tend to be more rapidly progressing than those associated with other lesions[18]. Fever found in only 58% of cases.[17] Headache, vomiting, cranial nerves palsies and motor deficit are the most common symptoms.[2,3,5,7,17] In case of our patient, fever is not a presenting symptom but, gaze palsy, vomiting and walking difficulty are more prominent which are typical of a brainstem lesion. Laboratory finding shows normal WBC count and slightly elevated ESR. It has been well documented that laboratory findings are usually not of value in the diagnosis of brainstem abscess[9,17] and in many series the laboratory and CSF examination finding were normal or nonspecific. [2] The diagnostic tools of choice for assessment of a suspected case of brainstem abscess are brain CTS and/or MRI which allows not only diagnosis of the lesion but also accurate localization of the abscess within the brainstem. Ring enhancement is the typical finding on both brain CTS and MRI with the restriction diffusion images on diffusion weighted MRI images can hypothesis the brainstem abscess.[2,17] Although these findings described on brain CTS and MRI may be characteristic of a brainstem abscess but they are not pathognomonic and indeed they may resemble other pathological entities including brainstem glioma [18] as what happen with our patient where brainstem glioma was diagnosed preoperatively. The most common site of brainstem abscess is the pons followed by midbrain with medullary abscesses are extremely rare,[9,8] but in large abscesses two or more areas may be involved. In case of our patient, both the pons and medulla were involved. Sarma, etal.[7] reported a brainstem abscess with involvement of both midbrain and the pons. Treatment of brainstem abscess include, medical therapy with antibiotics alone[4,15, 19] , stereotactic aspiration [1, 11,12, 20] or open microsurgical intervention [2, 3, 7, 8, 13, 17, 18] and there continue to be controversy regarding which approach is the best .Antibiotics are the integral part of the treatment armamentarium with or without aspiration of the abscess. Prolonged antibiotic therapy along with symptomatic treatment is required to provide a successful outcome.[4] Favorable outcome is also reported following stereotactic aspiration and subsequent antibiotic treatment.[11] Stereotactic aspiration has a number of advantages over the

microsurgical procedures. It can be accomplished rapidly and safely through a single burr hole and under local anesthesia that makes it particularly attractive in seriously ill patients. Microsurgical approaches are indicated if the abscess is large with thick organized capsule, abscesses close to the surface of the brainstem and if there is doubt about the diagnosis. Microsurgical approaches result in a greater drainage value even if the abscess fluid is thick and the surgeon can also control for occasional bleeding with direct view of abscess decompression.[2,7,8] For the above reasons we choose microsurgical approach for management of our patient and mainly because there is doubt about the diagnosis since the diagnosis of our patient was brainstem glioma preoperatively. Advances in the diagnosis and treatment have drastically reduce the mortality related to brainstem abscess. Channane etal.[17] revised his series of patients with brainstem abscesses including 24 patients treated with conservative, stereotactic aspiration, and microsurgical drainage and they concluded that there is no mortality was reported since the eighties, however the morbidity is still high. The clinical course of brainstem abscess may be catastrophic with rapid deterioration and fatal outcome especially in immunocompromised patients. A poor prognosis is also associated with a delayed diagnosis or misdiagnosis, severe mental state changes at the time of diagnosis, rapid progression of neurological deficit or the infection, ventricular rapture or improper management. However, good recovery from brainstem abscess has been recently obtained with early accurate diagnosis and appropriate medical and surgical therapy.[21]

CONCLUSION

Microsurgical aspiration of a brainstem abscess is still a good therapeutic option, especially if it is combined with proper knowledge of the posterior fossa and brainstem anatomy and appropriate selection of the surgical approach. This case report shows that complete emptying of the purulent accumulation and subsequent adequate and proper antibiotic treatment may result in a favorable outcome in this potentially lethal condition. In addition, microsurgical aspiration of brainstem abscess resulted in rapid improvement of patient neurological function and radiological shrinkage of the lesion. Despite the significant reduction in mortality, brainstem abscess remain a serious illness that can result in death if misdiagnosed or managed improperly. High clinical index of suspicion is necessary for early diagnosis and treatment that can result in improvement of the functional outcome.

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