Case Report

Brain Stem Abscess Treated Successfully by Ultrasound-guided Aspiration

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A 52-year-old man presented with a pontine abscess manifesting as diplopia and right hemiparesis initially misdiagnosed as a brain stem glioma. His condition worsened rapidly. Magnetic resonance (MR) imaging revealed a rapidly growing mass lesion in the pons. At first the patient was treated with antibiotics, but his consciousness deteriorated. The abscess was resolved after ultrasound-guided aspiration via a suboccipital approach and appropriate antibiotic therapy. We believe that this is the first report of a favorable outcome in a patient with a brain stem abscess treated by ultrasound-guided aspiration. The value of ultrasound-guided aspiration with color Doppler is explained with a review of the relevant literature.

Key words: abscess, brain stem, ultrasound, color Doppler

Brain stem abscess is a very rare condition associated with high mortality⁸⁾. In younger individuals, brain stem tumors are relatively common; the vast majority are brain stem gliomas. The MR image of a brain stem abscess is similar to that of abscesses elsewhere in the brain²⁾. However, differential diagnosis is not always easy^{2, 3, 5, 7, 8)}. There are few reported cases of successful management of brain stem abscesses^{2, 3, 5, 7, 8)}. We report the use of ultrasound-guided aspiration for successful treatment of a brain stem abscess.

Case Report

A 65-year-old man was referred to a local hospital with a 7-day history of weakness on the left side, right facial palsy and diplopia on July 14, 1995. He had no history of congenital heart anomaly, paranasal sinusitis, tooth carries or head injury. His symptoms became progressively worse. CT scan revealed a round mass lesion in the pons (Fig. 1). At first, the patient was diagnosed as having a brain stem glioma. T1-weighted MR images showed enlargement of the mass lesion. Ring enhancement was evident after administration of Gd-DTPA.

The patient was referred to us on July 21, 1995. On

Fig. 1 Initial enhancement CT

admission, he complained of diplopia and right facial palsy. Nuchal rigidity was noted, but not Kernig's sign. His body temperature was 38°C and his white blood cell count was 15600/mm³. The optic fundi were normal. On July 22, MR images showed further enlarge-

Reprint request

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[Received December 4, 1996; Accepted February 6, 1997]

a : axial

b : sagittal

Fig. 2 T1-weighted MR images after the administration of Gd-DTPA.

ment of the mass lesion, with more distinct marginal enhancement (Fig. 2). The patient's consciousness deteriorated. A spinal tap performed on the same day showed a cell count of $12000/\text{mm}^3$, a glucose level of 50 mg/dl, and a protein level of 80 mg/dl. Based on the rapid worsening of his clinical condition, the liquor findings and the image findings, which were highly suggestive of brain stem abscess, emergency ultra-

sound-guided aspiration was performed via sub-occipital craniectomy (Fig. 3). The aspiration was done after detecting the posterior inferior cerebellar artery by color Doppler (Hitachi EUB565A) with a 5-MHz sector scan probe. Aspiration through the ventricular cannula (1.2 mm inner diameter) with gentle suction yielded 6 ml of pus (Fig. 3b). The abscess cavity was not irrigated. The swollen cerebellum immediately

a : initial

b : post aspiration of the pus, high echo in the abscess (ventricular cannula)

Fig. 3 Intraoperative ultrasound

Fig. 4 T1-weighted MR image after administration of Gd-DTPA 14 days after operation.

collapsed. The operating time was about two hours. Pus culture was negative.

There was a dramatic improvement in the patient's consciousness after aspiration. Subsequent therapy consisted of intravenous administration of cefazolin sodium and piperacillin sodium for two weeks and then oral administration of ampicillin for more than 6 weeks. Serial MR images revealed a decrease in the abscess size (Fig. 4). Four weeks after aspiration, the patient was discharged with mild left hemiparesis and right facial paresis.

Discussion

Brain stem abscesses constitute about 4% of posterior fossa abscesses and less than 1% of all intracranial abscesses⁸⁾. The root of infection is mainly direct extension, usually from middle ear infection, or hematogenous spread from a remote location⁸⁾. Some brain abscesses are of unknown or undetectable origin. In our case, the origin was unknown and cultures were negative. The mortality of patients with brain abscess has decreased to 5% or less since the development of neuroimaging techniques and modern antibiotic therapy⁶⁾. However, there are few reports of successfully treated brain stem abscesses^{2, 3, 5, 7, 8, 9)}. Reports of survival suggest that reasonable functional recovery can be achieved by early, accurate diagnosis with appropriate surgical evacuation^{2, 3, 5, 7, 8, 9)}. Recently,

stereotactic techniques in five patients have been applied to the management of brain stem abscesses. None of these five cases had any surgical morbidity, and all of them had an excellent outcome^{5, 9)}. The use of real time ultrasound in the operating theater can enhance the ability to localize intracerebral masses, allowing accurate needle puncture of brain abscess^{1, 4)}. Brain abscess usually appears on US (ultrasound) as an isoechoic to slightly hypoechoic lesion surrounded by a strongly hyperechoic capsule and an ill-defined, slightly hyperechoic zone of edema outside of the capsule. However, clear-cut diagnosis is not possible on the basis of US alone^{1, 4)}, because a similar pattern may occur with other lesions, especially gliomas with central necrosis¹⁾. In most cases seen at our institution, the 5-MHz transducer was found to be the most useful instrument for characterizing intracerebral masses. More recently, we have used color Doppler sonography to detect the main vessels surrounding the masses. If complicated bleeding occurs, it is possible to evacuate the hematoma quickly. In this case, we decided to use ultrasound-guided aspiration to manage the brain stem abscess. The correlation between the histology and MR images of brain stem abscess at the inflammatory stage should be investigated further. However, brain stem abscess is suspected on the basis of the clinical course and the appearance of the lesion on MR imaging. Brain stem abscess, which is potentially curable with appropriate management, should be considered in the diagnosis of mass lesions in the brain stem. In these cases, if the mass lesions require surgery, ultrasound-guided aspiration should be considered as well as stereotactic aspiration.

References

- 1) Enzmann DR, Britt RH, Lyons B, Carroll B, Wilson DA, Buxton J: High resolution ultrasound evaluation of experimental brain abscess evolution; comparison with CT and neuropathology. *Radiology* 142: 95-102, 1982
- 2) Imai H, Ono N, Zama A, Tamura M: Diagnosis and treatment of brain stem abscess using magnetic resonance imaging and microsurgical aspiration. *Neurol Med Chir* 35: 160-164, 1995
- 3) Kashiwagi S, Abiko S, Aoki H: Brain stem abscess. *Surg Neurol* 28: 63-66, 1987
- 4) Masuzawa H, Kamitani H, Sato J: Intraoperative application of sector scanning electronic ultrasound in neurosurgery. *Neurol Med Chir* 21: 277-285, 1981
- 5) Nauta HJW, Contreras FL, Weiner RL, Crofford MJ: Brain stem abscess managed with computed tomography guided stereotactic aspiration. *Neurosurgery* 20: 476-480, 1987

- 6) Rosenblum ML, Hoff JT, Norman D, Weinstein PR, Pitts LH: Decreased mortality from brain abscesses since the advent of computerized tomography. J Neurosurg 49: 658-668, 1978
- 7) Rossitch E Jr, Alexander E, Schiff SJ, Bullard DE: The use of computed tomography techniques in the treatment of brain stem abscesses. Clin Neurol Neurosurgery 91: 365-368, 1988
- 8) Russell JA, Shaw MDM: Chronic abscess of the brain stem. J Neurol Neurosurg Psychiatry 40: 625-629, 1977
- 9) Vedantam R, Mathew JC : Successful stereotactic management of a large cardiogenic brain stem abscess. Neurosurgery 34: 368-371, 1994

文献抄録

Transcranial Doppler Monitoring and Causes of Stroke from Carotid Endarterectomy Merill P. Spener, MD

Stroke 25 : 685-691, 1997

CCA の分岐部の動脈硬化性プラークを外科的に摘出する事は CVC (脳血管合併症) を予防するために行われるが、この頸動脈内膜剥離術 (CEA) 自体が CVC を起こすのでその価値は手術の安全性にかかっている。この論文では脳卒中の原因としての低灌流、過剰灌流、塞栓の可能性を評価し、DMES (Doppler microembolic signals) の意義を評価するために Transcranial Doppler Ultrasound (TCD) が用いられた。500回の CEA のいろんな場面で同側中大脳動脈を TCD でモニターし血流動態の変化、DMES の頻度を調べた。合併症をその重度に従って段階分けして、その原因を TCD クライテリアと病歴チャートから評価した。その結果、24例の CVC (4.8%) を認めた。TIA が 9 例 (1.8%)、永久的欠落症状が 15 例 (3%) で、原因としては塞栓によるものが 13 例 (54%)、低灌流によるものが 7 例 (29%)、過剰灌流によるものが 4 例 (17%) である。手術医は TCD の情報に応じた戦略で TCD の情報に対応した。すなわち cross-clamp に際して MCA 血流が 30% 以下に落ちればシャントングを行ったり、血圧を上げたりする、cross-clamp の開放に際して MCA 血流が clamp 前以上に増加すれば CCA を部分閉塞したり血圧を下げたりする、DMES が認められればヘパリンを追加する、などである。その結果永久的欠落症状の頻度は最初の 100 例の 7% から次の 400 例では 2% に減少した (統計学的に有意)。シャントング例はノンシャントング例に比べ脳血管合併症をより多く伴っていた (統計的には有意差はない)。

著者は塞栓症が CEA の合併症の主たる原因であるが、低灌流、過剰灌流も重要な原因であると述べ、TCD は CEA による脳卒中のこれら三つの主たる原因をすぐに同定し治療するための情報を与えるものであるから、外科医が TCD モニタリングの所見に基づいて適当な処置をとることにより、周術期の脳卒中発生率は減らすことができると結論づけている。

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