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Avicenne Military Hospital, Marrakech, Morocco

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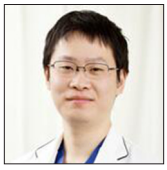
Case Report

A case of brain abscess successfully treated with continuous irrigation therapy

Takuma Takano[1], Nakao Ota[2], Tomomasa Kondo[3], Tetsuya Kusunoki[2], Soichiro Yasuda[2], Keita Toh[2], Yasuaki Okada[2], Hiroyuki Mizuno[2], Tomoya Yokoyama[2], Kohei Yoshikawa[2], Kosumo Noda[2], Sadahisa Tokuda[2], Rokuya Tanikawa[2]

[1]Department of Neurosurgery, Sapporo Higashi Tokushukai Hospital, Sapporo, [2]Department of Neurosurgery, Sapporo Teishinkai Hospital, Sapporo, [3]Department of Neurosurgery, Shonantobu General Hospital, Chigasaki, Kanagawa, Japan.

E-mail: *Takuma Takano - kyokui130088@gmail.com; Nakao Ota - nakao1980@gmail.com; Tomomasa Kondo - tomomasa.kondo@gmail.com; Tetsuya Kusunoki - kusunoki.tohoku@gmail.com; Soichiro Yasuda - y.soichi523@gmail.com; Keita Toh - milano_sand_access@icloud.com; Yasuaki Okada - yasu.vio04nagata@gmail.com; Hiroyuki Mizuno - m09201080@gunma-u.ac.jp; Tomoya Yokoyama - ytomoya341@gmail.com; Kohei Yoshikawa - ko.yoshi.2205@gmail.com; Kosumo Noda - kosumo119@gmail.com; Sadahisa Tokuda - s_tokuda@teishinkai.jp; Rokuya Tanikawa - superbypass@gmail.com



***Corresponding author:**
Takuma Takano,
Department of Neurosurgery,
Sapporo Higashi Tokushukai
Hospital, Sapporo, Japan.

kyokui130088@gmail.com

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ABSTRACT

Background: Some reports are suggesting the efficacy of continuous irrigation therapy for brain abscesses, but the way how to irrigate and perfusion abscesses and cerebral spinal fluid has not yet been established. Here, we present the case of successfully treated by continuous irrigation therapy for the severe bacterial brain abscess, meningitis, and encephalitis.

Case Description: A 62-year-old man presented to our hospital with a chief complaint of headache and vomiting. Magnetic resonance imaging revealed an encapsulated lesion with peripheral contrast in the left cerebellar hemisphere, and the lesion showed high signal intensity on diffusion-weighted imaging. We diagnosed him with a brain abscess. In addition to drainage of the cerebellar lesion by small craniotomy and systemic administration of antibiotics, continuous irrigation therapy was performed for 7 days until the cell count of the cerebrospinal fluid became negative. Saline with antibiotics was infused through from ventricular drain, which was inserted through the anterior horn of the lateral ventricle to spiral drainage. His state of consciousness improved, and he was able to live at home.

Conclusion: Our proposed novel continuous irrigation therapy may lead to a positive outcome in brain abscesses.

Keywords: Brain abscess, Continuous irrigation therapy, Infection

INTRODUCTION

Brain abscess has a poor prognosis, with mortality rates still reaching 10%.[1] The basic treatment for brain abscess is surgical drainage and administration of antibiotics,[5] while some reports suggest the usefulness of continuous irrigation therapy.[2,4,7] However, techniques for continuous irrigation therapy have not been established. Here, we report a case of brain abscess successfully treated with a novel method of continuous irrigation therapy.

CASE REPORT

A 62-year-old male presented to our hospital due to the onset of vomiting in addition to the headache that had persisted for the past 3 months. He had a history of dental decay. On

admission, the Glasgow coma scale (GCS) was 8 (E1V2M5), his temperature was 39.7°C, and he had a stiff neck. Magnetic resonance imaging revealed an encapsulated lesion with peripheral contrast in the left cerebellar hemisphere. The lesion was 4.5 cm in diameter and showed high-signal intensity on diffusion-weighted imaging (DWI) [Figure 1]. The cerebrospinal fluid (CSF) cell count was 1003/μL, glucose was 0 mg/dL, and protein was 562 mg/dL. We diagnosed him with a bacterial brain abscess and meningitis. There was no evidence that he was immunocompromised, and his hepatitis B surface (HBS) antigen and syphilis treponema pallidum (TP) antibodies were negative. The cause of the abscess was seen by dental decay. Hence, after the completion of the neurosurgical procedure, we performed caries extraction, and oral care was continued during the hospitalization.

At first, surgical drainage of the abscess was performed by the small craniotomy for the cerebellar lesion [Figures 2a and b]. In addition, due to the poor prognosis predicted, we decided to initiate continuous irrigation therapy. Previously reported continuous irrigation therapy involves irrigation between the bilateral lateral ventricles.[2,4,7] However, considering the location of the abscess, it was thought that the previously reported technique would not provide adequate irrigation, so a new technique was devised. A ventricular drain was inserted into the lateral ventricle through the left anterior horn puncture, and a spinal drain was inserted at the L3–L4 intervertebral space [Figure 2c]. Continuous irrigation therapy was initiated, in which saline with gentamicin (10 mg gentamicin in 500 mL [0.9%] NaCl) was drained from the ventricle through the cerebral cistern and out the spinal drain [Figure 3]. We opened the ventricular drain every hour to check pressure. The height of the spinal drain was adjusted so that the drainage volume from the drain was 20 mL/h, the same as the infusion volume from the ventricular drain. Meropenem (6 g/day), vancomycin (2 g/day), and rifampicin (450 mg/day) were also administered intravenously. Classically, CSF is thought to be produced in the choroid plexus within the lateral ventricles, flows into the subarachnoid space through the fourth ventricle, and is absorbed from the arachnoid villi.[3] Therefore, our novel continuous irrigation therapy was expected to drain the abscess along the physiological CSF flow. All culture tests, including CSF and abscess contents, were negative.

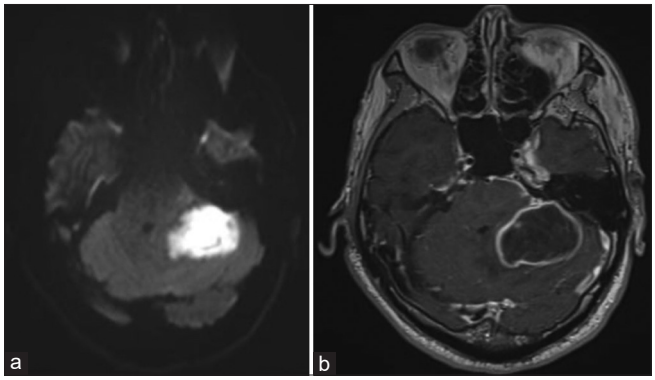

Figure 1: Preoperative imaging findings. (a) Diffusion-weighted imaging (DWI) showed a high-signal lesion 4.5 cm in diameter in the left cerebellar hemisphere. (b) Gadolinium-enhanced T1-weighted magnetic resonance imaging showed an encapsulated lesion with peripheral contrast.

The drain inserted into the abscess cavity was removed on the 4th day of hospitalization because it was no longer draining. On the 5th day of hospitalization, DWI revealed high-signal lesions around the brainstem and bilateral ventricular walls [Figures 4a-c]. However, with continued treatment, including continuous irrigation therapy, imaging findings began to improve on the 7th day of hospitalization [Figures 4d-i]. His blood and CSF test findings and fever gradually improved. Continuous irrigation therapy was performed until the cell count of the CSF became negative and was completed on the 9th day of hospitalization. Intravenous administration of antibiotics was completed on the 43rd day of hospitalization, based on blood leukocyte counts and body temperature. He was transferred to another hospital for continued rehabilitation on the 58th day of hospitalization. The GCS at that time was 14 (E4V4M6), and the modified Rankin scale (mRS) was 5. Seven months later, the mRS had recovered to 4, and he was able to live at home in a wheelchair.

DISCUSSION

This report presents a case of brain abscess successfully treated with continuous irrigation therapy. Although some reports are suggesting the usefulness of continuous irrigation therapy for brain abscesses,[2,4,7] the method has not been established, and we propose a novel method.

With advances in diagnostic imaging techniques and the establishment of a treatment regimen of surgical drainage and antibiotics, the mortality rate for brain abscess has improved from 40% to 10% over the past 40 years.[1] However, the prognosis for brain abscesses is still poor, and the predicted mortality rate of 60–100% for stupor or coma and 80–100% for rupture into the ventricles.[8] Therefore, other treatment options should be considered in those cases.

Continuous irrigation therapy is one treatment option for brain abscesses. In the previously reported continuous irrigation therapy, saline or artificial CSF with antibiotics was injected into the lateral ventricle and drained from the contralateral or ipsilateral lateral ventricles.[2,4,7] Moreover, the following criteria have been reported as guidelines for indication: CSF findings (cell count ≥200/μL, glucose

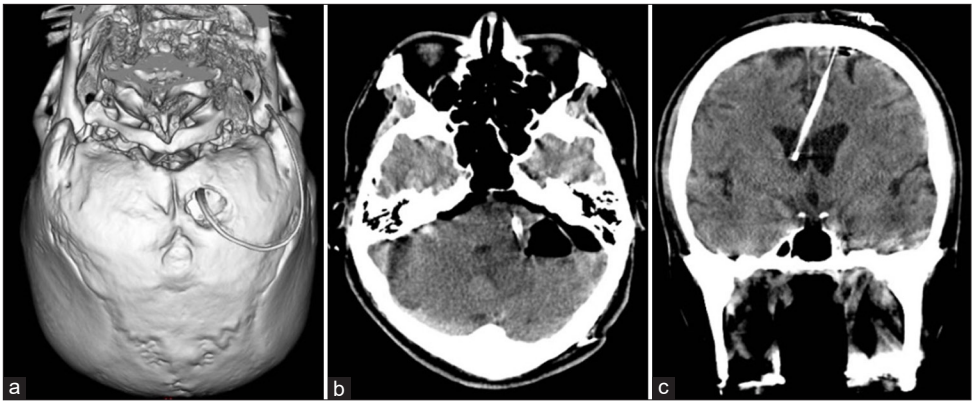

Figure 2: Postoperative computed tomography imaging findings. (a and b) A small craniotomy was performed to drain the cerebellar lesion. (c) A ventricular drain was inserted.

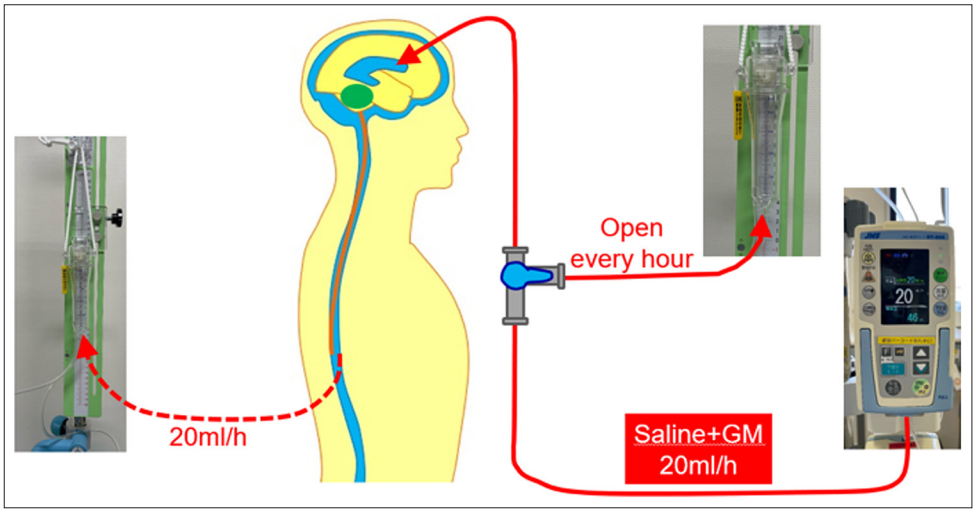

Figure 3: Overview of our continuous irrigation therapy. Saline with gentamicin was drained from the ventricle through the cerebral cistern and out the spinal drain. We opened the ventricular drain every hour to check pressure. GM: Gentamicin.

≤30 mg/dL, and protein ≥200 mg/dL), cases that do not respond to systemic administration of antibiotics, and severe intracranial hypertension.[6] However, even if these conditions are met, conventional continuous irrigation therapy may not be sufficient to achieve a therapeutic effect, given the location of the abscess, as in this case.

Classically, CSF is thought to be produced in the choroid plexus within the lateral ventricles, flows into the subarachnoid space through the fourth ventricle, and is absorbed from the arachnoid villi.[3] Our proposed novel continuous irrigation therapy involves irrigation of the ventricles to the cerebral cistern. Therefore, it may be more effective for brain abscesses in various sites compared to conventional methods. In fact, we were able to save this patient, who was expected to have a high mortality rate, using this method.

Our proposed novel continuous irrigation therapy has some possible complications. First, the continuous injection of fluid into the cerebrospinal cavity may increase cerebrospinal pressure. There is also a risk of subdural hematoma if too much fluid is drained from the spinal drain.[9] Thus, as we have shown in this report, periodic checks of fluid drainage and pressure are necessary. Second, artificial perfusion has the potential to spread infection and inflammation throughout the CSF. Therefore, a good indication for this continuous perfusion therapy is in cases where infection has already spread over a wide area within the central nervous system.

In this case report, we showed that our proposed novel continuous irrigation therapy may lead to a positive outcome in brain abscesses.

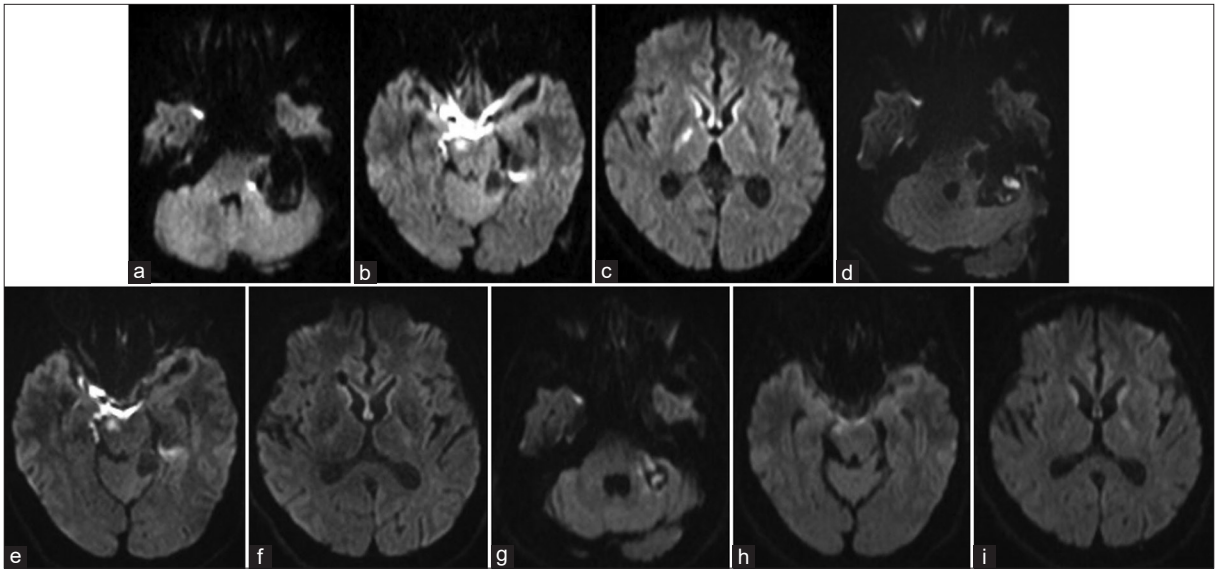

Figure 4: Time course of postoperative DWI. (a-c) DWI on the 5th day of hospitalization. High-signal lesions around the brainstem and bilateral ventricular walls were found. (d-f) DWI on the 7th day of hospitalization. High-signal lesions began to improve. (g-i) DWI on the 51th day of hospitalization. High-signal lesions almost disappeared. DWI: Diffusion-weighted imaging.

CONCLUSION

Continuous irrigation therapy, in which fluid is drained from the ventricles through the cerebral cistern and out the spinal drain, may be useful for brain abscesses.

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