Case Reports & Case Series (CRP)

Usefulness of fast imaging employing steady-state acquisition magnetic resonance images for appropriate fenestration in a recurrent convexity arachnoid cyst

Motomasa Furuse, MD, PhD *, Ryo Hiramatsu, MD, PhD, Naokado Ikeda, MD, PhD, Yoji Tamura, MD, PhD, Toshikiko Kuroiwa, MD, PhD

Department of Neurosurgery, Osaka Medical College

Abstract

It is difficult for convexity arachnoid cysts to determine where the cyst should be fenestrated because there is no large cistern around the cyst. We successfully fenestrated a recurrent convexity arachnoid cyst during a second surgery because of the information provided by preoperative fast imaging employing steady-state acquisition (FIESTA) magnetic resonance (MR) imaging. A 19-year-old woman experienced a progressive headache and was diagnosed with an arachnoid cyst in the right temporal lobe, for which she underwent membranectomy. However, the cyst was gradually enlarging for 2 years after the first surgery and the patient’s headache recurred. FIESTA MR images revealed the membrane between the cyst and the distal sylvian fissure. This membrane was dissected and resected to connect to the cistern in the second surgery.

Introduction

In cases of basal arachnoid cysts, endoscopic surgery is less invasive and is suitable for fenestrating the cyst wall. However, for convexity arachnoid cysts, it is difficult to determine where the cyst should be fenestrated because there is no large cistern around the cyst. Here we report the case of a patient with a convexity arachnoid cyst, who underwent membranectomy because the point where the cyst fenestrated to the cistern was not located in the initial surgery. After the cyst recurred, however, it was successfully fenestrated during a second surgery because of the information provided by preoperative fast imaging employing steady-state acquisition (FIESTA) magnetic resonance (MR) imaging. Some reports have demonstrated that FIESTA and constructive interference in steady-state, three-dimensional, Fourier transformation (CISS) MR images are useful for surgical fenestration of basal arachnoid cysts [1,2]. However, there no studies have reported that FIESTA MR imaging is also useful to plan a preoperative strategy for fenestration for convexity arachnoid cysts.

Case report

A 19-year-old woman had a severe, progressive headache and was referred to our institute. T2-weighted MR images showed an enlarged arachnoid cyst in the right temporal lobe (Fig. 1A). The patient underwent emergency craniotomy to treat intracranial hypertension, and additional MR images, including FIESTA, was not performed. The convexity of the membrane was resected microscopically rather than endoscopically, the cyst was decompressed, but it was not connected to any cistern, because a connection point was not anticipated. Immediate postoperative MR images showed cyst shrinkage (Fig. 1B). However, the cyst was gradually enlarging for 2 years after the first surgery and the patient’s headache recurred. FIESTA MR images (1.5 T; TR, 4.99 ms; TE, 1.46 ms; field of view, 200 mm; matrix, 256×416; flip angle, 45; thickness, 1.20 mm) clearly revealed the membrane between the cyst and the distal sylvian fissure (Fig. 2A). There was only one point connecting the cyst to the cistern, where the branch of the middle cerebral artery arose from the sylvian fissure. The second surgery was performed to fenestrate this membrane microsurgically. Neuroendoscopy was not used in either the first or second surgeries. The membrane around the artery which arose from the sylvian fissure was dissected and resected (Fig. 3A–C). Finally, the corridor for cerebrospinal fluid (CSF) was obtained (Fig. 3D). An Ommaya reservoir was placed to avoid emergent intracranial hypertension due to cyst aspiration just in case fenestration was not achieved. Immediate postoperative FIESTA MR images showed that the membrane was resected and the corridor between the distal...
Fig. 1. A: Preoperative MR image revealing a massive convexity arachnoid cyst in the temporal lobe. B: The cyst had shrunk after the first surgery (membranectomy). C: MR image taken 2 years after the second surgery showing that the cyst had almost disappeared.

Fig. 2. A: The cyst enlarged again, and FIESTA MR images showed the membrane between the cyst and the distal sylvian fissure (arrows) and the branch of the middle cerebral artery arising from the distal sylvian fissure through the cyst membrane (arrowheads). B: Postoperative MR images revealing the pore between the cyst and the distal Sylvian fissure (arrows) and the MCA branch arising through the pore to the cortical surface (arrowheads).
sylvian fissure and the cyst was spared (Fig. 2B). Follow-up MR images revealed that the cyst had almost disappeared 2 years after the second surgery (Fig. 1C), and the patient’s headaches did not recur. There was never the need to tap the Ommaya reservoir during this period.

Discussion

Fenestration is a theoretically ideal procedure and endoscopic fenestration has been increasingly used to treat basal arachnoid cysts because it is less invasive. A preoperative surgical plan to determine where the fenestration should be made is of utmost importance. CISS and FIESTA MR images are reported to be useful to describe the thin wall of arachnoid cysts [1,2]. The cyst wall of basal arachnoid cysts and surrounding normal structures can be visualised by these images. Yildiz et al. evaluated the communication between arachnoid cysts and the cisterns by computed tomography cisternography and phase-contrast Cine MR imaging [3]. In 5 convexity arachnoid cysts, communication with CSF was not seen using both modalities in all cases. In our case, however, FIESTA MR imaging clearly depicted the membrane around the branch of the MCA between the cyst and the distal sylvian fissure (circle). C: The membrane was dissected and resected, and the cyst was connected to the distal sylvian fissure.

Fig. 3. A, B: Intraoperative photographs showing the border between the cyst and the normal brain (dotted line) and preoperative FIESTA MR images revealed the membrane around the branch of the MCA between the cyst and the distal sylvian fissure (circle). C: The membrane was dissected and resected, and the cyst was connected to the distal sylvian fissure.

It seems that the cyst did not communicate with the cistern but to the subdural space. In another recent case series with 15 patients with intracranial arachnoid cysts treated using endoscopic fenestration, 9 cysts were stable in size after treatment and only 4 cysts decreased in size [7]. Cysts that are incompletely removed could recur in future. Regardless of craniotomy or endoscopic procedures, therefore, we emphasize that unplanned procedures may lead to surgical complications including subdural collection and cyst recurrence. Preoperative FIESTA MR imaging is very useful even for managing convexity arachnoid cysts. A preoperative surgical plan should be made based on FIESTA MRI and the optimal fenestration point closest to the nearest cistern should be located based on MRI before surgery. We are not attempting to compare microsurgery and endoscopic surgery, but we wish to point out that, if endoscopy provides better access to the fenestration point than microsurgery, endoscopy should be used. Conversely, if the fenestration point is accessible under microscopy, then microscopy should be used to fenestrate the cyst.

References