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Neuroendoscopic fenestration of the septum pellucidum for monoventricular hydrocephalus

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ABSTRACT

Objectives: Monoventricular hydrocephalus (MH) is a rare condition in which the site of obstruction is located around one of the interventricular foramen. In this paper, the authors offer their experiences in the neuroendoscopic management of this uncommon type of hydrocephalus.
Patients and methods: The authors retrospectively reviewed 12 neuroendoscopic procedures performed between July 2003 and June 2011 with MH. Clinical and radiological charts were reviewed and analysed.
Results: The operative course is a simple and successful procedure, and the postoperative complaints are mild. The postoperative radiological findings showed maintenance of ventricular enlargement in four cases and a significant decrease in enlargement in eight patients. However, upon shifting of the septum pellucidum, the periventricular transudation disappeared in all patients.
Conclusions: Fenestration of the septum pellucidum by neuroendoscope is the best treatment for patients with monoventricular hydrocephalus. The approach for fenestration of the septum pellucidum is based on the experience of the neurosurgeon and the preoperative planning.

1. Introduction

Monoventricular hydrocephalus (MH), or unilateral hydrocephalus, is a special obstructive hydrocephalus in which the site of obstruction is located around one of the interventricular foramen. The reports about monoventricular hydrocephalus are still rare since it was first described by Von Mohr [1] in 1842. This condition may present with increasing symptoms such as headaches, incontinence, seizures, mental status changes, hemiparesis, ataxia, visual field deficits, and papillary oedema for increasing intracranial pressure [1]. The clinical manifestations of this condition are commonly mild or slowly progressive, and the diagnosis is often delayed [2].

The two primary treatments of monoventricular hydrocephalus are cerebrospinal fluid (CSF) shunts or a neuroendoscopic approach [3–6]. Cerebrospinal fluid shunts are generally considered a simpler method, although high rates of complications and revisions have been reported, especially in infants [7,8]. The endoscopic fenestration of the occluded foramen of Monro or septum pellucidum is another treatment option with low morbidity that is used to elucidate a CSF pathway [9,10]. An open craniotomy for monoventricular hydrocephalus does not confer advantages when compared with the less invasive treatment methods, except in cases where the primary procedure necessitates tumour removal [11]. To date, neuroendoscopic management is considered the "gold-standard" in treatment for obstructive hydrocephalus [12].

This article reports our experience with twelve patients with monoventricular hydrocephalus treated by neuroendoscopic fenestration from the enlarged ventricle to the contralateral compressed ventricle and discusses the advantages and results of this technique.

2. Patients and methods

Twelve patients with monoventricular hydrocephalus were treated by neuroendoscopic techniques between July 2003 and June 2011 in our neurosurgical department. All twelve patients (seven females and five males, mean age 12.8 years, range 3–25 years) had radiologic evaluation with magnetic resonance imaging (MRI). The enlargement of one lateral ventricle confirmed the diagnosis of MH (Fig. 1A and B). Headaches were the most common clinical presentation (all patients) followed by vertigo (four patients) and papillary oedema (three patients). The average time from the initial clinical manifestations to diagnosis was 4.5 months (range 1–8 months) (Table 1).

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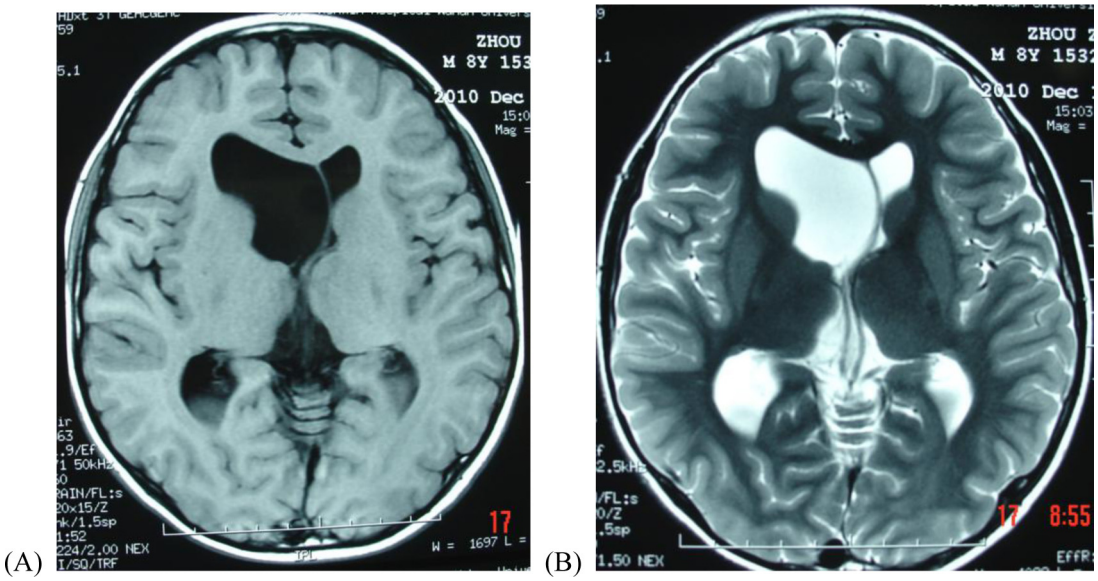

Fig. 1. Preoperative axial T1-weighted and T2-weighted MR imaging sequences (A and B) show enlargement of right lateral ventricles accompanied by contralateral displacement of the septum pellucidum.

All patients underwent neuroendoscopic surgery. The operation was carried out with the patient in a supine position with the head slightly elevated at approximately 30°. The burr-hole point was determined at the standard point (1 cm anterior to the coronal suture and 3 cm lateral to the midline) on the side of the ventricular enlargement. After opening the dura and inserting a rigid 4-mm rod, a neuroendoscope (Karl Storz, Germany) was introduced into the frontal horn of the lateral ventricle. The foramen of Monro in the lateral ventricle was identified by the anatomical location of the thalamostriate vein and choroid plexus. After careful initial examination, the electrode was advanced up to the septum pellucidum and monopolar coagulation was performed. By gently moving the endoscope, a window was created (Fig. 2A–D).

Postoperative follow-up was accomplished with MRI and clinical evaluation. All patients signed an informed consent for this study.

3. Results

The operative course was simple and successful, and bleeding was usually very minimal and ceased upon irrigation during the fenestration. All patients were observed for congenital stenosis of the foramen of Monro under the neuroendoscopy.

Mild headaches, vomiting and vertigo during the first 48 h after surgery were the main postoperative complaints. The headache and vomiting were completely resolved within 5 days in all cases. During the follow-up period (22 months, range 3–96 months) no patient presented any clinical recurrence and no severe complications were observed.

Postoperative radiological findings showed maintenance of the ventricular enlargement in four cases and a significant decrease in ventricular enlargement in eight patients. However, shifting of the septum pellucidum and any periventricular transudation disappeared in all patients six months after the surgery (Fig. 3A and B).

4. Discussion

The interventricular foramen is the site of blockage in normal cerebrospinal fluid pathways in all cases of monoventricular hydrocephalus. The interventricular foramen is also known as the foramen of Monro from the first description by Alexander Monro in 1783 and 1797 [13,14]. However, many authors think that the term foramen of Monro was a misnomer and should be replaced by the term interventricular foramen because Monro misinterpreted the nature of communication between the third and lateral ventricles [13,14].

When a single interventricular foramen becomes obstructed, it causes enlargement of the lateral ventricle due to blockage of the flow of CSF. This enlargement then leads to monoventricular

Table 1
Data on 12 cases of monoventricular hydrocephalus treated by neuroendoscopic surgery.

Case No.	Age/sex	Clinical presentation	Ventriculomegaly	Time (months)
1	7Y/M	Headache	Left side	1
2	4Y/F	Headache, papilloedema	Left side	3
3	11Y/F	Headache, vertigo	Right side	6
4	10Y/F	Headache, vertigo, papilloedema	Right side	8
5	16Y/M	Headache	Right side	7
6	12Y/F	Headache	Left side	6
7	25Y/M	Headache, vertigo	Right side	2
8	18Y/F	Headache	Right side	2
9	3Y/M	Headache	Right side	8
10	13Y/F	Headache, vertigo, papilloedema	Left side	2
11	20Y/M	Headache	Left side	5
12	14Y/F	Headache	Right side	4

Y, years old; M, male; F, female; Time, time from first symptoms to diagnosis.