

Multiloculated hydrocephalus in an adult: Role of MRI FIESTA sequence in diagnosis and management

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This is a case of an adult patient with hypertensive intraventricular haemorrhages complicated by hydrocephalus that failed to respond to endoscopic third ventriculostomy (ETV). High-resolution 3D Fast Imaging Employing Steady State Acquisition (FIESTA) magnetic resonance imaging (MRI) revealed underlying multiloculated hydrocephalus. This case report highlights the appropriate sequence and its attributes that offer adequate preoperative information detailing the ventricular system.

CASE REPORT

A 46 years old lady with poorly controlled hypertension presented to the emergency department for sudden onset of headache, giddiness and vomiting. Computed tomography revealed acute intraventricular haemorrhages with acute hydrocephalus (Figure 1). She was immediately referred to neurosurgical team for external ventricular drainage (EVD). She had prolonged hospitalisation due to coagulase negative staphylococcus (methicillin resistant) ventriculitis that was diagnosed by cerebral spinal fluid (CSF) aspiration. Ventriculitis responded to treatment with vancomycin but required several revisions of the external ventricular drain (Figure 2). Image guided endoscopy performed found an obliterated foramen Monroe with multiple adhesions in the 3rd ventricle and the



Figure 1. Axial plain CT brain at the level of lateral ventricle showing acute bleeds in the lateral ventricle (black arrow) and third ventricle (thin arrow) with acute hydrocephalus.

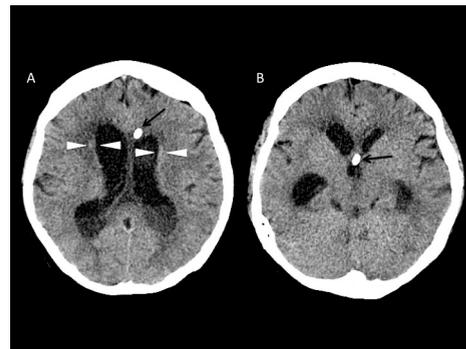


Figure 2. Axial CT Brain depicts hydrocephalus with the presence of external ventricular drain (black arrows). (A) shows the presence of fluid-fluid levels within the posterior horns of both lateral ventricles with thickening of the ventricular walls (arrowheads) in keeping with ventriculitis. The tip of the drain is within the 3rd ventricle in (B).

pre-pontine cistern. Foramenoplasty of foramen Monroe and an endoscopic third ventriculostomy were done. Post procedure, the opposite ventricle was dilated and when the EVD was clamped she developed symptoms of obstructed hydrocephalus (Figure 3). This suggested that ETV was not successful in resolving the hydrocephalus. She further underwent endoscopic septo-pellucidotomy and a medium pressure ventriculoperitoneal shunt was inserted. Post-shunting her symptoms resolved. She was discharged home with assistance for activities of daily living and wheel chair for mobility. A 3T MRI (GE Medical System, Milwaukee, WI) was performed. T2 weighted images revealed irregular

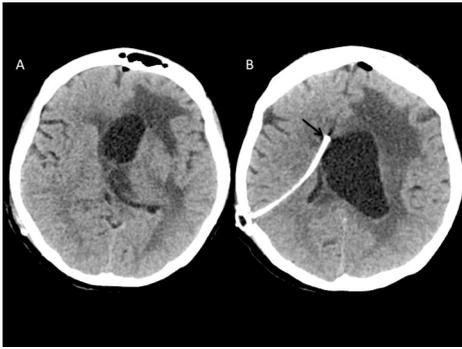


Figure 3. Axial CT Brain demonstrates isolated dilatation of the left lateral ventricle with acute seepage of CSF. VP shunt is visualised in (B) with its tip in the anterior horn of the right lateral ventricle which is not dilated.

contour of the lateral ventricles (Figure 4a) and multiloculated cystic lesion in the peri-thalamic region (Figure 4b). 3D FIESTA images were performed in the sagittal plane with the following parameters: TR=3.8 ms, TE=1.8 ms, number of excitations=1, acquisition time=5.54 minutes, Flip angle=40°, FOV=240×240 mm, slice thickness = 1.0 mm, matrix =256×256, bandwidth = 83.3kHz/pixels and NEX =2. The FIESTA images revealed multiple linear intraventricular septations within the 3rd ventricle, aqueduct of Sylvius, pre-pontine region and basal cisterns (Figure 5). These septations represent adhesions due to late complication of intraventricular haemorrhages and the contributing factor to the failure of endoscopic

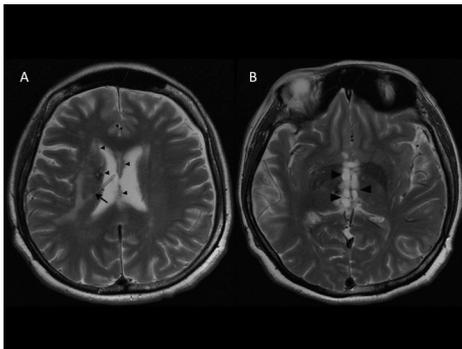


Figure 4. Axial MRI brain on T2-weighted image (A) at the level of the lateral ventricles showing mild enlargement of the lateral ventricles with irregular borders (black arrowheads). The tip of ventriculoperitoneal shunt (black arrow) was seen within the body of the right lateral ventricle. (B) demonstrates T2 weighted Axial MRI brain at the level of the third ventricle with multiloculations at the peri-thalamic region (black arrowheads).

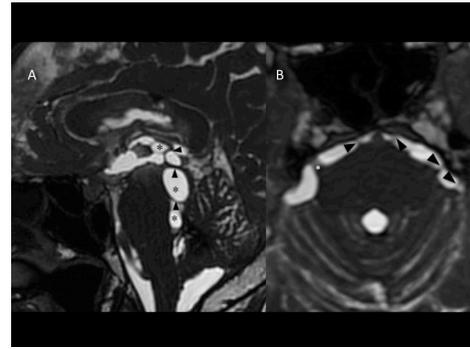


Figure 5. (A) Mid sagittal MRI of brain obtained via FIESTA sequence with multiloculated appearance of the third and fourth ventricles (black asterisks) with irregular border and multiple internal septa (black arrowheads) within. (B) Axial reconstruction at the pre-pontine region depicting multiple septations. (white asterisk denotes the right trigeminal nerve).

third ventriculostomy. The endoscopic septo-pellucidotomy and medium pressure VP shunt resolved the acute hydrocephalus. Patient is now asymptomatic.

DISCUSSION

This is a case of multiloculated hydrocephalus that had occurred in an adult patient secondary to intraventricular haemorrhages and ventricular infection. The definitive treatment is surgical, yet the treatment remains controversial. In this case, the patient had obstructive triventricular hydrocephalus in which third ventriculostomy was the preferred procedure to placement of extracranial CSF shunts.¹ The success rate of endoscopic third ventriculostomy (ETV) has been reported to be fairly high with patients with obstructive hydrocephalus with a history of either haemorrhage or infection.² To assist in the decision making process, detailed knowledge of intraventricular and foraminal anatomy ably provided by FIESTA/ Constructive Interface in Steady State (CISS) images have become very crucial.

The conventional MRI T1-weighted and T2-weighted sequences generally used for diagnosis and classification of hydrocephalus has its limitation due to poor spatial resolution, poor contrast-to-noise ratio between the cisterns and neighbouring structures and CSF flow effects when investigating the CSF pathway.³

FIESTA sequence is designed to generate a strongly T2/T1-weighted image by combination of

two true-fast imaging with steady-state precession sequences of different radio-frequency pulses.³ This sequence accentuates T2 values between CSF and adjacent structures, as well as improving the resolution with submillimeter slices.³ Another benefit is the reduction of intrinsic signal loss from CSF pulsatile flow by acquiring Free Induction with Steady-state Precession (FISP) with flow compensation over each TR cycle instead of each TE cycle.³ This sequence offers high CSF and brain tissue contrast as well as extremely high spatial resolution. This sequence is developed specifically for GE MR scanners, whereas other manufacturers have its analogues, which also may be used for the same purpose. Particularly CISS provided by SIEMENS is also very effective for visualization of the CSF-filled spaces.^{4,5} As a result, it is possible to demonstrate the thin membranous structures or septa at various parts of the ventricles (as in this case, Figure 4).

In conclusion, MRI FIESTA sequence, hold a pivotal role in the treatment plan of complex hydrocephalus. In our case, MRI FIESTA findings of multiple adhesions in the ventricular system as well as in the cisterns suggest that the success rate of ETV procedure would be low.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the support for this case study and article preparation from University of Malaya Research Grant [RP 008/13 HTM].

DISCLOSURE

Conflict of interest: None.

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