IDIOPATHIC UNILATERAL FORAMEN OF MONRO STENOSIS: NEUROIMAGING FINDINGS IN THREE PATIENTS

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ABSTRACT

INTRODUCTION

Blockage of normal cerebrospinal fluid (CSF) pathways causing obstructive hydrocephalus is often a life threatening condition. If the site of obstruction is located around one of the foramen of Monro, an enlargement of one lateral ventricle will occur with or without periventricular CSF seepage depending upon the cause and this condition is called as unilateral hydrocephalus. Idiopathic unilateral foramen of Monro stenosis an uncommon cause of unilateral hydrocephalus without nearby secondary cause around the foramen of Monro. The clinical manifestations are mild or slowly progressive which often delayed the diagnosis of this entity.

So early imaging diagnosis of foramen of Monro stenosis is important for early surgical planning and neuroendoscopic approach for a successful treatment.

KEYWORDS

Foramen of Monro, 3D CISS (Constructive Interference in Steady State), Magnetic Resonance Imaging (MRI), Neuroendoscopy, Computed Tomography (CT).

HOW TO CITE THIS ARTICLE: Boruah DK, Arora M, Prakash A, et al. Idiopathic unilateral foramen of Monro stenosis: Neuroimaging findings in three patients. J. Evid. Based Med. Healthc. 2016; 3(34), 1673-1675. DOI: 10.18410/jebmh/2016/374

INTRODUCTION: Obstruction of unilateral foramen of Monro may cause unilateral hydrocephalus.[1,2] Idiopathic primary foramen of Monro stenosis or membranous occlusion is uncommon. Secondary causes of obstruction at Foramen of Monro may be due to wide range of causes including acute or chronic inflammatory conditions,[3] subependymal gliosis,[4] arteriovenous malformations,[2] intraventricular cysticercosis, post shunting and over drainage of lateral ventricle.[1]

We are reporting neuroimaging appearances in 3 patients of idiopathic unilateral foramen of Monro stenosis. These three patients underwent neuroendoscopic management with fenestration of the primarily obstructed foramen of Monro and two patients also underwent fenestration of the septum. Secondary displacement of septum pellucidum in unilateral foramen of Monro stenosis causes occlusion of the contralateral foramen of Monro, hence pre-surgical evaluation unilateral foramen of Monro stenosis will be useful in guiding the most suitable neurosurgical approach in this uncommon condition.

Financial or Other, Competing Interest: None.
Submission 01-04-2016, Peer Review 18-04-2016,
Acceptance 25-04-2016, Published 28-04-2016.
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DOI: 10.18410/jebmh/2016/374

CASE REPORTS:

Case 1: A 35-year-old male patient presented with headache and seizures for 4 years duration. No history of fever. MRI scan was done in Siemens Avanto 1.5 Tesla machine (Siemens Medical Systems, Erlangen, Germany). Axial T2 (image A), 3D CISS (image B) and Coronal FLAIR (image C) showed asymmetrical unilateral dilatation of left lateral ventricle without periventricular CSF seepage with normal appearance of 3rd ventricle. Short segmental narrowing was noted in left foramen of Monro (Yellow arrow in images B). Coronal 3D CISS images (D and E) showed normal-appearing right foramen of Monro (white arrow in image D) and stenosed left foramen of Monro (Red arrow in image E) Normal appearance of 3rd and 4th ventricles were noted. No abnormal enhancing lesion was noted in and around stenosed left foramen of Monro in post-gadolinium T1 weighted images. Unilateral left-sided foramen of Monro stenosis was made. The patient underwent neurosurgical management with endoscopic septostomy and left-sided foraminoplasty.

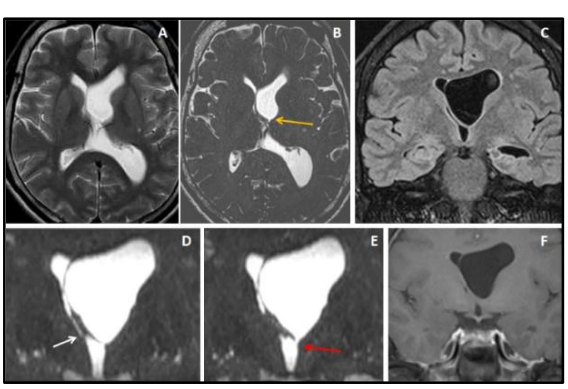

Fig. 1

A 35-year-old male patient presented with headache and seizures. Axial T2 (image A), 3D CISS (image B) and Coronal FLAIR (image C) showed asymmetrical unilateral dilatation of left lateral ventricle without periventricular CSF seepage with normal appearance of 3rd ventricle. Short segmental narrowing was noted in left foramen of Monro (Yellow arrow in images B). Coronal 3D CISS images (D and E) showed normal appearing right foramen of Monro (white arrow in image D) and stenosed left foramen of Monro (Red arrow in image E). No abnormal enhancing lesion was noted in and around stenosed left foramen of Monro in post-gadolinium T1 weighted images (image F).

Case 2: A 13-year-old male patient had gradually increasing weakness of left upper limb from childhood. Initial plain CT scan of brain [image A] was done in day 10 of childhood showed asymmetrical dilatation of right lateral ventricle with more dilatation of temporal horn and body. Smooth narrowing was noted in right foramen of Monro. No periventricular CSF seepage is noted. No periventricular calcification was noted. Paucity of deep periventricular white matters were noted over asymmetrically dilated right lateral ventricle. Followup plain CT scan done at 13 years of age showed remarkably dilated right lateral ventricle and stenosed right foramen of Monro [image B, C, D, E&F]. Yellow arrow in image E showed stenosed right foramen of Monro. The dilated right lateral ventricle exerts extrinsic pressure effect over septum pellucidum. Right-sided foramen of stenosis was made and patient underwent neuroendoscopic foraminoplasty.

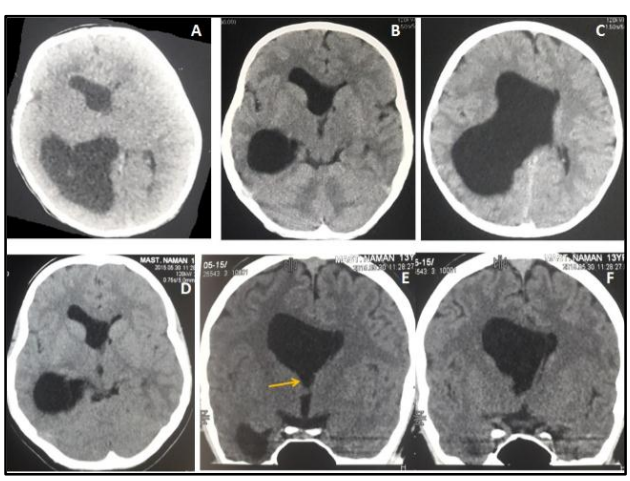

Fig. 2

Initial plain CT scan of brain done in day 10 of childhood showed asymmetrical dilatation of right lateral ventricle with more dilatation of temporal horn and body with smooth narrowing in right foramen of Monro. No periventricular CSF seepage or periventricular calcification was noted [image A]. Followup plain CT scan [image B, C, D, E, F] was done at 13 years of child age which showed more remarkably dilated right lateral ventricle and stenosed right foramen of Monro (yellow arrow in image D).

Case 3: A 10-year-old male patient presented with headache and vomiting for 3 days. No history of fever was there. No focal neurological deficiency was noted. Computed Tomography (CT) scan was done in 64 slice MDCT scanner (Aquilion 64, Toshiba Medical Systems Corporation). It revealed diffuse asymmetrical dilatation of left lateral ventricle with markedly dilated frontal horn and body of left lateral ventricle. Smooth narrowing was noted in left foramen of Monro (red arrow in image D). Minimal periventricular CSF seepage was noted around the dilated left lateral ventricle. On post-contrast scan, no abnormally enhancing soft tissue lesion or leptomeningeal enhancement was noted in and around the left foramen of Monro. No abnormally enhancing lesion was noted in left choroid plexus. The dilated left lateral ventricle exerts extrinsic pressure effect over right lateral ventricle and displaces septum pellucidum towards right side. Idiopathic unilateral foramen of Monro stenosis was made, then patient underwent left-sided septoplasty and foraminoplasty. Followup postoperative CT scan after 7 days shows significant regression of periventricular CSF seepage around the dilated left lateral ventricle.

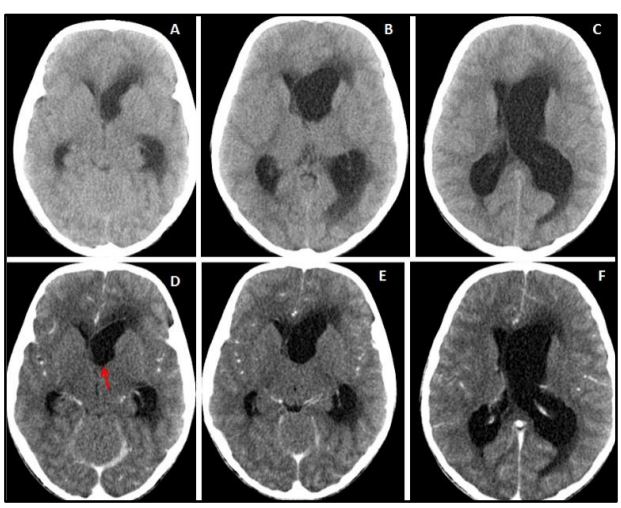

Fig. 3

10 years male presented with headache and vomiting. CT scan showed diffuse asymmetrical dilatation of left lateral ventricle with remarkable dilatation of frontal horn and body of lateral ventricle. Smooth narrowing was noted in left foramen of Monro. CT hypodense minimal periventricular CSF seepage noted around the dilated left lateral ventricle. No abnormally enhancing soft tissue lesion or leptomeningeal enhancement was noted in and around the left foramen of Monro in contrast enhanced CT scan images (D, E & F).

DISCUSSION: Hydrocephalus is one of the most common clinical situations that lead to neurosurgical intervention.[5,6] Otherwise, unilateral hydrocephalus is rarely reported. Unilateral hydrocephalus is asymmetrical dilatation of one lateral ventricle which caused by obstruction at foramen of Monro. Unilateral lateral ventricular enlargement caused by asymmetrical cerebral atrophy can be easily differentiated from unilateral hydrocephalus.

Idiopathic unilateral foramen of Monro stenosis is an uncommon cause of unilateral hydrocephalus. Two forms of

idiopathic foramen of Monro stenosis have been reported. First with an absent or stenosed foramen of Monro. Second where a membrane occludes a normal sized foramen of Monro. Both congenital and adult presentations are reported. The ideal treatment of idiopathic foramen of Monro stenosis includes ventricular shunting or neuroendoscopic surgery for foramen of Monro stenosis.[7,8] Most of the patients are asymptomatic. But some patients may have had headache, visual disturbances, nausea, vomiting and seizures. Contralateral limb weakness is an uncommon presentation.[9]

Neuroimaging plays important rule in early diagnosis and followup cases of unilateral obstructed hydrocephalus. Cranial ultrasound can be helpful in neonates. However, cross-sectional imaging like computed tomography and magnetic resonance imaging can correctly detect the foramen of Monro stenosis and also exclude secondary causes of unilateral dilatation of lateral ventricle like obstructive cyst, tumour, vascular lesion, or meningeal lesion.[1]

Oi's proposed classification[10] of unilateral hydrocephalus in four different categories according to the appearance of the foramen of Monro; (1) atresia; (2) morphological obstruction; (3) functional obstruction; and (4) patent foramen.

As a differential diagnosis of unilateral obstructed hydrocephalus, trapped lateral ventricle is considered. Trapped lateral ventricle occurs in choroid plexitis or choroid plexus tuberculoma. Trapped lateral ventricle can simulate unilateral obstruct hydrocephalus in foramen of Monro stenosis. However, in acute trapped lateral ventricle had significant periventricular CSF seepage with more dilatation of temporal horn of lateral ventricle.

The cine-phase contrast MR CSF flow study is usually performed in the sagittal plane to displays the major CSF pathways in continuity. Cine-MRI CSF flowmetry had important role in unilateral hydrocephalus. MRI CSF flowmetry displays the CSF flow dynamics and velocity.[11] In patient with unilateral hydrocephalus, especially in children cine-MR CSF flowmetry allows the determination of whether the probable site CSF flow obstruction is foramen of Monro, aqueduct of Sylvius or fourth ventricular outlet foraminae and which holds great promise for improved diagnosis even in cases of idiopathic foramen of Monro stenosis.

The application of cine-MRI CSF flow technique also had important role in followup of patients after neuro-endoscopic procedures like fenestration, foraminoplasty, septostomy or ventriculostomy[12] for efficacy of these procedures.

Neuroendoscopic management is the gold standard for treating unilateral obstructed hydrocephalus. Procedures like endoscopic fenestration, foraminoplasty and septostomy can be done for treating idiopathic unilateral obstructed hydrocephalus.[13,14]

CONCLUSION: Unilateral lateral ventricular dilatation and slit or normal looking 3rd ventricle in the absence of focal mass lesion or abnormal post-contrast enhancement at or around the foramen of Monro should raise a radiological suspicion for this uncommon neurosurgically treatable entity.

Successful treatment in this entity can be accomplished through a neuroendoscopic approach and avoiding the use of ventricular shunts.

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