Case Report

Post meningitis subdural hygroma: Anatomical and functional evaluation with ^{99m}Tc-ehylene cysteine dimer single photon emission tomography/computed tomography

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ABSTRACT

Subdural hygroma is the collection of cerebrospinal fluid in the subdural space. Most often these resolve spontaneously. However, in cases with neurological complications surgical drainage may be needed. We here, present the case of an 8-year-old boy with post meningitis subdural hygroma. ^{99m}Tc-ehylene cysteine dimer (^{99m}Tc-ECD) hybrid single photon emission tomography/computed tomography (SPECT/CT) carried out in this patient, demonstrated the subdural hygroma as well as the associated cerebral hypoperfusion. If ^{99m}Tc-ECD SPECT/CT is integrated into management of these patients, it can help in decision making with respect to conservative versus surgical management.

Keywords: ^{99m}Tc-ehylene cysteine dimer, magnetic resonance imaging, single photon emission tomography/computed tomography, subdural hygroma

INTRODUCTION

Subdural hygroma is a subdural body of cerebrospinal fluid (CSF) collection, without blood. They can be caused by leakage of CSF following minor trauma in the setting of cerebral atrophy, following meningitis in children or more commonly after ventricular shunting.[1] Most of the subdural hygroma are small and clinically not significant. However, some of them can be large and cause compression and secondary neurological symptoms. Hence, it is important to detect the secondary effects of subdural hygroma on adjacent normal brain parenchyma early and intervene before it causes permanent damage. Brain perfusion single photon emission tomography (SPECT) can help in this regard.[2] We here present the case of a child with post meningitis subdural hygroma and highlight the role ^{99m}Tc-ehylene cysteine dimer (^{99m}Tc-ECD) hybrid SPECT/computed tomography (CT) can play in such a scenario.

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CASE REPORT

An 8-year-old boy presented to the neurology department. The parents complained that the child was becoming quieter. In addition, he was having difficulty in walking. This was associated with unsteady gait. There was no history of trauma. The child had a history of bacterial meningitis 2 year back for which he was treated and declared cured. Clinical examination was unremarkable except for reduced power (4/5) in both legs. CSF biochemistry, microscopy, and culture were within the normal limits. Magnetic resonance imaging (MRI) findings revealed bilateral frontal subdural CSF collections, suggestive of hygroma, more marked on the left side [Figure 1]. Similar collection was also noted in relation to the right cerebellum [Figure 1c and f]. As subdural hygroma are known to resolve spontaneously and there was no associated hydrocephalus, the clinician decided for a conservative medical management. Because of the parents concern the child was referred to Department of Nuclear Medicine for evaluation of cerebral perfusion. The child was injected 185 MBq (5 mCi) of ^{99m}Tc-ECD intravenously and rested in a quiet room. SPECT/CT of the brain was performed under oral sedation 30 min later. The SPECT/CT images confirmed the subdural hygroma [Figure 2a-c]. In addition, it also revealed hypoperfusion in bilateral frontal, parietal and temporal cortices [Figure 2d-i]. In contrast to the hygroma, hypoperfusion was more marked

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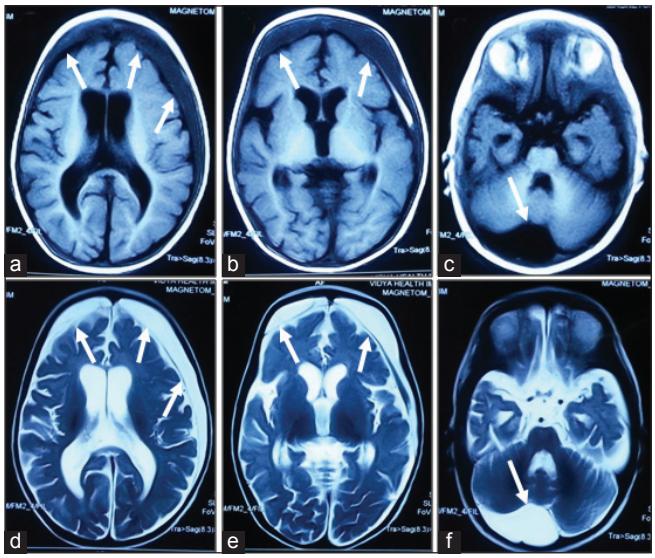

Figure 1: Transaxial magnetic resonance imaging of the brain. Trans-axial T1 weighted images (a, b) reveal hypointense subdural collection in bilateral fronto-parietal region (arrows), more marked on the left side. Furthermore, noted is the hypointense subdural collection over the right cerebellum (c, arrow). Transaxial T2W image shows hyperintense collections in the same corresponding areas (d-f, arrows). The ventricles are normal in size and there is no midline shift

on the right side. The occipital cortex and cerebellum showed preserved perfusion while the basal ganglia showed relative hyperperfusion. Based on the combination of SPECT/CT findings and clinical signs, the patient underwent drainage of the subdural hygroma with significant clinical improvement.

DISCUSSION

Subdural hygroma is subdural accumulation of CSF, most commonly seen following head trauma or decompressive craniotomy.[1,3] It has also been found to be associated with meningitis,[4] the cause in present patient, and intrathecal chemotherapy.[5] The factors contributing to the development of subdural hygroma are unknown, but there is probably an underlying disturbance of normal CSF absorption or an alteration of the dynamics of CSF circulation. Various theories have been proposed to outline the pathogenesis of subdural hygroma including, arachnoid rupture, arachnoid flap, blood-brain-barrier failure, and brain atrophy.[6] The general consensus is on that of due to arachnoid membrane rupture or arachnoid flap leading to CSF accumulation in the subdural space. This CSF is trapped and remains there because of flap valve mechanism.

Subdural hygroma can be seen on CT; however, the differentiation form subdural hematoma or cerebral atrophy is not always possible. Contrast enhanced MRI is useful for differentiating the two entities.[7] However, conventional MRI is not able to assess the impact of the subdural hygroma on underlying brain parenchyma. Functional imaging in the form of perfusion SPECT has been shown to be useful to assess these changes secondary to extracerebral fluid collection.[2] SPECT with ^{99m}Tc-

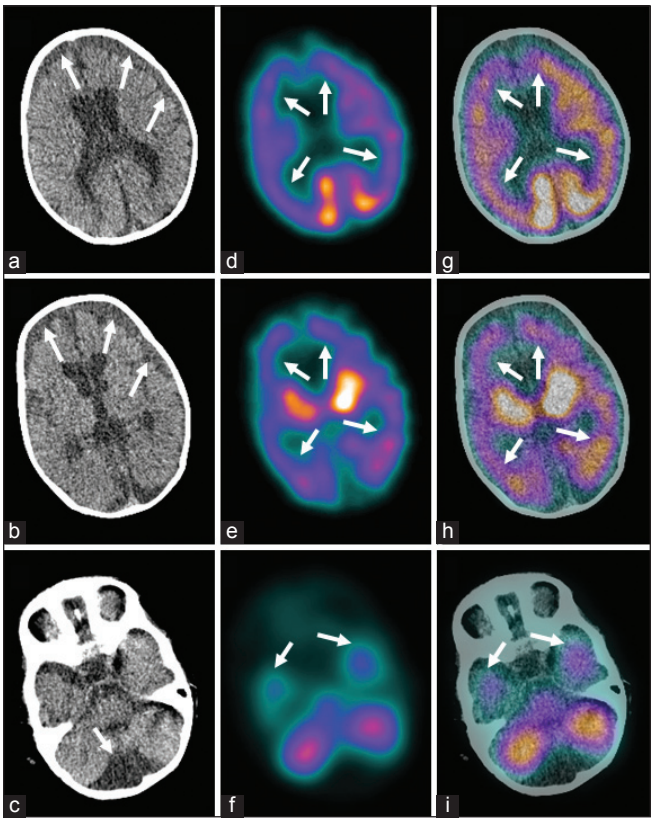

Figure 2: Transaxial ^{99m}Tc-ehylene cysteine dimer (^{99m}Tc-ECD) hybrid Single photon emission tomography/computed tomography (SPECT/CT) images. The non-contrast transaxial CT images (a-c) confirms the subdural hygroma (arrows) seen on MRI. Transaxial SPECT (d-f) and SPECT-CT (g-i) images demonstrates hypoperfusion involving bilateral frontal, parietal, and temporal cortices (arrows). Contrary to the subdural hygroma, the hypoperfusion is more marked on the right side. The occipital cortex and the cerebellum show preserved perfusion, while the basal ganglia demonstrate relative hyperperfusion, more marked on the left (e)

ECD is an established method for assessment of cerebral perfusion, especially for detection of early changes.[8] In the present patient, ^{99m}Tc-ECD brain perfusion SPECT showed hypoperfusion in bilateral frontal, parietal, and temporal cortices and provided the imaging correlate for patient symptoms. In addition, hybrid SPECT/CT can provide both structural and functional information in a single setting, as in the present case, thereby avoiding the need for a dedicated CT examination.

Most of the subdural hygroma resolve spontaneously and do not require surgical intervention.[9] However, a subset of patients who develop compression symptoms will require surgical intervention to avoid permanent neurological sequelae. The decision to perform surgical intervention is guided by clinical and imaging findings. Combined structural and functional imaging in the form of ^{99m}Tc-ECD brain SPECT/CT may be especially advantageous for guiding surgical therapy. Different surgical interventions have been described to evacuate chronic subdural collections. These include transfontanel percutaneous aspiration, subdural drains, placement of bur hole(s) with or without a subdural drain, and shunting.[10] While shunt placement typically provides good long-term success it has well-known early

and late complications. The minicraniotomy technique may be superior to the burr-hole method, especially in children and was employed in the present case.

The present report highlights the potential role of ^{99m}Tc-ECD brain perfusion SPECT/CT in a case of post meningitis subdural hygroma. Integration of ^{99m}Tc-ECD brain perfusion SPECT/CT in management of such patients can help in decision making with respect to conservative versus surgical management.

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