Subependymal nodular heterotopia: MRI findings
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Section: Neuroradiology
Area of Interest: Neuroradiology brain
Procedure: Diagnostic procedure
Imaging Technique: MR
Special Focus: Seizure disorders Case Type: Clinical Cases
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Patient: 16 years, female

Clinical History:
The patient, a 16-year-old girl, coming from the Pediatrics unit, suffered from seizures. The patient showed EEG abnormalities (focal spikes) localised in the right frontal lobe.

Imaging Findings:
MR imaging examination on 1.5 T system, coil dedicated, on the axial, coronal and sagittal planes, using SE T1W, FSE T2W, FLAIR T2W and SPGR 3D IR sequences, were performed. MRI showed a small area nodular isointense to the gray matter adjacent to the frontal horn of the right lateral ventricle.

Discussion:
Malformations of the human neocortex have been recognised for more than 100 years, and were considered to be extremely rare disorders that were seen exclusively in individuals with severe intellectual and neurologic disabilities [1]. Recent advances in neuroimaging have revealed that cortical malformations are much more common than were expected previously, and not uncommonly are found in children with developmental delay, cognitive deficit, and epilepsy. Gray matter heterotopia are aggregates of abnormally located neurons that result from an arrest of radial migration. Heterotopia have been associated with a wide variety of genetic, vascular, and environmental causes. The exact pathophysiologic process of the migration arrest has not been established. Gray matter heterotopia can be classified as subependymal, focal subcortical, and band heterotopia [2]. Subependymal heterotopia (SEH) can be subdivided genetically into X-linked and non-X-linked inheritance patterns. SEH had the MRI appearance of round to ovoid subependymal nodules, located just beneath and abutted the ependymal lining of the lateral ventricles and protruding slightly into its lumen resulting in an irregular ventricular outline. The number and size of heterotopia varied widely, from small nodules to a thick layer of coalescent nodules of gray matter lining the lateral ventricles. The nodules were isointense to the cortical gray matter on all MRI sequences. Malformations of cortical development are more common than was recognised in the era before MRI, as heterotopia on CT may be difficult to visualise. Heterotopia is the most frequently occurring anomaly affecting cortical development [3]. It is considered to be one of the most common congenital disorders in familial and early onset epilepsy. MRI classification of gray matter heterotopia into subependymal, subcortical, and band types has been considered useful because patients in these three groups have different clinicoradiologic presentations and different underlying genetic disorders. This classification of heterotopia may be useful in predicting patient outcome. On MRI; the heterotopic tissue was
isointense with gray matter on all MR pulse sequences. The inversion recovery sequence was considered useful for the demonstration of heterotopic gray matter and the assessment of cortical thickness as it provides a strong contrast between gray and white matter [4, 5]. The main differential diagnosis of subependymal heterotopia on neuroimaging is tuberous sclerosis. The salient features that differentiate the nodules of subependymal heterotopia from the hamartomas of tuberous sclerosis include their ovoid and smooth rather than elongated and irregular shape, isointensity to grey matter rather than isointensity or hypointensity to white matter, and lack of enhancement after gadolinium injection. Treatment is mainly directed at seizure control.

**Differential Diagnosis List:** Subependymal nodular heterotopia, Hamartoma (tuberous sclerosis), Subependymal haemorrhage

**Final Diagnosis:** Subependymal nodular heterotopia

**References:**

Figure 1

Description: A small area of subependymal nodular heterotopia adjacent to the frontal horn of the right lateral ventricle (white arrow) Origin: Dipartimento di Radiologia POLT
Figure 2

Description: A small area isointense to the gray matter adjacent to the frontal horn of the right lateral ventricle (white arrow)  
Origin: Dipartimento Radiologia POLT