A COMPREHENSIVE REVIEW OF ANIMALS IN NEURORADIOLOGY

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ABSTRACT

Neuroradiology remains the most fascinating dimension of radiology; encompassing a variety of interesting radiological signs manifested in the brain with particular neurological disease. Interestingly most of these signs resemble different animals, birds or insects in the brain. Understanding and recognizing these signs aids in successful interpretation of the scans and aids in establishing appropriate diagnosis. The aim of this study is to illustrate these typical neuro-radiological signs resembling various animals and to briefly outline the underlying pathogenesis. **METHOD:** We compiled all these cases with interesting neuro-radiological signs manifested on MRI brain performed at Shifa international hospital, Islamabad from January 2016- December 2019. These include:

1. Hallervorden Spatz disease; Eye of tiger sign
2. Wilson disease; Face of the giant Panda sign
3. Central pontine myelinolysis; Owl eye appearance
4. Glioma; Butterfly sign
5. Joubert syndrome; Bat wing fourth ventricle
6. Metachromicleukodystrophy; Tigroid pattern
7. Dysplastic cerebellar gangliocytoma; Tigroid or leopard skin pattern
8. Meningioma: Tail sign
9. Corpus callosum agenesis; Steer horn ventricles
10. Penguin sign; Progressive supranuclear palsy
11. Caput medusa; DVA.

CONCLUSION: Knowledge of these easily decipherable animal based signs in brain is important as it helps in narrowing down the elaborate list of differentials and also facilitates in making imaging based diagnosis.

Key words: Neuroradiology, Wilson disease, Joubert syndrome, Glioma, Corpus callosum agenesis.

Introduction

Neuroradiology remains the most fascinating dimension of radiology; encompassing a variety of interesting radiological signs manifested in the brain with particular neurological disease. Interestingly most of these signs resemble different animals, birds or insects in the brain.[1] As a radiologist we frequently encounter these imaging appearance and neurological diseases. In order to put forward suitable diagnosis and to narrow down the elaborate list of differential diagnosis; one must be well aware of imaging appearances attributed with underlying particular disease.[2,3] Recognition of these easily decipherable signs not only makes learning process easier but also increases the diagnostic confidence.[3,4] Therefore, aim of this study to provide a comprehensive review of these animals based neuro-radiological sign and to briefly outline the underlying pathophysiology.

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Method

We compiled all these cases with interesting neuro-radiological signs manifested on MRI brain performed at Shifa international hospital, Islamabad from January 2016- December 2019. These include:

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Discussion

EYE OF TIGER SIGN:

The eye of tiger sign classically manifested in Hallervorden Spatz syndrome. It is seen as symmetrical hypointense areas around central region of high signal intensity in the antero-medial globuspallidus on MRI T2WI. The central high singnal is due to gliosis, neuronal loss and high water content, while excess deposition of iron leads to peripheral low signal.[5,6] Other differentials related to presence of this sign include extra pyrimdal parkinsonian disorders, cortical-basal ganglionic degeneration and Steele Richardson-Olszewski syndrome.[6]

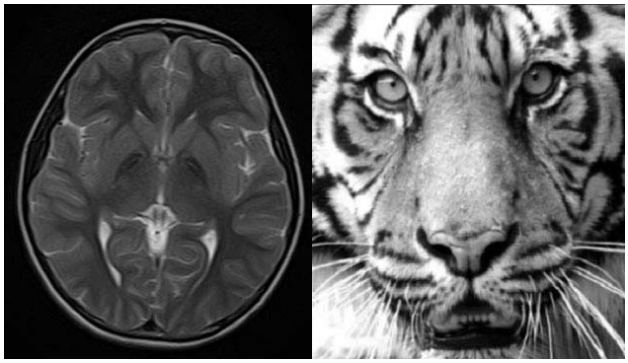


Figure 1: Axial T2WI MRI showing eye of tiger sign in bilateral globuspallidi.

FACE OF THE GIANT PANDA SIGN

The face of giant panda sign was described first by Hitoshi et al. in 1991. It appears as combination of signal abnormalities including hyperintense signals in tegmentum of midbrain, normal preserved signals of pars reticulate of substantia nigra and low signals in the superior colliculus of midbrain on T2WI MRI. The postulated pathogenesis is deposition of heavy metals including copper and iron resulting in paramagnetic effects attributing to these imaging appearances.[7]

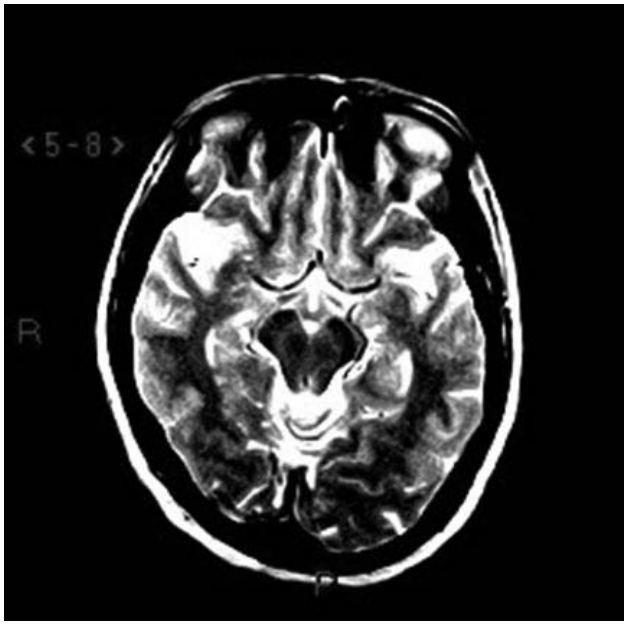


Figure 2: Axial T2WI MRI image showing face of the giant panda sign in the midbrain.

OWL EYE SIGN:

Owl eye appearance of the pons on axial T2WI MRI is described with central pontine myelinolysis (CPM). This demyelinating non-inflammatory disease involves white matter tracts of pons. There is relative sparing of descending cortico-spinal tracts and involvement of transverse pontine fibres leading to Owl eyesign.[8]

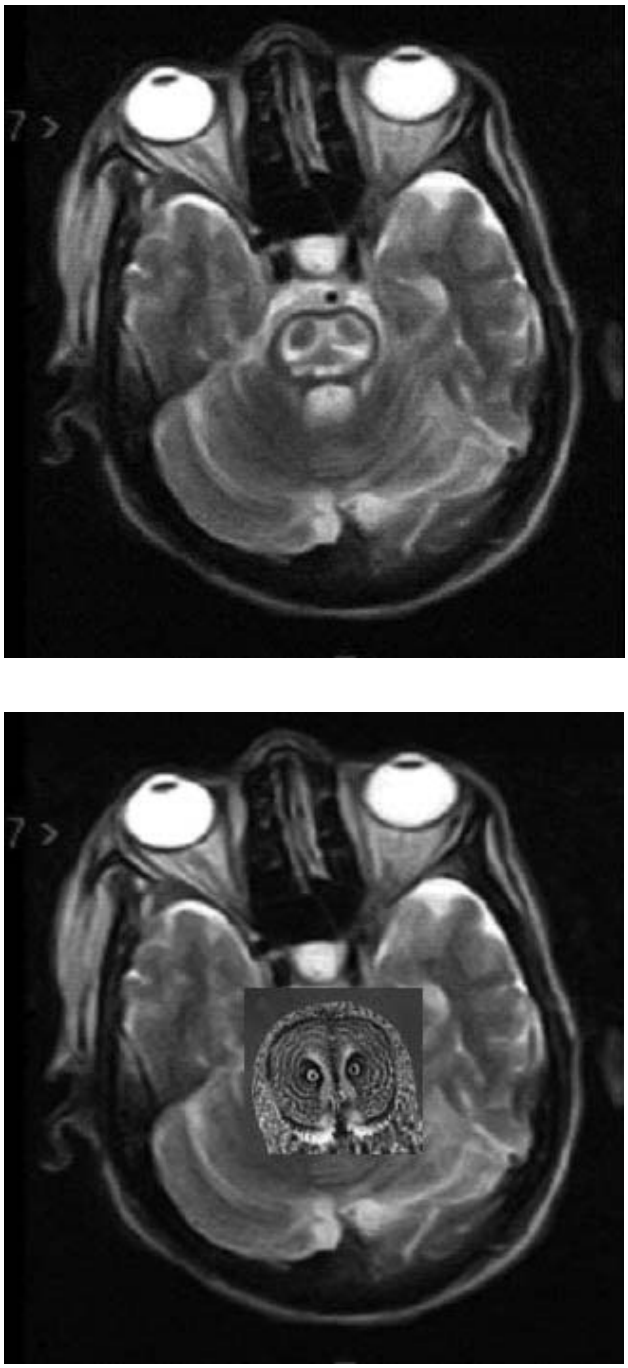


Figure 3: Axial T2WI MRI depicting owl eye appearance in the brainstem.

BUTTERFLY GLIOMA:

The term butterfly glioma refers to symmetric wing like extension across the midline via corpus callosum and is described with high grade astrocytoma/ glioblastoma multiforme (GBM). This sign however is not pathognomic of high grade gliomas and can be seen with many other lesions that cross the midline involving corpus callosum. These differentials include cerebral lymphoma, tumefactive demyelination and metastasis.[9]

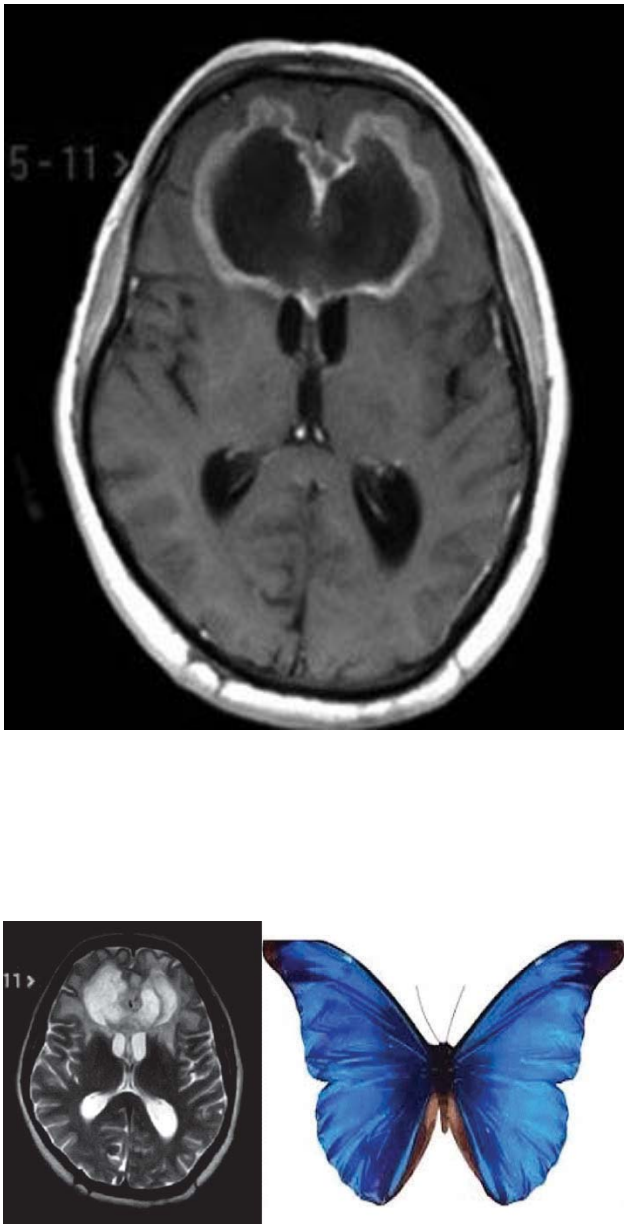


Figure 4: Axial post-gadolinium T1WI and T2WI MRI images showing butterfly glioma.

BATWING FOURTH VENTRICLE:

The bat wing configuration of fourth ventricle is seen with Joubert syndrome. This autosomal recessive disorder leads to varying degress of cerebellar vermis agenesis. Also, crossing of fibres of pyrimdal tracts and superior cerebellar peduncles are absent. The agnesis of vermis is responsible for bat wing shape fourth ventricle.[10] Another sign described with Joubert syndrome is "Molar tooth appearance" due to thickenend prominent elongated superior cerebellar.[11,12]

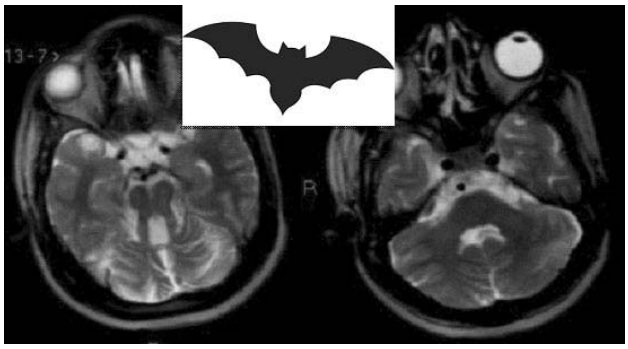
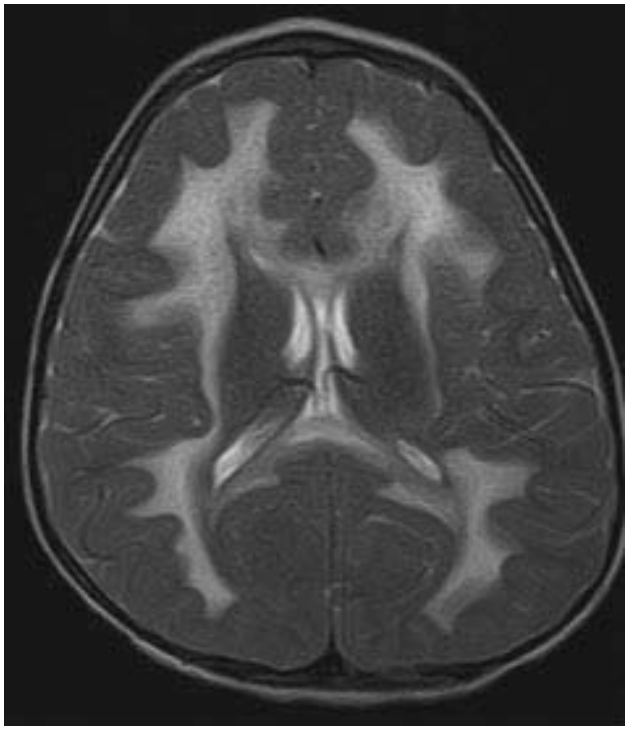


Figure 5: Axial T2WI MRI images showing Molar tooth appearance and batwing appearance in a patient with Joubert syndrome.

TIGROID PATTERN:

Tigroid pattern or leopard skin sign is seen with Metachromicleukodystrophy (MLD), a lysosomal storage disorder classified as dysmyelinating disease. On axial T2WI MRI symmetrical confluent hyperintense areas in the periventricular white matter which in early phases of disease typically spares subcortical U fibers. The peculiar Tigroid pattern is formed due to sparing of the perivascular white matter within the periventricular white matter and centrum semiovale.[13,14]



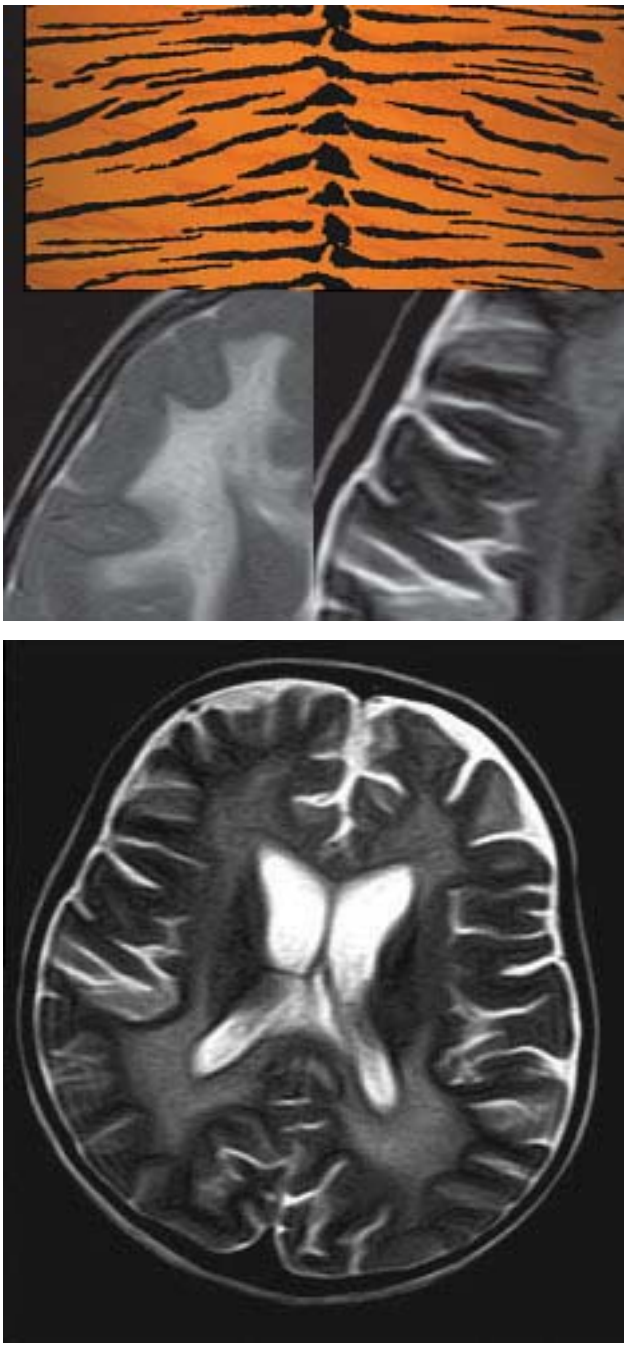


Figure 6: Axial FLAIR and T2WI MRI images showing tigroid pattern in a patient with MLD.

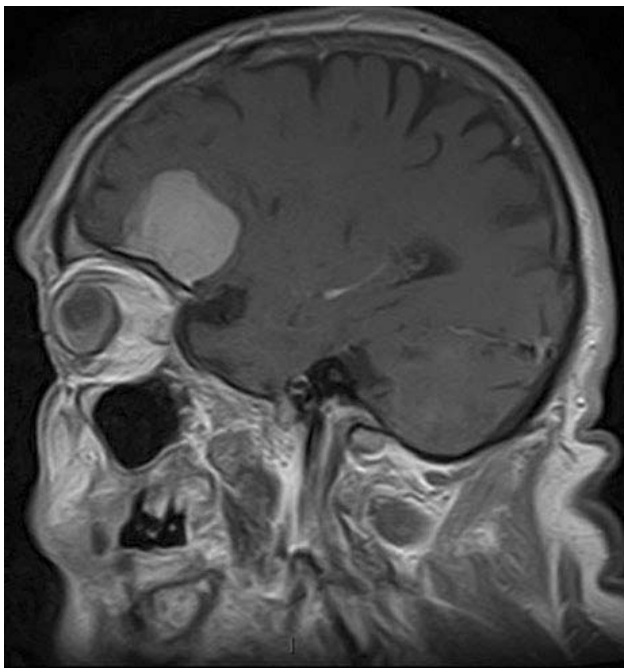
TIGROID / TIGER STRIPE PATTERN:

This sign is refered to alternating bands of hyperintense signals with outer hypointense areas in the cerebellum due to approximation of thickened cerebellar folia, seen in Lhermitte Duclos disease or dysplastic cerebellar gangliocytoma. Cerbellar folia are thickened and hyperplastic however overall architecture of cerebellum is preserved.[15,16] The exact pathogenesis of this rare condition involving unilateral cerebellar hemisphere is not known however thought to be hamartomatous.[15,16]

Figure 7: Axial T2WI MRI image showing tiger stripe appearance of cerebellum seen with dysplastic cerebellar gangliocytoma.

TAIL SIGN:

Tail sign or dural tail refers to a tail like configuration of thickened dura mater adjacent to a mass on post contrast T1WI MRI and appears as a tail extending from the lesion.[17] Most common lesion depicting this sign are meningiomas, with tail sign seen in approximately 60 - 72%.[18] Other differentials showing tail sign on imaging include acoustic neuroma, lymphoma, neurosarcoidosis, metatstasis and glioblastomemultiforme.[17,19]



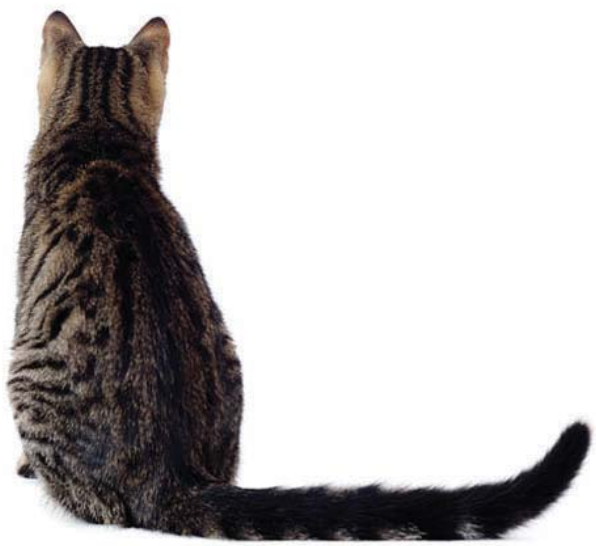


Figure 8: Coronal post-gadolinium T1WI MRI image showing a meningioma with dural tail sign.

STEER HORN VENTRICLES:

This sign is classically seen with corpus callosum agenesis. The lateral ventricles assume abnormal steer or bull's horn like configuration on coronal MRI sequence images due to absence of supporting deep white matter fibres with resultant redirection of longitudinal callosal fibres.[20]

Figure 9: Coronal T2WI MRI image showing agenesis of corpus callosum with steerhorn ventricles.

PENGUIN SIGN:

Penguin sign is demonstrated on mid sagittal T2W1 or T1WI MRI in patients with progressive supranuclear palsy (PSP). There is selective atrophy of mid brain tegmentum with relatively preserved pons assuming a penguin like configuration and reported sensitivity of this sign for PSP is nearly 100%.[21,22,23]

Figure 10: Sagittal T2WI MRI image showing atrophy of midbrain with penguin sign.

CAPUT MEDUSAE:

It is present in developmental venous anomalies (DVA) and appears as tubular structures or snakes that converge towards a common point/ the head on post contrast MRI or CT scans.[24]

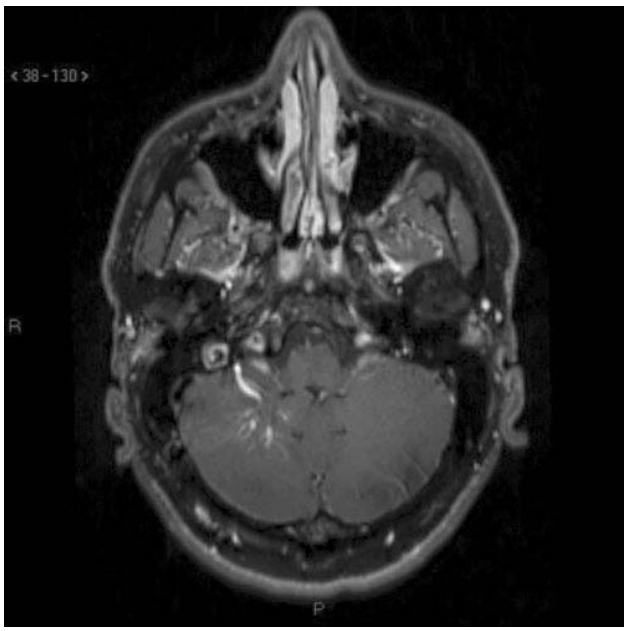


Figure 11: Axial post-gadolinium MRI depicting caput medusa sign.

Conclusion

Radiologist must be aware of these easily memorable animal based signs helping them to recognize certain underlying neurological pathologies. The elaborate list of differential diagnosis can be narrowed down by knowing which pathologies create typical signs on imaging, thus imaging based diagnosis can be made more efficiently and confidently.

Conflict of Interest: None.

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