imaging the world™

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Editorial Greetings from the Department of Radiology,

With the blessings of Paramapujya, , Jagadguru, Sri Sri Sri Dr Balagangadharanatha Mahaswamiji & His holiness jagadguru Sri Sri Sri Nirmalanandanatha Mahaswamiji and under the able guidance of our beloved
Principal Dr MG Shivaramu , we shall take great pleasure to introduce
"IMAGING WORLD" , the quarterly newsletter from our department.
At the outset, we wish express our sincere thanks to our Principal Dr MG Shivaramu for bringing forth the novel concept of newsletter in our institution.

IMAGING THE WORLD , is presented by the Department of Radiology , the branch that has an amazing ability to visualize the body without a scalpel!! . Radiology is now the key diagnostic tool for many diseases and has important role in monitoring and predicting the outcome. Radiologist have become clinical specialists, who have been obliged to also become experts in image capture technology.

Our Department is equipped with dynamic faculty members who are actively involved in both diagnostic workup and academic activities.
In this edition we present to you few interesting cases that we came across , ongoing research projects, upcoming events which will enlighten our dear fellow colleagues and postgraduates in the all the department in their academic venture. The newsletter will be published on a quarterly basis.

We are open for your valuable comments and suggestions. You may contact us at aimsradiology@gmail.com.

Dr. Prashantha Eshwar.

INTERESTING CASE FROM OUR CT CONSOLE ROOM

Scheuermann disease

Introduction: Scheuermann disease (SD) is a spinal disorder named after Dr. Holger Werfel Scheuermann, who, in 1921, first described a structural thoracic kyphosis mainly affecting adolescents.Its best-known manifestations are multiple wedged vertebrae (WV) and thoracic kyphosis known as Scheuermann kyphosis. Its classic diagnostic criterion was "3 or more consecutive wedged thoracic vertebrae," proposed by Sorensen in 1964.

Clinical history:

An 18 year old young female presented with history of low back ache, tiredness and stiffness since 3 weeks.

Clinical examination:

Spasm of paraspinal muscles with limited range of flexion and extension of spine.

The patient was referred to X ray and MRI for further evaluation

Anteroposterior and lateral Xrays were obtained. Thoracolumbar kyphosis noted with Cobb's angle of 25-30 degree.

MRI Findings:

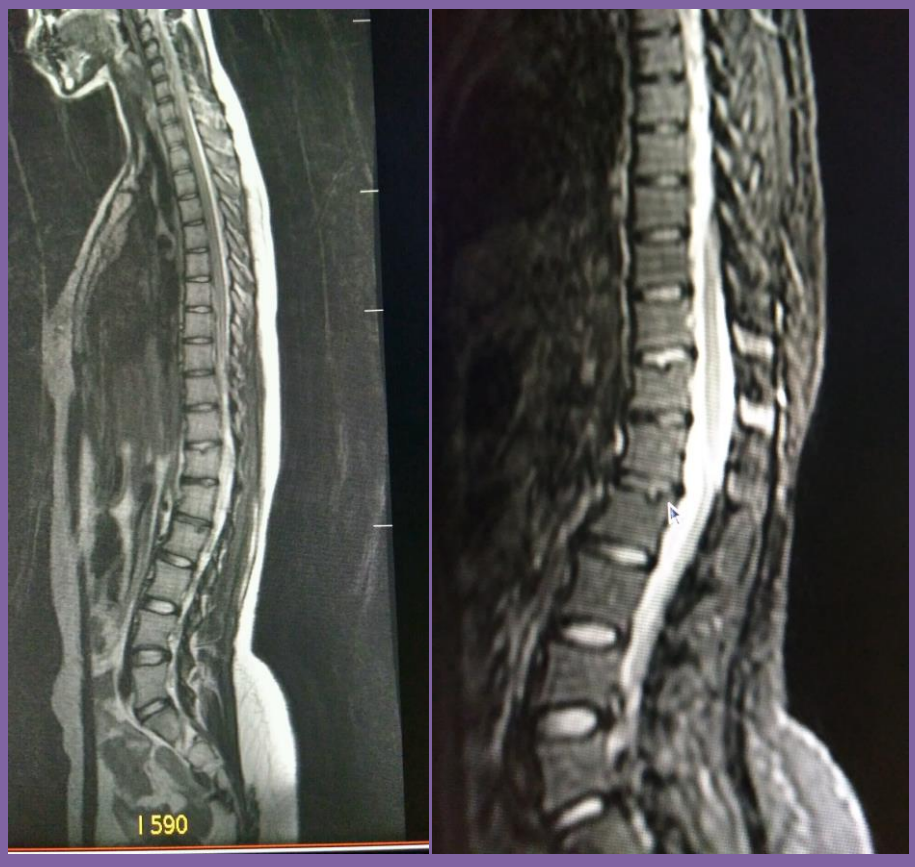
There was kyphosis of the thoracolumbar region associated with anterior wedging of contiguous vertebrae involving D12, L1 and L2. Multilevel Schmorls nodes were noted.

There was associated disc bulges at lower thoracic and lumbar vertebrae.

Diagnosis of scheuermann disease was given.

Discussion: Scheuermann's disease (SD) is the most common cause of degenerative structural thoracic or thoracolumbar hyperkyphosis associated with back pain in adolescents and could be observed in typical and atypical patterns. It manifests itself with successive endplate irregularities and anterior vertebral wedging in radiography, and additionally as disc degenerations, herniations and syringomyelia in spinal cord in magnetic resonance imaging (MRI). Impairment in intervertebral distance and disc degeneration are more evident in SD with atypical pattern. When multiple endplate irregularities and anterior vertebral wedging are observed in MRI of patients thought to have thoracolumbar disc pathology, SD should be considered.

Etiology of SD still remains largely unknown. Among the several theories proposed are elevated levels of growth hormone release, impaired collagen fibril formation and, as a consequence, weakening in vertebral endplates, juvenile osteoporosis, vitamin A deficiency, trauma, epiphysis and poliomyelitis. Recent studies report major effects of genetic background for the disease. Disorganized endochondral ossification, collagen decrease and mucopolisaccaride increase in vertebral endplates have been reported in histopathology of SD. As secondary to these, intervertebral discs can be influenced due to low quality endplate development, which could in turn pave the way for the degenerative disease. SD frequently has a benign prognosis and can lead to small deformities and symptoms. Back pain and fatigue are the most common complaints during the development, which generally clears after skeletal maturity.



Thoracic and lumbar sagittal plane T2 weighted magnetic resonance imaging showing elevated kyphosis at lower thoraco lumbar level, endplate irregularities and disc degenerations and schmorls nodes.

In conclusion, SD could be seen in typical and atypical patterns. Since degenerative diseases accompany SD, especially atypical pattern, when irregularities are detected in successive endplates in patients for whom spinal MRI is requested for disc pathology pre-diagnoses, radiologists should consider SD.

INTERESTING CASE FROM THE CT CONSOLE ROOM

OSMOTIC DEMYELINATION SYNDROME

Introduction: Central Pontine Myelinolysis is brain cell dysfunction. It is caused by the destruction of the layer (myelin sheath) covering nerve cells in the middle of the brainstem (pons).

Clinical history: A 7-year-old girl came with complaints of acute onset of reduced alertness, drowsiness or sleepiness, lethargy, poor responses, slurred speech with previous history of fever one week before.

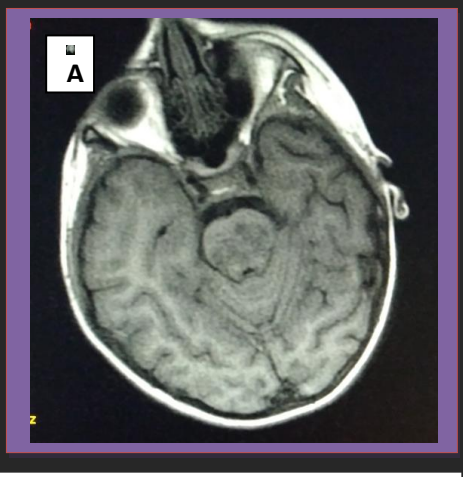
On examination there was weakness in the face, arms, or legs, affecting both sides of the body. The girl was referred to MRI for work up.

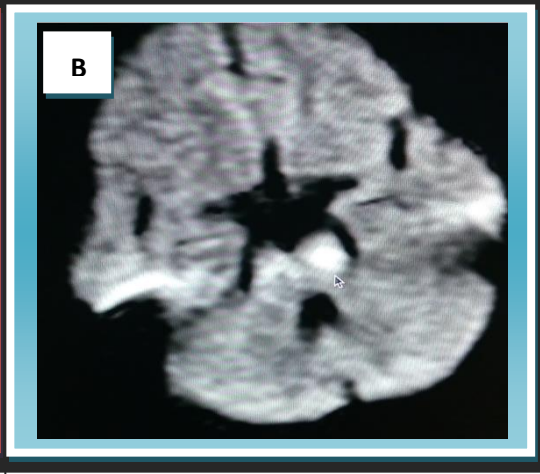
MRI findings:

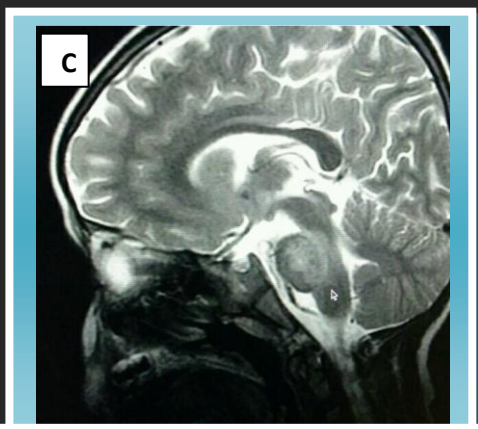
There was T1 hypo, T2/FLAIR hyperintensities involving the central pons, crossing the midline, with perilesional edema extending into the midbrain, cerebral peduncles.

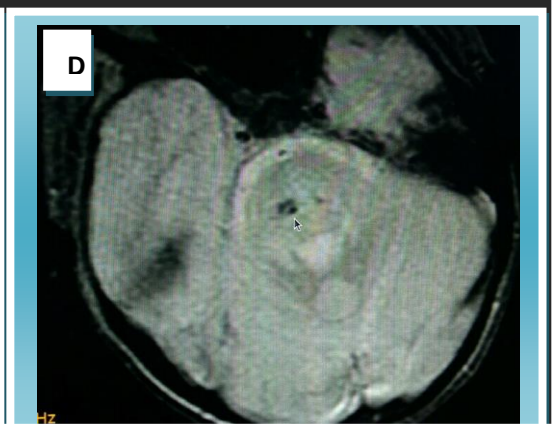
Discussion: Osmotic demyelination syndrome affects men more often than women, and it is most common in middle-aged patients. The mechanism of myelinolysis is not fully understood; however, it is thought to be linked to intramyelinitic splitting, vacuolization, and rupture of myelin sheaths, which is presumably caused by osmotic effects in the setting of correction of sodium levels. Oligodendrocytes, which constitute the sheaths, are particularly sensitive to osmotic changes; therefore, the distribution of the changes that occur with osmotic demyelination syndrome parallels the distribution of oligodendroglial cells . Alcoholic and malnourished patients generally are deficient in organic osmolytes, a condition that may put them at greater risk for developing osmotic demyelination syndrome. Additional comorbid conditions that predispose patients to osmotic demyelination syndrome include prolonged use of diuretics; liver failure; organ transplantation, particularly liver transplantation with cyclosporine use; and extensive burns.

Imaging findings of osmotic demyelination syndrome typically lag behind clinical symptoms, and images acquired within 1–2 weeks after the onset of symptoms often show no features of the disease. Imaging performed after symptoms have been present for 2 weeks has been advocated to help confirm the diagnosis, although osmotic demyelination syndrome cannot be excluded with imaging alone. More recent studies have noted that restricted diffusion may be seen in areas of myelinolysis as soon as 24 hours after the onset of symptoms, and some authors therefore advocate performing diffusion-weighted imaging early in the course of disease .









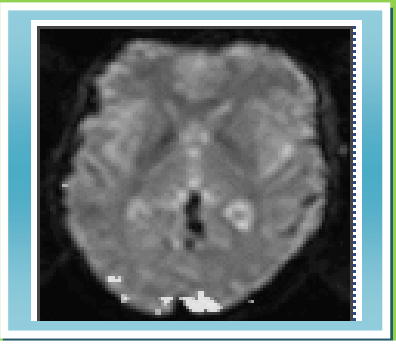
A: Axial T1 weighted image showing hypointensities invovloing the pons. B: There is corresponding diffusion restriction on DWI image. C: Sagittal T2 weighted image showing hyperintensities involving the pons. D: GRE image showing blooming suggestive of microbleeds.

CT is less sensitive than MR imaging in depicting osmotic demyelination syndrome. Areas of myelinolysis are hypoattenuating, usually located within the basilar part of the pons, and lack a mass effect. The pontine tegmentum often is spared. Areas of hypoattenuation also are often seen in areas other than the pons (eg, in the basal ganglia and thalamus); these findings are indicative of extrapontine myelinolysis.A symmetric trident-shaped area in the central pons is a characteristic finding on T2-weighted and FLAIR MR images. The ventrolateral pons and the pontine portion of the corticospinal tracts typically are spared. Decreased signal intensity throughout affected areas, with no mass effect, is a classic finding on T1-weighted images. Less commonly, lesions appear isointense relative to surrounding brain tissue on T1-weighted images.

A little bit about Imaging of function

Most radiological techniques depend on morphological change for detecting disease, while radionuclide imaging primarily shows abnormal function. Positron emission tomography, for example, using the radionuclide labelled glucose analogue 18-fluoro-deoxy-glucose, shows differences in glucose metabolism between benign and malignant tumours, identifying tumour metabolic activity with high sensitivity. Radionuclides can be targeted at specific tumours; for example, ^{99m}technetium-sestamibi detects breast cancers of more than 1 cm diameter with a sensitivity that exceeds 95%.

Developments in magnetic resonance imaging mean that this technique is beginning to challenge the supremacy of radionuclide imaging for functional imaging, particularly in the brain, where structural detail aids spatial localisation. Functional magnetic resonance imaging uses specific pulse sequences and sophisticated image processing techniques to map brain activation in response to various motor and sensory stimuli onto anatomical images. The physiological mechanism exploited is the increase in cerebral blood flow that accompanies neuronal activation. This overcompensates for the rise in the demand for oxygen and causes a relative increase in the oxyhaemoglobin concentration in cerebral blood. Increased oxyhaemoglobin is detectable as a transient local signal change on magnetic resonance imaging—for example, in the occipital cortex during visual stimulation. Sequential studies of brain topography and function in normal volunteers and children become feasible because of the non-invasive nature of magnetic resonance imaging. Applications in clinical practice include preoperative localisation of the motor strip and language areas for neurosurgical planning, and monitoring the effects of psychotropic drugs on cognition. Current high performance magnetic resonance scanners can also show the diffusion of water protons over a distance of a few microns during the application of specific pulse sequences. In evolving stroke, the local diffusion of water molecules is restricted by cytotoxic oedema of ischaemic cells. Signal changes detectable by diffusion weighted magnetic resonance imaging provide early evidence of acute cerebral ischaemia before structural changes become apparent. Patients who are diagnosed during this potentially reversible stage may benefit from thrombolytic drug treatment, and their response can be monitored by diffusion weighted magnetic resonance imaging



Transaxial magnetic resonance imaging scan of the brain showing activation of the occipital cortex during visual stimulation