**I. Cerebrovascular Disease**

Diffusion weighted imaging (DWI) provides unique contrast during the evaluation of acute cerebrovascular disease. It is essential for the detection of ischaemic stroke and provides a unique opportunity to identify the regions of acute ischaemia. DWI shows the presence of cytotoxic edema and vasogenic edema with increased signal and low apparent diffusion coefficient (ADC) values respectively. ADC values are decreased in the acute phase of stroke, providing a window of opportunity for the identification of early ischaemia. DWI is also useful in identifying the extent of ischaemic injury and in guiding treatment decisions. Conventional MRI with T1 and T2 imaging may provide additional information about the extent of damage and the underlying pathology, but is limited in identifying the acute ischaemic changes.

**II. Hypoxic Ischemic Injury**

Pediatric AIS is less common and almost 50% of the pediatric AIS are due to hypoxic ischemic injury. The DWI signal in hypoxic ischemic injury is often hyperintense in the acute phase and hypointense in the chronic phase. Increased ADC values reflect the increased extracellular water with elevated diffusion. Diffusion tensor imaging (DTI) can also be used to assess the integrity of white matter tracts, due to cortical or subcortical demyelination. Diffusion tensor imaging (DTI) is a powerful tool in evaluating the extent of white matter injury and in identifying the areas of fibre damage. The ADC values are also useful in identifying the areas of axonal injury, which are characterised by decreased ADC values.

**III. Axonal Injury (DAI)**

DAI refers to traumatic white matter injury induced by sudden acceleration-deceleration forces. This injury is common in head trauma and is characterised by decreased ADC values (arrows). Additional subtle hazy increased FLAIR signal is seen in the area of injury. Figure 8 shows the typical appearance of DAI on DWI and ADC images. The decreased ADC values are due to axotomy of the white matter tracts, leading to increased extracellular water and reduced diffusion. The FLAIR signal is increased due to the formation of subacute gliosis and macrophage infiltration.

**IV. Shock and Trauma**

Shock and trauma can lead to diffuse axonal injury (DAI), which is characterised by decreased ADC values (arrows). Additional subtle hazy increased FLAIR signal is seen in the area of injury. Figure 8 shows the typical appearance of DAI on DWI and ADC images. The decreased ADC values are due to axotomy of the white matter tracts, leading to increased extracellular water and reduced diffusion. The FLAIR signal is increased due to the formation of subacute gliosis and macrophage infiltration.

**V. Metabolic Disorders**

Metabolic disorders can lead to decreased ADC values (arrows). Increased extracellular water with elevated diffusion is seen in the area of injury. Figure 8 shows the typical appearance of DAI on DWI and ADC images. The decreased ADC values are due to axotomy of the white matter tracts, leading to increased extracellular water and reduced diffusion. The FLAIR signal is increased due to the formation of subacute gliosis and macrophage infiltration.

**VI. Infections**

Infections can lead to decreased ADC values (arrows). Increased extracellular water with elevated diffusion is seen in the area of injury. Figure 8 shows the typical appearance of DAI on DWI and ADC images. The decreased ADC values are due to axotomy of the white matter tracts, leading to increased extracellular water and reduced diffusion. The FLAIR signal is increased due to the formation of subacute gliosis and macrophage infiltration.

**VII. Malignancy**

Malignancy can lead to decreased ADC values (arrows). Increased extracellular water with elevated diffusion is seen in the area of injury. Figure 8 shows the typical appearance of DAI on DWI and ADC images. The decreased ADC values are due to axotomy of the white matter tracts, leading to increased extracellular water and reduced diffusion. The FLAIR signal is increased due to the formation of subacute gliosis and macrophage infiltration.

**VIII. Vascular Malformations**

Vascular malformations can lead to decreased ADC values (arrows). Increased extracellular water with elevated diffusion is seen in the area of injury. Figure 8 shows the typical appearance of DAI on DWI and ADC images. The decreased ADC values are due to axotomy of the white matter tracts, leading to increased extracellular water and reduced diffusion. The FLAIR signal is increased due to the formation of subacute gliosis and macrophage infiltration.

**IX. Traumatic Brain Injury (TBI)**

TBI can lead to decreased ADC values (arrows). Increased extracellular water with elevated diffusion is seen in the area of injury. Figure 8 shows the typical appearance of DAI on DWI and ADC images. The decreased ADC values are due to axotomy of the white matter tracts, leading to increased extracellular water and reduced diffusion. The FLAIR signal is increased due to the formation of subacute gliosis and macrophage infiltration.

**X. Pediatric AIDS**

Pediatric AIDS is a complex disorder caused by the human immunodeficiency virus (HIV) infection. The disease progresses through different stages, including the acute phase, the chronic phase, and the end-stage disease. The acute phase is characterised by the development of opportunistic infections and the chronic phase by the progression of HIV infection. The end-stage disease is characterised by the development of HIV-related complications and the progression to AIDS.

**XI. Pediatric Meningitis**

Pediatric meningitis is a clinical diagnosis and can be caused by various pathogens, including viruses, bacteria, and fungi. The disease progresses through different stages, including the acute phase, the chronic phase, and the end-stage disease. The acute phase is characterised by the development of meningitis and the chronic phase by the progression of meningitis. The end-stage disease is characterised by the development of meningitis-related complications and the progression to meningitis-associated mortality.

**XII. Pediatric Melanoma**

Pediatric melanoma is a rare disease that affects children and adolescents. The disease progresses through different stages, including the acute phase, the chronic phase, and the end-stage disease. The acute phase is characterised by the development of melanoma and the chronic phase by the progression of melanoma. The end-stage disease is characterised by the development of melanoma-related complications and the progression to melanoma-associated mortality.

**XIII. Pediatric Brain Tumors**

Pediatric brain tumors are a group of neoplastic diseases that affect the brain and its surrounding tissues. The disease progresses through different stages, including the acute phase, the chronic phase, and the end-stage disease. The acute phase is characterised by the development of brain tumors and the chronic phase by the progression of brain tumors. The end-stage disease is characterised by the development of brain tumor-related complications and the progression to brain tumor-associated mortality.

**XIV. Pediatric Epilepsy**

Pediatric epilepsy is a neurological disorder characterised by recurrent seizures. The disease progresses through different stages, including the acute phase, the chronic phase, and the end-stage disease. The acute phase is characterised by the development of epilepsy and the chronic phase by the progression of epilepsy. The end-stage disease is characterised by the development of epilepsy-related complications and the progression to epilepsy-associated mortality.

**XV. Pediatric Neurodegenerative Disease**

Pediatric neurodegenerative disease is a group of neurological disorders that affect the brain and its surrounding tissues. The disease progresses through different stages, including the acute phase, the chronic phase, and the end-stage disease. The acute phase is characterised by the development of neurodegenerative disease and the chronic phase by the progression of neurodegenerative disease. The end-stage disease is characterised by the development of neurodegenerative disease-related complications and the progression to neurodegenerative disease-associated mortality.

**XVI. Pediatric Strokes**

Pediatric strokes are a group of neurological disorders characterised by the sudden loss of neurological function caused by the interruption of blood flow to the brain. The disease progresses through different stages, including the acute phase, the chronic phase, and the end-stage disease. The acute phase is characterised by the development of strokes and the chronic phase by the progression of strokes. The end-stage disease is characterised by the development of stroke-related complications and the progression to stroke-associated mortality.