Introduction

Lesions in the cerebellar peduncles include various pathological conditions that may affect the cerebellum, midbrain, and tegmentum, and are associated with various clinical symptoms. This chapter discusses the anatomy, pathology, and imaging features of the cerebellar peduncles.

Anatomy

Cerebellar anatomy (Figure 1A)

The cerebellum is connected to the basis of the brainstem by the third set of cranial nerves (CNs), including the facial nerve (CN VII), the vestibulocochlear nerve (CN VIII), and the superior cerebellar artery (SCA). The lateral and inferior aspects of the cerebellum are connected to the brainstem by the middle and inferior cerebellar peduncles, respectively. The superior and inferior cerebellar peduncles are confluent in the midline and are connected to the brainstem by the bridge of the peduncles. The brainstem is connected to the cerebellum by the cerebellar peduncles and is not directly exposed to the cavity of the fourth ventricle. The anatomical relationships and the functional consequences of the cerebellar peduncles are discussed in this chapter.

Pathology

Infection (Figure 2-4)

The posterior fossa is a source of serious infections due to its close proximity to the brainstem and cerebellum. Routes of infection include hematogenous spread, direct extension from contiguous infections, and neurosurgical procedures. The clinical manifestations of posterior fossa infections include fever, headache, vomiting, ataxia, dysphonia, dysarthria, and cranial nerve palsies. Imaging findings include parenchymal and subarachnoid lesions, edema, hydrocephalus, and mass effect. The treatment of posterior fossa infections is guided by the microbiological findings and the extent of the infection.

Hemorrhage (Figure 5-8)

Hemorrhage in the posterior fossa can be caused by a variety of conditions, including trauma, aneurysms, arteriovenous malformations, and intrinsic cerebellar lesions. The clinical manifestations of hemorrhage in the posterior fossa include headache, vomiting, ataxia, and cranial nerve palsies. Imaging findings include mass effect, edema, and hemorrhage within the cerebellum or brainstem. The treatment of hemorrhage in the posterior fossa is guided by the underlying cause and the extent of the hemorrhage.

Demyelinating disease (Figure 9-12)

Demyelinating diseases of the posterior fossa include multiple sclerosis, acute disseminated encephalomyelitis, and neuromyelitis optica. The clinical manifestations of demyelinating diseases include motor and sensory abnormalities, ataxia, and cognitive deficits. Imaging findings include T2-weighted hyperintensities in the cerebellum, brainstem, and spinal cord. The treatment of demyelinating diseases is guided by the underlying cause and the extent of the disease.

Conclusion

The cerebellar peduncles play a critical role in the function of the cerebellum, midbrain, and tegmentum. Lesions in the cerebellar peduncles can result in a variety of clinical symptoms, including ataxia, dysarthria, and cranial nerve palsies. The diagnosis and management of lesions in the cerebellar peduncles require a thorough understanding of the anatomy, pathology, and imaging features of the cerebellar peduncles.