

# CHAPTER A4

## Infectious Diseases of the Brain

### INTRODUCTION

In this chapter, magnetic resonance imaging (MRI) for the accurate and safe detection and characterization of infectious diseases of the brain is covered, with an additional section on the imaging of cerebral trauma included. Cerebral infections may take many forms, including cerebritis, abscess, or meningitis, and can involve any area of the central nervous system. Though rare today, these infections are of clinical concern and interest in specific patient populations (e.g., the immunocompromised). The timely and accurate diagnosis of such infections is also critical, as they may be rapidly progressive, often culminating in serious or permanent neurologic deficiencies or death. Cerebral infections are fortunately treatable in the majority of patients if detected and addressed early enough, thus placing a premium on quality imaging studies (primarily MRI) for the correct identification and triage of these patients.

In the first unit, *UNIT A4.1*, the imaging of cerebral abscess is outlined, utilizing a protocol that is simple, versatile, and largely applicable to the remainder of the chapter. Also presented are several more complex studies utilizing spectroscopy or diffusion/perfusion sequences to add specificity in the diagnosis of patients with this condition.

For the imaging of patients suspected of meningitis, the protocol outlined in the first unit (*UNIT A4.1*) is largely sufficient; however, in *UNIT A4.2*, several additional (and often quite subtle) “tricks” to elucidate the findings of meningeal infection are described. Also, the optional use of a venous angiographic sequence for the detection of dural sinus thrombosis, a serious and not uncommon sequela of meningitis, is outlined.

The emergence of the AIDS epidemic has brought with it a marked increase in the need for imaging studies which are both accurate and reproducible for these patients at high risk for atypical cerebral infections and tumors. In *UNIT A4.3*, preferences for optimizing the MRI examination in this patient population are presented.

Finally, though not an inflammatory condition, cerebral trauma presents a particular set of challenging clinical problems regarding the patient with neurologic abnormalities that cannot clearly be explained by the trauma sustained, or that may indeed have preceded and possibly caused the traumatic event. The rendering of an accurate prognosis for the patient with cerebral trauma is also an overlooked but important area for optimization by means of directed and comprehensive imaging. MRI adds valuable diagnostic information in the evaluation of head-injured patients because of its high sensitivity for traumatic brain lesions. The optimal MR imaging protocol depends on the timing of the scan (acute versus chronic), the ability of the patient to cooperate during the scan, and the clinical question to be answered. In *UNIT A4.4* a head-injury protocol is presented. Based upon the examination outlined in *UNIT A4.1*, volumetric  $T_1$ -weighted gradient echo, diffusion echo planar, MR angiography (MRA), and spectroscopy sequences found to have utility in certain cases are also described.

The sequences described in this chapter are optimized for a 1.5 T magnet, but can easily be modified to perform high-quality imaging on most MR systems.

Andrew E. Auber and Clifford Belden