The utility of MRI in suspected CNS infection in patients with haematological malignancy - A retrospective 10-year review

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Patients with haematologic malignancy are at increased risk of central nervous system (CNS) infection due to an underlying haematology disorder (e.g. bone marrow failure) or iatrogenic immunosuppression (e.g. systemic immunosuppression, allo-HCT). Symptoms can mimic other diagnoses such as malignant CNS infiltration or treatment related side effects, which may pose a diagnostic challenge. We conducted a 10 year retrospective review of cases of potential CNS infection in this cohort in a tertiary referral centre, describing infectious and non-infectious diseases with correlation with MRI Head.

Methods

MRI Head scans in patients with haematological malignancy in a tertiary referral centre between October 2007 to October 2017 were identified from electronic records (n = 1855). Of these, MRI Head for the investigation of suspected CNS infection were identified using keyword searches of radiology reports (140 MRI Head studies in 110 patients). Each MRI Head study was classified as high probability of CNS infection or low probability of CNS infection. Each scan was independently reviewed by two radiologists and the anatomical distribution of the radiological abnormality were classified as per Table 1. Diagnosis of CNS infection was confirmed by the review of clinical and laboratory data by two clinicians.

1855 MRI Head studies were performed in patients with haematological malignancies over the 10 year inclusion period. Of these, 140 MRI Head studies (7.5%) in 110 patients were performed in the investigation of suspected CNS infection. At the time of imaging, the mean age of the study cohort was 48.05 years (median 52, range 13-81) and 86.4% (95) were inpatients. Underlying haematological malignancies included leukaemia (n=51), lymphoma (n=48), multiple myeloma (n=4), myelodysplastic disease (n=3) and other (n=4). 30 patients had presumed or confirmed CNS infection. Common aetiologies included viral (n=15), fungal (n=5), parasitic (n=4), bacterial (n=4), mixed (n=2) (Table 1). The most common pathogens identified were cytomegalovirus (CMV) (n=7) and toplasmosis (n=4).

In 31 of the 110 patients, MRI imaging findings were classified as highly suggestive of CNS infection by the reporting consultant neuroradiologist. In 77.4% of these cases (24 of 31 patients) a CNS infection was subsequently confirmed following cerebrospinal (CSF) fluid analysis, biopsy or clinical diagnosis (Table 1). 3 of these 31 cases (9.6%) were later confirmed to represent recurrence of an underlying haematological malignancy. An example of this is illustrated in Figure 2.

A low probability of CNS infection was reported in 79 of 110 patients (71.8%). 6 of these patients (7.6%) were subsequently diagnosed with a CNS infection.

The most common anatomical distribution for CNS infection was multicentric, multiple and leptomeningeal.

In all patients, non-infectious diagnoses (n=26) were mainly due to malignant CNS infiltration (n=15), although chemotherapy related toxicity (n=5), PRES (n=2) and intracranial haemorrhage (n=2) were also identified.

Results

Conclusions

In all patients, non-infectious diagnoses (n=26) were mainly due to malignant CNS infiltration (n=15), although chemotherapy related toxicity (n=5), PRES (n=2) and intracranial haemorrhage (n=2) were also identified.

Patients with haematologic malignancy are a unique group who are at increased risk of CNS infection, including atypical infection. MRI Head is shown to be a valuable non-invasive tool in the investigation of suspected CNS infection in patients with haematological malignancy. Intracranial involvement of an underlying haematological malignancy can present within imaging findings similar/identical to infective processes and should remain a consideration. Familiarity with the range and appearance of CNS infections that may occur, alongside potential diagnostic pitfalls / alternative diagnoses in this group is important and can have a profound impact on patient management and clinical outcome.