We found of interest that despite the underlying diffuse arterial wall abnormalities observed in patients with TS, there are no prior reports in the literature of carotid dissection and there is a single case report of bilateral vertebral artery dissection associated with dissection of the aorta [5]. Further studies are needed to determine whether the occurrence of arterial dissection of the neck vessels in patients with TS presenting with stroke is an underdiagnosed disease or a rare association.

Conclusion

Arterial dissection of the neck vessels should be suspected in patients with TS presenting acute ischemic infarction. CTA can be useful in establishing the diagnosis.

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USPIO-Enhanced MRI of Neuroinflammation at the Sub-Acute Stage of Ischemic Stroke: Preliminary Data

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Introduction

Postischemic cerebral inflammation may be involved in delayed ischemic brain damage. The development of noninvasive imaging methods is a critical issue and might allow the assess-

ment of neuroprotective therapies. According to experimental data, brain inflammation is present at the acute stage of ischemic stroke [1]. Ultra-small superparamagnetic particles of iron oxide (USPIO)-enhanced MRI may allow noninvasive monitoring of neuroinflammation [2–5]. In a previous study [5], we investigated 10 patients who presented with acute anterior circulation stroke. USPIO was administered on day 6 and signal alterations following USPIO injection were observed in 9/10 patients on day 9 T₁-weighted imaging. Hematogenous macrophage may act as the main target for USPIO uptake. As far as we know, no data investigating USPIO uptake at an earlier time window has been published in human stroke.

Patients and Methods

We designed a sequential MRI protocol in order to assess brain inflammation in patients with ischemic stroke. We enrolled patients who presented with documented acute anterior circulation stroke, with an NIHSS score ≥ 8 , and who were not eligible for thrombolytic therapy. Oral and written informed consent was obtained prior to inclusion. Major exclusion criteria were: (1) brain hematoma on initial brain CT scan or MRI; (2) Initial MRI performed more than 24 h previously; (3) ambiguous time of symptom onset; (4) lesion size below 1 cm³ on diffusion-weighted imaging on initial stroke imaging; (5) enrolment into other clinical studies; (6) Past history of neoplasia or known active liver disease; (7) Administration of gadolinium complexes within 24 h or iron particles within 6 months prior to this study; (8) Known allergy to dextran or drugs containing iron salts, and (9) current contraindications to MR imaging. The study design was approved by our ethical committee (CCPPRB Lyon B) [5].

The MRI protocol included T₁-weighted imaging (T1WI), gradient-echo T₂* imaging (T2*WI), diffusion-weighted imaging (DWI), perfusion-weighted imaging and MR angiography. Blood-brain barrier (BBB) disruption was defined as post-gadolinium enhancement on T₁-weighted images at day 2 before USPIO administration. BBB disruption was classified as absent, mild (<1/3 of the MCA territory), or severe (>1/3 of the MCA territory). USPIO (ferumoxtran, AMI-227, Sinerem®) was provided by Guerbet (Roissy CDG Cedex, France). It was administered by a single dose infusion (2.6 mg iron/kg body weight) through a 0.22- μ m pore filter at a rate of 4 ml/min immediately after day 2 MRI. Volume of signal changes attributed to USPIO were assessed both on T₁- and T₂*-weighted imaging at day 4. Volumes of USPIO-related signals were delineated manually, by the consensus of two neuroradiologists, in cerebral parenchyma, excluding large vessels. Since the analysis of USPIO-related signal changes could be affected by hemorrhagic transformation (HT) of brain infarction, the volume of HT-related signal changes was assessed at day 2 T₁- and/or T₂*-weighted imaging, and was removed from the day 4 USPIO signal change volume.

Results

The protocol was completed in 5 patients (4 women and 1 man): median age, 67 years (range, 52–75); mean day 2 DWI lesion volume, 111 cm³ (range, 28–201); median NIHSS score at day 0, 14 (range, 10–24). Three patients showed evidence of hemorrhagic transformation on day 2 T2*WI. A BBB disruption was observed in three patients. Parenchymal signal change attributable to USPIO was seen in a single patient on day 4 T1WI, and was confined within the ischemic lesion. A BBB disruption was ob-

Fig. 1. Day 2 pre-USPIO and day 4 post-USPIO MRI in a patient with a right middle cerebral artery infarction. **a** From left to right: Pre-USPIO DWI, T2*WI and TOF MRA disclosing an insular branch occlusion (arrow); the thrombus is hypointense on T2*WI (arrow). **b** Pre-gadolinium T1WI showing within the infarct a focal enhancement attributable to USPIO (arrows). **c** Post-gadolinium T1WI demonstrating a BBB disruption extending beyond the USPIO-related enhancement (arrows).

served in the same patient, extending beyond the USPIO-enhancing area (fig. 1). No USPIO-related parenchymal signal change was detected on day 4 T2*WI in any patient.

Discussion

In addition to positron emission tomography methods using the ligand [^{11}C](R)-PK11195, ultra-small superparamagnetic particles of iron oxide (USPIO) may also assess neuroinflammation [6, 7]. The search for an optimal time window allowing the detection of post-ischemic inflammation is a challenging issue.

A single patient presented an USPIO-related signal change on T1WI USPIO enhanced MRI between days 2 and 4. These results are discrepant with both experimental and clinical data [2–5]. Indeed, a more consistent enhancement was seen in patients during the second week following the onset of symptoms [4, 5], suggesting that USPIO uptake might be dependent on a phagocyte subtype recruited later in the infarct [8]. The infarcts size may have no impact on USPIO-related enhancement. We did not observe any difference in infarct size in patients who had a subacute as-

essment of USPIO enhancement compared to those who had a later assessment [5].

According to the sample size, these data prevent any significant conclusion about the optimal time window allowing the assessment of postischemic inflammation with this method. Accordingly, further studies involving more patients may provide a stronger rationale supporting the use of USPIO-enhanced MRI in stroke patients at the subacute stage of ischemic stroke.

Although experimental data showed a reproducible USPIO-related enhancement as early as 24 h postischemia [3], the higher USPIO doses used in mice and the higher magnetic field strength (7T) might explain these differences. In line with previous studies [4, 5], the USPIO-related enhancement differed from gadolinium enhancement in our patient. This finding is suggestive of an active USPIO uptake due to focal inflammation, rather than passive leakage secondary to BBB disruption.

The present data may highlight some limitations of USPIO-enhanced MRI in assessing the dynamics of macrophagic recruitment in human stroke. In addition, USPIO uptake might be de-

pendent on a specific phagocyte subtype that remains to be identified [9].

To date, available data suggest that USPIO-enhanced MRI is a relevant surrogate marker of neuroinflammation in experimental models. Further understanding of inflammatory processes and improvement of contrast agents targeting neuroinflammation are needed before effective clinical applications.

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The Relationship between Socioeconomic Deprivation, Atypical Respiratory Infections and Survival Outcome in Elderly Stroke and Medical Patients

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Introduction

Socioeconomic deprivation [1–9] (SED) and infections [10–11] are potentially important stroke risk factors. For the first time, we investigated the relationship between SED, atypical respiratory infections and survival outcome in elderly stroke/transient ischaemic attack (TIA) and control medical patients.

Methods

We have reported the seroprevalences of the atypical respiratory pathogens *Chlamydia pneumoniae*, *Mycoplasma pneumoniae*, *Legionella pneumophila* and their association with stroke (90 cases) or TIA (10 cases) versus 87 control medical patients in the C-PEPS, M-PEPS and L-PEPS case-control studies [cf. ref. 11]. The subjects in these studies were Caucasians aged over 65 years recruited prospectively during the period 20 December 1999 until 31 March 2000 in London, England. The controls were admitted with medical conditions categorised as: gastrointestinal (n = 40), musculoskeletal pain/immobility/falls (n = 20), haematological (n = 12), neurological/psychiatric (n = 11) and renal/metabolic disturbances (n = 4).

Within the same cohort, we studied the SED of 92 ischaemic cases and 87 controls using the Index of Multiple Deprivation (IMD) and the Income Deprivation Affecting Older People Index (IDAOPI) deprivation scores [12]. Patients' socioeconomic status was determined from their postcode areas of residence. Patients' survival was determined from health records after 6 years of follow-up terminating on 31 March 2006.

Results and Discussion

The mean IMD scores of cases and controls were 23.3 and 25.0, respectively (p = 0.29), whereas the mean IDAOPI scores of cases and controls were 0.19 and 0.21, respectively (p = 0.22).

In the controls, but not the cases, there was a statistical difference in the mean IMD (p = 0.02) and IDAOPI (p = 0.005) scores between patients seropositive and seronegative for IgM, but not for IgG. This suggested that acute atypical respiratory infection could be associated with SED in the controls.

There was an association between number of pathogens (IgM but not IgG) and IDAOPI scores (p = 0.004), suggesting that acute infection of multiple atypical respiratory pathogens was significantly and specifically associated with income deprivation, in both the elderly stroke/TIA cases and medical controls.

The odds ratios (ORs) for stroke/TIA in relation to IgG seropositivity for atypical respiratory infections have been published