Brain abscesses are less common than brain tumours, but their frequency has increased over the past decade as a result of AIDS and the increasing number of immunocompromised patients.1,2 Abscesses are usually solitary in the frontal or parietal lobe, of variable size, and develop by contagious spread. Multiple abscesses are usually related to pulmonary and dental infections and arise from hematogeneous dissemination.1 Multiple abscesses are serious neurological problems with high mortality and disabling morbidity in survivors.3,4 The causative pathogens of bacterial brain abscess vary with geographic distribution, age, underlying medical and surgical conditions and mode of infection.3 Reports on brain or spinal abscesses caused by Fusobacterium nucleatum are uncommon.4,5 Recently, we cared for a patient with multiple brain abscesses due to Fusobacterium nucleatum and conservative treatment resulted in clinical recovery with only mild cognitive deficits.

CASE REPORT

A 59-year-old woman was found confused in her home. There was a history of moderate ethanol (three cans of beer a day) use. On admission
she was disorientated and suffering from marked neck stiffness. Her body temperature had risen to 38.7°C. The neurological examination did not show focal abnormalities. Contrast enhanced computed tomography (CT) of the head (Figure) revealed nine ring-shaped enhancing lesions.

Lumbar puncture showed granulocytic pleocytosis (32,000 white cells/cu mm; normal <4), elevated protein (5.98 g/L; normal <0.5g/L), elevated lactate (15 mmol/L; normal 1.1-2.1 mmol/L) and decreased glucose (<1%, normal >40%). Microbiological studies of the CSF using PCR technique demonstrated DNA of *Fusobacterium nucleatum*. Blood and CSF cultures were negative. The only predisposing factor in the patient’s history was moderate alcohol consumption. Tests for diabetes mellitus and HIV infection were negative. Ceftriaxon 2g / daily, fosfomycin 3x3g/ daily and metronidazol 3x0.5g / daily were administered for four weeks. In addition, dexamethasone (3x3g / daily) was administered to treat brain edema for ten days. Neurosurgical stereotactic aspiration and drainage was discussed initially but discarded because of rapid neurological clinical improvement. Transesophageal echocardiography, CT of thorax and abdomen and otolaryngeal consultation did not show any source of infection. Dental examination revealed a poor dental hygiene but there were no recent dental infections. The patient improved but intercurrent nosocomial bronchopneumonia required ciprofloxacin (2x0.4g / daily for ten days) and transient mechanical ventilation for four days. The patient later received rehabilitation and recovered with only mild cognitive deficits (impaired attention and memory).

**DISCUSSION**

Despite the demarcation of nine abscesses on the CT scan, including one prominent one in the brainstem, our patient showed only signs and symptoms of diffuse brain dysfunction and no focal neurological deficits. Thus, only two of the typical triad¹ (headache, fever, focal neurologic dysfunction) were present. Further differential diagnosis for multiple ring-shaped enhancing lesions includes primary and secondary tumors, other infectious etiologies such as fungal and parasitic infections, resolving cerebral hemorrhage, radiation necrosis, granulomatous processes and inflammatory demyelinating diseases (see Table).² ³ These were excluded in our patient by history and adjunt laboratory studies.

Microbiological cultures of the CSF and blood were negative.

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**Figure:** Axial contrast enhanced CT demonstrates multiple ring-enhancing lesions.
Demyelinating diseases

Tumour-like lesion with enhancement in multiple sclerosis (MS) or in Radiation necrosis

History of radiation

Granulomas

Tuberculoma, gumma, sarcoidosis

Encapsulated hematoma

Encapsulated hematoma with ring of contrast enhancement and perifocal malformation

Primary or metastatic brain tumours (e.g. glioblastoma, lymphoma)

Space-occupying, perifocal edema, mostly with broad contrast enhancing ring

Other infectious etiologies which mimic multiple abscesses

Subdural empyema, epidural abscess, viral encephalitis, bacterial or acute aseptic meningitis, endocarditis with septic embolism, fungal and parasitic infections

Table: Differential diagnosis of multiple brain abscesses (modified from Grumme et al., Solbrig et al. and Roda et al.)

<table>
<thead>
<tr>
<th>Differential diagnosis</th>
<th>Notations / CT-findings</th>
</tr>
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<tbody>
<tr>
<td>Abscesses / multiple abscesses</td>
<td>Space-occupying, perifocal edema, mostly with small contrast enhancing ring, ring of enhancement often thicker near the cortex and thinner near the ventricle, blood-borne abscesses often found at grey and white matter junctions in the territory of the middle cerebral artery</td>
</tr>
<tr>
<td>Other infectious etiologies which mimic multiple abscesses</td>
<td>Subdural empyema, epidural abscess, viral encephalitis, bacterial or acute aseptic meningitis, endocarditis with septic embolism, fungal and parasitic infections</td>
</tr>
<tr>
<td>Primary or metastatic brain tumours (e.g. glioblastoma, lymphoma)</td>
<td>Space-occupying, perifocal edema, mostly with broad contrast enhancing ring</td>
</tr>
<tr>
<td>Encapsulated hematoma</td>
<td>Encapsulated hematoma with ring of contrast enhancement and perifocal edema usually caused by vascular malformation</td>
</tr>
<tr>
<td>Granulomas</td>
<td>Tuberculoma, gumma, sarcoidosis</td>
</tr>
<tr>
<td>Radiation necrosis</td>
<td>History of radiation</td>
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<tr>
<td>Demyelinating diseases</td>
<td>Tumour-like lesion with enhancement in multiple sclerosis (MS) or in progressive multifocal leukoencephalopathy</td>
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Using PCR, DNA of anaerobic *Fusobacterium nucleatum* was identified as the most probable causative organisms in CSF. Anaerobic isolates are encountered with increasing frequency, but solitary *Fusobacterium nucleatum* is rarely identified. Despite this, we did not find the infectious source and assumed that there was an underlying oro-facial infection, due to the poor dental health of the patient. *Fusobacterium nucleatum* belongs to the family of *Bacteroidaceae*. The term is derived from the Latin word *fusus*, referring to its spindle-shaped appearance. The germ is nonsporeforming, nonmotile, gram-negative and mainly anaerobic. Its pathogenic potential has gained significance in the development of periodontal diseases and, in particular, in oro-facial infections. Infection of other organs such as liver, lung, heart and central nervous system caused by *Fusobacterium nucleatum* are very rare.

Conservative treatment in our patient using antibiotics and steroids was successful. Nevertheless the optimal treatment of brain abscesses is still a matter for debate. Proposed treatment regimens are either antibiotics alone or in combination with systemic antibiotics. Multiple abscesses, small abscesses, early stage of cerebritis or abscesses in an unfavourable location warrant conservative treatment perhaps combined with stereotactic drainage and to identify the causative organism.

REFERENCES